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WE have repeatedly had occasion to speak of the industrial schools established in New York by the Metropolitan Museum of Art in a small way two years ago, which after a few months, thanks to the generosity of Mr. Richard T. Auchmuty, were developed into what might almost be called the beginning of a trade university, comprehending systematic courses of instruction in house and decorative painting, carriage designing, plumbing and sanitary work, carving and modelling, and other branches, all taught in the most thorough manner, both theoretically and practically, in a building planned for that special purpose, and with the earnest sympathy and good offices of the best masters in the several trades. After one very successful season, it has been decided to take a further step in advance, by separating the classes in what may be called industrial design from those which devote their attention to technical processes only. This progress has been made possible by the kindness of another gentleman, who has made a gift of fifty thousand dollars to the Metropolitan Museum to be devoted to the advancement of art education, thereby enabling the managers to engage a separate building, the "Glass Hall," in Thirty-fourth Street, for the classes in applied and fine art, retaining the Auchmuty building, on the corner of First Avenue and Sixty-seventh Street, for the strictly technical departments. Mr. Charles F. Wingate, S. E., well known as an expert, and for some years editor of the *Sanitary Engineer*, has been placed in charge of the latter division of the school, Mr. John Buckingham continuing as director of the art classes in their new Thirty-fourth Street rooms. The next season, under Mr. Wingate's supervision, instruction will be given at the Sixty-seventh Street building in sanitary engineering and plumbing practice; in the technical science of house painting and decorating, including the finishing of various woods and paper-hanging; and in the theory and practice of brick-laying. The last course is established with the advice of Union No. 2 of the National Bricklayers' Association, and includes instruction in mechanical drawing, in the laying out of work from architects' plans, and in the principles governing the strength of walls and the thrust of arches; besides practice in the use of mortar and cement, the laying of face-brick, construction of flues and fireplaces, arches and cornices. For the five months' course, comprising tuition two evenings in each week, from November to April, the fee will be only five dollars. New York is just now full of masons and bricklayers from different parts of the country, attracted by the high wages offered there, and these temporary inhabitants, few of whom have families with them, will find this opportunity to advance themselves in their business of inestimable value. The Union which has set so noble an example in promoting the establishment of the school should not fail to use its utmost influence in leading at least the younger members of the trade, sojourning for a time in the great city without the pleasant occupation for leisure hours or the restraining influence which family and social ties afford, to interest themselves in joining the classes, and doing what they can, not only to gain knowledge for their own benefit, but to make themselves useful to their fellows.

NO one can inspect the immense wooden hotels now building in great numbers at our seaside resorts without being struck by the air of insecurity which pervades them. To the expert, the long, straight corridors, planned expressly to catch the breezes which always blow through them from their ample windows, the elevator-shafts of wire netting and thin boards, giving instant communication between all the different stories of the building, the endless succession of light stud partitions, and the picturesque roofs, covered with shingles, and broken by gables and turrets, consisting of masses of furring, — all indicate a construction combining every requisite for sudden, rapid, and uncontrollable combustion, from the most trifling cause; while even the careless visitor experiences a vague uneasiness at the grim aspect of the fire-axes and water-buckets or hose which confront him on every floor. It is creditable to the managers of these places that they are usually unsparing of expense in maintaining the fire-extinguishing apparatus in what they suppose to be efficient condition; but the circumstances are so different from those existing in other buildings, and the accumulation of dangers so great, that ordinary precautions are totally inadequate. The recent destruction of two seaside hotels, from one of which the guests escaped without their baggage, and barely with their lives, has aroused the New York *Herald* to a timely protest against the questionable economy which leads in the construction of such buildings to the sacrifice of durability, safety, and even comfort, for the sake of cheapness. The *Herald* calls attention to the fact that the hotels of the great summer resorts in England and the Continent are made substantial, comfortable, and safe, not alone because such building is habitual in Europe, but still more for the reason that by this means they are enabled to retain their patrons late in the season, and even through the winter, when our seaside and mountain hotels are absolutely uninhabitable, and advises those who contemplate future enterprises of the same kind on this side of the ocean to adopt similar measures. This advice we can heartily second. Of late years there has been a demand for special comfort and luxury to suit a certain class of visitors at the beach hotels, and there can be no doubt that the guests who are willing to pay a high price to enjoy the tawdry splendors of the Oriental would be glad to exchange them for the substantial comfort and homelike charm of a well-built stone structure.

THE electric-light companies have begun a quarrel which promises to disgrace them in the eyes of the civilized world. Next to the squabbles about awards in industrial exhibitions, there is nothing perhaps so bewildering to the average mind, and so strongly suggestive of wholesale violation of the Ninth Commandment, as the accounts which are published in the newspapers concerning patents, and those who own and use them. One of the sensations of the past fortnight was the announcement that the United States Electric-Light Company, which had prepared a very brilliant display of the Maxim incandescent lamp, which the company controls, in the Paris Electrical Exposition, had been enjoined by the French courts, on the application of the Edison Electric-Light Company, against exhibiting the lamp anywhere in France. We should be sorry to impute the motive of malicious desire for annoying a rival to any one, but as the Maxim lamp had been constantly shown and used in New York for months before the Paris exhibition, it is at least strange that the Edison Company should have postponed so long the assertion of its rights. Major Eaton, the vice-president of the company, explained the circumstances to a *Tribune* reporter by saying that the managers had never before cared to take the trouble to enforce their claim to the exclusive use of incandescent lights, but that on the occasion of the Paris exhibition they had telegraphed instructions to their agents, who showed such a clear case that the court granted an injunction against the United States Company without delay.

ABOUT twenty-four hours after the publication of these facts, another paragraph appeared in all the daily journals, announcing that the decision of a lower tribunal as to the validity of the Maxim patent for incandescent lighting had been fully confirmed by the board of examiners at the Patent Office in favor of Mr. Maxim. How this glaring discrepancy between the dif-

ferent accounts of the matter is to be explained, we cannot imagine, unless in the way in which the ancient conundrum was solved, — that "one of them lied;" and if this should prove to be the correct interpretation, we might suggest that falsehoods of this kind, by whomsoever they may be uttered, which affect the rights and property of other people, are simply criminal, and their authors ought to be speedily brought to justice. Major Eaton is reported to have said, on the authority of his company's counsel, that "Mr. Edison's patents gave him an exclusive control of incandescent lighting, and that other analogous systems were infringements which he could at any time suppress by going into court." This comprehensive claim, if really made, was probably a legal fiction, since the production of light from a wire heated by the passage of a voltaic current has been a familiar experiment for generations. It must not be forgotten by those who interest themselves in the problem of electric illumination, that the patents are controlled by corporations whose shares are bought and sold in Wall Street, and that no tale is too ridiculous to be invented or credited by those whose ardor for speculation leads them to see profit in a sudden rise or fall of the stock.

The Philadelphia *Press* has been comparing the streets in that city with those of Boston and New York, to show that their condition in each town bears a close relation to the amount of money expended for the purpose of cleaning them. In Boston, which boasts the best-kept thoroughfares on the Atlantic coast, the annual appropriation for street-cleaning is about three hundred and fifty thousand dollars, while Philadelphia pays one hundred and thirty-one thousand for the same service. In Boston the work is done by a corps of men employed by the city, with the help of the city horses, carts, and other facilities, while the Philadelphians entrust it to contractors, who fulfil their agreements in such a way as to leave the largest percentage of profit to themselves. New York expends nearly as much in proportion to its population as Boston, the last appropriation having been seven hundred and thirty-five thousand dollars, but in spite of its admirable situation and soil, the discrepancy between expenditure and result which is generally to be observed in the municipal transactions of the metropolis seems to afflict this service with peculiar virulence, and Cologne itself can hardly surpass the undisturbed foulness of many miles of its streets.

At the last session of Congress an appropriation of a million dollars was made for the purpose of improving the navigation of the Mississippi River, and under the direction of Commissioners for whom General Q. A. Gillmore, Major C. R. Suter, and Mr. B. M. Harrod act as a committee on construction, extensive works of "canalisation" are to be carried out below the mouth of the Ohio. Many an enthusiastic lover of picturesque nature can recall his vexation at seeing mountain torrents in the wildest parts of Europe neatly graded, the bottom and sides paved, and the banks laid out in straight lines, joined by mathematical curves. The object of all these improvements is to confine the stream within a course ample in all parts for the utmost volume of water which may at any time flow through it, and free from those obstacles or sudden turns which, so to speak, excite the rage of the torrent, and cause it to deviate irregularly from side to side, cutting away the banks in one place, washing up débris in another, and thus accumulating new obstructions, to give rise in their turn to fresh disorders. The remedy is found very effectual, and it is proposed to apply it on a great scale to the reclamation of the Mississippi, whose irregular action upon its banks is the source of most of the troubles which afflict the navigation of the river. As no revetment of stone would be practicable under the circumstances, the necessary protection to the banks will be afforded by mattresses of brushwood, such as have long been used in protecting the levees along the lower course of the stream. These mattresses are weighted with stone, and soon become filled with silt from the muddy water. On the same principle, where the river has enlarged its bed, forming a shallow lake, new banks will be formed through the lake by dikes of hurdles and fascines, which will, it is supposed, become firm banks of alluvium.

The Providence Athenæum has been robbed in a peculiarly exasperating manner by some ignorant and malicious thief, who broke into the building and stole a small sum of money out of the cash-drawer, and then, turning his attention to the gallery, packed up and carried away two portraits, one of James G. Percival, the poet, and the other of Cyrus Butler, together with a famous composition — the Hours — by the miniature-painter, Malbone. A picture by Sir Joshua Reynolds was cut from its frame, but left on the floor, the robber having apparently no conception whatever of the value of what he took. One would hardly suppose that the portrait of a poet and a merchant, however estimable, would prove very available property for a thief, while their possession will render his detection almost certain. It is to be hoped that it may be speedy, and that an exemplary punishment may serve to deter other persons of similar evil disposition.

Some time ago an order was passed for the demolition of the building on Fifth Avenue, between Forty-first and Forty-second Streets, New York, which served for many years as a distributing reservoir for the lower part of the city, but has long been superseded by the great basins in the Central Park. The water is still allowed to flow into the reservoir, and it might in emergency be used for a reserve supply; but the situation is a very fine one, and the ground which the structure occupies has long been coveted for other purposes. The western portion of the open space on which the reservoir stands was the site, twenty-three or twenty-four years ago, of the New York Crystal Palace, and the plan of the central rotunda can still be traced in the gravel walks of the pretty garden which now occupies the ground, while the little children playing in the grass often pick up lumps of melted glass, relics of the conflagration which destroyed the building. This reminiscence seems to have inspired the city authorities at one time with the idea of removing the reservoir and constructing in the middle of the square a kind of Permanent Exhibition building, and plans were even drawn for the structure; but this scheme was fortunately abandoned, and under the latest ordinance the whole of the ground will be grassed over, and used as a park. There would probably be no serious objection to this project, if it were not for the fact that the owners of abutting estates are to be assessed to pay the cost of making the improvement, and as this will be considerable, some of them, who are quite contented with the sight of the blackened stone-work, covered, as it is, with beautiful vines and flowers, and feel that the reserve of water stored in the structure may some time be of value to them or others, have instituted proceedings to have the ordinance set aside as unnecessary, and in violation of the terms under which the use of the land was granted to the city. There is much reason in their arguments, and aside from the legal merits of the case, we should ourselves be sorry to see the avenue deprived of an object which by its simplicity of line and mass of shadow relieves so picturesquely the elaborate architecture about it.

Two more Swiss villages have been lately swept away by fire. One of them, in the Grisons, was a place of some importance, while the other had a certain peculiar interest on account of the character of its inhabitants. Situated far up the Rhone valley, in a region rarely visited by strangers, it, with a few other little hamlets, formed the abode of a community differing completely in traditions, descent, language, and manners from those about them. Switzerland is said to contain a remnant of every race which has inhabited or invaded Central Europe, its isolated valleys offering, after each successive inroad of barbarians from the East, a secure and permanent shelter for a certain number of families out of the tribes which had preceded them; and in this manner the depths of the Valais are said to have received and maintained to this day the descendants of the Huns who under Attila crossed the Alps and devastated Northern Italy. That they should have maintained their blood and language almost unchanged for fifty generations is explained by the difficulties which nature puts in the way of communication between the various habitable portions of the country. Even now, there is hardly anything in Europe more singular than the contrast in architecture, habits of living, language, and religion, between the French Catholic district of the Valais, and the German canton Bern, separated from it, at Loëche, only by a perpendicular cliff, four hundred feet high; and similar transitions are to be observed in many other places. These diversities of blood and race give rise to corresponding differences in modes of building, so that the little Helvetic republic contains within its borders an almost endless variety of architectural types, modest in character, but interesting in many ways.

CARBONIC OXIDE AND CAST-IRON STOVES AND FURNACES.[1] — I.

IN 1865 a peculiar epidemic occurred in Savoy. It was a new thing, and consequently new theories were put forward to explain it. Among these, the one which attracted most attention was that of M. Carret, who, in a communication read before the French Academy, attempted to show that the disease was due to the use of cast-iron stoves, from which in some way carbonic oxide was given off, thus contaminating the air.

Gen. Morin then became interested in the subject, and requested Messrs. H. Sainte-Claire Deville and Troost to make a chemical examination of the air in immediate contact with a specially constructed cast-iron stove heated to redness, as he thought that Carret's statement might possibly be explained by supposing that carbonic oxide passes through the red-hot iron, as earlier experiments of Deville and Troost had shown that this is possible. The work undertaken by the last-named chemists led them to the belief that carbonic oxide may and does pass through cast-iron heated to redness. As their experiments were the first undertaken to determine whether cast-iron stoves are objectionable or not, and as the names of the chemists have carried great weight in the discussion of the question, it is desirable to know here exactly what they did.

They first analyzed the air of a room heated by a cast-iron, stove and found considerable quantities of carbonic oxide and of hydrogen. They then took the apparatus furnished by Gen. Morin, consisting of a specially constructed cylindrical cast-iron stove, surrounded by an envelope of cast-iron fitting into grooves in plates above and below the stove. The air was drawn out of the space between the stove and the envelope, and then passed over pumice-stone moistened with sulphuric acid and over caustic potassa. Thus freed from water and carbonic acid, it was passed into a combustion tube containing heated cupric oxide, the water and carbonic acid thus obtained weighed, and the weights of hydrogen and carbonic oxide deduced from those of the water and carbonic acid. The amounts found vary between 0.250 and 1.072 parts hydrogen, and between 0.141 and 1.32 parts carbonic oxide in 1,000 parts of air. These experiments have been justly criticised by others, and I only record the judgment of every thinking chemist when I say, that the experiments do not furnish satisfactory proof of the presence of carbonic oxide in the air. In the first place, there is always present in the air a certain amount of organic matter of complex nature which by combustion will yield carbonic acid and water, and hydrocarbons which are, as is well known, formed in large quantity by the heating of coal, might also be present in the space immediately surrounding the stove. These would also yield carbonic acid and water by combustion.

A little later the French Academy, impressed with the importance of the subject, appointed a committee, consisting of MM. Payen, Morin, Fremy, H. Sainte-Claire Deville, Boussy and Claude Bernard, to make a thorough investigation. The committee began work in March, 1868, and continued until February, 1869, when Gen. Morin, at the request and in the name of the other members, handed in an exhaustive report to the academy.

The work reported upon comprised mainly: —

1. Experiments on rabbits.

By a method suggested by Claude Bernard, but not described in the report, it was determined that the blood of rabbits kept for three days in rooms heated with cast-iron stoves contained carbonic oxide.

2. Direct analyses of the air of the examined rooms by the method of Deville and Troost.

3. Experiments with the above-mentioned stove used by Deville and Troost.

4. Collection of carbonic oxide itself by passing the air through a vessel containing a solution of cuprous chloride in hydrochloric acid. The gas thus collected was then set free and burned, when, from the characteristic color of the flame, the conclusion was reached that the gas was, in fact, carbonic oxide.

As a result of the investigation, the conclusion was reached that cast-iron stoves, as soon as their temperature reaches dark-red heat, cause the escape of not inconsiderable quantities of carbonic oxide, a very poisonous gas.

It is not surprising that this opinion of a committee composed of such eminent scientific authorities produced a strong impression. The conclusion quoted has been pretty generally accepted as final, and cast-iron stoves have naturally come into disrepute. Hot-air furnaces made of cast-iron have also suffered, and "furnace air" has often been used to signify air contaminated with carbonic oxide. The matter is evidently one of great importance from the standpoint of hygiene, and it is desirable here to inquire how far the report of the French commission can stand the test of unprejudiced criticism.

In the first place, the experiments with the rabbits, upon which so much stress is laid as proving the presence of carbonic oxide, are not fully described in the report, and, so far as I know, they have not been described since. It is impossible for this reason to determine to what extent these particular experiments may be relied upon as furnishing the evidence which they are supposed to furnish. There is only one good method known for the detection of carbonic oxide involving the use of animals, and this was introduced some years after the report under consideration was published. If the committee really used a reliable method, it is strange that, in the active discussion which has been carried on within the last three or four years with reference to the value of their report, the details of the method have not been published. Under the circumstances, it seems to be justifiable to disregard the indefinitely described experiments with rabbits.

As regards the direct analyses, the case is more difficult. The method used was the same as that of Deville and Troost, already referred to. The calculation of the results was, however, made in a different way. Instead of assuming that all the hydrogen of the water found was originally present as free hydrogen, and all the carbon as carbonic oxide, the fairer assumption was made that some of the hydrogen, at least, was present as marsh gas. This would at once reduce the quantity of carbonic oxide found. The experiments show that carbonic oxide was present to the extent of 0.04 per cent, or 4 parts in 10,000, and that in some cases the amount was even greater.

It is plain from these experiments that, after the carbonic acid was removed from the air experimented on, there were left other substances containing carbon and hydrogen; and inasmuch as the amount of hydrogen present is not sufficient to account for all the carbon, assuming the two elements to be united in the form of marsh gas, the conclusion is drawn that carbonic oxide must be present. But this conclusion is by no means certainly correct, and there are mainly three good reasons for doubting its correctness until further evidence is brought forward in its support. These are: —

1. The fact that hydrocarbons other than marsh gas and containing a larger proportion of carbon, not only may be present, but are just as likely to be present as marsh gas.

2. The fact that there are always present in the air organic substances of unknown composition which by combustion would increase the quantity of carbonic acid found. Erisman found such substances in an unoccupied and unheated room, by using the method of Deville and Troost; and Dupré and Hake have very recently described some experiments undertaken for the purpose of determining the amount of organic matter in the air. The last-named chemists took extraordinary precautions to remove the carbonic acid and water from the air before it was heated with cupric oxide, and they distinctly state that these precautions are necessary. While not claiming any degree of accuracy for the figures given by Dupré and Hake, they certainly do show that the organic matter in the air should be considered in such experiments as those under special scrutiny at present.

3. The fact pointed out by Dupré and Hake, and just referred to, that it is very difficult to remove all the carbonic acid from the air before it reaches the combustion tube. In experiments long continued and involving large volumes of air, the error occasioned in this way might be comparatively large. Again, taking everything into consideration that bears upon these direct analyses, it will be seen that the evidence which they afford of the presence of carbonic oxide is far from conclusive.

Much weight cannot be attached to the experiment in which the carbonic oxide was collected and afterward burned. The only evidence that the gas thus collected was really the oxide was obtained by burning a few cubic centimetres and taking the color of the flame as the test. It cannot be denied that other things may have been present, and that the test was a very unsatisfactory one. These few critical remarks are intended to show that the subject under consideration cannot be regarded as exhausted, and that after the report of the French commission new evidence, either for or against the correctness of the conclusion drawn, was loudly called for.

A few years ago H. Vogel called attention to a very pretty and delicate method, which he recommended as well adapted to the detection of small quantities of carbonic acid. The method depends upon the action of the gas on blood, and consists in shaking with a little blood the air to be examined, and then examining the blood with a spectroscope, the presence of carbonic oxide being revealed by a peculiar absorption spectrum, which will be described below. Vogel claims that by this method 0.4 per cent of the gas can be detected in the air. In a later article the same author describes some special experiments, undertaken at the request of the authorities of the city of Berlin, for the purpose of determining whether carbonic oxide was present in the air of certain school-houses in that city. Although Vogel succeeded in increasing the delicacy of his method, so that he could certainly detect 2.5 parts of the gas in 1000 parts of air, he was unable to find any evidence of its presence in the buildings examined by him.

J. Gottschalk was also requested by the authorities of the city of Leipzig to examine the air of certain school-houses, and in 1877 his report was published in full, under the title: "Ueber die Nachweisbarkeit des Kohlenoxyds in sehr kleinen Mengen und einige Bemerkungen zu der sogenannten Luftheizungsfrage." (Leipzig, Barth.)

The method used by Gottschalk consisted in passing the air to be examined through a neutral solution of palladium chloride. When carbonic oxide passes through such a solution, it exerts a reducing action; small black flakes of the metal appear, and the presence or absence of the gas may be judged of by the presence or absence of the black flakes. It is undoubtedly true that carbonic oxide acts in the way described, and that very small quantities of it may be detected by means of the reaction mentioned; but it is also true that certain hydrocarbons which are likely to be in the air in the neighborhood of stoves and furnaces act in the same way. Hence, if the solution of palladium chloride were changed by the air, we

[1] Carbonic Oxide as a Source of Danger to Health in Apartments heated by Cast-Iron Furnaces or Stoves. By Ira Remsen, Professor of Chemistry in the Johns Hopkins University.

should have evidence of the presence of either carbonic oxide or hydrocarbons, or, possibly, some of the easily oxidizable organic matters always present in the air. If, on the other hand, no change were produced, we might fairly conclude that carbonic acid is not present, — at least not in quantity greater than that which the method is known to be able to detect. According to Gottschalk, the method is competent to detect 0.22 parts in 1000 of air, a fact which was established by a series of experiments undertaken specially for the purpose. In the air of the school-houses, Gottschalk found no evidence of carbonic oxide, from which fact the conclusion may be drawn, that the gas was not present to the extent of 0.22 parts in 1000.

The negative results obtained by Vogel and Gottschalk have led to several examinations of a similar kind. In 1878 there appeared an article by S. Wolffhügel, in which some of the earlier experiments are subjected to criticism, and some new experiments are described. The article opens with a criticism of the results of R. Kaiser, who found carbonic oxide in the air of the Gewerbemuseum at Nürnberg. The gas was detected by oxidizing with chromic acid solution, and also by absorption in a solution of cuprous chloride in hydrochloric acid. As Kaiser does not describe his experiments with sufficient accuracy to enable the reader to judge of their value, and there are so many precautions necessary in order to insure success, his results are entirely disregarded.

Aug. Vollert has also stated that he had detected carbonic oxide in the air of the Johanneum at Hamburg; but the method used by him is the old one of Deville and Troost, and he entirely neglects the hydrocarbons, so that no weight can be attached to his results.

Wolffhügel's own experiments consisted in making a box on the side of a cast-iron stove so that one square decimetre of cast-iron, that could be easily heated to redness, was covered by the box. The box ended in a tube by which connection was made with an aspirator. The air was then examined by means of Vogel's blood test. By means of this test he was able to detect carbonic oxide in tobacco smoke; but in all his experiments with the cast-iron stove, the results were negative.

Several important details are lacking from Wolffhügel's description of his experiments. It is not stated, for example, what relation the piece of cast-iron which was heated to redness bore to the heated coal within the stove — whether it was above the coal or the coal came in contact with it. The thickness of the plate of iron is also not mentioned.

Some experiments with cast-iron tubes were next tried. The walls of these tubes were 0.35 centimetres to 0.65 centimetres in thickness, and their internal diameter was from 2.5 to 5 centimetres. They were placed in blast furnaces and heated to redness. The air drawn through them contained considerable quantities of carbonic oxide, which was easily detected.

Within a short time past several suggestions have been made looking toward the increased delicacy of the method for detecting carbonic oxide. Among these may be mentioned those of Th. Weyl and B. Anrep, of C. H. Wolff and S. v. Fodor. None of the suggestions appear to have been followed up very closely, and the papers in which they are described contain no satisfactory evidence in favor of the methods employed. There is one method, however, which deserves special attention, as it has been tested very carefully by the inventor, and seems to be admirably adapted to the detection of very small quantities of carbonic oxide. This is the method described by W. Hempel. It consists of a modification of Vogel's blood test. By passing air to be examined through dilute blood, Vogel could detect 2.5 parts of the gas in 1,000 of air. Hempel concentrates the effect of the gas by allowing small animals (mice) to breathe the air for a considerable period. He then kills the animals and examines the diluted blood with the spectroscope. By this means it was found, that a much smaller amount of the gas can be detected than by the original Vogel method. The limit stated by Hempel is 0.5 parts in 1,000, or about one-fifth the limit given by Vogel. Hempel contented himself with proving the value of the method. He mentions no experiments involving the application of his method, nor has it, as far as I can learn, ever been practically used in investigating the question regarding the presence of carbonic oxide in the air of rooms.

In view of the uncertainty connected with the subject and its evident importance, it seemed to me to be desirable to undertake a new investigation, using that method which, after careful study and comparison, should prove best fitted for the purpose, and, at the request of the National Board of Health, I have for some time past been engaged upon the work, in the experimental part of which I have had the valuable assistance of Mr. D. T. Day.

THE EVOLUTION OF THE PLUMBER.

Who does not know the plumber? — and yet how little we know of him. At a glance it would almost seem that his calling is as old as the hills, but he is of to-day. If we think of him at all, it is to laugh at jokes made at his expense, and which are as stale as the witticisms of the Miller school. This he takes pleasantly, and makes no reply. It is enough for him that he knows much which the majority of his employers do not know; and although he has no credentials and no recommendation, other than that he has worked at his calling from boyhood, we put faith in his ability, and intrust to him the sanitary arrangement of our dwellings. This work he does not hesitate to undertake; in fact, he prides himself in doing such work well and expeditiously. If he has not always done it well, he usually tries to do his best, and until within a few years the average plumber was up to a recognized standard. But now, when men of science have taken up the subject, when death and disease have whipped us into the study of a matter that has been shamefully neglected, the plumber finds it quite another thing to keep up with the times, and it is only the exceptional few of his craft who have the intelligence and industry to read, and then apply what they learn.

A man need not be very old to remember the time when there was no such trade as the plumber's, as we understand the term; for there was no call for any such craft, separate and distinct from bell-hanging, gas-fitting, and lock-tinkering. Until within a few years, there was no discussion on the subject of plumbing; no theories were advanced, and no new facts, in connection with what little plumbing was done, were brought to light; and if men died, as unquestionably men did die, of diseases engendered by bad sanitary arrangements, no one was the wiser, for no one knew the danger to which he was exposed, and of course there was no effort to avoid it. The first number of the London *Builder* was issued in 1842, and its first article on the subject of plumbing appeared in 1854, with these apologetic words: "Some of our readers may perhaps think that such things lie beyond the boundary of our inquiry, but in that opinion we do not concur." Of late years the *Builder* has ably fought for the right, and it still continues to do valiant service in this prolific field of inquiry.

The little that was required of the plumber in the days of our fathers was of the most simple, though not always of the most harmless, character. The bath-tub was made of wood, put together with white lead and nails; then came painted tubs, japanned and galvanized. The waste was got rid of as opportunity offered, but almost always in a way that would be condemned by sanitarians of to-day. To carry off the kitchen waste was also a troublesome matter. A piece of lead pipe was attached to the kitchen sink, which conducted the waste to a gutter or catch-all; in either case there was no intervening trap, for that was wholly above the plumber. The pipe itself was an improvement on the wooden spout that was formerly used for this purpose: which spout has passed away within a period of less than a lifetime, for it was not earlier than 1820 that lead pipe was first drawn by hydraulic pressure, and some time elapsed after that date before it came into general use.

But when Croton water was introduced into New York, there came a call for a class of men till then but little known at the Mechanics' Exchange. Is it to be wondered at that the work done at that time, and for some years after that event, was of the most flimsy character? The oculist who said he ought to know how to cure sore eyes, for he had spoilt a hat-full in learning, probably did not overrate the mischief he had done; but how many hundred thousands of lives have been swept away through these early days of house-plumbing, it would be difficult to conjecture. We cannot realize to-day, with all our "modern improvements," what discomforts attended a residence in New York before the introduction of water. Think of supplying a great hotel by means of a pump, and the shifts that had to be resorted to to get rid of the daily waste of such a house. The same difficulties had to be contended with in the dwellings of the rich and the poor. The water for a neighborhood was drawn from a well in the street, set on the edge of a curb-stone, and the handle of a pump so placed was kept going day and night. Horses and dogs quenched their thirst from a trough set there for that purpose, and the hogs, then the scavengers of the city, sucked what trickled down and gathered into pools in the gutter. Nor were these the only frequenters at the pumps. It was a part of the duty of house servants to go there for water, and there they often stopped to gossip, to the great annoyance of their masters.

But the troubles growing out of an inadequate supply of water were light, compared with the annoyance attending the emptying of the vaults in the yards; the contents of which had to be taken through the basement at night, and dumped into carts drawn up before the door for that purpose. From this infliction there was no escape, except for persons who occupied corner houses; and it mattered not where one resided, everybody had to submit to the semi-annual poisoning of the night air in this barbarous manner.

But Croton water was at last introduced, and then there was not only great rejoicing, but also great activity in the market for sheet-lead and lead pipe, bowls and water-closets. Of plumbers, as we understand the term, I have said there were none. There were men who, in connection with other callings, were occasionally employed to put in some simple apparatus, in the way of modern improvements, in houses on lines where there was a chance of getting rid of the waste; but what they did was crude in design, imperfect in workmanship, and at best a makeshift. The newspapers were filled with advertisements for journeymen-plumbers, and almost every man who could handle a soldering-iron found his way to the metropolis. There was no time to look closely into the qualifications of an applicant; if he handled his tools at all well, and was quick to learn, he could soon be raised from the position of "helper" to that of journeyman, and as a plumber's contracts were only limited in number and extent by the amount of help he could command, he was pretty sure to take every man who applied for work. Men possessed of an ordinary degree of aptitude picked up rapidly all they were expected to know of the trade, and soon there was a class of mechanics who claimed to be at the head of their calling — who knew all about plumbing.

And when the owner of a house in town saw what had been done for him, how the plumber had added many fold to the comfort of his family, he set his heart on having his country house plumbed in the same way; and so the work has gone on and expanded, until it has reached its present magnitude. If all that is now done under this head is not what it should be, it is vastly better than the plumbing of five and twenty years ago. Then, if a plumber wanted to unite two lengths of lead pipe, he made a cup-joint, for he knew nothing of a wipe-joint; but to-day there is a large amount of work (scamping) done in the same way, to meet the exacting demands of owners and contractors, who ask no questions other than that the plumbing bills shall be as light as possible.

Another evil, traced directly to the early days of house-plumbing, was the use of lead soil-pipes. The lead-workers did all in their power to supply the different sizes of pipes called for, but they had no appliances for drawing a four-inch soil-pipe, and the plumber was forced to make one. This he did by bending a strip of sheet-lead into the proper shape, then he ran a soldering-iron down the seam, and in so doing made a joint that varied from three-quarters of an inch to an eighth of an inch in width. The pipe, when ready, was put into its place more or less securely, covered up and left to do its deadly work; for no man then in the plumbing business knew that lead exposed to sewer-gas is rapidly decomposed and eaten into holes. There is not a house to-day that was plumbed twenty or five and twenty years ago, that has not a soil-pipe of this description, and I have never yet opened the casing of such a pipe, to examine into its condition, that I did not find the seam gaping open in many places, and the foul contents trickling through its sides. Death has come into these houses and taken its victims, and no man knew why they sickened and died. If the hundreds, I may say thousands, that have been swept away in this manner were known to have died from such a cause, we should be appalled by their numbers.

Defective as are such soil-pipes, the mischief they have done would have been less if they had been ventilated; but ventilation in such connection was not thought of till about twenty years ago, and it was some time after that date that its advantages were tolerably understood. At first it was thought a pipe an inch in diameter was enough to carry off all the sewer-gas from a four or five inch soil-pipe. When this was questioned, it was claimed that an inch-and-a-half or a two-inch pipe was certainly ample for that purpose, and after much discussion, many theories and conjectures the knot was cut by making the ventilating pipe the full size of the soil-pipe, all the way up to and out of the roof at the highest point. The plumber now understands this, and believes that ventilation is essential to good plumbing; but he has been, and still is, confused by the discussion going on in connection with his calling, and so long as doctors disagree, how is he certainly to know which course to pursue? Some of the leading sanitary reformers in England are to-day engaged in a controversy as to the proper place to locate a soil-pipe. One party maintains that it should be on the outside of a house, while the other side holds to the belief that it should be on the inside. And if the arguments brought forward on either side are not always convincing, they are certainly confusing to the plumber, who is not much of a scientist, but who is usually sensible enough to see and recognize a good thing when it is brought to his notice in a clear and practical way. Nearly all that he knows was learned by experience. Until lately there were no books of instruction that he could consult, for there were no instructors to prepare such books, and it was hardly to be expected that a man whose schooling was confined to the merest rudiments should make any headway beyond the ordinary work of the shop. But within a few years his eyes have been opened, and he sees how much there is that he should know. That he reads, and reads well, we have the evidence in the readiness with which his views are given in the journals that take an interest in his calling, and it is safe to predict that in a few years he will be far ahead of his present position. CHAMPLIN.

LEGAL NOTES AND CASES.

Negligence of Municipal Corporations. — Bricks piled in Street. — Danger. — Evidence. — Notice. — Intervening Sunday.

THE question of the liability of the city of New York for damages for an injury caused by the falling of a pile of bricks negligently stacked in the street by builders who were engaged in taking down a building was considered in *Rehberg vs. The Mayor and Aldermen*, in the New York Court of Common Pleas, on June 6, 1881. The pile was completed on Friday evening, and it fell of the following Monday morning. The city had no express notice of the dangerous condition of the stack, but the plaintiff relied upon the fact of a constructive notice by reason of an alleged apparent danger. Judge Van Brunt, in the opinion, confirming a judgment in favor of the city, said: —

The temporary use of the public street, or some portion thereof, during the erection or repair of a building on a lot opposite the same, is expressly recognized by the charter of the city of New York; consequently the mere fact of the existence of such an obstruction does not of itself impose a duty upon the corporate authorities. When, however, such an obstruction is of such a character that it becomes dangerous to passers-by and the public, it becomes the duty of the city, either upon actual or constructive notice of such condition, to remove or guard the obstruction so as not to imperil passers-by. There was a large quantity of evidence taken in this case in reference to the safety or non-safety of the pile of bricks in question, and a review of the testimony shows that it requires an expert to determine, from all the evidence in the case, whether the pile of bricks was dangerous or not. There is no evidence going to show that a person of ordinary intelligence would have concluded, upon an inspection of the pile of bricks in question, that it was dangerous.

It is urged, upon the part of the plaintiff, that the police, having seen this pile of bricks, should have reported it, and that the city is liable for such negligence; but it is not to be assumed that all the policemen in the city of New York are experts in building, or that they are required to know more upon that subject than the ordinary observer: and there is no evidence in this case which will lead to the conclusion, that to the ordinary observer this pile of bricks was of the dangerous character which it is claimed it was upon the part of the plaintiff. The use of the public street for the purpose of piling the bricks not being in itself unlawful, the Police Department were not bound to take notice of that fact in order that the obstruction might be removed; and it is only when such an obstruction is of such a character that it is dangerous to passers-by that the corporate authorities are bound to remove it, or be responsible for the damages sustained by reason of its non-removal. In consequence of the intervening Sunday, it cannot be said that sufficient time elapsed from the time that this obstruction could have been reported by the Police Department to the Department of Public Works for this department to have taken the necessary means in order to ascertain whether the structure was dangerous or not, and in case they found that it was dangerous, to remove the same before the happening of the accident. And even if the above position is not well taken in reference to the time which has elapsed, the fact that it is nowhere proven in the case that the pile of bricks was of such a character that it was dangerous to the ordinary observer is fatal to the plaintiff's right to recover in this action, because unless the pile of bricks was of that character, then there was nothing which the police were called upon to report, and, as a consequence, the question of constructive notice could not be considered in this case.

THE ILLUSTRATIONS.

CRADOCK HOUSE, MEDFORD, MASS. (1634.) SKETCHED BY MR. M. P. HAPGOOD, BOSTON, MASS.

THIS interesting relic[1] of colonial times — soon to be demolished — stands in the eastern part of Medford, on elevated ground near the Mystic River, — an advantageous situation for a combined fort and residence.

The walls are of local brick, relieved by moulded courses of an ogee contour. These bricks, although coarsely made, are well burned and of good color. The original sashes are filled with slightly tinted glass — pink and green. The main girders are large and heavily moulded.

The rumored intention of the owners to tear down this old relic of the past makes it an object of special interest at this time. The Boston *Transcript* says: —

"The Cradock House was built in 1634, thirteen years after the first party of white men entered Boston Harbor, and although the storms of nearly two hundred and fifty years have beat against its sturdy walls, they stand as firmly as they did in the days of their builder. 'When it was erected,' says Drake, 'Charles I. reigned in Old England, and Cromwell had not begun his great career. Peter the Great was not then born, and the house was waxing in years when Frederick the Great appeared upon the stage. The Indian, who witnessed its slowly ascending walls with wonder and misgiving; the Englishman, whose axe awakened new echoes in the primeval forest; the colonist, native to the soil, who battled and died within view, to found a new nation — all have passed away, but here in this old mansion is the silent evidence of those great epochs of history.' The house is of brick, and the walls are nearly two feet in thickness; the windows were protected with heavy iron gratings like a prison; loopholes in the second story served for defence against possible attack by the Indians, and a pane of glass was set in one of the huge chimneys, through which the inmates could look toward the town. The timbers were massive and strong, and some of the rooms fireproof. It was, in effect, a castle, whose owner could bid defiance — temporarily at least — against almost any force in those early days which could be brought against it. Its location was admirably chosen, as it commanded an extensive view in every direction, and there was no vantage-ground for any possible assailants. For more than a hundred years after its building, it was surrounded by a palisade with heavy gates. Cradock, who never visited America himself, was a member of the Long Parliament, and the governor of a commercial company in London, under whose auspices the settlement of Salem was made, and by which the settlers were governed. In order to secure a more important class of emigrants, among them Winthrop, Saltonstall, Dudley, Johnston, Cradock offered to transfer the government from the company in England to the inhabitants here. It was an act in defiance of the crown, but it succeeded. Cradock sent over agents who built the house, and established a park for cattle and deer, the land extending back a mile from the Mystic River in all places. He also sent over skilled workmen for

[1] This house is near Glenwood Station, on the B. & M. R. R. It has now a dilapidated coat of whitewash. Mr. Higginson, in his history, speaks of a Connecticut house as "the oldest,"— but that was built in 1639, five years later. M. P. H.

building vessels, and the more important of the earlier New England craft were built under his auspices.

"Says Drake again, in reference to this ancient structure, which is locally known in Medford as 'the Old Fort:' — 'This house is the monarch of all those now existing in North America. As we trace a family back generation after generation, until we bring all collateral branches to one common source in the first colonist, so we go from one old house to another until we finally come to a pause before this patriarch by the sea. It is the handiwork of the first planters in the vicinity of Boston, and is one of the first, if not the very first, of the brick houses erected within the government of John Winthrop. . . . The regret that the Commonwealth ever parted with, even to a noble charity, the old mansion-house of the provincial governors was by no means trifling or inconsiderate. The error might be retrieved by the purchase of the house of the first governor of Massachusetts. Every officer, civil or military, that holds a commission by State authority derives it in a certain sense from Matthew Cradock. He made the first move to erect an independent community on our shores. The house is his monument.'

"More than twenty-five years ago, Rev. Charles Brooks, the historian of Medford, warned by what had already been done in the way of the removal of ancient landmarks, pleaded for the preservation of this rare old relic of antiquity. He suggested that it be purchased, restored to its ancient appendages, and made a depository for Medford antiquities, for an historical library and a museum of natural curiosities. This plea is now in season. The owner declines to let it remain a non-paying piece of property longer on his hands, and advertises its sale. If the people of Medford possess a spark of the public feeling or local pride for which they have long been renowned, they will not allow its desecration or demolition. The few thousands necessary for its purchase and preservation ought to be raised in a single day's canvass, and we feel assured will be. . . .

"The mortgage on the Cradock House and the equity above the mortgage are both held in the same family, and the owners are willing to sell the house and a sufficient quantity of land around it at a valuation to be fixed by disinterested parties. Probably $2,000 would be ample, and it is a pity that so venerable and interesting a relic, the oldest building within the limits of the original thirteen States, should be sacrificed when so small a sum will save it."

CUVIER CLUB-HOUSE, CINCINNATI, O. MR. JAMES W. McLAUGHLIN, CINCINNATI, O.

This building is being erected by an association formed for "the protection of fish and game from the destructive pursuit of mercenary or thoughtless persons, in and out of season." Besides the rooms for social purposes on the ground floor, and the library and billiard-room above, there will be a room 25′ x 59′, on the second floor, 23′ 4″ high in the clear, and surrounded by galleries, for a Museum of Natural History. The front will be of pressed brick, laid with black mortar. The basement, oriel-window, cornice, and other finish, will be of Ohio freestone. The jambs and frieze of doorway will have appropriate carvings of fish and game, while a bust of the eminent naturalist from whom the club takes its name will decorate the pediment. The contracts for the entire building have been let for $16,000.

HOUSE FOR MR. HENRY C. PEDDER, LLEWELLYN PARK, ORANGE, N. J. MR. H. H. HOLLY, ARCHITECT, NEW YORK, N. Y.

The whole building, above first story, is constructed in wood. The foundation is built of Birum bluestone, from the quarries at Greenwich, Conn. The front-entrance steps are of Wyoming bluestone, the platforms being of tile. The parlor story is built of Philadelphia and moulded brick; the entrance vestibule of buff brick, with terra-cotta frieze. All the rooms on first and second stories are finished in hard wood, the hall finish being of dark oak, the main stairs of mahogany. The parlor is of rosewood, the reception-room of birch, dining-room ash, library of mahogany, while the attic and kitchen are finished in natural pine. The floors are all double, with felting between; those on the first story are of inlaid woods, with wide marquetry borders.

THE CHURCH OF THE "STIFT HAUG," WURZBURG.

As we [The *Builder*] have more than once pointed out, although the Renaissance style was introduced into Germany at the end of the fifteenth century,[1] yet it was two centuries before it came into anything like general use in the construction of churches. The earlier ecclesiastical edifices erected in this style in Germany are, as a rule, very dignified, and rather severe in character, and possess considerably more picturesqueness of treatment than those of Italy or France. The high-pitched roof and projecting external buttresses of the Gothic are still retained in combination with regular Italian domes and façades. The curious bulb-shaped spire, consisting of a series of lanterns superimposed, and each crowned by an onion-shaped dome, is a remarkable feature of these buildings, and although it may be objected that these spires are unconstructional and eccentric, there can be no doubt that they have a remarkably picturesque appearance, especially when seen in combination with other buildings. The Church of the "Stift Haug," at Würzburg, is an interesting example of this style, and exhibits all the peculiarities of that particular phase of architecture which we have been describing. The name "Stift Haug" really means "the Establishment of Haug," and is the designation given to a college of priests, of which this was the church. The church itself is dedicated to St. John the Baptist, and was erected between the years 1670 and 1683, under an architect named Petrini, a native of Würzburg, who erected many buildings in that town. The name Petrini certainly has a very Italian sound about it, but Italian names are so common in Würzburg, even at the present day, that it is probable that an Italian colony was established here some centuries back. The Church of the Stift Haug consists of a single choir, terminating in a polygonal apse to the east, transepts, and a nave of three bays, with chapels instead of aisles. A finely-proportioned dome rises over the intersection, and two lofty towers, crowned by bulb-shaped spires, flank the western façade. The interior of the building is simple and dignified, and the altars and furniture are in better taste than is usual with buildings of this date, while the organ is really a fine piece of design. The pendentives of the domes rest upon a series of pilasters rather singularly treated. The church is built of a fine warm sandstone, except some of the plainer portions of the walls, which are of rubble covered with plaster. The apse has rather a Romanesque character about it, and were it not that there is positive evidence to the contrary, one would be led to suppose that remains of an earlier church had been worked into the existing building. The architect Petrini also erected the magnificent tower of the University Church, the "Julius Hospital," the city gates, and a portion of the castle at Würzburg. All his works have a fine picturesque outline, and the detail is bold and effective, though rather coarse.

[1] The "Coronation Hall" in the Hradschin at Prague, which dates from the years 1470-1520, is said to be the earliest building exhibiting Renaissance detail in Germany.

DECORATION AS APPLIED TO ARCHITECTURE FROM A PAINTER'S POINT OF VIEW.[2]

I HAVE been asked to write a paper on a subject about which so much has been written, and well written, that it is almost impossible to say anything new about it; but perhaps, when looking at the subject from my own (a painter's) point of view, I may be able to say something which may be of interest to you as architects. It is unfortunately out of my power to speak of any of the earlier work, such as is to be found at Assisi, Perugia, and other towns north of Rome, but in Rome itself and the surrounding neighborhood we can examine the later work at its perfection and the commencement of its decline better, I should think, than anywhere else. In the Vatican, too, we have the advantage of being able to study entire rooms left almost, if not quite, as they originally were; and as I am unable to give drawings in illustration of what I say, it will be an advantage that most of what I speak of is, to a certain extent, familiar to all of us.

I will divide what I have to say under the heads of Arrangement, Scale, Color, Construction, Relief, and Material.

ARRANGEMENT.

To commence, then, with the Vatican. In the roof of the Sistine Chapel the main subjects of the flat of ceiling are placed lengthwise across the ceiling, so that to look at each and all of them it is necessary to face the altar; but these subjects are surrounded by the single figures of the Prophets and Sibyls, and groups in the cove, so placed that whichever way you may be looking at the ceiling you must see one or more of them the right way up. Even with this marvellous work before me, I cannot help wishing that it was on the walls instead of the ceiling. It seems to me that anything requiring very much study from spectators is out of place on a ceiling, and that important figure-subjects, if introduced at all, should be so arranged that they can be easily seen and taken in at one view, while the main subjects should be on the perpendicular surfaces of the walls, where they can be seen and studied without difficulty. In this case more particularly do we wish to study carefully every square foot of the painted surface, for this wonderful work is, or should be, one may say, a standard of excellence in design and style for painters of all time.

The ceilings in the *stanze* of Raphael vary much in excellence; and the later ones, in the designs of which he can, I fancy, have taken but a small share, if any, show very plainly that the decadence had commenced. In the Camera della Segnatura the ceiling is beautifully arranged, so that the centre compartment can be seen whatever the position of the spectator underneath, and also one or other of the four compartments containing the large well-known figures representing Theology, Philosophy, Poetry and Jurisprudence.

This ceiling is much better divided and arranged than that of the next room, — the Heliodorus, — which is not so well balanced. Having taken a circle, divided into four, as the main division of the ceiling, — the room not being quite square, — the extra spaces at the shorter sides of the room have to be in some way filled up, and in this case these spaces have been made unnecessarily wide. It seems as if this had been done in order to get more space for the small figure-subjects in grisaille, whereas by another arrangement there would be a much smaller space left, which in the former room is done, and is filled up with a running ornament. This seems to me much better in effect than the cutting up into so many small spaces for the grisailles.

A very good instance of the inconvenience of a large picture on a ceiling is to be seen in the last room, the Sala Constantino, where the centre compartment of the ceiling is occupied by a large picture which can only be seen from one place. This is also the case with the much over-praised "Aurora" of Guido, in the Rospigliosi Pal-

[2] A paper by R. Corbett, read at the Architectural Association June 10.

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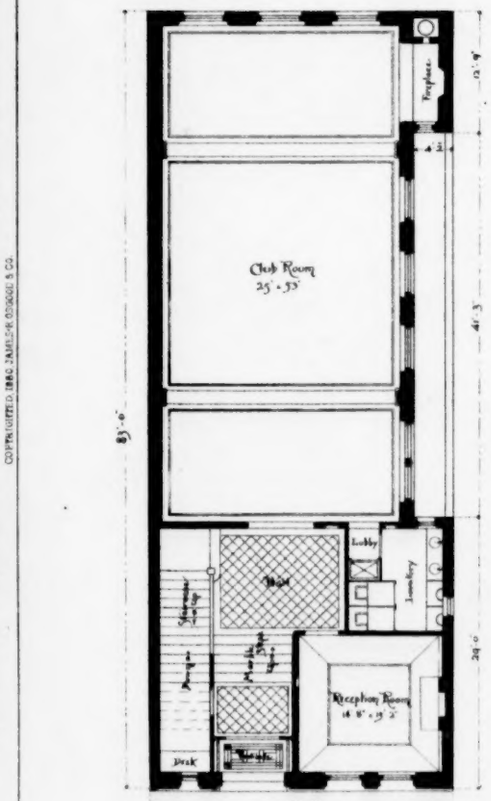
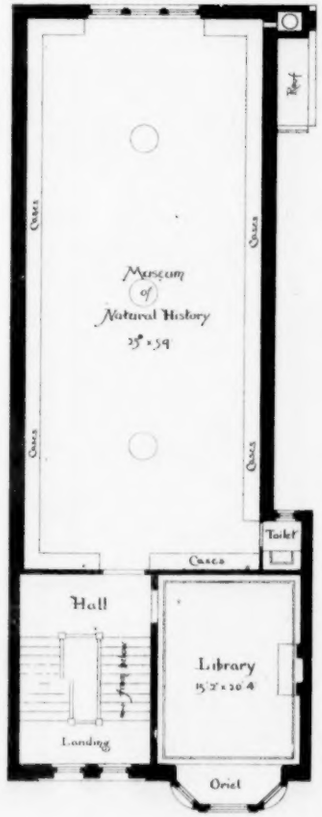
CUVIER CLUB
CINCINNATI

Jas. McLaughlin
Architect



Plan of first floor



Plan of second floor

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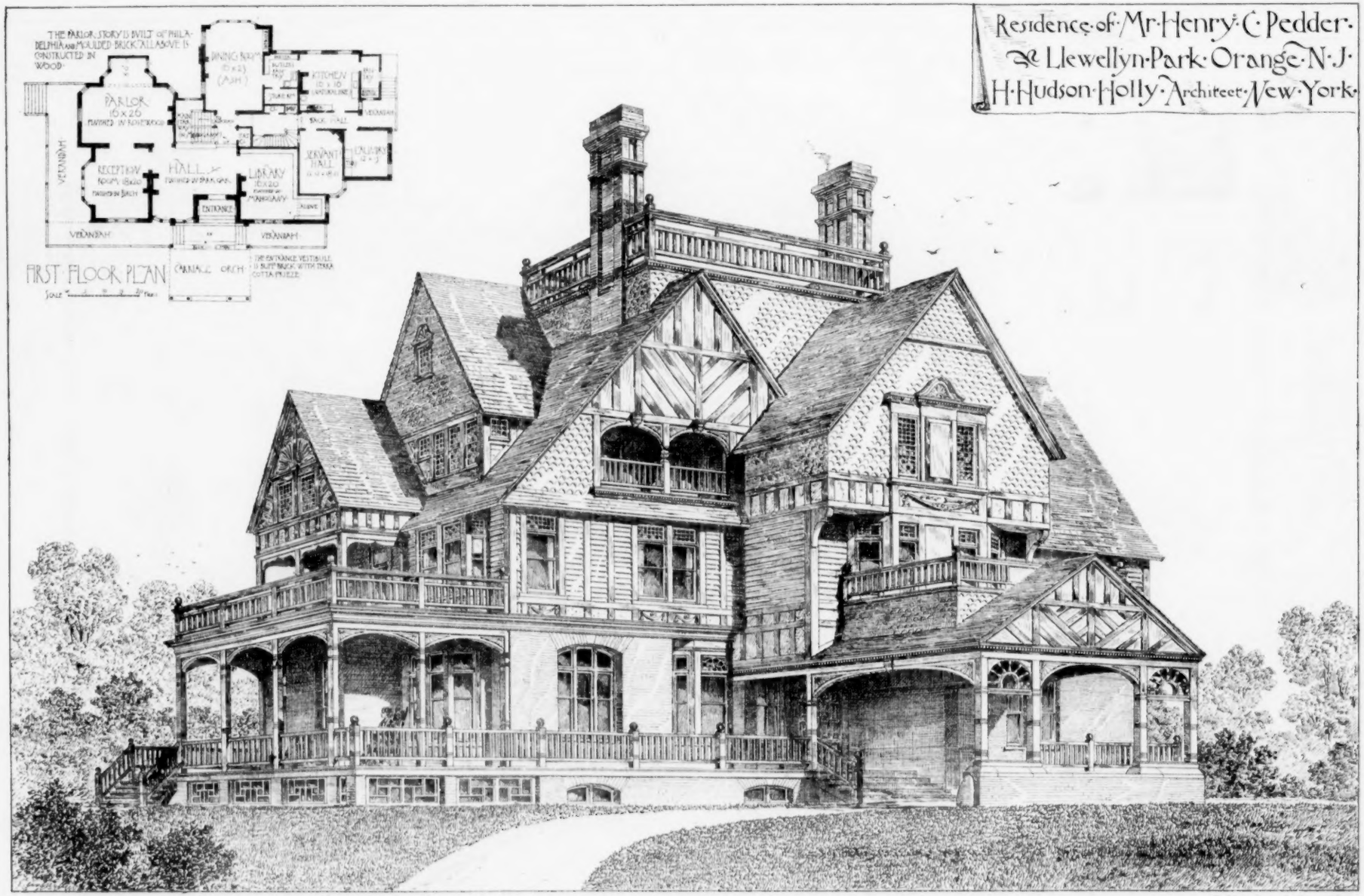

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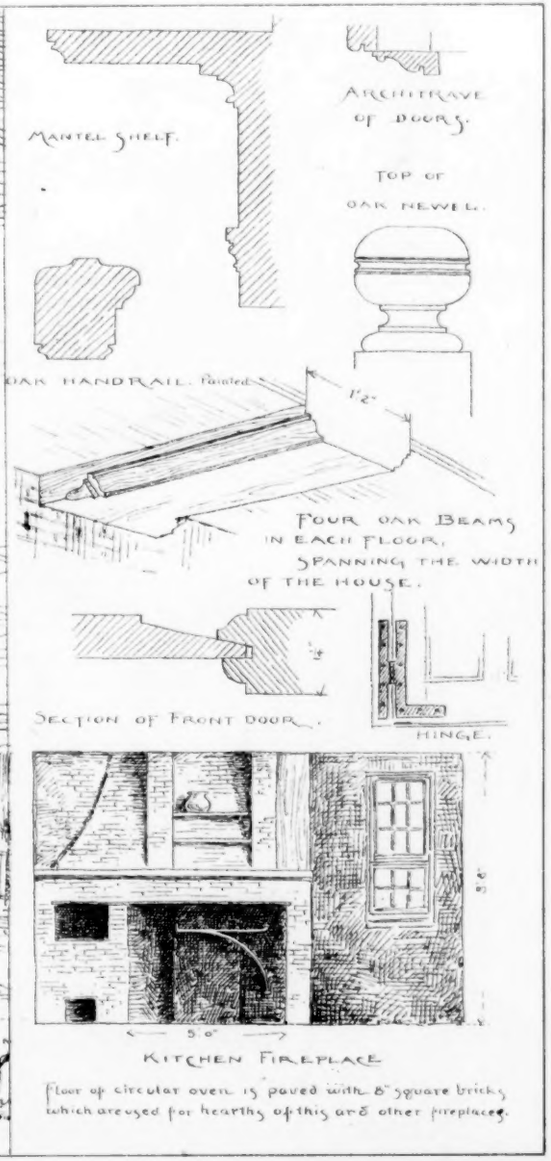

Craddock House, Medford, Mass. A.D. 1634

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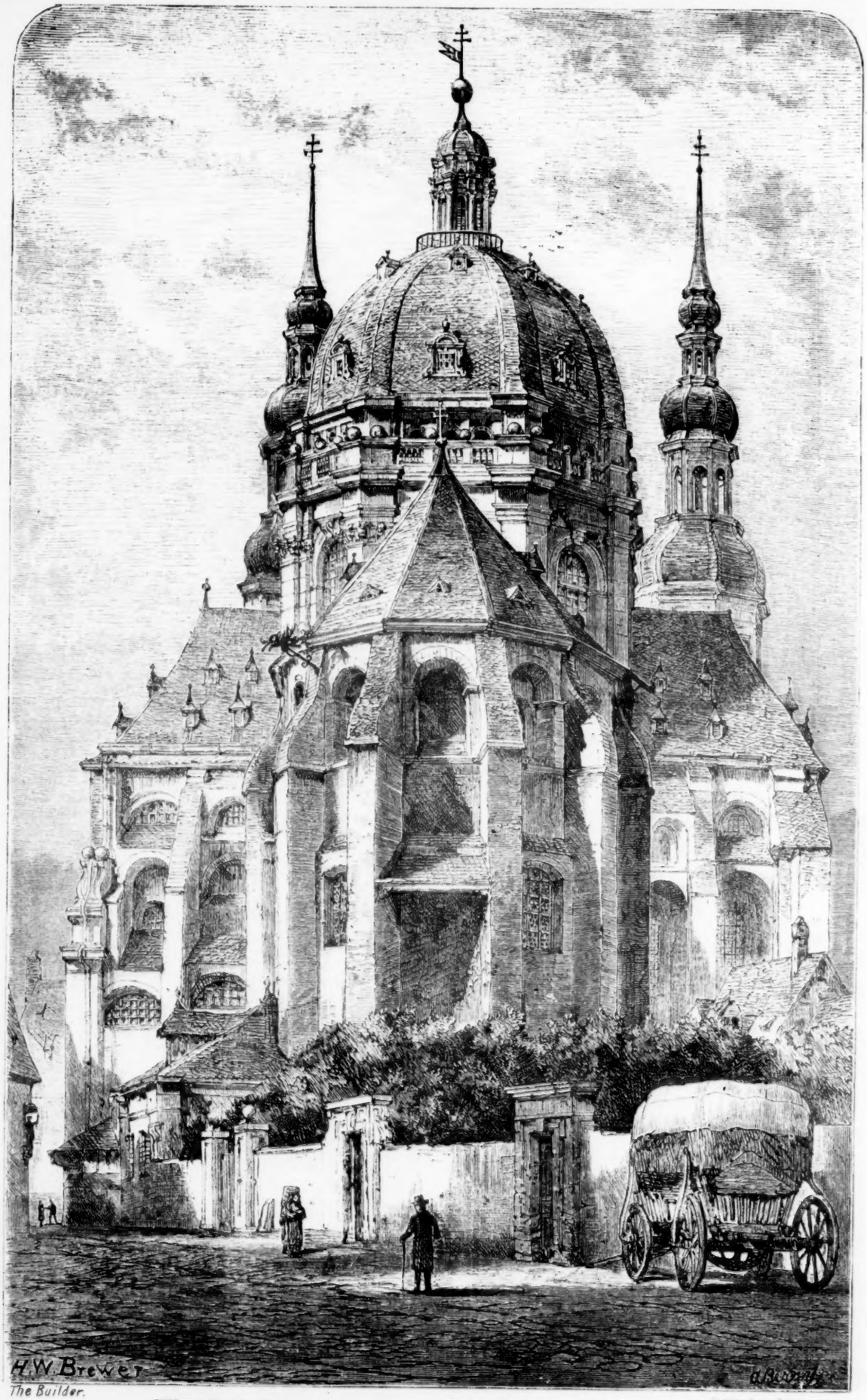


The Builder.

CHURCH OF THE "STIFT HAUS," WÜRZBURG: SEVENTEENTH CENTURY.

ace, and countless other ceilings in Rome of the late period. The top of the ceiling of the Sala Constantino is more depressed in section than that of the Sistine Chapel, which is, I believe, a flat semi-ellipse. A large picture in the centre of such a ceiling, with no reason for the spectator being in one place more than in another, is surely wrong. Whilst in the case of the ellipse, though almost equivalent to a flat surface at the top, it would be rather more allowable, and Michael Angelo has made the most of the perpendicular portion, by carrying up the figures at the sides right into the curved part, and not improbably for this reason. Here, also, the spectator is always supposed to be facing the altar, and is not intended to see the ceiling unless so doing. It seems to me, then, that the pictorial treatment of a flat ceiling is not advisable.

It appears to me that in this respect the French painters of the present day are entirely wrong. They go in very much for the pictorial decoration of ceilings in a florid manner, continuing the Italian traditions of the late period, apparently basing their work upon that of the Cavaliere d'Arpino, about the middle of the seventeenth century, and others of that time.

One of the subjects of design always given to a French student of painting at the Villa Medici, which he has to send home in the year, is the decoration of a ceiling. It has never obtained much in Rome, and instances are comparatively rare of ceilings treated in this manner.

The secret of the fitness of a certain treatment for a certain place in a building seems to lie very much in this, — that the higher the constructive value is of the space to be decorated, the more severe and conventional should that decoration be — if decorated at all. The decoration is intended for those parts not so structurally important. Where the ceiling is quite plain and unpanelled, the decoration should be very evenly distributed; where the ceiling is panelled, or otherwise divided, those spaces, such as the panels, can be decorated more pictorially than the more constructive parts, such as the mouldings, or the borders enclosing the panels. There are numerous examples of this in the work of the best time. Pinturicchio's ceiling in the choir of Santa Maria del Popolo (which has been published by the Arundel Society) illustrates this very plainly, as do the *stanze* of Raphael. A similar principle is well illustrated by the "grottesche," or modelled reliefs in *gesso*. At the Villa Madama there are some lovely examples of this mode of decoration. It seems to me that it might be made much more use of in England than it is at present. I do not think it need necessarily be expensive; a great deal of the best at the Villa Madama seems to have been executed by pressing a mould onto the wet plaster, and slightly modelling on it, if necessary, afterwards. There can be no reason why it should not be used with a more severe style of architecture, if treated with more reticence than it is here. And I fail to see why, when good designs have been made by good artists, they should not be repeated again and again. Formerly, if a design were really good, people saw no reason why it should not be used again under different circumstances. Now it is usually the bad examples which are reproduced *ad nauseam*. Now-a-days I dare say there would be an outcry if a well-known artist were to design stuccoes for a house, say in Park Lane, and make use of some of them again in decorating a house in Prince's Gate. These stuccoes were made much use of by Giovanni da Udine and others of that time. When on a wall-panel there is no reason why they should not have considerable relief, or on a spandrel or place not so constructively important as, say, in an architrave or panels of a pilaster.

The same principle seems to run through the whole, — that the more essentially constructive a part of a building is, either in reality or even in appearance, the more severely and conventionally it should be treated as regards its decoration. This can be seen very well in Raphael's Loggie in the Vatican, though in some respects he has gone contrary to the law, by decorating the side pilasters with flowing and undulating arabesques, which take all firmness and stability away from them, and at once cause them to lose their constructive value, — in this case a real one. In earlier work a pilaster is never treated in this way, either in painting or sculpture; it usually has a line running perpendicularly down it through the ornament, which gives the requisite suggestion of strength, and the ornament is always more severe and has less relief than in other places. There are good examples of this in Santa Maria del Popolo. Surrounding the windows in a chapel painted by Pinturicchio, the ornament is low in relief (in marble), and flowing round the curved top of the window and at the bottom, whilst at the sides it is perpendicular in its *motif*, and has a stem, as it were, running down all through it, which gives it stability. I noticed in one of the flat pavement tombs, of which there are some good examples in Rome, that a border was treated in this way, having a very unpleasant effect on the horizontal surface, and particularly when I happened to see the tomb upside down. Surely when this is to be seen from any point, and is itself horizontal, it should be treated with running ornament, or ornament like what might be found on a moulding, and not with that which is expressive of a perpendicular *motif*. On the other hand, there can be no objection to such a treatment in the frontispiece of a book, as we see in so many of Holbein and his school, for in this case it is to be seen only from one point of view, and there can be no objection to an upright treatment.

SCALE.

The effect of all the *stanze* is much marred by hideous yellow figures and caryatides on the dado, which throw the pictures out of scale by their enormous size. On the other hand, I do not object (that is to say, as regards scale) to the medallions on the dado or the smaller figures on the ceiling; they do not seem to interfere with the rest. I believe that many architects would say that such combination is absolutely wrong, and that all the figures, both on the ceilings and the walls, should be to exactly the same scale. This I entirely disagree with, as it limits so very much the use of figure-subjects, and I do not see the necessity for it. What seems to me necessary is that all figures of the same rank, occupying, that is, equally important places on the walls or ceiling, should be to one scale, while those of another rank may be to another scale; according to their importance in the scheme, so should be the scale of the figures, and those very far from the eye should not be to too small a scale, so that everything may be seen clearly.

The scale of the figures in the School of Athens and the Disputa appears to be a little less than life. As regards scale, I think that as a rule, even in good Renaissance work, they are far too apt to put elaborate small work in places where it is quite lost, and is often injurious to the general effect. This seems to be particularly the case with the stucco-work before mentioned. At the Villa Madama there is much beautiful work placed very high up on the domed ceilings, especially some very exquisitely proportioned and modelled female figures, and some extremely beautiful arabesque borders, which have no business there; they should be where they can be seen. This is also the case very much at the old palace called "Papa Giulio," about half a mile out of Rome, beyond the Porta del Popolo, which has some extremely fine stucco-work, — very fine in design, especially a frieze in one of the principal rooms, in which *amorini* are combined with foliage, forming a most lovely decoration. This question of scale is rather a vexed one, and artists differ very much about it.

If we are to carry out the principle I first mentioned, of making all the figures to one scale, we might have to go even farther, and make every object introduced in the decoration round to fit scale with the figures, which surely would tie the artist down most unnecessarily.

In the case, for example, of an altar-piece in several compartments, — very often three, — the three would be to the same scale, while there would very likely be smaller pictures to a different scale below in the predella, illustrating different episodes probably in the life of the saint. Were the artist restricted to one scale, he would be debarred from this, and if he had smaller compartments at all, would be obliged to fill them with ornament only. It was suggested to me as a likely reason for putting small work so high (as I mentioned was the case at the Villa Madama and elsewhere), a desire to increase the apparent size of the vault, and it looks as if it might be so. On the whole, I think the Villa Madama superior to Raphael's Loggie; it is not quite so overloaded with ornament, and the stuccoes are extremely beautiful both in design and execution.

COLOR.

Even distribution and the most perfect balance of color is what Raphael has carried to perfection in the Disputa. The gilt parts are few, only up at the top of the picture, where they combine with the richness of the gold ground on which the greater part of the ceiling is painted. Even the host on the altar and the rays from the dove above it are painted, not gilt; also the ornament on the altar-cloth. Were these gilt, they would glitter and destroy the breadth of effect; also, the parts which Raphael has gilt are at the top of the picture, where they get no direct light, and, in consequence, do not glitter, but only look rich, and gradually lead up to the still greater richness of the ceiling. In the ceiling the gilt ground of the pictures (not of the framework in which they are set) is lined over with a rich brown, giving the effect of mosaic; it prevents the larger masses of gold from predominating, and has a very pleasing effect. In the smaller subjects the mosaic divisions are reduced in scale to suit the size of the figures. Even in ornament I doubt the expediency of using gold in places very well lighted, as in its application it is often difficult to determine when and where to stop. If a fresco is surrounded by much rich work, it seems necessary that it should have perhaps in itself much gilding, but it is very likely to lose rather than to gain by such surroundings, and in order to stand against rich marbles, gold, mosaic, and the like, if it would not be thrown quite into the shade, it must avail itself of such a resource as gilding. I often feel that, even in the good old work, the gilt parts of a fresco tell as spots and injure the breadth of effect, even when very evenly distributed. This can be seen in the frescoes in the Sistine Chapel below those of Michael Angelo, by Luca Signorelli, Botticelli, and others, though in this instance the gold is used only in thin lines and patterns on the dresses. I fancy nothing harmonizes really well with mosaic except a wealth of rich marbles of varied color, and as we in England can seldom get these in any quantity, I fear it is an argument against the very general use of mosaic, — at any rate, that with much gold in it, — though on the other hand it has great advantages for our climate, as, besides being so permanent, it looks well in a low light.

As regards the general effect of a painted wall-decoration, it should, I think, not be too dark, because it has no gold frame like an easel-picture to isolate it, and for a similar reason white should never be too high in key. The latter would also give an unsubstantial look, as it suggests a hole in the wall with light seen beyond. For these reasons I think a middle tone is the most suitable, but it would be better to be too light than too dark of the two. In the Convent of St. Mark, at Florence, Fra Angelico has represented many monks in

black dresses, but he never paints them black or anything really approaching it, not because he had not the means or was unable to do it, but evidently because he felt it was unsuitable.

White is often used by Pinturicchio in his ceilings with particularly happy results. It is always very low in tone, but even then it is the most prominent of the colors in effect, and is always used when he wishes to emphasize a moulding or line round a medallion, to isolate it from the ground on which it is placed. I must repeat again what I said about the use of gold; if used in shadow it always looks well and rich, and helps other colors, especially blue and red, very much. Pinturicchio uses it with great success in bands of ornament in deep shadow on the ceiling mentioned before, but he never seems to use it in any quantity when in light.

CONSTRUCTION.

All through the *stanze* one meets with a great deal of what I cannot but think misplaced decoration. In the so-called Disputa, the pilasters at the sides, drawn in perspective, are a great mistake, and I cannot see the occasion for them; the perspective of the pavement gives quite enough perspective to the picture. The ornament round the top of the picture is also in perspective. I am sure that the whole would gain if this were more conventionally treated, and the painted mouldings dividing the panels of the ceiling might perhaps be treated rather more flatly, as in many cases they have the appearance of real mouldings. This applies to a certain extent to the ceiling by Pinturicchio, in the choir of S. Maria del Popolo, where the painted mouldings are in some cases very deceptive. There are strong cast shadows from the pilasters (painted) of the niches containing the figures of the four Fathers of the Church in the pendentives, which have a very unpleasant effect, as it strikes the observer that such niches could not possibly exist in such a position, and it makes them look as if they would fall forward at any minute. This realistic treatment is surely an error. Had the cast shadows not been insisted on, there would have been no objection to the painted architecture, as it would then have become merely a symbol, and a means of dividing up the space. This ceiling has been very much restored not long since, and I think that much of what we now see is due to other hands than those of Pinturicchio. This painted architecture is to be found in all the *stanze* and on the roof of the Sistine Chapel, and we have all heard much said against it in these days by architects; but surely there can be no reason against dividing a ceiling beautifully by means of an imaginary architectural construction and decorating the spaces so made, so long as (and this is the important point) the architecture is treated as painted architecture, and not carried so far that by means of strong cast shadows and very forced perspective it is made to look as if it formed part of the actual construction of the building decorated. There are few things more annoying than looking up at a ceiling and fancying that you see the groining of a roof, and discovering, on closer examination, that it is only painted. On the other hand, I fail to see why a ceiling should not be divided as if by groining correctly designed, supposing the construction to be actually vaulted. If it be treated quite flatly, and merely as a means of separating one portion of the vault from another, all these representations of architecture should be definite representations; there should not be for a moment a doubt in the mind of the spectator that what he sees is not a real moulding, but a painted one; and were these mouldings treated carefully, they need deceive no one. I feel pretty sure that in the case of Pinturicchio's work in S. Maria del Popolo, what we now see of strong cast shadows and other resources for realistic effect is due to other and later hands. Almost all his work in this church has been much injured by so-called restoration, and the great thing seems now to be to make a thing look like what it is not. Formerly in Italy, and doubtless elsewhere, a brick house was covered with stucco and marked so as to look like stone; now they cover them with stucco and then paint and mark them to make them look like brick again.

In the case of the Sistine Chapel, the figures are so solid and so wonderfully real that Michael Angelo may have felt it was necessary to make much of his painted architecture in order to support his figures, and consequently has made it stronger in relief than would perhaps have been justifiable in the case of figures less wonderfully solid and in every sense large. Each niche in which a prophet is seated has its own vanishing point, so that there can never be any question as to the reality or non-reality of the representation. But on the whole, I am inclined to say that it would be better not to represent, in a purely decorative way on a surface, things which might themselves in reality be there. False construction and bad taste are carried to an extreme excess in the Sala Constantino, which is later in date than the other rooms.

We find the huge picture of the Battle of Constantine painted on the main wall, with edges painted so as to look as if the picture were painted on a curtain, with a fringe at the bottom, and the top edge shown as if suspended from rings, though the artist has not gone so far as to carry the folds which must necessarily ensue down into the picture, which, if consistent, he would have done. What is so objectionable in this last room, with regard to the painted architecture, is that what is painted in order to represent say a pillar or pilaster, either to divide a space or to emphasize construction, often forms part of the actual picture as well. So what he has really done is to jumble the whole thing up together: architecture painted so as to represent real architecture, architecture painted so as to form part of a picture, and architecture professing to serve both these ends forming part of a picture, and forming part also of the construction of the room, and each and all represented in an equally realistic manner. But this is a supremely bad example of the style, and I think it should be borne in mind that in this style of the Renaissance, both early, middle, and late, the architecture is often responsible in a measure for the decoration, and much that is admissible in late Renaissance decoration would not be admissible in a purer style.

The indifference to construction seems to be almost a principle of a great deal of Renaissance architecture, and in direct contrast to the Gothic principle (which is more in favor now) of showing on the outside, as far as possible, the construction and arrangement that is within. No wonder, then, that the decoration assumed a similar license, and false construction became a canon of art decorative as well as architectural.

What is so beautiful in Renaissance decoration is the design of the detail and the execution and finish of the work, often wrongly distributed, often put high up in places where it cannot be seen, often divided up and injured by the excessive amount of it, but usually lovely in *motif*, and generally (at any rate, in most of the examples I have seen here) exquisite in execution.

RELIEF.

It is the fashion with some architects of the present day, when they have figure decoration to design or superintend, to insist on having it in flat tints with dark outlines. In some cases, no doubt, it is want of funds which makes this a necessity if the decoration is to be of figures, but to assume it as a principle of good decoration is surely a mistake.

The early painters of the twelfth and thirteenth centuries did not make all their figures flat because they thought it right, but because they were unable to make them round and solid; and it is easy to trace the effort to attain solidity and roundness through all the best art of Italy right up to the sixteenth century. The beauty of these early pictures consists in no way in their flatness, though I have often heard work of this kind praised by architects for its decorative fitness, because it was flat. The flat tint and dark outline is only a concession to want of funds, or inability to produce work demanding so much more time and skill. Of course the amount of relief required depends on what the decoration is, — what place in the whole scheme of decoration it occupies; if on a place of very evident constructive value, it should not (as before mentioned) be in very strong relief; but in a case of this kind the sort of decoration employed would and should preclude this being possible.

The more important parts constructionally of a building (following the principle discussed when speaking of construction) certainly demand less relief than those spaces less necessary to the construction. For instance, a pilaster will bear less relief (not only relief represented by means of colors on the flat surface, but relief modelled, as in stucco or marble) than will a spandrel. As rounded forms are shown off more in a side light than a front or a diffused light, the relief of the stucco must be treated accordingly. A very good effect seems to be obtained in many instances by incising a line, especially if it be upright in its general direction; this will always tell in a diffused light. The Elgin frieze is a very good example of a similar treatment. It was intended to be seen in a diffused light, and the whole treatment is very flat, the outline being every now and then insisted on. Of course, when much relief is used in a decorative treatment of stucco, it must be supported by much greater strength and width of mouldings.

MATERIAL.

A final word on the subject of the materials for decorative purposes. Of course, from my point of view, fresco is, *par excellence*, the material, and it is a great pity that it is not more used in England. I do not mean that it should be used only for the production of important pictures, which seems to be the only use to which it has yet been put in England, but for ceilings or walls decorated with arabesque or what not, and places where large pictures may not be required, it possesses to the full all the qualities most desirable for this as well as for large monumental works, and spirit fresco so-called (the Gambier Barry process) comes very near it. For some reasons not hitherto satisfactorily explained, pure fresco does not seem to stand well in this country, I fancy very often because we do not sufficiently know how to use it.

Most of the painting which we find combined with stucco relief is in distemper and most beautifully executed; indeed, the tradition of this work has been handed down even to the present day, and I believe Italian workmen are to be found now who are no longer artists in the right sense, but whose technical skill enables them to execute ornamental work in distemper in a way that very few Englishmen could. It is, to a great extent, the same in Italy with all the arts. The workers in marble and the wood-carvers are to this day almost unequalled for a certain technical skill and power over their material. But I think that even if the pictures are only to be small medallions surrounded by much ornament, as in the ceiling before mentioned, in the third chapel in S. Maria del Popolo, fresco is a very good material, and one which might be used with better effect than any other. But, putting aside fresco, there are many other modes of painting walls.

Encaustic is a very fine medium, seldom or never used, I believe, in this country. We all know its wonderful powers of lasting, and of withstanding damp. According to Müller, the wall paintings at Pompeii were not encaustic, but merely water-colors on smooth plaster, — distemper, in fact, though the effect of some of them is certainly much like encaustic. At Herculaneum, which I have not

visited, Müller says the ground is generally fresco and the rest tempera. A great deal of the Egyptian painting was very like encaustic; if not so in the true sense, the colors were mixed, in a great measure, with wax, and laid on the dry plaster. True fresco does not seem to have been known to them, at any rate not used. Wax might be made much more use of; it renders colors safe from damp, and gives a good surface, besides being a very pleasant medium to work with.

ASPHALT.

A LECTURE on "Asphalt" was read by Mr. E. B. Bell, C. E., before the members of the Balloon Society, at the Westminster Aquarium, on Friday evening. The material was, it was shown, a natural production, consisting of from five to fifteen per cent by weight of pure bitumen combined by carbonate of lime. Although its composition was well known, and the components could be derived in abundance and at moderate cost, asphalt had not yet been artificially produced with success, either chemically or commercially. Its employment was of the highest antiquity, it having been well known to the Egyptians, Assyrians, and Babylonians, although, curiously enough, no allusion to it was made by Roman or Greek writers, nor could it be found in the works of those classic nations. It appears to have been rediscovered by Dr. D'Eyrinis, who published a work in 1721, enthusiastically advocating its use, not only as a cementitious material, but as a universal panacea in medicine. Dr. D'Eyrinis found out the material while making a geological excursion in the year 1781, in the Val de Travers, canton of Neuchatel, Switzerland, and for nearly a century this was the only mine worked. In 1838 the first foot-paths were made in the material at Paris, and the Seyssel mines were opened; but owing to commercial speculations, asphalt lost favor, and it was not till 1854 that the first Parisian carriage-way, that of the Rue Bergère, was paved with it. Since 1871 a very large proportion of the streets of Paris, both the carriage and foot ways, had been laid with asphalt. The first experiment in London was in May, 1869, when 485 square yards of Threadneedle Street were laid with it, and its use had been largely extending. The material was at first used as mastic, boiled on the spot in large cauldrons, but latterly it had been found better to use it as a powder, rammed by manual pressure. The present treatment was that the rock was brought to England and stored in the open. It was thrown into a stone-crushing machine, and having been reduced to pieces about the size of a walnut, the material fell onto a chute, from the bottom of which an endless chain of buckets carried the material to the hopper of a Carr's disintegrator, in which it was reduced to powder. It was then heated in cylinders over a coal fire. Each charge consisted of about 2½ tons, and took from two to three hours to attain the requisite temperature, and varied according to the amount of vapor to be driven off, and had to be very delicately regulated. If the material was not sufficiently heated, it would not adhere enough under compression to give the laid surface a hard face. If, on the other hand, it was overheated, the bitumen was fused, and little but comparatively worthless limestone left; as a rule, the heat varied from 220° to 250° Fahr., but much was left to the experience of the skilled calciner. The powder was now ready for laying, and owing to its dense, compact nature it would retain the heat for many hours. A concrete foundation having been laid and allowed to set firmly, the asphaltic powder was brought to the street in open carts and spread transversely across the carriage-way in widths of from 3 feet to 4 feet, in a thickness about two-fifths above the specified compressed section. It should still have a minimum temperature of 115° Fahr. It having been raked with as much regularity as possible over the concrete, the powder was rammed all over with heavy iron, mushroom-headed punners, heated in portable furnaces to a temperature that prevented adhesion. This ramming was the crucial point of the operation, and was at first done very lightly, the pressure being augmented as the material attained solidity. An opening presented itself to mechanicians to devise some mode of mechanical ramming; many plans had been suggested, but at present none had answered. The objection to rollers was that they drove the powder forward in a wave, and the force was not advantageously applied; a steam hammer executed the work better, but the practical difficulty of laying the temporary rails had been fatal to the method. After the surface was compressed by the punners, the surface was seared with a smooth iron, and it was gauged by a long straight-edge, beaten to a uniform level, and the roadway was finally thrown open for travel as soon as it had cooled to the temperature of the atmosphere. The lecturer then indicated the advantages of the asphalt as a paving material from the sanitary, mercantile, ratepayers', and humanitarian points of view. He thought all would agree that that material was best for roadways which created least dust and mud, presented the most continuous surface, and retained least damp. Dust in itself, apart from its impure character, was injurious to health, and was rendered worse by the deleterious substances contained in it. Asphalt stood foremost, he held, in its imperviousness to filth and moisture, and hence no exhalations could pass through it from the ground below, nor did it suffer any change under moisture. It was also almost noiseless, and although exceeded in this respect by wood, asphalt had not the peculiar rumbling sound which that material caused. To the mercantile portion of the community it was not only commended by its freedom from dust and mud, but from the absence of vibration, and the minimizing of tractile force needed to draw given loads. The unpopularity of asphalt with many engineers and architects arose from the fact that streets were laid with preparations of gas-tar, or pitch and limestone, or clay, which resulted in a soft surface during the first year or two, giving off oils by evaporation, and breaking up after two or three years' wear. The cost of cleansing and watering was greatly reduced by the use of true asphalt. Comparisons made by Lieut.-Col. Haywood, the city engineer, showed that one cart-load of refuse was swept from every 344 square yards of macadam, from every 500 square yards of granite, from 1,666 square yards of wood, whereas 4,000 square yards of asphalt had to be traversed before a load was obtained. The expense and inconvenience of renewal was also reduced. One of the greatest conveniences for a crowded city was the fact, that an asphalt roadway once down, the street need never be blocked for repairs. Cheapside had now been laid for eleven years, and the traffic had never been interrupted for an hour during mending. The watering, again, was reduced to the flushing of the channels with streams of water. The common objection to asphalt was that it afforded a bad foot-hold to horses. In itself, however, whether dry or quite wet, it was not slippery but became so when the air was humid and after slight dirt upon the surface rendered it greasy. Lieut.-Col. Haywood had proved by statistics that fewer horses fell on asphalt than on granite, and this was confirmed by much independent evidence. Further than this, horses hurt themselves the less by a fall on asphalt than on granite. It was chiefly on the transition from one material to another that accidents occurred, and the true remedy appeared to be to lay all with the same class of paving. In conclusion, the author showed that amongst the other uses of material were in flooring warehouses and granaries, for which its imperviousness to damp and vermin strongly recommended it.

A discussion followed the reading of the paper, in which the chairman (Mr. W. H. Le Fevre, C. E.), Col. Bryne, R. E., and Messrs. Ford, Burton, Harrison, Piper, Read, Durrant, and others, took part. Some questions were asked as to original cost and outlay of maintenance as compared with other materials, to which Mr. Bell replied, that the two should be taken in conjunction, when the balance was slightly in favor, he believed, of asphalt; the first consideration, he urged, with a local authority should be, What was the best paving material? The discussion turned chiefly on the question of how to reduce the admitted greasiness of asphalt when in a semi-moist state. Flushing with water was said to be a remedy; Mr. Ford, as surveyor of Bermondsey, said he thought he had tried an original cure, viz., that of sprinkling with sawdust, and that the result had been very satisfactory; Mr. Durrant had found ordinary gravel, thinly applied, useful; but Mr. Harrison pointed out that the rounded particles of sand or gravel lessened the grip they afforded; he, as a surveyor, had tried, with success, emery, sparingly applied, which was, when a road was greasy, well worth its cost, about 2*d.* per pound. Several speakers pointed out that both emery and gravel cut into and destroyed the asphalt, and had very soon to be swept off as mud, and the meeting was closed with a vote of thanks to Mr. Bell. — *Building News.*

THE FINDING OF ROMAN TOWERS AT OLD CAIRO.

MR. A. J. BUTLER writes as follows to the London *Athenæum*: —

Before leaving Egypt I had the good fortune to make what I believe to be a discovery, and a discovery of some interest. Every one who has visited old Cairo knows that there are considerable remains of the Roman wall which enclosed the fortress of Babylon. The short south wall with its three bastions is the most conspicuous and familiar to travellers. The western wall shows here and there at intervals for three hundred yards; but for the rest the walls have either disappeared entirely or pass unnoticed among private houses and gardens. No attempt has, I believe, ever been made to trace the entire circuit or to draw a plan of the original fortress; for the task, not easy in itself, is made harder, and sometimes almost impossible, by the suspicion and resistance one encounters at every step. While I was engaged upon the work, from the roof of one of the churches which I had climbed for a view, I noticed a part of the wall not visible from outside nor from any street. It was curved something like the southern bastions, only the curve fell entirely inside the fortress instead of abutting outwards, and the outer wall formed a tangent to it. The place was quite shut in by houses through which it was necessary to pass, *i. e.*, to run the gauntlet of men threatening, women screaming, and dogs barking; to be accused of breaking into harems; and finally, if fortune favored, to lay the storm with a little baksheesh. Fortune did favor, and I soon found that the wall which had puzzled me was unquestionably Roman, the alternate layers of brick and stone courses being continued unchanged from the tangent wall, and that it was part of a large round tower nearly one hundred feet in diameter. Just half the tower is left, showing a kind of vertical section, though the remains are much encumbered by Arab sheds and houses. It was, however, clear that the plan of the tower consisted of two concentric circles, the space between the two being divided into eight chambers by radiating walls. These chambers seemed to open into the central chamber, but there were no signs of a staircase, though there were remains of at least two stories.

Where the outer wall touches the tower it ceases, or rather bends round with it; but of this curve scarcely anything is visible from outside. An Arab wall continues the line at a slightly changed angle for thirty yards; next comes a lofty mass of masonry, covered with plaster and whitewash, from which the Roman wall finally

emerges and runs onward. Thinking over the matter afterwards, I remembered that the whitewashed wall has a slight curve inwards opposite to and corresponding with the curve of the tower, and I at once formed the conclusion that it was part of a second tower, and that the two defended the entrance on that, the western side of the fortress. A visit next day fully confirmed my theory. I found the tower existing in almost perfect preservation for three stories. The plan is exactly like that of the other tower, and the measurements identical; but I found the staircase occupying one of the octagonal side divisions, and not in the centre as I had imagined. It is built of stone, and passes by alternate short and long flights about a rectangular pier; the roof is vaulted, and altogether it is a beautiful piece of work. Of the three remaining stories, in the lowest, the ground floor, only two chambers are accessible, as the doorways to the others are blocked by Arab walls; and these two are used as pigsties, and only approachable through a labyrinth of ruined Arab outhouses and passages blocked with broken doors. The story above is simply a dungeon without a ray of light; all the windows have been closed in mediæval times. No one ever goes down there, and the only live things are spiders and centipedes, though the Arabs say there are also devils.

The third story is well known; it is the landing with the eight-pillared room which visitors to the Greek convent pass through on the way upwards; for the fourth story, built, I believe, on the roof of the original Roman tower, is the Greek convent which has long been familiar to "Murray" and to travellers as a point of interest. Any one who will take the trouble to look around this eight-pillared room will find the eight divisions between the two original circular Roman walls, such as exist in the stories below and in the tower opposite. But it is no wonder that year after year people have mounted the Arab staircase (which rises to the third story from outside the tower, and enters by an enlarged window) without suspecting that the convent was built on a huge round tower of Roman work. Inside, the plan is obscured by odd Arab walls, running here and there without system, and over all lies thick whitewash, making the Roman masonry indistinguishable from the Arab. Outside, the face of the tower that is visible in passing is covered with whitewash, hidden by Arab houses that cluster round it, deformed by wooden balconies, etc. All the windows are blocked and their outline lost, except two, which are quite disguised, and, singularly enough, in the few small places where the plaster has fallen, one sees, not Roman, but Arab, brickwork beneath; *i. e.*, either window-blockings or Arab patching of some defacement. But there is one side of the tower where both the general shape is perfectly clear and the masonry from top to base remains in beautiful condition and unmistakably Roman. This is a side extremely difficult of approach and quite unknown; but I have managed to get a photograph of it taken, besides some others.

These towers are, it seems, unique in construction; no instance is known of any similar Roman building in Europe. At present I must content myself with the above rough sketch, only adding that the thickness of the walls is eight feet, changing to five feet at the first floor; the diameter of each tower is ninety feet, and the height I calculate at seventy feet. In course of time I hope to publish plans and details of the towers and of the whole fortress, in connection with other work.

COLD-AIR SUPPLY.

Barlows Ins. Surveys, August 22, 1881.

To the Editors of the American Architect: —

Dear Sirs, — Referring to page 90, No. 295, "Cold-Air Supply," would say that the dwelling of K. C. Barker, tobacconist, and since mayor of Detroit, Mich., built in 1859–60, E. Willard Smith, architect, is supplied with air through tubes in the hollow brick wall, opening in the cornice. This is for the distribution through the house. We think a similar plan was adopted in Westminster Church, Detroit, and in various dwellings erected under his direction at Cleveland, O., and Chicago, Ill. Mr. E. W. Smith, having a migratory career from always holding some position as a civil engineer, was on the waterworks at Chicago, built one-half of the Michigan Central Railroad, and designed all its depots and warehouses, etc.

I would like to question if there is sufficient difference in the pressure at the ground, or forty feet above, to cause any question as to the practicability of thus taking the air-supply — without danger of back draught, especially if the cold-air supply-pipe enters the hot-air chamber of the furnace as usual lower than the hot-air pipes.

The above seems somewhat different in detail from the question, and may be referred to "A. S." as whether to the point or no.

As to reversing the current and sending the hot air out of the house, a branch from the top of the hot-air chamber into this cold-air flue would permit its use in that direction if desired.

Mr. Smith sometimes used one of the brick chimneys for his cold-air pipe, I think.

Respectfully, J. M. Bancroft.

A SYSTEM OF HOTEL PROTECTION.

Philadelphia, August 15, 1881.

To the Editors of the American Architect: —

Sirs, — The recent destruction by fire of a large hotel at the seaside recalls public attention to the dangers to which thousands are constantly exposed in our popular summer resorts. In hotels already built, of course, very little can be done to avoid these dangers beyond providing fire-extinguishers, and efficient police. But many new houses are erected every year; and it seems to me, that every such house of large capacity could be furnished with an overhead tank of considerable capacity, so supported and arranged that an ample supply of water in case of fire could be safely counted upon.

Suppose, for example, that a hotel for two or three hundred guests had an iron tank, say 16 feet diameter, 10 feet deep, holding 1,500 gallons, supported at the top of the house by wrought-iron hollow columns of some riveted pattern, resting upon ground foundations, and carried upward through all the stories. These hotels have usually a wide corridor the whole length of the house. Four columns could be used, two on either side of this corridor, their diameters projecting into it, so as not to interfere with floor framing.

Two difficulties must be provided against, in such an arrangement, viz.: first, that if fire began below, surrounding the columns in any part, there would be danger of their warping or giving way under the superincumbent weight.

The other is, that by neglect and inattention, overhead tanks are often empty when the emergency occurs. Both points could be met by a simple construction. Let the columns be water-tight and closed at the bottom, extending upward within the tank part of its height, and open at top. Within them, place a pipe of half the area (or less), having its lower end open and within a few inches of the bottom of the column, and the upper end so connected with the extension within the tank as to draw water from the tank close to the bottom, while leaving open a connection between the column and its extension.

Then (first) in the event of fire surrounding these columns, they being full of water, the heated currents ascend, replaced by the cold currents descending by the inside pipe, so that the columns would keep cool. Secondly, the house attachments for ordinary purposes should be made at some point in the height of the tank, say three-fourths the distance up, and only the fire attachments made to the tank columns. Thus when a fire broke out, there would always be 10,000 or 12,000 gallons to depend upon for fire purposes.

The four columns could be tapped for fire-hose with valves on the several floors, and on each a section of hose should be screwed. There should also be one or two hose attachments outside the house.

The columns should be braced together at the several floors, so that they would stand independently of the building. In the event of fire occurring, there should be at a point entirely outside the hotel a good pump with hand-brakes drawing from the cisterns under the house, and forcing into the supply-pipes of the upper tank.

As to cost: the tank could be built in place, it would weigh not over 7,000 or 8,000 pounds, and with four riveted columns, say 40 feet in length each, and all the accessories, would not be very expensive. At any rate the interest upon its cost would be far less than could be saved in insurance, — to say nothing of the inestimable advantage of reasonable security from fire which it would afford.

Respectfully, J. Vaughan Merrick.

COLONIAL ARCHITECTURE.

New York, 16 August, 1881.

To the Editors of the American Architect: —

Dear Sirs, — Your number of last Saturday, among its other customary very readable and look-at-able things, has a couple of articles of somewhat more than ordinary interest to me, perhaps because (such is the egotism of human nature) I can congratulate myself on having had something to do with originating them.

One is the preliminary report of the Special Committee, American Institute of Architects, on the "Practice of American Architects and Builders during the Colonial Period and the first Fifty Years of our Independence," the appointment and *personnel* of which I moved at the Thirteenth Convention. All your readers must, I think, be grateful to the Chairman of that Committee, Mr. George C. Mason, Jr., for his valuable contribution to the building archæology of the country. It is noticeable that all his charming illustrations are taken from the interesting old town of his place of residence. But Newport is not the only American city which combines the architecture of the forefathers with the "palatial residences" evolved from modern luxury and our architects' brains; and it is to be hoped that the Committee's contribution so far, and the suggestions at the close of it, may incite other architects to illustrations of their respective localities in time for the next Convention of the Institute in November. I may add *en passant* my regret that the single illustration to the report made simultaneously by another committee, on a better way of building New York tenement-houses, and published by you some time ago, was not equally well rendered, either as to inclusions or as to exclusions with those of Mr. Mason's excellent contribution.

Your other topic interesting to me is "The Genesis of the *American Architect*," appended to the report of late meetings of the Institute Board of Trustees, — which report, by the way, you have got just a little mixed, the letter from myself to a South Carolinian architect — Mr. Southard — having been written, as its date shows, after both the meetings noted; the copy may have been sent to you under the same cover with the excerpts from the minutes, but it was not part of them. I may add, I think it would be to the interest of architects if they would endeavor to secure among themselves common grounds of vantage and defence before calling on the crowd to examine the weak spots in their armor; and there-

fore I think several communications have lately appeared in your columns on the subject of the relations of practitioners to their work and their clients which might more discreetly perhaps have been withheld by their writers, at least till there should be assurance that only publicity could lead to possible amelioration. Your publication of the "Genesis" suggests that an exhaustive presentment of its historical data may prove of general interest; and this (though I have no time for it at present) I shall endeavor to supply from the archives, in print and MS., of the Institute at its next Convention.

I ought not to close without thanking you for spreading before your readers the circular letter to architects included in the minutes, and which I have lately been casting abroad like bread upon the waters, hoping that it may be returned unto the Institute after many days, if not before; for, though my list of American practitioners is a pretty full one, it may be that some of your architect-readers are not named in it. Yours truly, A. J. BLOOR.

NOTES AND CLIPPINGS.

A MISTAKE made in the bindery last week caused us to send out to our subscribers an unknown number of copies which contained, instead of the complete set of illustrations, a duplicate sheet of one-half of them. Any one who finds his copy in this incomplete condition will oblige us by returning the entire copy so that he may receive a complete copy in its place. We cannot undertake to rectify the mistake in any other way.

A NEVER-FAILING SPRING. — An Elmira man has had in his cellar for the past eight years what he supposed was a never-failing spring. Recently the flow of water caused an inundation, and on examination the spring was found to be a leak from the street-main. — *Telegram.*

MAKING PAINT OF MUMMIES. — A gentleman, passing through Long Acre the other day, peeped into a little shop and started suddenly at the sight of several dead bodies. They had been dead for over 2,000 years — they were mummies. Where did they come from? From Thebes. Are more coming? Yes; plenty. There appears to be a regular business going on in mummies between Thebes and Long Acre. The mummies are brought over enveloped in their rich bituminous covering, and — *horresco referens* — ground up, bones, cases, coverings, bitumen, and all. What for? Why, for paint. There seems to be no burnt sienna like ground mummy. The artists are willing to pay high prices for this mummy paint. Our Academy walls may be limned with the dust of the Ptolemies. — *London Truth.*

THE WHITE HOUSE. — It does not become laymen to venture to express an opinion as to what accessory sufferings have been inflicted on the wounded President by the malarious atmosphere of that part of Washington where is placed the White House, or by the supposed insanitary condition of that building itself, but it is reasonable to suppose that both these conditions have been anything but advantageous to the patient. A thorough examination of the sanitary condition of the White House is now making by Mr. George E. Waring, Jr., and it is to be hoped that any slight re-arrangement of plumbing, etc., which can at this time be made without increasing the evil it seeks to remedy, will not come too late to help the sick man and his watchers. It is almost impossible, however, that the White House should ever become a fit place of habitation, whatever may be done to the building itself, so long as the general sewerage system of the city remains as at present; and it is doubtful whether even the radical changes recommended by Mr. Waring (See *American Architect* for August 14 and 21, 1880.) could make that portion of the city so free from malarious taint that it should continue to be the seat of the home of the chief magistrate of the country, rather than a site in some other part of the city higher than and farther removed from the river mists and the dangerous exhalations from the Potomac flats.

BLACK BIRCH. — Black birch is rapidly coming into favor. Black birch is a close-grained, handsome wood, and can be easily stained to resemble walnut exactly. It is just as easy to work, and is suitable for nearly, if not all, the purposes to which walnut is at present applied. Birch is much the same color as cherry, but the latter wood is now scarce, and, consequently, dear. It is with difficulty that cherry wood can be obtained at fifty dollars a thousand feet, while birch wood can be purchased at any saw-mill for one dollar per thousand feet. When properly stained it is almost impossible to distinguish the difference between it and walnut, as it is susceptible of a beautiful polish, equal to any wood now used in the manufacture of furniture. In the forests throughout Ontario, birch grows in abundance, especially if the land be not too boggy. There is a great difference in the wood of different sections. Where the land is high and dry, the wood is firm and clear, but if the land is low and wet, the wood has a tendency to be soft, and of a bluish color. In all the northern regions it can be found in great abundance, and as the tree grows to such a size, little trouble is experienced in procuring a large quantity. The forests of the Manitoulin Islands abound with it, as well as those of the Peterborough and Haliburton districts. The Muskoka district also contains a plentiful supply. During the past few years large quantities of this wood have been exported from the Province of Quebec at a low figure. It is very easily detected among other trees by its height, large trunk, and the peculiar color of its coarse bark. Most of the perforated chair-bottoms now in use are manufactured from it. There is a species of bird's-eye birch, but it is very scarce. An evidence of the weight and solidity of the wood is the fact that it will sink after being a few days on the water. This is a slight drawback to the work of having it conveyed to saw-mills. One of the principal means resorted to is binding it together with pine logs, and thus it is brought to the mill, but pine cannot always be found where birch grows, and it is then necessary to haul it, sometimes a great distance, with the aid of horses. — *Toronto Globe.*

THE NEW MINERVA. — An abstract of a report by M. Cavvadius on the statue lately found in Athens, and which he ascribes to Polycletus, has been published in the *Athenæum.* The figure is in fairly good condition. Only the head, and the arms below the elbows, are wanting. It was found while the part of the theatre between the stage and the orchestra was being cleared out; therefore it may be conjectured that it adorned the hyposcenium. As it represents none of the great deities of Olympus, it is supposed by M. Cavvadius that it depicts the daughter or wife of the god on whose ground the theatre was built. This would be either Epione or Hygeia, and rather the latter on account of the maidenly character of the figure. Hygeia is depicted in an attitude of repose, and leans her weight upon her left foot; the right is thrown slightly forward. She wears thick sandals, and the sandals are connected with a small square base. Her rich dress consists of an *himation* and a sleeved *chiton* reaching down to the feet, with a *diplois.* The upper part of the bosom is free. The *chiton* is divided by a girdle at the hips; a charming disposition of the drapery is thus obtained. But through the folds of the *diplois* are to be seen the beautiful, lifelike, youthful breasts of the goddess, and the exposed portion of the lovely bosom. The lower portions of the *chiton* are deeply folded, and remind one of the arrangement of an archaic statue, such as Hippodamia at Olympia. The uniformity that results therefrom is broken by the slight curve of the right knee, whereby its folds are naturally brought about. Especially characteristic is said to be a fold which falls exactly from the middle of the knee to the middle of the foot, where it divides, bent by its own weight. The hands appear to have held a serpent or a vase, or something similar. None of the hair is to be seen on the shoulders. M. Cavvadius therefore conjectures that it was bound up in a knot. The statue is said to be distinguished by its quiet dignity. The parts are closely connected, and yet at the same time each retains its own full development. There is a wonderful harmony throughout. M. Cavvadius recognizes in the work the peculiar characteristics ascribed to the great Polycletus by the ancients — the air of repose, the wonderful delineation, and the massive harmony. The statue is said to give evidence of the *quadratum* which Pliny attributes to Polycletus. Some remains of archaism in the execution he explains by the hypothesis that Polycletus may have executed this work in the early years of his artistic career, and he has no hesitation in finally awarding the statue to him. — *The Architect.*

COLOR PHOTOGRAPHS. — A recent communication to the French Academy of Sciences announces a new method of taking photographs in color, which, although it is not a solution of the prime problem for photographers, — how to photograph nature in her own hues, — is at least some mechanical approach to it. It is the invention of MM. Ch. Cross and J. Carpentier [mentioned in the *American Architect* for July 12, 1879], and consists in taking three separate photographs of the red, yellow, and blue tints, then combining them. Three negatives of the object are first taken, one through a screen of orange liquid, one through a screen of green liquid, and one through a screen of violet liquid. The varying opacities and transparencies of these negatives indicate the relative quantities of red, yellow, and blue tints in the object. The proofs are taken on plates of glass coated with coagulated albumen which has imbibed bichromate of ammonia. A transparent negative, or first photograph, is applied to one of these, and exposed for some minutes to a diffused light, so that the transparencies and opacities of the negative shall imprint themselves on the sensitive albumen. The proof-plate is then plunged into a coloring bath, and in the parts protected by the opacities of the negative, the coloring matter spreads and fixes itself. By repeating this operation with the three different negatives, the three colors are combined on one glass plate, and a fair imitation of the original object is the result. Of course, for the image obtained through the green screen, the coloring bath is red; for that through the orange screen, blue, and for that through the violet screen, yellow. The same screens and pigments serve to reproduce all sorts of polychromes. The screens hitherto used are glass vessels filled with solutions of chloride of cobalt, chromate of potash, and sulphate of copper. When the electric light is used, the screen is put before the lamp, so that the object will be illuminated by a monochromatic light and photographed in the ordinary way. — *Engineering.*

WASHINGTON'S WINDOW-GLASSES. — The late General Robert Patterson, of Philadelphia, provided in his will, just admitted to probate, for the retention of the "Washington glasses" in his family. The concluding paragraph is in these words: "That the Washington glasses, now in my residence, at Thirteenth and Locust Streets, Philadelphia, being the same which were set in the walls of General Washington's house, upon Market Street, and which I purchased and had reframed and set up in my house on Arch Street more than fifty years ago, and thence removed them in the year 1836 to my present residence, shall remain where they now are so long as any of my descendants shall continue to occupy the residence." Upon the sale of the house, the glasses are to go to his son Robert, afterward to his grandson Frank, and then, it is declared, "it is my wish and hope that my said grandson will provide for the transmission of the said glasses to his own children, if he shall have any, or to some other of my descendants, so that the same shall forever hereafter remain as heirlooms in the possession of some one of my descendants."

THE ROTHSCHILDS COLLECTION AND THE LOUVRE. — An exchange states that one of the Paris Rothschilds announces his intention to bequeath to the Louvre an art collection upon which he has spent twenty-five million francs and a large part of his life. Thescollection is famous among connoisseurs. He also promises to leave one million francs with it, to meet the expense of keeping it in preservation and the salaries of custodians. The reason assigned for this act is the desire to keep the collection intact, and the wish to repay France in part for its just and liberal treatment of the Jews. The Secretary of State of Fine Arts promises to keep the collection in a separate gallery bearing the name of Rothschild.

ROTARY JAIL OR PRISON.

Specification forming part of Letters Patent No. 244,358 dated July 12, 1881, issued by the United States Patent Office to William H. Brown and Benjamin F. Haugh, of Indianapolis, Ind., assignors of one-third to John L. Ketcham, of same place.

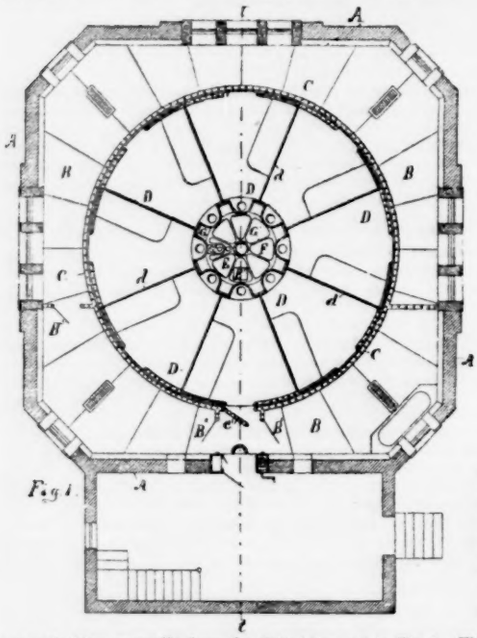
Application filed April 12, 1881. (No model.)

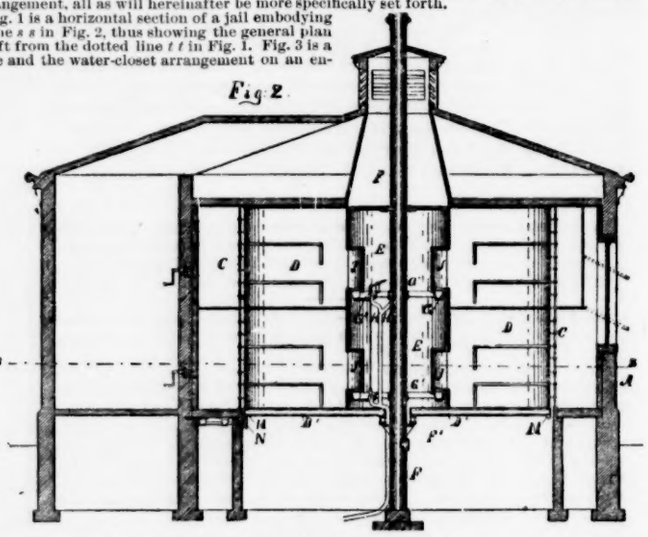
To all whom it may concern: —

Be it known that we, William H. Brown and Benjamin F. Haugh, both of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Jails or Prisons, of which the following is a specification.

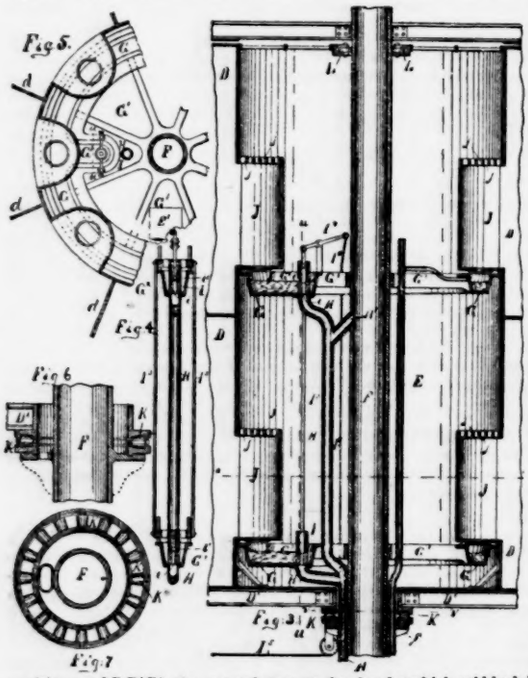
The object of our invention is to produce a jail or prison in which prisoners can be controlled without the necessity of personal contact between them and the jailer or guard, and incidentally to provide it with sundry conveniences and advantages not usually found in prisons; and it consists, first, of a circular cell structure of considerable size (inside the usual prison-building) divided into several cells capable of being rotated, and surrounded by a grating in close proximity thereto, which has only such number of openings (usually one) as is necessary for the convenient handling of the prisoners; second, in the combination, with said cell structure, of a system of shafts and gears, or their equivalents, for the purpose of rotating the same; third, in constructing within said circular cell structure a central space for the purposes of ventilation and the disposition of offal, etc.; fourth, in constructing niches in the side of the cells next said central opening to serve as water-closets, and arranging underneath said niches a continuous trough to contain water, to receive and convey away into a sewer with which it is connected all the offal deposited therein by the prisoners in all the cells; fifth, in the combination, with a cell structure, of a central vertical hollow shaft, which will also serve as a smoke-stack; and, sixth, in various details of construction and arrangement, all as will hereinafter be more specifically set forth.

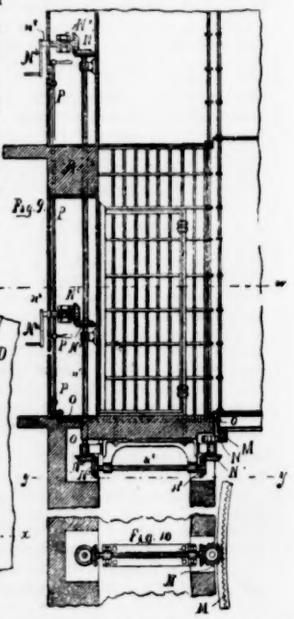
Referring to the accompanying drawings, which are made a part hereof, Fig. 1 is a horizontal section of a jail embodying our invention, looking downwardly from the point indicated by the dotted line *s s* in Fig. 2, thus showing the general plan of such a jail. Fig. 2 is a vertical sectional view thereof, looking to the left from the dotted line *t t* in Fig. 1. Fig. 3 is a detail section on the same line as Fig. 2, showing the central ventilating-space and the water-closet arrangement on an enlarged scale. Fig. 4 is a sectional view of the valves to the soil-pipe, and the operating mechanism therefor, looking inwardly toward the central shaft from the dotted line *u u* in Figs. 3 and 5. Fig. 5 is a plan view of a portion of the water-closet arrangement, similar to the corresponding portion of Fig. 1, but on a larger scale. Fig. 6 is a sectional view of the mechanism by means of which the cells are enabled to revolve easily, similar to the lower central portion of Fig. 3, but on a larger scale. Fig. 7 is a plan of the rollers and surrounding parts, as would be seen when looking downwardly from the dotted line *v v* were the superstructure resting on said rollers removed. Fig. 8 is a horizontal sectional view, looking downwardly from the dotted line *w w* in Fig. 9, showing the operating and locking devices in plan, and more especially the construction of the doors, which are too small to be plainly shown in Fig. 1. Fig. 9 is a vertical sectional view, looking toward the top of the sheet from the dotted line *x x* in Fig. 8, showing the operating and locking mechanism in elevation. Fig. 10 is an under-side plan of the operating mechanism and surrounding parts, as seen when looking upwardly from the dotted line *y y* in Fig. 9. Fig. 11 is a general plan of a very large prison constructed in accordance with our invention.

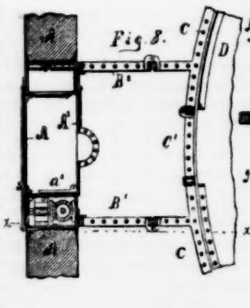




In said drawings the portions marked A represent the outer walls of the jail or prison, constructed substantially as in ordinary structures of this character; B, a corridor extending around within said walls, between them and the cell structure; C, a heavy grating extending entirely around all the cells, and from the floor to the roof of the same, and permanently secured in place; D, a circular structure, divided into cells by partitions *d*, and so mounted as to be capable of revolving about a central vertical axis; E, a central space or opening in the structure D for purposes of ventilation, etc., as is elsewhere more fully explained; F, a central pipe or shaft, on which the cell structure is preferably mounted and revolves, and which is also preferably so constructed as to serve as a smoke-stack; G, an annular trough, mounted upon arms G′, attached to the central shaft, adapted to contain water, and provided with an inwardly-extending portion, G^2, at the lowest point, which connects with the sewer by means of a soil-pipe; H, said soil-pipe; I, a valve therefor, by means of which the trough may be periodically emptied, and which also, by means of the openings *i i′*, serves as an overflow conduit; I′, a cross-head moving on guides I^2, by which said valve is kept in place; I^3, connecting-rods, by means of which all the valves are enabled to be simultaneously operated when the structure is two or more stories in height; I^4, a pivoted lever, and I^5 a cord, by means of which said valve is operated; J, niches in the inner walls of the cells, which project inwardly over the trough G, and with said trough form the water-closets therefor; *j*, openings in the plate or grating which forms the roof of the water-closet, which communicate with the central ventilating-shaft, and are a part of the system of ventilation employed; K, rollers upon which the cell structure is mounted and revolves; L, anti-friction trucks, by which said structure, as it revolves, is prevented from rubbing against the central pipe or shaft at the top; M, a rack attached to the outer edge of the cell structure; N, a pinion which engages with said rack, and is driven preferably by a crank or hand-wheel, N^a or N^b, through a system of gears, N′ N^2 n' n^2, etc., as shown; O, a lock-bolt, by means of which the cell structure may be immovably locked in one position; and P P′ P^2, etc., a crank-arm mechanism by which said lock-bolt is operated.







We will now explain more particularly the general construction, set forth the mode of operation, and enumerate the advantages of our improved prison.

The cell structure containing all the cells may be one or more stories in height (two stories are shown in the drawings), and rotates bodily on a central ver-

(*Continued on next page.*)