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CONTENTS.

As has been the fashion with international exhibitions, that of this year is opened at the appointed time rather nominally than really, being by no means in order. Even the French exhibits are said to have been a good deal behindhand, though some smaller displays — the Swiss, Japanese, and Chinese, for instance — were entirely ready. The presidency of the Prince of Wales has stimulated the English to extraordinary exertions, and the telegraph, on the opening day, reported their department as the best arranged and most promising, — excepting the French, we presume. It is due to the energy and organizing ability of the American commissioner that the negligence of Congress has not left our country far behind the rest. As it is, although the American exhibit is very much slighter than it should have been, from shortness of time and of money, it is in forwardness not behind some others. It may probably surprise foreigners to be told that a nation of forty millions of people could not spare from its standing army in time of peace, on special invitation, soldiers enough to mount guard in a building fifty feet square; but the telegraph assures us that the marines who were detailed for this duty made a creditable appearance. The American display of tools and machinery is said to do us credit; and we are told that our exhibition of pictures is better than at any previous world's fair. There are some hundred and twenty of them, including a few water-colors. Two thirds were selected by the jury in New York; the rest are the contributions of American artists in Europe. We are sorry to learn that the Americans in Munich have sent no paintings.

IN spite of the predictions of the opponents of the scheme, the threatenings of war, and the machinations of the political adversaries of the republic, who are even reported to have tried during the month of April to bribe the mechanics to abandon work on the buildings, and so bring the undertaking to naught, by preventing their completion, the exhibition of 1878 has at length become an actuality. Coöperation, subdivision of labor, and that light-hearted energy peculiar to the French have accomplished the heavy task of preparing suitable buildings for the largest and best-ordered world's fair that has yet taken place. Of the principal buildings, of which we have spoken already, and of which the daily papers have given frequent descriptions, it is useless for one who has not seen them to attempt to speak critically. It is not to be expected that with an appropriation of only about seven million dollars, out of which a permanent building of the size and avowed architectural pretensions of the Palace of the Trocadéro was to be built, much could be done to make the main building an artistic or imposing construction in anything save size. Its designer and builders may be content if it serves its purpose and is a structural success. Those who visit the exhibition for architectural purposes will probably find more to interest them in the numerous buildings typical of their several countries, which are scattered through the exhibition grounds. These have been designed with unusual care and cannot but prove instructive. Among the most interesting are the Moorish palace, containing the Algerine exhibition, the river front of which will reproduce the façade of the mosque of Sidi-Ben-Medineh at Tlemeen; the Chinese and Japanese buildings, each built by native workmen; and, to Americans, the five English buildings — the pavilion of the Prince of Wales, designed in the Elizabethan style, a half-timbered house designed by Mr. Gilbert Redgrave, with richly carved woodwork, a terra-cotta building furnished by Doulton and the Shoolbreds, a Queen Anne house designed by Mr. Norman Shaw, and another building designed by Mr. Colcutt.

THE explosiveness of flour-dust when diffused through the air, of which we made mention at the time of the explosion of the Greenfield candy factory in New York, has apparently received a startling illustration in the destruction of the flouring mills at Minneapolis. The manner in which the accident occurred can never be made clear, for every man perished who was in the great Washburn Mill where the first explosion occurred; but no other cause than the flour-dust has been seriously argued, so far as is known. The material which could by its detonation throw down in an instant all four solid stone walls of the great mill, more than a hundred feet square, and lift the roof bodily some hundreds of feet into the air, must have been pretty thoroughly diffused throughout the building. The most violent fulminate placed in any part of the mill could hardly have done this; in fact, the more violent it was the more sure it would be to tear away from the rest of the building the parts immediately about it. There was no explosive known to be in the building but the dust of flour, and certainly there could have been none other diffused through it, but this was everywhere. The risk of such catastrophes in flouring mills has become pretty well known, and it is said that in the Washburn Mill great care was taken to guard against it by prohibiting open lights, since the mill had before narrowly escaped being destroyed by the use of them. It is therefore likely that in this case the disaster was the result of some act of carelessness. It must come to be admitted, we fear, that men engaged in fine milling do their work in an atmosphere almost as dangerous as the fire-damp of coal-mines. The loss of seventeen lives and a million of property may probably be enough to make those who have witnessed it careful henceforth, and there are doubtless adequate precautions where people are watchful. But against the carelessness of men there is no ultimate protection.

PERHAPS the accidents that have occurred during the rebuilding of St. John are no more frequent nor severe than might be expected in a city where until lately there has been no building law, and where circumstances have compelled the employment of unknown architects and mechanics, who in some cases have proved to be but little better instructed in the proper ways of doing their work than the owner, who too often undertakes to superintend and direct the work himself. We have an example in the warehouse, already occupied, which was wrecked on Thursday, May 2. The third floor fell, being overloaded by the goods of the tenants, who were manufacturers' agents. The mason who built the building claimed that he and the carpenter remonstrated with the owner for allowing such light floors to be put in, but his warning was disregarded and the floors were put in as directed by the architect. The *Telegraph* states that the joists of the first floor, which were twelve inches deep, had a bearing of twenty-five feet and were "supported by wooden columns, and built up from the rock were brick piers, these, however, being carried up but one story." No warning of the coming catastrophe was given, the floor falling all at once and carrying with it into the cellar the two floors below it and the goods upon them. The walls of the building were not disturbed nor were the windows even broken. Laying aside the consideration of the proper or improper construction of the floor, this accident furnishes one more illustration of the need there is, as we have before said, that the architect should furnish the owner with a statement of how great a weight each floor in the newly finished building is capable of sustaining. It seems that the Superintendent of Buildings in New York is at the present time taking active steps to enforce the law passed in 1871, which declares that "in all storehouses the weight that each floor will safely sustain upon each superficial foot shall be estimated by the owner thereof, and posted in a conspicuous place on each floor thereof." It further provides that the load shall be evenly distributed, and appoints a fine to be collected from owners who disregard this law. Another section of the same law declares

that every floor shall be so built as to be able to bear, in addition to its own weight, seventy-five pounds per square foot, but if it is the floor of an assembly room it must be able to bear one hundred and twenty pounds, and if it is "used as a store, factory, warehouse, or for any other manufacturing or commercial purposes, from 150 to 500 pounds and upwards." The trouble with such laws is that, so far as overloading is concerned, they are very difficult of enforcement; but they are useful in insuring that an owner shall know what it is proper for him to do and give an opportunity, in case of disaster, of bringing the responsibility home to the right person.

Another instance of ignorant overloading is that of a warehouse on Beekman Street, New York, where, on Friday night, May 3, a portion of a basement floor, about thirty feet square, fell into the cellar below. About twenty-six tons of copper and tin in sheets had been brought from a vessel shortly before nightfall, and stored in the warehouse. The floor had often borne heavier weights, and, as it was the intention to rearrange the metal early in the morning, no particular heed was paid to the manner of storing it, so that the greater part of it was placed full in the middle of the floor, where, after an hour, it fell through to the cellar. The weight of the floor and its load at this point seems to have been borne by only two transverse iron beams, which bent under the weight and drew out from the side walls. Moreover, these side walls seem to have been in a very unsafe condition, for the bricks torn away by the fall were of poor quality, and the mortar did not stick to them.

The difficulties which for a long time beset the use of the electric light, and confined it to the functions of a scientific toy, are gradually being overcome, and there is a prospect that it may become a useful commonplace. The success of many experimenters, especially of M. Jablochkoff, has shown what may be done for hotels and factories, and the lighting of the *Place de l'Opéra*, at Paris, has attracted universal attention. One of the chief obstacles heretofore to the convenient use of this light has been the difficulty of economizing the electric current and of subdividing it among a number of lamps which could burn independently. The cost of supplying batteries has been got over by using the induced current of a magneto-electric machine, as is done by Dr. Siemens and others; and latterly Mr. J. B. Fuller, of Brooklyn, is said to have devised a means of subdividing the current so that a great number of lamps can be supplied without interference with each other. He has also invented a form of street lamp which is said to be simple, efficient, and cheap enough for ordinary service, being an adaptation of the device by which the carbon points, laid parallel, are isolated by a slip of glass which melts away as the points burn down. Mr. Fuller claims that with one of his machines he can supply a hundred lamps, placed in a circle of a mile radius, with an expenditure of thirty pounds of coal per hour for steam power in running the magneto-electric machine.

But while the rest of the world is studying the multiplication of lights, Mr. George Magg, of Pittsburgh, has come forward with a project for illuminating that city by three light-houses set upon the hills about it, with "such a flood of light that anywhere in Pittsburgh or Allegheny a pin could be seen if lying on the pavement in the darkest night," — a proposition which has provoked from some unsympathizing newspapers an inquiry analogous to the famous reply: "Who the d—l *wants* to swing a cat?" Most people, we fancy, would have no thanks for the man who seriously undertook to abolish their nights. It is hard enough to find repose in this world as it is, without seeking to absolutely abate the natural distinction between the seasons of labor and of rest. Fortunately there is not much danger that any one would succeed in it. It is the nature of any artificial or secondary illumination, even of moonlight, to offset its light by shadows in which nothing can be seen, and the more brilliant the light, the more impenetrable the shadows, which could only be avoided by a light vast enough, like that of the sun, to fill the general air with luminousness. Unless, then, the light-houses could be set in air directly over the city and made to shed their beams vertically upon it, it would take an inconvenient number of them, we should think, to throw their light into all the streets and alleys of even a rectangular town. There is no knowing, to be sure, how serviceable an atmosphere of smoke may be in diffusing such a light.

The eighth Annual Convention of the American Labor Reform League met in New York last Sunday. Its platform is a very fair indication of what we said a week ago about the connection between the labor agitation and communism. The first resolution says: —

> That since capitalists take life and destroy property to retain their power to steal, the Kearney men, who invoke the halter in California, the Molly Maguires, reported to have killed coal-bosses, and the railway strikers, are lawful belligerents, justly exercising the same rights of defensive warfare applauded in tipping tea into Boston Harbor, in John Brown's march on Harper's Ferry, and in the killing of pro-slavery Southerners by Northern Unionists.

At one with this are protests against payment of the national debt, arguments for female suffrage, for the abolition of marriage and of interest-bearing debts, and for all the lawless desires which are the favorites of radical socialists. We cannot suppose that the workingmen of the country have any interest in this reckless movement, or even that many of them outside of certain great cities know of its existence; nevertheless it shows, like many other things, the persistent effort of the anarchists in the country to get possession of the banner of the workingmen and lead them to the destruction of society, or at least of what gives society its form and security. So far as we know, all the general movements and assemblies held in the name of workingmen throughout the country are under control of people of this sort. Their leaders, mostly people who have been expelled from the orderly communities of Europe by judicial sentence or by natural selection, are cursed with glibness of tongue, and their followers, inaccessible to reason, are open to their eloquence. It is difficult to see what defence in a time of general discontent is to come between the real workingmen and the influence of these men, who plot and persuade in their name, who are the only ones that assume to lead in pursuit of their interests. The incendiary excitement seems to be communicating itself from Chicago to her rival, St. Louis, and to Cincinnati. We read of the arming and drilling of men in these cities with an avowed purpose of extending an armed league through all the cities of the country. The *Army and Navy Journal* recalls the embarrassment of the Government during last summer's riots, and points with alarm to the reduced proportion which our army bears to our population as compared with earlier and more tranquil times, and to the enormously increased range of its duties that comes with an extended territory. But although there are, we may assume, no communists in Congress, there are many there to whom the army gives a convenient opportunity for cutting down expenses, many who are too busy with their little schemes to give attention to the dangers of society, and some who are not afraid to draw their profit from a popular cry that accounts an army solely as an instrument of despotism.

SCHLIEMANN'S MYCENÆ.[1]

II.

In our first notice of this book (*American Architect*, No. 119) we gave some account of the chief points of architectural interest in it, and of the finding of the circular Agora, within which were afterwards discovered tombs filled with splendid treasures. It remains for us to make such mention as we can of the tombs and their contents.

The sepulchres were rectangular pits of considerable size, sunk some way into the solid rock. They were carefully lined for two or three feet from the bottom, and sometimes more, with walls of stone. The bottoms were strewn with a layer of pebbles, and on these lay bodies half consumed, some more, some less, in a stratum of wood-ashes, and heaped with a profusion of ornaments and valuables. Over the bodies was spread a layer of white clay, and over this a second layer of pebbles, above which the earth was filled in. Three of the sepulchres contained each three bodies or skeletons; one contained five, and one a single body. The three skeletons found in one of the tombs were of women, the rest of men. All the bodies lay with their heads to the east, with the notable exception that in the largest tomb three were in this position and two lay north and south. They had evidently been burned where they were found, as was shown by the blackening of the pebbles beneath them and the walls around, as well as by the ashes; the gold ornaments about them

[1] Mycenæ: A Narrative of Researches and Discoveries at Mycenæ and Tiryns. By Dr. Henry Schliemann, citizen of the United States of America. Author of "Troy and its Remains," "Ithaque, le Peloponnèse, et Troie," and "La Chine et le Japon." The Preface by the Right Hon. W. E. Gladstone, M. P. Maps, Plans, and other Illustrations, representing more than 500 types of the objects found in the Royal Sepulchres of Mycenæ and elsewhere in the Excavations. New York: Scribner, Armstrong & Co. 1878

also showed the marks of fire. There was every indication that in each tomb the bodies had been burned and buried simultaneously. One of the sepulchres was narrowed by the lining walls to five feet six inches in width, and the bodies which lay across it had been put in a sitting or perhaps half reclining posture. The body of one of them, an unusually large man, was wonderfully preserved in texture, but absolutely crushed to the thinness of a plank, and his head crowded into his chest, by the tremendous pressure of the twenty or thirty feet of earth and stones which had weighed on him for thousands of years. Dr. Schliemann had a painting made of the body, lest it should crumble before it could be moved; but after being cleverly injected, or embalmed, by a druggist, with a solution of gum sandarac in alcohol, it was carried to Athens in safety.

It is Dr. Schliemann's opinion that the layer of pebbles beneath the bodies was put there to give ventilation to the fires upon it; but it is difficult to see how it could do this at the bottom of a pit, and perhaps the fact that the pebbles made a clean substratum for the funeral piles, and a covering for the bodies, is explanation enough of their being there, both above and below. One may venture to guess that the layer of clay was used for disinfection, being impervious, when we consider the half burnt condition of the bodies. Experience has shown us that even in these days of blast furnaces and retorts, complete cremation is not easily accomplished, and we might suspect that in the heroic ages it was not looked for — out of poetry — which is perhaps in itself sufficient reason for a custom of burning bodies in the pits that were to be their sepulchres.

There is good reason to doubt, we think, whether the tombstones which were found several feet above the sepulchres were contemporaneous with the burial, and we do not understand that Dr. Schliemann assumes them to have been so. They seem to have been placed without any very exact reference to the position of the tombs below, except the round structure which he calls an altar, and which he distinctly says was over the centre of one tomb. It looks rather as if they might have been set by some later generation to mark the spots which pious tradition assigned as the resting-places of venerated ancestors, from which the original memorials had disappeared through violence or accident. At any rate the workmanship of them, though analogous in style, as would be natural, is so out of keeping with that of the objects found in the tombs, and so inferior, that it is difficult to believe that the people who could command the one would be satisfied with the other. But to this we may have occasion to recur.

We will not follow Dr. Schliemann through the many reasons by which he supports his foregone conviction — which is apparently accepted, but more cautiously, by Mr. Gladstone — that these were the tombs and bodies of the murdered Agamemnon and his companions. He lays chief stress on there being five tombs, as Pausanias had said; on the somewhat irreconcilable postulates that the bodies were buried in royal splendor, and yet crammed into their sepulchres with unseemly haste and violence; and that the identical manner of the interments shows them to have been all simultaneous. A few suggestions, however, occur to the reader of the book, which it is natural to mention. The sepulchres are indeed five, and doubtless were in Pausanias's time. But the bodies are fifteen, which are more than the Homeric legends provide for, to say nothing of bodies found buried outside the royal tombs. The arrangement of the tombs does not look as if they were laid out together. They are jumbled in the Agora like graves in a country churchyard, sometimes almost interfering, as if they had been put in successively wherever room was found. They are not excavated uniformly, but are capriciously irregular in depth and level as well as in position. One of them is lined with a straight wall of large stones laid dry; others with a sloping or battered wall of irregular rubble laid in white clay; one has a lining of inclined slabs jointed with clay, and another a sloping wall faced with similar slabs. All these irregularities suggest a successive rather than a simultaneous construction. On the other hand, the way in which the bodies are sorted out in threes, the women together, may suggest an opportunity for distribution that would not have occurred unless a large number of bodies had been buried at the same time. But this arrangement again encourages the idea of some peculiar rites of burial; a habit, for instance, of burying a royal person of either sex with two faithful attendants, whom the casualties of war might commonly make ready, or who might even be immolated for the occasion. There are, as we have indicated, two marked exceptions to such an arrangement, — the tomb with a single body and that with five, — exceptions which may or may not indicate a difference in the habit or preference of successive generations. It is noticeable that the sepulchres are distinctly proportioned in size to the number of bodies they contained, showing that they were deliberately adapted to their use; and it is a matter of regret that Dr. Schliemann does not tell us whether he detected any such differences in the condition in which the adjacent bodies lay as might indicate a superiority of either personage. This was to be looked for especially in the large tomb where two of the five bodies lay with their heads in a different direction from all the other thirteen. It was evidently a matter of feeling or rite, and not of convenience; for anybody who will take the trouble to draw a diagram, to scale, of the plan of this sepulchre, which was eighteen by ten and one half feet on the floor inside the lining walls, its length being north and south, will see that there are only two ways in which five bodies might have been conveniently arranged in it. The natural way was to lay all side by side across the floor, the axes of the bodies being east and west, as was the case with all the other bodies in all the tombs. The other way, which is according to Dr. Schliemann's account, and which would not have been adopted without a distinct reason, was to turn two of the bodies at right angles to the rest and make them lie north and south, as if to class them apart, probably as a mark of inferior rank. We do not find, however, in the accounts of the book, any evidence of a difference of estate, except perhaps in the fact that one of the women wore an enriched crown and the others simpler diadems; and, it may be, some slight indication in the form of the masks they wore that the two bodies which lay across the direction of the others were those of younger men.

As for Dr. Schliemann's theory of haste and indignity in the burial, the facts which he cites seem to tell directly against it. The laborious hewing of sepulchres in the solid rock, the careful lining with stones laid in clay for mortar, and in some cases the facing of these stones with smooth slabs, the regular disposition of the bodies, and the way in which they were heaped with all manner of precious articles, all seem directly opposed to it. The thing in which he puts most reliance is the way in which the body we have mentioned as found crushed had been, as he thinks, violently thrust into a grave that was too small for it, so as to force its head down upon its breast; but who can say, from the appearance of a body which has been loaded for centuries with tons of earth and stones, whether it was first crowded rudely into its place or seated reverently with its back to the wall, as it has been the habit of many peoples to seat their dead?

We cannot attempt a detailed account of the smaller objects which Dr. Schliemann found in the tombs and during his excavations. Our readers may see them illustrated in the book itself, which we trust they have read or will read, and have found descriptions of them in many notices of the discoveries in newspapers and magazines. The records of actual exploration have shown nothing comparable to them in romantic interest; we have to turn to the discoveries of Aladdin for a parallel to their splendors, which have dazzled the public as their age and relationship have puzzled the archæologists. In the *débris* which encumbered the Agora, as well as at Tiryns, and indeed everywhere, Dr. Schliemann found abundance of fragments of pottery; in the upper strata, as he says, of the Macedonian epoch, and lower down, shards and vessels of more archaic times, both hand-made and wheel-made. There were none or almost none of the so-called whorls, such as were found at Hissarlik; but a great store of rude animals in terra cotta and an immense number of shapeless little figures which he calls idols. A theory which he holds of the meaning of Homer's βοῶπις, which he translates "cowheaded," leads Dr. Schliemann to call all his animals cows and all his figures cowheaded Junos, a theory into which we shall not venture to follow him. Beads of glass and stones were found, gems cut in intaglio, some of them with very considerable skill, axes and arrowheads, both of stone and of bronze, bronze swords in great numbers, rings and various ornaments, but nothing of iron, except one or two knives and keys in comparatively recent strata. The absence of iron might be accounted for by its perishable nature, were it not that several carved objects of still more perishable material, bone and wood, were found in fair preservation at the very bottoms of the sepulchres.

The details of the burial of these bodies are interesting as a chapter of archæological study, but do not as yet lend much assistance to the classification of the Mycenæan antiquities, for want of examples for comparison. The position of the bodies,

with their heads toward the east, is a common usage in the burials of early and primitive races. Certain analogies in the modes of burial, as well as in the workmanship of the ornaments found with the bodies, have led Mr. A. S. Murray, of the British Museum, to suggest that Dr. Schliemann may have discovered only Germanic remains, — a scepticism in which we believe few authorities agree. It is to the objects found in and near the sepulchres, the pottery and metal work, that the study of archæologists will be chiefly directed, and here there is room for much comparison before their classification can be fairly established. The pottery is of a kind which does not find a place in any chronological system thus far determined, and Mr. Murray is inclined to allow it no earlier date than the sixth century B. C. It bears, however, striking analogies to that recently discovered at Ialysus and Camirus in Rhodes, at Santorin, and in Cyprus; and it will not be till all these have been thoroughly studied and some classification of them fixed, that its place can be determined. The goldsmith's work offers, by its profusion and the curious characteristics of its design and execution, the most attractive subject for examination; and without attempting to disentangle the intricacies of archæological research, we shall try to give some account of it in a third article.

HEAT AND VENTILATION. II.

[*See page 155, ante.*]

But to return to our main point, the necessity of supplying purified and mildly temperatured air to all our fellow-citizens. Is it not somewhat remarkable that human beings should by the mere power of habit come to love what they have loathed? And yet they do so. They actually defend the perpetuation of the air-poisoning to which I have referred, and which is one of the effects of the combustion of the fourteen ounces of carbon that Dr. Liebig says are burned daily within the body. The share of impurity of the air thus contributed by each living furnace has been variously estimated. "From experiments with men of different stature," says the eminent English engineer, Dr. Bernau, "Menzies found that from fourteen to eighteen respirations were made in a minute; and others have found they vary from thirteen to twenty-two; the average generally assumed is twenty respirations in a minute. The quantity of air drawn into the lungs at each respiration varied from 40.7 to 46.7 cubic inches; and under all the circumstances, Menzies considered 720 cubic inches about the average quantity of air inhaled by a healthy man in a minute. A woman may inspire, on an average, about five hundred cubic inches; a mean inspiration from a healthy pair of the species will not, probably, exceed 612 cubic inches in a minute.

"The fresh air before it is taken into the lungs is composed of 23.2 per cent of oxygen, 75 5 per cent of nitrogen, about 1½ per cent of carbonic acid, and a variable quantity of vapor of water. After it has been expired from the lungs, in which it remains from ten to twelve seconds, it contains a larger quantity of vapor, the same quantity of nitrogen, from 11 to 12 per cent only of oxygen, and between 8 and 9 per cent of carbonic acid; so that nearly a half of the oxygen or vital element of the air has been changed into carbonic acid. If atmospheric air contains merely 3.5 per cent of this gas, it is unfit to support animal life. Air, therefore, which has been expired from the lungs contains twenty-four times this quantity; so that a person who inhales 600 cubic inches a minute renders 1400 cubic inches unfit to be breathed again.

"The amount of exhalation from the skin varies also in different individuals, and from the same person at different times. A hand emitted ½ of a grain in a minute, at another trial ½ of a grain, and in a third experiment it exhaled ¾ of a grain of vapor in a minute; which is 45 grains a minute for the whole body. If one of each sex be taken, the mean will be about 23 grains each in a minute."

We must not suppose, however, that these air-poisonings through the exhalation of our bodies have been observed only in modern times. The architectural remains left us by the ancients clearly testify to a thorough knowledge of the evil and to the endless strife to overcome it; and even their garments were varied, like our own, according to the temperature, day, or season. People must have an outlet for the carbonized air of their bodies, in their dwellings, and an inlet for new heat-impregnated pure air. The Esquimaux gets his warmth from the train oil and his powerful ventilation from his snow hut; while the French lace-makers, who work only during the night, produce an artificial climate by getting some farmer to allow them the privilege of working in the stable where his cows are tethered. "The cows are tethered in a row, on one side of the apartment, and the lace-makers sit cross-legged on the ground on the other side, with their feet buried in straw. The cattle being out afield by day, the women work all night; and numbers of young men of their own rank resort to these cow-houses, and sit or lie down on the straw beside their sweethearts, and sing, tell stories, and say soft things to cheer them in their labors."[1]

So in primitive days, as well as at present amongst primi ive people, heat was unconsciously sought for by men as the effective means of ventilating their bodies. For those exhalations of our bodies are carried from the body by diluting them with atmospheric air, which at a certain temperature can hold in suspension only a certain quantity of vapor, the amount of which is shown in the following table,[2] the first column giving the temperature of the air, and the second column the number of grains of water a cubic foot of it will contain, in the form of vapor, at that temperature.

Temperature.	Grains of Water in a Cubic Foot of Air.	Temperature.	Grains of Water in a Cubic Foot of Air.
32 degrees.	2.53	62 degrees.	6.57
33 degrees.	2.63	63 degrees.	6.79
34 degrees.	2.71	64 degrees.	7.01
35 degrees.	2 80	65 degrees.	7.23
36 degrees.	2.89	66 degrees.	7.44
37 degrees.	2.97	67 degrees.	7.66
38 degrees.	3.06	68 degrees.	7.89
39 degrees.	3.15	69 degrees.	8.13
40 degrees.	3.23	70 degrees.	8 39
41 degrees.	3.37	71 degrees.	8.65
42 degrees.	3.50	72 degrees.	8.92
43 degrees.	3.63	73 degrees.	9.19
44 degrees.	3.76	74 degrees.	9.48
45 degrees.	3 89	75 degrees.	9.78
46 degrees.	4.02	76 degrees.	10.10
47 degrees.	4.15	77 degrees.	10.38
48 degrees.	4.27	78 degrees.	10.69
49 degrees.	4.40	79 degrees.	11.01
50 degrees.	4.53	80 degrees.	11.33
51 degrees.	4.68	81 degrees.	11.66
52 degrees.	4.83	82 degrees.	12.05
53 degrees.	5.03	83 degrees.	12.35
54 degrees.	5.17	84 degrees.	12.71
55 degrees.	5.34	85 degrees.	13.08
56 degrees.	5.51	86 degrees.	13.45
57 degrees.	5.67	87 degrees.	13.87
58 degrees.	5.86	88 degrees.	14.23
59 degrees.	6.04	89 degrees.	14 61
60 degrees.	6.22	90 degrees.	15.00
61 degrees.	6.39		

According to the table a cubic foot of air at the freezing point can retain 2.53 grains of water only; if, therefore, it contains 1 grain only, then each cubic foot will absorb or carry off 1.53 grains of vapor from a moist surface, which may be the insensible perspiration from the surface of the body. If this air be heated to 60°, a cubic foot of it will carry off 5.22 grains of moisture from the skin; for it is seen from the table that air at 60° can suspend 6.22 grains of water. To carry off 23 grains of insensible perspiration per minute will therefore require about 15 cubic feet of the colder air, and about 44 cubic feet of the warmer air. If less than this be supplied, the moisture will accumulate on the skin, and the air of the room become saturated with vapor. And this moisture will be still further increased by the air entering the house through the windows. It has been ascertained that each square foot of glass in a window will cool about one cubic foot of air as many degrees per minute as the temperature of the room exceeds the temperature of the external air. If a window has 5 square feet of glass, and the temperature out of doors be 32° and in the room 60°, then 5 cubic feet of air will be cooled 28° in a minute. Of the quantity of cold air admitted at the crevices round the window-sashes and round the door no definite estimate can be given; it depends on the position of the window above the floor, on its fitting, on the difference of temperature between the room and the air outside, on the force of the wind, and other causes. If three times the width of the sash, added to twice its height, be multiplied by three, it will give about the number of cubic feet of air cooled from this cause. The crevices round the sashes of a window 4 feet wide and 8 feet high will cool about 8.5 cubic feet in a minute. Twice the width, added to the height of a door, multiplied by 26, will give the cubic feet of air cooled per minute for that opening. When well made, a door 3 feet wide and 7 feet high will cool about 5.2 feet in a minute.

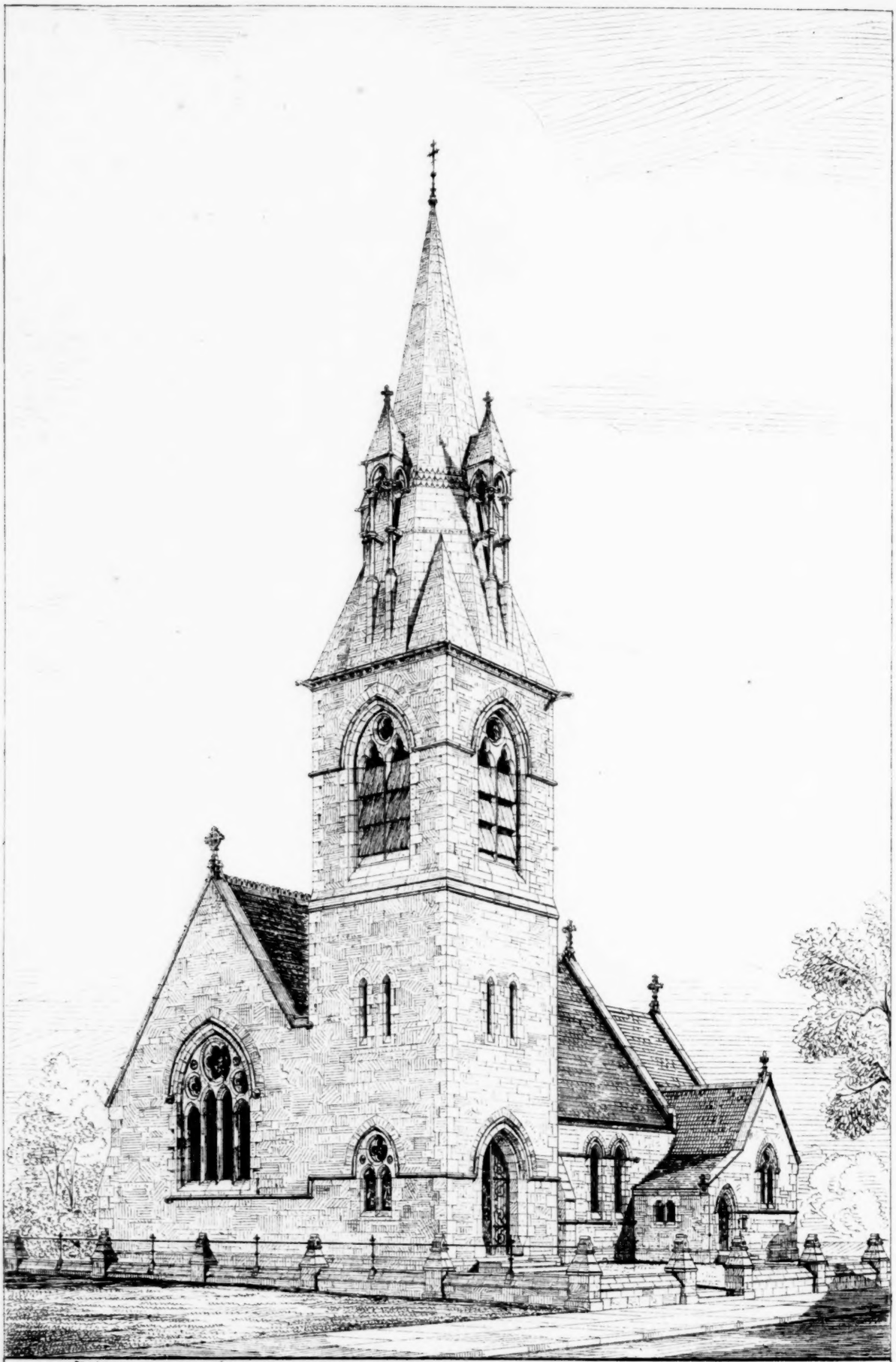
The absorption and radiation of heat from every 200 square feet of the wall, ceiling, and floor may be taken on an average as equal to cooling one cubic foot of air per minute as many degrees as the internal is warmer than the external air.

In fixing the quantity of heating surface to produce this effect, some other points have to be considered. The wind, for instance, greatly accelerates the cooling of the walls and windows in any state of the air. The air being moister at one period than another, its power to carry off heat is much increased; and there are also great changes of temperature. So that if a steam-pipe or a hot surface were sufficient to heat a certain sized building at one time, it might prove insufficient when the air was at the same temperature but windy, or when it was moist, or when the temperature fell.

As the hot water, steam, or hot air apparatus cannot be enlarged, nor its temperature raised beyond a certain point, and as it must be proportioned to meet the greatest degree of cold that is likely to occur, the usual way to make an allowance for these contingencies in practice is to calculate the quantity of surface that would be required to heat the building, if the outside air were at the lowest degree to which it had ever fallen in the place where the apparatus is erected.

[1] St. John, Journal of Residence in Normandy.

[2] Daniel, Meteorological Essays, p. 158.



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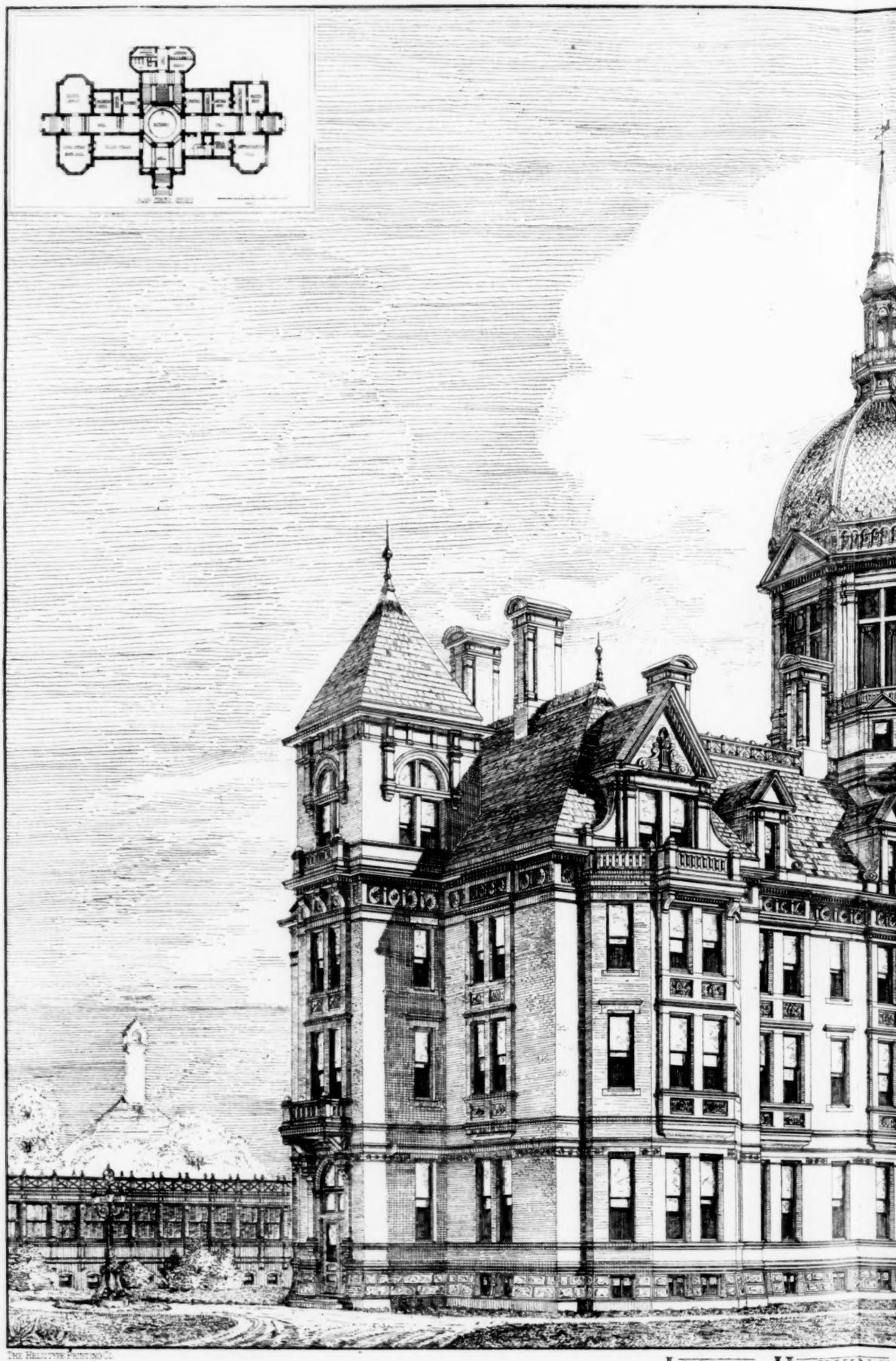

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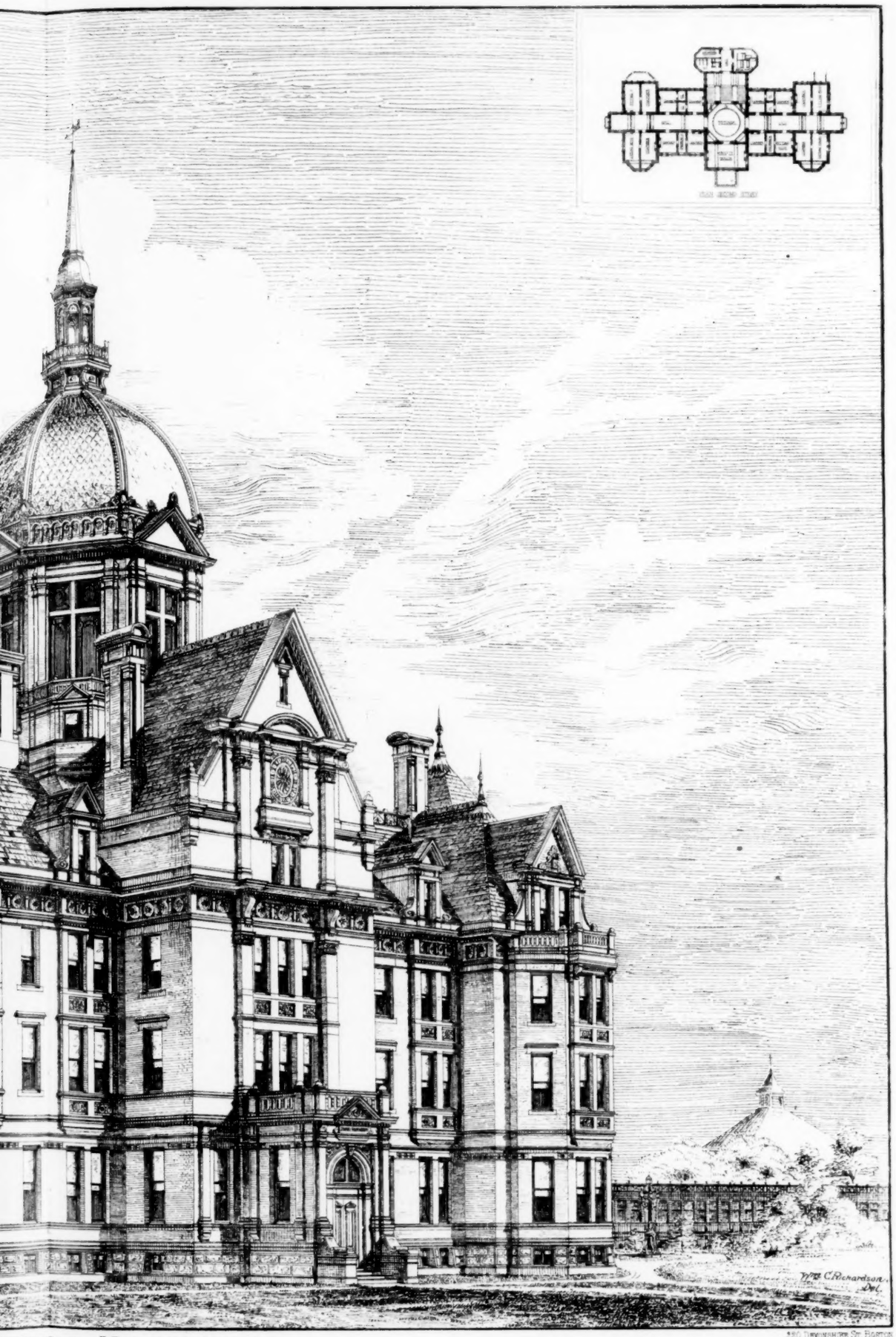

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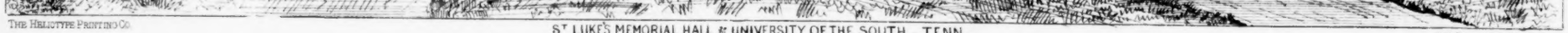

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H. HUDSON HOLLY. ARCHITECT

In estimating the quantity of steam or hot water pipe that should be placed in the room described, to allow 161.9 feet to be heated in a minute, the statement would be thus: external air at zero, temperature of room 64°, pipe-surface 200°, then by the rule $125 \times 64 \div 136 \times 157\frac{1}{4} \div 222 = 41.1$ feet of 4-inch pipe which would be required.

The quantity of air to be heated being determined, the size of the aperture for the egress of the vitiated air may be found in the following way: —

Temperature.	Bulk.
32 degrees	1.000
212 degrees	1.375
302 degrees	1.5576
392 degrees	1.7389
482 degrees	1.9189
572 degrees	2.0976
680 degrees	2.3125

In a room 16 feet between the floor and ceiling, when its temperature is 64° and the air outside is 32°, the warm air will flow through an aperture in the ceiling with a velocity of 7.8 feet in a second; if the number of cubic feet of air required for ventilation in a second be divided by the velocity thus found, it will give the area in square feet of the aperture required. In the above example, as 1619 cubic feet are to be removed in a minute, the ventilator must have an area of about 43.2 square inches. This also may be the size of the opening to admit the cold air; but in practice it is made considerably larger, to diminish the velocity of the air at entering the room.[1]

I have said that the art of ventilation and regulating the temperature of a dwelling or city was well known to the ancients. They applied it in its two most important forms of the sewer and the chimney, and perfected it to a comparatively rare degree; but with the great invasion of the Asiatic barbarians over Europe this art perished with all other arts and sciences, nor did it revive until the twelfth and thirteenth centuries, when the Minnesinger created a new poetry, when the gigantic conceptions of the Strassburg and Cologne cathedrals were being wrought out, and the science of law received new form fitted to modern circumstances, under the direction of Frederic II. of Hohenstauffen, — the second emperor of the Old German Empire, whose Code may well compare with that of Justinian or that of Napoleon, as he was perhaps their equal in statesmanship and the art of war.

Indeed, the bodily refinement which followed the culture excited by the crusades and the consequent revival of all ancient art, literature, and learning could not long endure contentedly the nauseating effluvia of unventilated rooms and undrained houses. Rigord, the physician of Philip Augustus, the King of France, at the close of the twelfth century, relates that one day the king, after walking to and fro in the audience chamber of his Parisian "palace," went to look out on the river for recreation; some citizens happened to pass at the moment under the window where the king had placed himself, when the substance forming the street, being stirred up by the revolution of the wheels, exhaled a stench so intolerable as to overpower Philip. Urged by the disgust thus excited, the king exerted himself to persuade the citizens to pave their streets with stone, he himself being rather lacking of cash; and to perfect still further the works of purification and prevent the future desecration of the cathedral, through its remaining a common corner of convenience, his piety and zeal for decency incited him to surround the sacred edifice with a wall, by which means, his biographer observes, he so improved his capital, that from being called Lutetia (*lutia a luti fœtore*) or "Mud city," on account of its dirtiness, it was henceforth named Paris, after the beautiful son of King Priam.

After the advantages of drainage and purifying the air had thus been detected and some of the means discovered by which these results could be more permanently established, such as making the streets solid and with gutters, men suddenly discovered a treasure in the earth, which for centuries had been lying there in its black ugliness, until a Promethean spark made it burst forth upon the astonished people as not only a giver of wondrous light, but also a dispenser of the most gracious and easiest attainable warmth. About the end of the twelfth century a notice of coal appears as an article of traffic and as a staple element in the social comfort of Great Britain. In the *Leges Burgrum*, enacted at Newcastle about 1140, the especial privilege of not being distrained but for their own debts is granted in Scotland to the inbringers of fuel, which is described to be "wood, turfs, and peats." With respect to coal there is a complete silence, from which it has been somewhat hastily concluded, that, though coal must have been known, it was not used as fuel. The first legal notice of this mineral is in a grant, made in the reign of William the Lion, by William de Vetereponte, to the monks of Holywood, of a "tenth of his coal at Cariden," and in the Chartulary of Newbottle, there is in 1189 a grant to the monks by De Quincy, Constable of Scotland, of the coal between Whiteside and Penkie, which is also confirmed by King William.

In 1239, Henry III. granted a charter to the inhabitants of Newcastle to dig for coal, which is the first legal mention of the fuel in England. Its properties and value must, however, have been long known in this locality before the privilege to dig for it was thought worth a payment of one hundred pounds a year. The use of the mineral seems to have rapidly increased, for in 1281 Newcastle is said to have had a considerable trade in it; and about the end of the century, coal was imported into London for the use of brewers, dyers, smiths, and others. So strong, however, was the prejudice of the citizens against its use, from a belief that its fumes corrupted the air and were most injurious to health, that in 1306 Parliament petitioned the king to prohibit the burning of the noxious fuel within the city. The royal proclamation having failed to abate the growing nuisance, a commission was appointed to ascertain who burned coal within the city and in its neighborhood, and to punish them by fine for the first offence and by demolition of their furnaces; and if they persisted in transgression, more rigorous measures were to be resorted to. Subsequently a law passed making it a capital offence to burn coal within the city, and only permitting it to be used in forges in the neighborhood. Among the records in the Tower, Mr. Astle found a document stating that in the time of Edward I. a man was tried, convicted, and executed for the crime of burning coal in London. Yet it is difficult to reconcile this extreme rigor with a claim made to Parliament for the sum of ten shillings for pit coals that had been ordered, but not paid for, by the clerk of the palace, and were burned at the king's coronation, which took place a few years afterwards. Shortly after this, coal was exported; and in 1325, a vessel, the property of Thomas Rente, of Pontoise (a town at that time belonging to England), trading to Newcastle, returned with a cargo of pit coal. It is probable that at this time it was a marketable article in the place of importation. In all likelihood the trade had increased, for in 1327 the measure of coal became an object of municipal regulation; in Scotland, also, its use was gaining ground; in 1329 a chaldron of coal appears charged to the Scots Parliament. It had become a common article of traffic when Sir William Douglass and Sir Simon Fraser, a few years afterwards, surprised the English garrison in Edinburgh Castle. He and his party, according to the chronicler, went to sea, and purchased oats, oatmeal, *coal*, and straw, and landed at a port about three miles from the stronghold; they loaded twelve horses with these articles, and disguising themselves "in old thread-bare clothes with torn hats like poor tradesmen," they proceeded to the castle and offered their merchandise for sale. When admitted by the porter within the first gate, they flung off the loads of two horses, which consisted of coal, directly upon the sill of the gate, so that it could not be shut, and then seized the porter, whom they murdered instantly, and placing the remainder of the coal also within the gates, so that they could not be closed, "the dire coal merchants introduced their companions within the castle."

Together with the discovery of coal as the most excellent material for heating purposes, came the application of glass windows to houses, to the marvellous effects of which as an agent in the process of ventilation we have already referred. At a future time and occasion we may perhaps expound more at length another of its wonderful powers, to which Mr. Shove has given special attention in the book alluded to at the beginning of this essay. Meanwhile we propose to set apart hygiene as a part of the science of architecture.

[1] Walter Bernan on Warming and Ventilating Rooms and Houses.

THE ILLUSTRATIONS.

JOHNS HOPKINS HOSPITAL, BALTIMORE, MD. MESSRS. CABOT AND CHANDLER, ARCHITECTS, BOSTON; MR. JOHN R. NIERNSÉE, CONSULTING ARCHITECT, BALTIMORE.

THIS scheme contemplates twenty or more buildings, which will occupy fourteen acres of land crowning one of the hills upon which Baltimore is built. The perspective shows the Administration Building, which will be built of Baltimore face brick and Cheat River stone, a fine-grained blue stone; the decoration to be of terra cotta of the same color as the brick. The very responsible position of superintendent of construction is held by Mr. John E. Marshall, one of the most experienced builders of Baltimore.

ST. THOMAS'S CHURCH, HANOVER, N. H. MR. FREDERICK C. WITHERS, ARCHITECT, NEW YORK.

The foundations of this church were laid in 1873, and the nave was built in the following year. The funds were raised by subscription. In 1876 the chancel and robing-room were added, at the expense of Mrs. C. A. Harris, of New York, in memory of an only child. The view herewith given shows the church complete with the tower, which is to be built at some future time. The walls are constructed of local granite laid in random courses of small stones with rock face, the heads and beds being squared. The finish is of New Brunswick stone. The timbers of the nave roof are exposed to view, the trusses being constructed with hammer-beams and curved braces resting on moulded stone corbels. The chancel ceiling is boarded under the roof timbers, which are arched, and divided into panels by moulded ribs. The east window is filled with stained glass, made by Daniel Bell, of London; the subjects are the Birth, Crucifixion, and Resurrection of our Lord, in the three lights, and the Ascension, in the large circle in the head. There is accommodation for about three hundred worshippers.

ST. LUKE'S MEMORIAL HALL, UNIVERSITY OF THE SOUTH, TENN. MR. H. HUDSON HOLLY, ARCHITECT.

CLEOPATRA'S NEEDLE. — The salvors of the Cleopatra obelisk have been awarded $10,000 and costs.

SIR GILBERT SCOTT.

He was, so to speak, the artist of reason. He first cleared his own mind as to what he wanted, and he then worked up to that result with the precision of a mathematician solving a problem. He was not only the typical architect of a school and age, but he was to that age the administrator of the principles which the school existed to teach. With him the poet never absorbed the philosopher, although the philosophy which he wooed was that of constructive rhythm. This peculiarity of temperament manifested itself in some well-defined idiosyncrasies. Those who have made a consecutive study of his works will have noticed some successive "manners" in them. He was at first strongly and exclusively English, — and to the last his allegiance to specific English architecture was always true and loyal, — but very naturally those studies in German architecture which the Hamburg commission necessitated had for a time their influence on his style. Later in life he passed under the fascination of Italian Gothic, and, although he never yielded to it so complacently as some younger men, traces of Southern taste continued to adhere to his works. He there realized the value of a richer variety of material in marbles, terra cotta, etc., than mediæval England pointed to. Both Germany and Italy had taught him the value of brick. From Italy, too, we believe, he brought back a certain flavor of *rangedness*, graceful more than strong, in his pillars and windows, which it is impossible accurately to describe in words, but which, more than any other peculiarity, marks off his designs. In Italy, especially, he learned to appreciate the undeveloped value to Gothic art of the dome, as yet reckoned in the vulgar estimation as the badge of the other side; and we fancy that he never felt a greater artistic disappointment than that of having failed of the opportunity to give material expression to the conviction. On the other hand, the occasion which the Albert Memorial, coupled with the Albert Chapel at Windsor, offered to him of experimenting, in concert with brother artists, on fresh materials and combinations, — glass mosaic, for instance, and metal work on a large scale and for external use, — in addition to the compliment involved in his being selected for those commissions, made the work one of peculiar importance in his eyes. It was no doubt the result of his cautious forethought that, although he was as anxious as any other architect of his party about the decorative accessories of his buildings, and although, as founder and foster-father of the Architectural Museum, he took a more self-denying interest in the art-workman movement than other men, he never was tempted like some of his brethren to be his own designer of artistic accessories. He ordered and he superintended his painted glass, his roof and wall polychrome, his apparatus in the precious metals, his hangings and embroideries; but he never furnished the absolute design, as Pugin did, and as some very eminent architects are still accustomed to do. He was indeed his own designer in woodwork, in pavements, and in the various combinations of iron and brass, — making the sculptured reredos and the choir screen his specialty; but the bulk and the value to the structure of the products of these materials bring them within the legitimate sphere of the absolute architect's studies.

There have been, we suppose, few men of whose personal character the popular idea, founded on inferences derived from the multiplicity of the works which he carried through, is more erroneous than of Sir Gilbert Scott. He has been popularly looked upon as the great master manufacturer who boasts of turning out his products wholesale —

Diruit, ædificat, mutat quadrata rotundis —

by telegram or mandate to his obsequious cohort of clerks, without much more personal feeling for the individuality of each article than the mill owner can be credited with for each successive bale of stuff. The real man was, with all his accumulation of work, genuinely modest, sensitive, anxious, and painstaking, and even self-tormenting over results which had cost him infinite time and thought. We do not hesitate to say that we think that Sir Gilbert Scott might with much advantage have retrenched his area of operations, nor can we deny that their number and variety involved the repeated risk of things being done which had not passed under the master's eye. But when once his attention was drawn to any such mishap, the genuine and conscientious earnestness of the man came into play. He was undoubtedly at his constructive best where the building was conspicuous; grandeur, bulk, intricacy of plan, and a public destination stimulated his inventive qualities, while he had but a subaltern interest in the small and the simple. But there was even a better side than his constructive one in his ethical nature, when he seemed to assume a double individuality and take himself into counsel so as to place his powers as an architect at the service of the patient intuitiveness which marked his archæological character. To unriddle and to revive an old building gave him all an antiquary's genuine pleasure; and if that building were one of the importance and grandeur of St. Albans, Ely, St. David's, or one possessing so strange an architectural history as Bangor Cathedral, his enjoyment became perfectly enthusiastic. We need only point to the anxious and daring work of engineering now in progress to save the fabric of St. Albans. He was the first himself to own that in the earlier days of the restoration era he was, like all his compeers, too exclusively possessed with that artistic partisanship which grasped the idea of a perfect epoch, and was too lightly willing to sacrifice, at a real loss of historical association, that which stood in the way of its symmetrical revival. But every year saw Scott more conservative, more anxiously painstaking, more appreciative of historical association and of the picturesque grouping of forms, not very noble in themselves, but valuable as elements of contrast. It was accordingly with a genuine grief of heart and a self-diffidence against which his antecedents and assured position ought to have fortified him, that Sir Gilbert Scott met the rough and inconsiderate assaults which have been recently made upon the practice both of himself and of his school by that knot of critics who have so oddly exalted Queen Anne into the patron saint of anti-restoration. He replied to them in an admirable spirit of candor, confessing to his blunders and the experiences which had been the schooling of himself and of his contemporaries, and relying on his fairness to demonstrate the injustice of a charge of which the basis was a misrepresentation of his motives. But when he had done this he seemed to be more hurt at the imputation of Vandalism than elated at the completeness of his vindication. — *Saturday Review.*

CORRESPONDENCE.

A CATHOLIC SCHOOL-HOUSE. — THE WINDSOR TOWN HALL. — THE CAPITOL. — TRINITY COLLEGE LABORATORIES.

Hartford, Conn.

A Catholic school is now building from plans by Messrs. Brown and Stilson, of New Haven. The school will be built by the parish of St. Joseph, now building the cathedral mentioned in a former letter. The site of the school will be at no great distance from the new state capitol on Capitol Avenue; the lot is a corner lot; already the ground has been broken and excavations begun. The building will have a frontage of 106 feet, with projecting bays on either side, and will be 74 feet 4 inches in depth. The façade will be marked by two bold projections 24 feet wide, carried up and finished with gables, and an intervening curtain wall pierced at each story by a series of six narrow windows. The building will be three stories high, exclusive of the basement. On the front of the building, in each L, will be the entrances, one for girls and one for boys, the hall-ways occupying the entire length of the L and also having entrances on the rear. The material used in the construction of the building will be red brick and Portland brown stone, which will be used for the foundations, caps, and sills throughout, for the walls to the height of the water-table, and for the entrance steps. The comparative plainness of the structure will be relieved by string courses and elaborate bands of ornamental brickwork, which are carried entirely around the building. The gables show brickwork corbeled out on either side of the stone coping, and the wall face of the gables at the intersection of the coping lines is enriched with ornamental brickwork, while in the curtain wall of the principal façade diaper brickwork will be shown above the series of square-headed windows, these and other instances of the use of brick, showing studied design, are seen in the principal cornices and in the chimneys.

The ground floor plan provides six school-rooms, three for girls and three for boys. The rooms for the girls occupy the projecting portions of the building on the left and a front room in the central part of the structure, the corresponding apartments affording school-rooms for boys. Near the rear entrance, and beneath the principal flight of stairs, are the steps leading to the basement. This will have a cemented floor, and being amply lighted will give space for play-rooms. Intersecting the main entrance hall on the ground-floor is a broad passage, from which doors open to the school-rooms. Each of the six school rooms is planned for the accommodation of sixty-four pupils. The rooms are well ventilated, the chimneys being provided with all the necessary flues and ducts. The first floor is arranged similarly to the ground-floor, the building thus furnishing twelve school-rooms in all. The second floor gives a large hall with two convenient anterooms. The roof upon the central part of the school is carried up higher than the adjoining ridges, and is crowned by a bell tower with pyramidal-shaped roof having extending eaves. The building throughout will be plainly finished in ash. At this writing the contracts have not been awarded, but approximate estimates place the cost of the structure in the neighborhood of $25,000. It is proposed to prosecute the work steadily when once begun, with a view to the occupancy of the school early in the fall.

Mr. S. W. Lincoln, architect, has in hand the plans for a town hall to be built at Windsor, a few miles north of Hartford. The materials used are brick, set off with bands and courses of black brick, and brown stone for window caps, sills, etc. Exteriorly the hall measures 50 by 73 feet, the front being broken by a tower whose walls are carried up to a height of 80 feet and are pierced at their upper portion by windows with louvre openings. The building is two stories high, exclusive of the basement: the principal floor supplies offices for the town authorities, and the floor above provides a hall with galleries. The finish will be plain in design. The cost of the entire work will not exceed $7,000.

About the time of the recent occupancy of the state house by the Connecticut legislature, work was resumed upon the dome of the building, which is now being pushed forward, or rather upward, at a rapid rate. Some modifications and changes have been made of late in the design of this prominent feature. From the line of the main roofs to the bottom of the cone the dome is dodecagonal in form, and above the cone is a lantern upholding the pedestal for the crowning bronze figure. The lantern originally presented a series of twelve gablets supported by lofty columns; the number has now been reduced, the gablets numbering but four, with eight supporting columns,

three miniature columns beneath each gablet being worked into the composition. The whole study is an improvement on the original, and shows more clever handling of details. Already the dome has risen about 80 feet above the principal roof lines, and displays much boldly executed work.

The praise which has been bestowed upon the arrangements and appointments of the rooms for the chemical department at the new Trinity College buildings is well merited, and the opinions are of value as coming from professional chemists who have visited the college and have compared the newly-finished rooms with other laboratories in this country and abroad.

The chemical lecture-room, on the ground-floor of the lecture-room block, is about 30 feet wide by 33 feet long; it is 15 feet high, and occupies the width of the block from east to west, thus having the advantage of light on two sides. The side walls are each divided by narrow piers of masonry into three bays. The piers support stone corbels, upon which rest the iron beams of the floor above. At a height of six feet from the floor the walls are pierced by triple windows filled with leaded sashes, one foot eight inches wide and three feet six inches high, with mullions of light stone; these triple openings compose a large window, whose head is marked by a six-lobed opening, the central portion of which is fitted with a circular iron frame swinging on a pivot. A swinging iron frame midway in the height of each window provides for the admission of air, and ventilation is secured by a large fireplace and by ventilators communicating with a great duct in one of the immense chimneys which flank the central portion of the block, and into which empties a horizontal duct extending the length of a wing of the building. The upward current in the great duct is strengthened by means of a steam coil. The chimney-piece of stone, reaching nearly from floor to ceiling, is built with a large hood, the lower opening of which is some six feet from the floor, the projection of the chimney-piece being two feet from the wall face. The room is fitted up in ash. The centre and a portion of the south bays are filled to the face line of the intervening piers by apparatus cases which are lined with zinc painted an India red, for protection against moisture and vermin.

The lecture-table, one of the most important features of the room, is eighteen feet long, two feet nine inches wide, and two feet nine inches high, and is divided symmetrically into seven sections. At the extreme right is a pneumatic trough. To it water is admitted by means of an external cock, and it can be expeditiously emptied by a very large waste-pipe ; the overflow is arranged to preserve a constant level, and the trough has movable shelves for the support of apparatus. The other sections are filled by shelves and drawers for various purposes. Gas is introduced at convenient intervals. Swing leaves at either end of the table increase its lineal dimensions to twenty-two feet. A circular opening in the top of the table has communication with a flue carried up in the chimney near by, to serve as a downward draught in experimenting with noxious gases. A sink with drip and supplied with hot and cold water is on the left of the chimney in a portion of one of the south bays.

The lecture-room is connected with two rooms in the central portion of the block, each about sixteen feet by twenty feet, one used as a private office for the professor, the other serving as a private laboratory, and between it and the lecture-room proper is a large segmental-arched opening in the wall, fitted on both sides with sashes hung on weights. The intervening space will be used for experiments in the course of which dangerous gases are evolved. The bed of the opening is a blue-stone slab, for the support of apparatus which is set at a level with the lecture-table, and is equally accessible from the lecture-room and from the laboratory. Across the opening upon the lecture-room side a black-board can be drawn when desired. This board when pushed back runs in a groove between two other boards in a framework, which are hung on chains running over fixed pulleys, and so arranged that when one is raised the other is lowered. The private laboratory is well lighted by double western windows, and also has a north light ; it is fitted up with working-tables, open shelves, cupboards, sink and drip, and a Bunsen pump over a working-table.

Beneath the laboratory is an apparatus-room, to which access is had by means of a private staircase ; a lift also runs up from this room to the laboratory, to facilitate the transportation of apparatus. Beneath the office is a store-room connected with the apparatus-room, and also with the students' laboratory below the lecture-room before described. This basement laboratory is amply lighted, and is nine feet six inches in the clear. It will be fully equipped. A sand bath and two furnaces for fusions will be built up against the chimney, and apparatus for condensing steam to provide distilled water will also be placed. In time laboratory desks arranged after the manner of alcoves will be put in for the use of students.

The arrangement of these details has been perfected by the professor of chemistry in association with the architect.

CHETWOOD.

AMERICAN INSTITUTE OF ARCHITECTS.

BOSTON CHAPTER.

THE regular meeting for May took place at the Architectural Library of the Institute of Technology on Friday, the 3d inst., President Cabot in the chair.

The committee appointed to raise money to assist Mr. J. F. Clarke's proposed explorations among the remains of the Doric order in Europe reported that the requisite amount had been assured to them. The amount voted by the Society for this purpose at the meeting of March 7 is therefore available.

The chairman of the committee on treasurer's accounts reported informally that they had examined the books of the treasurer and found no error in the record of receipts and expenditures so far back as October, 1876. Their examination did not cover any period preceding that date. The committee was then discharged.

The Society then proceeded to consider the subject appointed for discussion : " The Colonial Architecture."

Mr. Stephenson read a paper on the Old Houses of Jamaica Plain, the object being mainly to present a historical record of such houses, and including notices of their architectural characteristics.

Mr. Cabot made a statement concerning the characteristics of some of the colonial houses yet remaining in the neighborhood of Newbern, N. C.

The discussion was illustrated by drawings and photographs of the architectural antiquities of Salem, Marblehead, Boston, and other points in the neighborhood. The point was elicited that the gambrel roof seemed to be indigenous to this country, and followed the pitched roofs, making its appearance about the year 1675. Mr. Ware asserted his belief that it was a feature borrowed by the descendants of the Puritans from the Dutch in New York about the year 1680. The technical peculiarities of the style were considered, especially the characteristic of wide panels, the use of traditional forms in mouldings taken from contemporary works such as those of Batty Langley and Chippendale, and the gradual attenuation of the classic orders, a peculiarity attributed by some of the members to the legitimate influence of material, the proportions preserved in our work of the eighteenth century having been apparently adjusted to the necessities and convenience of constructions in wood.

Mr. Peabody then read a paper on the ante-revolutionary brick architecture and wrought-iron work yet remaining in Philadelphia and its neighborhood, illustrated by sketches. This neighborhood seems to be especially fertile in what is now known as Queen Anne work, apparently affected, however, especially in churches, by traditions from the Swedes who preceded Penn and his followers in the building of the city.

The thanks of the society were cordially voted to Messrs. Stephenson and Peabody for their interesting papers. There were also exhibited at this meeting a portfolio of sketches by Mr. Bulfinch, the architect of the state house, and many other conspicuous buildings of the preceding generation.

After which the meeting adjourned.

WARING'S CHECK-VALVE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — On page 144, issue of April 27, of your paper, in an article on modern plumbing, you publish a cut of Waring's check-valve which is far from correct, and apt to mislead those who are unacquainted with it, and consequently is an injustice to me, the manufacturer.

The illustration represents this valve as being an utterly useless invention, without accomplishing the results that are claimed for it.

As the illustration shows what this valve will *not* do, I will ask as a matter of justice that you show what it really is by inserting a correct illustration of the valve. Water as a seal has been proved inefficient, and traps that depend upon water as a seal are liable to siphonage or evaporation, and should not be depended upon.

Knowing your disposition to do justice to all, I make the above request. Very respectfully, A. G. MYERS.

MODERN CHURCH ARCHITECTURE.

BOSTON, May 4, 1878.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — It does truly seem impossible that any one can honestly ask: What do we care for previous architecture, etc.; especially to-day when the study of precedent, if not carried far enough, has at least received an attention never hitherto accorded it. Those who would ignore the intellectual inheritance left by the past have happily been well-nigh exterminated by the revolutions of the last hundred years. But it is the consideration of principles, the analytic emulation of methods of thought, not the "copyism" of mere forms of expression, by which alone we can advance. There is no possible substitute for thought, unfortunately, and all attempts to find it have as yet failed, not excepting the delusive endeavor to "catch the spirit" of a past age or a particular race, which aim, stripped of the phrases by which it is carefully enwrapped, is mimicry, not architecture. When, however, we are instructed that there is no choice other than the English Gothic style, that we must now accommodate our American meeting-houses, as best we may, to forms which were developed to meet the marked and peculiar demands of five or six centuries ago, it is not surprising that such Procrustean treatment

too often produces what one of the wisest of our profession has aptly, though with some asperity, termed "pseudo Gothicesque barns, copies of copies by mediæval village masons, which express fickleness, low cunning, hollow affectation, simulation, servility, and thought-flying hurry."[1] Study of the English churches of the Middle Ages cannot, of course, be too highly recommended, nay, insisted upon, but it should be to ascertain the manner in which the builders met the task before them; to gain, when possible, some insight into the more abstract principles of beauty, and not to content ourselves with adopting the solution of their problem as the solution of our own. What should be avoided is the thoughtless abuse of precedent, not its wise use; their means rather than their ends should be chiefly kept in view.

As things are, it is difficult to conceive of a greater lack of constructive trust than is generally displayed by our religious edifices. Yet architects have been more successful in other classes of buildings, and are, perhaps, here not altogether at fault. Such at least seems to be the opinion of the writer who has in your issue of to-day called attention to the indubitable fact that each religion in its architecture has always taken its proper outward expression. Every work of art and notably of architecture is an involuntary and unconscious exponent of the moral and mental nature of its creators. What, it has been asked, will teach a man so much, in so little time, respecting the comparative characters of the Greeks and the Chinese, as a glance at the views, placed side by side, of the Parthenon and a pagoda? Indeed, has any intelligent and unprejudiced mind a truer scale by which to adjudge the worth and loveliness of the beliefs of mankind in different ages than a parallel consideration of the temples of Karnak and Ægina, the Pantheon and St. Sophia, and the houses of worship typical of the thirteenth and of the nineteenth centuries?

Most truly yours, J. T. C.

NOTES AND CLIPPINGS.

A well-planned Competition. — The method adopted for selecting the gas fixtures of the new Providence City Hall deserves the attention of architects. It is the first case which has come to our notice where a carefully planned competition was arranged for such a piece of work. The following invitation was issued to manufacturers: —

You are hereby respectfully invited to submit an estimate for the gas-fixtures for the new City Hall in Providence, on the following conditions: 1st. Special designs must be submitted for the several stories, and for the several kinds in each story, in style to conform to the architectural character of the building. The drawings must all be at a scale of one eighth of full size. 2d. Your estimate must be accompanied by a bond with satisfactory sureties that you will sign a contract within ten days of the award of the contract, the amount of this bond to be equal to twenty per centum of the total amount of your bid. 3d. The committee will not necessarily accept the lowest or any estimate. 4th. The character and artistic merit of the designs, in connection with the estimate, will have weight in awarding the contract. The committee and architect desire that the designs should not exhibit over-elaborate work, preferring solidity of construction, perfection of workmanship, and adaptability to the building. The committee also desire that the total cost of the work shall not exceed $11,000. Your designs, estimate, and bond should be in the hands of the secretary of the committee on or before 12 o'clock, M., Wednesday, April 24, 1878. As soon as an award of the contract has been made your designs will be returned.

All the fixtures to be of the very best quality and workmanship, thoroughly tested, and put up complete in all their parts, to the entire satisfaction of the committee in charge and the architect. All items not mentioned to the contrary are to be of brass, with stained bronze finish, and are to have *opal* shades of the best quality, of size sufficient to insure a steady flame and proper effect. Burners to be with patent check and lava tips. Each bracket in business rooms to have an independent connection for flexible tubes. Candle burners to be of French make. No *sheet* brass work, either sawed or stamped, is to be used. Cast work is to be of fine brass, free from sand-holes. Globe-holders to be of cast brass, and to correspond with fixtures to which they are attached. All pendants of four lights and over to be hung with a ball joint.

It was also required that each bidder should make and put up a 3-light bracket as a specimen of style and workmanship, accompanying it with its drawing. Several bids were received, ranging in cost from $6,400 to $11,000. One was thrown out of competition because elaborate drawings were sent in, to double the appointed scale. The committee and the architect examined the designs and bids in consultation, and those of Messrs. Cornelius & Co., of Philadelphia, were accepted, the price being $9,717.

Painters' Hooks. — Any one who has watched painters suspended on scaffolds outside of a building must have wondered if accidents did not often happen by the straightening out of the large wrought-iron hooks which are their only points of attachment to the building. An accident has lately taken place in St. John, N. B., which shows that these hooks may be dangerous to others than the painters who are suspended from them. During the latter part of last year painters were employed upon the building of Mr. T. H. Hall, on King Street, and as usual made use of these hooks, which, as may easily be understood, quickly punched holes in the galvanized iron cornice. These holes the painters neglected to fill up, and as a consequence the rain and snow filtered through them all winter, slowly washing out the mortar in the brickwork until the upper part of the wall showed signs of being very unsafe. Workmen were at once set to work to repair the damage, but hardly had they removed a few bricks before all the cornice work on the King Street front fell to the ground, destroying all the window-glass in the building, but fortunately not hurting any one.

Fall of a Building. — A four-story brick building, occupied by Brigham, Royce & Co., hardware merchants, on the corner of Main and Market streets, Palmyra, N. Y., fell at noon, May 6th, while undergoing repairs, killing Samuel Traul, a bricklayer.

Cork Linings for Walls. — Russia is using large quantities of cork, which is cut into thin plates, and is then used as a lining for outside walls. It has been used with success in the United States.

[1] Edward Lacy Garbett, Rudimentary Treatise.

The Decoration of St. Thomas's, New York. — Mr. LaFarge, whose illness has delayed the completion of his decoration of the chancel of St. Thomas's Church, was able on Saturday, April 20, to place in position the companion cartoon entitled "The Three Marys." The women are represented as meeting the two angels on the morning of the resurrection. The wainscoting of the chancel wall will next receive the artist's attention.

Working in Caissons. — Workmen on the Poughkeepsie Bridge are paid twenty-five cents an hour for working "under pressure" in the caissons being sunk in the bed of the river for the piers.

A Memorial of General Custer. — A bill was introduced in the House on April 30th by Mr. Williams, of Michigan, to appropriate $25,000 for a monument to General Custer in the city of Washington. The bill authorizes the Joint Committee on the Library to select a statuary group, the central figure of which shall be an equestrian statue of Custer, the whole group being of such a character as shall vividly commemorate his death. It is provided that the group shall be of bronze and at least one and one fourth the size of life.

The Monuments of Great Men. — For some unexplained reason the monuments to great men rise slowly. That to our Washington seems rather to grow into the ground than into the air. And the Wellington monument in St. Paul's Cathedral has been twenty-three years in building. The cathedral itself was erected in twenty-two years, but it has required a year longer to bring nearly to completion the statue and tomb of the hero of Waterloo. This delay would have been dangerous in the case of any man less great than Wellington. A quarter of a century is a long time to put a hero on probation for his monument. While Wellington has been waiting for his crowning honor in St. Paul's, a score of men have risen to great prominence and sunk again into forgetfulness. Fortunate among them are those who secured monumental recognition early; it may be said of them as Bismarck said of the Russians, *beati possidentes*. If they had not secured monuments speedily after death, they never would have had them. The French act promptly in such cases. They thus have two pleasures, that of erecting the monuments to their heroes, and of pulling them down before the men are quite forgotten. — *Hartford Courant.*

A Mine on Fire. — Near Pittsburgh, Penn., is a mine which has been on fire for more than two months, and the owners have at length made a contract with a man who, for $35,000, undertakes to put it out. To the uninitiated the means he intends to employ seem singularly inadequate. He proposes simply to dig a deep trench and fill it with stones, thus making a barrier through which the fire cannot pass.

The Organ for the Trocadéro. — The great four-thousand-pipe organ for the Trocadéro palace, Paris, will not be ready for use before the 1st of July. The musical *fêtes* were to have commenced June 1st.

Equestrian Statue. — The gigantic equestrian statue of Charlemagne, cast by Thiebault, and weighing about sixteen tons, has been erected at Paris, at the entrance to the Exhibition.

Process for Purifying the Air. — A process, according to *La Nature*, has been devised, which cools and at the same time purifies the air introduced into dwellings for purposes of ventilation. By means of a fan which rotates rapidly, the air is forced into a closed box, and made to pass through a horizontal diaphragm pierced with holes, over which a very thin layer of water is continually flowing. The air, as it passes through this thin film of water from below, is deprived of its organic particles, which remain in the water, and pass with it into the lower chamber, and are so drawn off, while the air itself passes up through a pipe, in any direction.

A Natural Theatre. — The Temple is a side cañon some four and a half miles from Cañon City, and was discovered but a year or two ago. Once through the great rifts of rock, for all the world like the stairway of some grand place of amusement, the body of the Temple is reached, and, to the tourist's astonishment, before him is a stage with overhanging arch, with "flats" and "flies," with dressing-rooms on either side, and a scene already set as if for some grand tableau. If so intensely realistic from the parquet, as the broad circling floor might aptly be termed, or from the parquet or dress circles, as the higher ledges would suggest, the clamber up to the stage itself renders it all the more so. The stage is at the least thirty feet deep, and some sixty or seventy broad; the arch above is fully one hundred feet from the floor of the cañon, the stage itself being about forty feet above the floor. The arch is almost as smooth and perfectly proportioned as if fashioned by the hand of man. Upon the rear wall of the stage quite an aperture has been hewn out by some action, and the shape it is left in is peculiarly suggestive of tableaux preparation. There is absolutely not a solitary sign of vegetation about the Temple; all is bleak, bare, and towering, and a more weird spot to visit cannot possibly be imagined. — *Rocky Mountain Tourist.*

Wood Injection. — The value of creosote as a wood preserver is generally recognized, but the direct injection requires great quantities of heavy oil and a desiccation of the injected pores. The high boiling point of creosote (300°) does not permit its employment in vapor. Mr. John Blythe formed the idea of saturating a jet of steam with creosote in minute division, forming, so to speak, a gaseous emulsion. The apparatus comprises a high-pressure steam-boiler; another boiler containing creosote, in which the steam is saturated; a vat filled with creosote, to be pumped into the boiler; sheet-iron cylinders, for the pieces which are to be injected; and a system of tubing connecting the several parts. In this way Mr. Blythe completely fills the heart of oak, pine, or red beech; he uses 2 to 3 kilos. of creosote for a cross-tie, and 2 kilos. of brown phenic acid per cubic metre of saturated wood or cross-ties. The cost of preparing a cross-tie, measuring 0.085 m., is from 0 60 f. to 0.70 f. The apparatus can prepare 500 ties per day: the wood comes out softened, so that it can readily be bent or shaped, but it rapidly hardens; at first it shrinks, but after a few weeks it becomes seasoned and resists the influences of moisture; finally, the fibres are greatly strengthened. — *Ann. des Ponts et Chaussées.*