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CONTENTS.

MR. SCHLEICHER'S bill, as might have been expected, did not get to the front in the hurry of the last days of the session of Congress, and so has died a natural death. We have not even the satisfaction of judging from debate upon it how the House would have looked upon the change of policy in carrying on the public building which it proposed. Mr. Schleicher himself, however, in debate upon the general appropriations for public buildings, gave an outline of the arguments which he had to offer in support of his bill, in which he stigmatized the present system of building by annual appropriations as "crude and incorrect in principle; vicious, wasteful, and corrupt in practice." The greater or less annual allowance made for a building depended, he said, on the feeling or necessities of a congressional committee, not on any known principle. "When that amount has been expended the work ceases for that year, the walls are covered, the outfit and tools are put away to rust and rot, and the corps of laborers discharged until the following year, when the machinery is again set in motion by a piecemeal appropriation." This method of interrupted work, the result of the smallness of the annual appropriations, he called with reason crude and wasteful. As a matter of finance, he considered that building was not properly one of the current expenses of the Government, but an extraordinary expense, and therefore should be provided for by borrowing and funding, not, according to the "mediæval" system, by taxation.

WE will not follow Mr. Schleicher into the question of finance further than to say that there are two sides to it; that "mediæval" cannot nowadays be considered a name bad enough to hang a dog for, and that paying as you go is a habit that has its advantages in our time as well as in that of our grandfathers. Mr. S hleicher's arguments actually hold against the misuse of the system of annual appropriations rather than against the system itself. It is true, as he says, that "an economical Congress, intending to save money by making small appropriations, really wastes money instead of saving it;" and if the habit of making them annually tends peculiarly to this abuse, as perhaps it does, this is an argument against it. At all events, although it is the duty of Congress to guard against extravagant expenditure or misuse of the public money, where this is accomplished it is desirable that the public work should go on with as little interference as possible. The real difficulty lies behind the question of finance, in the fact that the appropriations are voted by an uninformed body and with an eye to other things than their legitimate use. They are apportioned as much to the influence of the town and the energy of its representative as to the exigency of the work. Congress, or the committee which fixes the amount, has its rough notion of what a post-office or custom-house for such and such a town ought to cost, which is always less than such buildings have actually cost. The local senator or representative has his notion of how much money ought to go for his town, or wants to get all he can. With these two grinding influences, and with more or less attention to the advice of the Supervising Architect, a limit is fixed by guess-work, which has usually to be enlarged two or three times before a building is finished, and in the end there is great complaint. This difficulty is independent of the manner in which the appropriations are divided or the money raised. It will not be got over until the appropriations are taken out of politics, with which they have properly no concern whatever, and fixed by an authority which knows what it is doing. This last will be done only when Congress delegates a part of its authority, a case that it is not worth while to discuss, or when it adjusts the appropriation on the information of a trusted officer, who shall explain in each case just what he proposes to do, and shall be held to justify by explanation all his demands. The system of annual appropriations has made it possible by its elasticity to get the government buildings built and to let Congress know what they were costing; but at the price of much inconvenience and under a false pretence. A limit of cost ought to be either merely advisory or else rigorously binding; but to be binding it should be made with accurate knowledge of what it is to cover. By the present system it pretends to be binding and is in reality only advisory.

THE one kind of discussion which such a bill was likely to call up may be inferred from the debates on the Eight-hour Law a while ago, and from some of the speeches on the appropriation bills at the close of the session, wherein it was urged by some Congressmen that it was the duty of the Government to relieve the present distress of the country and find work for the unemployed by undertaking public improvements with vigor. This sort of debate sounds very much like extracts from the platforms of the Socialists' and workingmen's public meetings. If so important a bill had been carried through by these arguments it would have been a strong encouragement of the spirit of Communism among workmen, and the harm of the debate might have outweighed the good of the bill. Such a way of relieving the hardship of dull times is like the use of alcoholic stimulants for physical depression: it creates an appetite which is never appeased, but grows with every indulgence. On this subject the New York *Times* had lately a very sensible article, saying that to so use the public money was only alms-giving by the Government, which was as much bound to provide for the needy of every other class as for a small number of workmen, and could do it more directly and economically by open charity than by a roundabout process that directed a good part of the money into the pockets of their natural enemies, the contractors.

As an offset to this tendency we have the failure of Congress to enact that a day of eight hours shall be paid for as a day of ten, and the order of the Secretary of the Navy which graduates the pay of workmen in his department according to the reduction of hours. The appointment of the Labor Commission of Congress does not please the Labor League, we are told, which holds to the popular notion that a commission to discuss any subject fairly must be composed of men who are already committed to decided opinions on it. We notice that one society of workingmen, the Cincinnati Typographical Union, in a circular issued as a call to form a Central Labor Union, which is of unusual good sense and moderation in tone, denies "most solemnly and emphatically all taint or suspicion of Communism, Socialism, Nationalism, or Politics." The circular adds truly, that "the relations between capital and labor are not as harmonious as they should be. Their relations being mutual," it says, "they should go hand in hand. In our opinion there are far more effective means of bettering the condition of our fellow-workingmen than by strikes, which can be perfected only by coöperation through such an organization as is now proposed." This looks like new light, and we hope it may spread; but then the trouble with most trades-unions has been that their only conception of what would better the condition of the workingmen was doing less work and getting more pay for it. To improve the quality of their work or cultivate their intelligence, or even to encourage the convenient virtues of thrift and temperance, has been beneath their care.

THE demands of travel have for a long time required that there should be some means of communication between First and Second Avenues at Forty-second Street, New York, which runs along a bluff in that part of the city. To make the

connection of the same grade with the avenues would involve making a deep and unsightly cutting, which would leave the existing houses perched in unsocial inaccessibility on either side of it. It was therefore decided to build a tunnel under the street, which should be two hundred and fifty feet long, with a span of forty feet; the rise of the brick arch above the granite abutments being ten feet. This work, like other city work, could be done only by contract, and bids were called for with the customary assurance that the maker of the lowest bid should have the work, provided he could furnish satisfactory bondsmen. This, Mr. J. R. Byron found no difficulty in doing, and three months ago the contract was awarded to him for $19,000, this being, it is said, $9,000 lower than the bid made by any other contractor. Too much weight should not be attached to these figures, for it is well known that the discrepancies between one man's bid and another's are perfectly inexplicable, even to the makers of the bids themselves. Work was begun at once, and at the time of the accident, on Friday last, one hundred and fifty-four feet of tunnel had been arched over with a brick vault composed of six layers of brick. The tunnel was built in sections seventy-five feet in length, and the centering had been some time removed from below the second section at the time that that fell and crushed to death an old man, who had gone under the archway in order to read his paper in the cool draught blowing through the tunnel. Since writing the above another body has been discovered, and as the ruins have not yet been all cleared away, the accident may have caused more deaths than is now supposed.

The immediate cause of the accident may have been the unequally distributed weight of the filling which was being packed in on the newly built section, which may have caused the collapse by forcing up the too lightly loaded crown. But examination of the ruins shows that there was possibly another reason for the accident. The heavy rains of the few preceding days probably did much damage to the mortar; but these could not have been enough to wash out every trace of cement and almost every trace of mortar in the fallen brickwork, as well as in that which still preserves its form, for it is said that what pretends to be cement-mortar has almost the appearance of pure sand, and is as friable as brown sugar. However negligent or criminal the contractor, who disclaims all theoretical knowledge, may have been, the Department of Public Works must share the responsibility, for one of its inspectors was detailed to watch over the work. This inspector is a master builder by trade, and should know the difference between good and bad work, and certainly between good cement-mortar and bad, unless, indeed, political influences may have caused him to forget momentarily his knowledge, for there are not a few who say that the extraordinarily low bid of the contractor was to be offset by claims for extras, engineered to a satisfactory issue for him by political tricksters and wire-pullers.

If the coroner's inquest shall bring to light evidence to show that the contractor was guilty of intentional or even unintentional criminal neglect, we hope to hear that the coroner's jury have returned as outspoken a verdict as was rendered on the late accident in Mott Street, New York. This verdict declares: That Martin Metzger came to his death by injuries received by the breaking of an iron girder in the building No. 190 Mott Street, on June 22, 1878. That Mr. H. Hermann, the lessee of the building, is responsible for not taking proper precautions in testing the building as to its strength and ability to withstand the weights placed in it in the prosecution of his business. The jury further recommended that a law should be passed making it the imperative duty of persons occupying or leasing premises for the purpose of carrying on other business, where weighty materials are to be used, to have the carrying capacity of the buildings thoroughly tested and certified to by the Department of Buildings.

Last week we stated that the Secretary of the Treasury had invited various architects to present competitive designs for the restoration and enlargement of the Patent Office at Washington; and that many had declined to compete on account of the inadequacy of the compensation. The Secretary has therefore addressed to the invited architects a second circular, stating that Congress had appropriated only six hundred dollars to this purpose, and that, out of regard to the protests of the profession, he had concluded so far to alter the scheme of the competition as to give the whole amount in one award to the successful competitor, according to the advice of a board of three architects selected by the Secretary. It would seem that the authorities are disposed, in this competition at least, to make every practicable concession to the architects, and we trust that they in turn may in their contributions be enabled to justify this unusual and unexpected attitude of the Government towards the profession. It is true that the programme is not one to make the largest demands upon the resources of design; to alter and enlarge a vast Greek Doric building like the Patent Office, with its blank mechanical repetitions of a misused order, is certainly not an inspiring theme; the scope for inventive genius in such a work is by no means great. Yet the effort satisfactorily to fulfil even such conditions as these may be sufficient to prove that if the architectural resources of our country are properly and fairly used, we may at length be enabled in our great public buildings to express somewhat of our highest civilization. By the present system the best professional ability of the country is practically kept from its proper monumental work, and confined to inconspicuous, often unworthy, and generally unremunerative fields of labor. Any effort on the part of the Government to change this state of things should be welcomed by the profession in no narrow or exacting spirit.

Early in June a public meeting was held in the Chapter House of Westminster Abbey, for the purpose of determining what should be done to commemorate the life and life-work of the late Sir Gilbert Scott. Of the many schemes that have been proposed, the most favored have been the restoration of the west front of St. Alban's Abbey, and the endowment of a scholarship in connection with the Architectural Museum, of which he was the founder. After some discussion it was decided, on the motion of the Dean of Lichfield, to "invite the assistance of the public towards carrying out a personal memorial in Westminster Abbey, and the endowment of a professorship or studentship in connection with the Architectural Museum.". The Dean of Westminster, Dr. Stanley, in supporting the motion, said that it was not his desire, and he thought it would not be the desire of the Chapter, that this memorial should take the form of the execution of any of the three schemes for the improvement of the Abbey that Sir Gilbert was entertaining at the time of his death. These are: the completion of the stained glass in the Chapter House; the building of a new cloister, ample enough to give burial to the illustrious dead for a thousand years to come; and the remodelling of the north porch, once the principal entrance to the Abbey. These works the Dean thought should be accomplished either by the Dean and Chapter from their own resources, or by Government, who had already promised to provide the stained glass, or by public aid secured for these specific purposes. The Bishop of St. Alban's endeavored to turn the decision of the meeting in favor of St. Alban's Abbey, pleading that it had no promise of government aid, and had no wealthy Dean and Chapter to carry on the work. He was reminded that it would be as appropriate to finish the west front of Lichfield Cathedral, or complete various other undertakings, which, as much as the work at St. Alban's, were equally "last works" of Sir Gilbert. All things considered, it seems most suitable that there where his body lies, in one of the few buildings where intra-mural interments are still allowed, a memorial should be erected which all men can recognize as such, a recognition which would be difficult of accomplishment in the case of stained glass, a half-finished cloister, or a restored porch. As between the scholarship and the restoration of St. Alban's the right choice seems to have been made, for never will there be a more appropriate occasion for founding such a scholarship, which is, moreover, as a memorial, most professional in its character, while it is not unlikely that the Bishop of St. Alban's will find other means of securing money for his restorations.

PALERMITAN ARCHITECTURE.

The capital of Sicily is, as we have already implied, the headquarters of an architectural style which is historically one of the most interesting forms that the art has ever taken, and it contains examples of other styles which are well worthy of attention. But its really most important buildings are not those which are the first to thrust themselves on the eye. Not a few of them have to be looked for; the noblest of all is elaborately stowed away out of sight. The best churches and houses have either been elaborately spoiled, or have

always stood in the less prominent quarters of the city. The metropolitan church and the royal palace stand prominently enough in their several open spaces; but both have grievously suffered. The noblest feature of the palace, the renowned and matchless chapel, can be seen from no external point at all. Truly all glorious within, it is only within that it can be seen at all. The best private palaces stand in secondary, sometimes in very narrow, streets, and sometimes only scraps and fragments of what has been are left. Only one at once forms a prominent object and keeps any great measure of ancient character. The changes which have taken place in the lay of the city absolutely forbid the existence of walls or gates of any great antiquity. It is only some small parts of them that are even mediæval; the greater part belongs to the days when walls and gates were needed, not to keep off foreign enemies, but to keep Sicily and her capital in bondage to the foreign enemy who called himself her king. The general aspect of the two great streets, the Cassaro or Toledo, once the Via Marmorea,— we cannot bring ourselves to speak of Via Vittorio Emmanuele, — is that of a stately city of the seventeenth and eighteenth centuries. Italian church fronts, built without regard to east, west, north, or south, with their attached monasteries, range with the houses in the street. The houses are solid, and are furnished with specially solid balconies. The long line of the Toledo, a mile or more from the eastern sea to the western gate, filled as it commonly seems to be with a crowd of human heads, is a striking sight. Palermo, after all that it bore at the hands of its Spanish lords, if it did not remain the rival of those German and Italian cities where history looks us in the face at every step, at least never fell so low as Bavarian Athens, as Haussmannized Paris and Rouen, or as the city which is rising on the *colles* of Rome to make us look with some measure of regret on the works of the very Popes themselves.

Still, in these two long lines of street, stretching as it seems to the eye from the mountains to the mountains, and from the mountains to the sea, there is but little of historic architecture, save at two points where the long line of the Toledo is broken, at one end by the Piazza del Duomo, and at the other by the Piazza Marina. Of these the former, as its name implies, contains the metropolitan church; the other contains the most important, in a general view, of the buildings which were reared as private palaces, that now known as the Tribunal. In the elder times the waters of the harbor flowed between them, and the line of the Cassaro, the Kasr, was far longer than it is now. The same opening brings in the view of the portico of the church of Sta. Maria della Catena, the church which stood by the chain which guarded the harbor, and whose portico is one of the best of the later buildings of Palermo. Otherwise, the look of the four great arms, stately and solid as it certainly is, is wearisome enough. It has not a trace, nor has any part of Palermo a trace, of the best feature in civic architecture which the revived classic styles can supply. We look in vain for anything of that system of arcades which has such an effect in Bologna, Padua, and other Italian cities. In the general effect of these streets the only point of antiquity or interest is to be found in the shops, the openings of which present many singular and interesting forms. It is in the narrow, crooked streets which fill up the four *regions*, each with its presiding virgin saint, into which the cross-lines divide the city, that we find the fragments of ancient Palermo. There the eye of the traveller must never be closed; every corner must be carefully explored. A careless observer might fancy that there was little left but the royal palace, the cathedral, and the Tribunal. He must look more narrowly, and he will find that the great days when the Saracen built at the bidding of the Norman have, after all changes, left no small traces behind them.

The great monuments of Sicily belong to two periods,— to the two periods of Sicilian greatness. There are the works of the Greek commonwealths, and there are the works of the Norman kings. Of Roman remains there must be much below the ground, and there is something above; but they do not form a marked feature, as in Italy and Provence. Byzantine and Saracen rule have indeed left their stamp behind them; but it is a stamp impressed at second-hand. Constantinople and Bagdad are dumb as far as their own voices are concerned, though both speak plainly enough by the tongue of a Norman dragoman. Of the later mediæval styles, the examples are, to our taste, greatly to be preferred to any of the kind on the Italian mainland; but till quite the end of the period they hold a very secondary place when compared with the masterpieces of French, German, and English art. The days when Corinth sent her fleets to colonize Syracuse, and the days when Palermo sent her fleets to harry Corinth, are the two great times whose mighty records in stone still abide on Sicilian ground.

Of these two periods the capital of Sicily has her share in the latter only. Phœnician Panormos had no part or lot in the glories of Gelôn and Timoleôn. Yet the Roman colony undoubtedly possessed Roman buildings; the fact needs no proof; and, if it did, an occasional mosaic found below the present level, an occasional column used up again in the arcades of a church or at the corner of a palace, would be proof enough. Nor can we venture to say that no Greek buildings went before them. As non-Hellenic Segesta boasts of one of the most perfect of Greek temples, non-Hellenic Panormos may well have rivalled her. Again, we need not prove, and, if it were needed, we know the fact historically, that the Christian city had churches, that the Mahometan city had mosques. But temples, palaces, churches, mosques, have all perished, except so far as palaces, churches, and mosques supplied both models and materials for the works of the great dynasty which for a century made Palermo the head of the most brilliant of European kingdoms.

It must always be remembered that it was only with the Saracen conquest that Palermo became the head of Sicily. From that day Syracuse shrank up and Palermo grew. It not only became the head of Sicily, it became one of the great cities of the Mussulman world. And it was emphatically the Mussulman city of Sicily. If we rightly understand the story of the Norman Conquest, no Christian church was allowed within its walls; the Greek archbishop was confined to a small chapel outside, while the former metropolitan church had become the head mosque. The first act of the conquerors was to install the banished prelate in the seat of his predecessors. The great age of Sicilian architecture was the twelfth century, and the architecture of that age is undoubtedly the Saracenic architecture, continued in use and adapted to Christian and European purposes. This Saracenic architecture is of course in its origin Byzantine, but modified by the introduction of the pointed arch. This style is so unique and so interesting on every historical and artistic ground that we must keep some of its more remarkable monuments for a more special notice. We mention it here in its historic order as the Palermitan style of the twelfth century. There is here no Romanesque style answering to the styles of England, Gaul, Germany, or Italy. The place of the later and finished Romanesque is taken by what we can call nothing but the Christian Saracen style.

In truth, so far as Palermo has anything which answers in the faintest degree to ordinary Romanesque, it belongs to a later time,— to the time which elsewhere is the time of the earlier Gothic. In the thirteenth, fourteenth, and even in the beginning of the fifteenth century we find a style which, like the Saracen style, uses pointed arches, but whose details are rather those of the transition from Romanesque to Gothic. We can see some of the steps by which the Saracenic type changes into this second Sicilian style, pointed Romanesque rather than Gothic. It is hard to explain the changes without illustrations, and without going into great technical detail; but any one who can compare the east end of the cathedral with the west, and that again with the monastic buildings of St. Salvatore and the palace called Casa Matteo, will be able to follow them. To say so is perhaps rather a mockery. Several works, though mostly large and costly, illustrate the ecclesiastical buildings of Palermo; we know not whither to send any one for even a photograph of most of its domestic buildings. Even dwellers in Palermo seem hardly to know the existence of the Casa Matteo; yet it is something thoroughly Palermitan. It is a characteristic example of a once splendid range of building in a street which has gone sadly down in the world. The street without must, even in the best of times, have been so narrow that it is hard to tell whether a range of windows, outdoing anything of the kind which we ever saw in domestic work, and coming nearer to Northern Romanesque than anything else in Palermo, has its arches round or pointed. Get on the opposite balconies, the only way, and you learn that there are some of both. Through these stages the Saracen style passes into a *quasi*-Gothic, which is decidedly better than any form of Italian Gothic, but which still is, in its doorways and windows, — almost the only features by which we can judge of it, — very flat, trusting quite as much to surface ornament as to mouldings strictly so called, and hardly getting so far as even plate tracery. A building which we have glanced at more than once, the Chiaramonte palace, afterwards the abode of the viceroys and then of the Inquisition, and therefore still known as Palazzo de' Tribunali, is a marked example of this style, and is almost the only domestic building in Palermo besides the royal palace which stands out prominently in a good position. It stands in the Kalsa, and it may stand on the site of the palace of the Emirs; but, as it now stands, it is a work of the years from 1307 to 1320. So far as it could have stood in England at all, it would have been set down as more than a hundred years earlier. Ten years later a rival noble named Sclafani vowed, and carried out his vow, to build in one year a greater palace than Chiaramonte had built in thirteen. First a palace, then a hospital, now a barrack, the Sclafani palace falls even farther back from our notions of a fourteenth-century building, and keeps some distinct features of the old Saracenic. Yet there is in it one little niche more like early Northern Gothic than anything else in Palermo. Here and there, as in the churches of St. Augustine and St. Francis of Assisi, doorways and windows of this style may be found, and we now and then light on them in domestic buildings. Its remains are always striking; in a stern, fortress-like looking house like the Chiaramonte palace, their flatness and half-Romanesque character is not out of place. But we are not clear, as we hinted when speaking of some of the Savoyard buildings, whether the latest form of good Palermitan architecture has not a greater interest than this intermediate form.

The style which we have just been describing lingers on into the fifteenth century, to the first years of which the tower of St. Nicolas in the Albergheria is assigned. In the course of that century it was supplanted by a form of late Gothic, distantly akin to French, or rather Burgundian, Flamboyant, but quite unlike anything in Italy. We now get, what we do not get in the earlier style, deep mouldings and most elaborate tracery. But the rounds and hollows of the mouldings are often set on a single plane, giving a wonderfully flat

look, and the tracery, most delicately wrought and supported on the slenderest of shafts, is usually placed under square or flattened arches. The flattened arch, which should be, but which is not always, elliptical, is also in constant use in the doorways; and the round arch, hitherto hardly seen in Palermo, now and then comes in. The best preserved specimen of this style is the Patella palace, with its striking gateway and square-headed windows. This was built in 1495 by Francesco Patella, who commemorates his exploits in a way which at first sight is puzzling:—

In Gallos inque Hispanos sub rege Sicano
Prœlia quæ gessi rex mihi testis erit.

It needs a little thought to take in that "rex Sicanus" — so called with singular propriety rather than "Siculus" — means Ferdinand of Aragon, and that the "Hispani" of the inscription can hardly mean any one but the Moors of Granada. This is a truly insular way of looking at things, to which we have tried in vain to find or to invent an Irish parallel. There is a good deal of this style scattered up and down Palermo, both whole houses and scraps. The other chief example besides the Patella is the palace called Paternò, Moncada, and Ajutamicristo, in which Charles the Fifth lived after his return from Tunis. This is much larger than the Patella, but not so well preserved. In the archbishop's palace is a large window of this style with a pointed arch, a thing unique, or nearly so, in Palermo.

The effect of this late Palermitan Gothic is by no means bad; but it is perhaps almost more remarkable for the effect which it had on the local Renaissance. It is, in short, hard to draw the line between the two. The column seems never to have gone out of use; only we see slight marks of Renaissance in the capitals, while everything else is still late Gothic. In some palace courts, specially in that of the Paternò, in the portico of Santa Maria della Catena, and in the lower part of Santa Maria Nuova, this stage comes out with excellent effect. The two porticos suggest for a moment the fifteenth and sixteenth century Romanesque of the Dalmatian Ragusa. (Here in Sicily, where there is another and less famous Ragusa, a case of "two Wussesters," the distinction is needed.) But a second glance shows that they could have been built only by men who were used to the same late Gothic which we see in the palaces. Graceful columns support flat moulded arches set, Saracen fashion, on stilts. They are in truth the best examples of a variety of Renaissance with much of Gothic feeling hanging about it which is characteristic of Palermo. Springer, in an excellent treatise, "Die Mittelalterliche Kunst" in Palermo, remarks that as the Saracenic style influenced the early Gothic, so the late Gothic influenced the Renaissance. Sicily, it would seem, did not at any time easily take to new ways. There is much of this style in both churches and houses. Doorways and windows keeping some traces of mouldings, columns — real columns — supporting elliptical arches, a general fondness for that form of arch in all cases, keep up some memory of better things to a very late date. And, just as the Renaissance was coming in, the church of the Spasimo, built in 1506, might almost be a bit of German Gothic. This, however, is purely exotic. More interesting locally is the tower, one of the few *campanili* of Palermo, of Santa Maria della Grotta, where this architecture may be well studied. The local type gradually goes off from this very curious and interesting intermediate type into all the horrors of a vulgar Italian style, gaudy within and shapeless without. Of hideous churches of this kind attached to the endless and mostly hideous monasteries Palermo is full. Some of the street fronts of both churches and houses keep a certain stateliness of their own kind. But go behind, and see their notions of aisles and clerestories. A good building of any good style will bear being seen naked:—

Induitur, formosa est; exuitur, ipsa forma est.

Let it be perfectly plain, and we see the lines of its outline all the better. If enriched, it is enriched by adorning the necessary features. In the Jesuit style, the naked building has no outline; it is simply hideous; the ornament is not made out of the essential features; it is something nailed or plastered on. And this kind of stuff, *baroco* or *rococo*, or whatever its name is, has come to line the Kasr of the Saracen, the Via Marmorea of the Norman. One peep of day is given through the Porta Nuova at the west end. Built late in the seventeenth century, it has a top to it, and it has a small decorative arcade, which might almost be Romanesque. And even where all else has vanished, courts and cloisters often keep very decent arcades, the bases of whose columns still show, in Jesuit days, the leaves which with us died out in the thirteenth century. The arch rising boldly from the column is everywhere a relief. Even if a stilt is thrust in, it may remind us of Ravenna. But wherever the arch rises straight from the abacus, be it in a Spanish palace, be it even in a Jesuits' college, it carries the thoughts back to the works of Jovius in his own home. — *The Saturday Review.*

THE ILLUSTRATIONS.

AN ARCHITECT'S ILLUSTRATED ALPHABET. PAINTED BY F. WEEKES, ESQ.

We reproduce this week from the *British Architect* the first portion of an illustrated alphabet that Mr. Weekes has painted for the new house of Mr. Walter Burges, the architect, in Kensington. The figures are painted upon the panels of the bookcase doors in the library, and are left to tell their own story.

HOUSE OF PIERRE LORILLARD, ESQ., NEWPORT, R. I. MESSRS. PEABODY AND STEARNS, ARCHITECTS, BOSTON.

FIRE-PLACES IN THE SAME.

FIRE-PROOF CONSTRUCTION.[1] II.

The shafts of cast-iron columns should be continuous from middle to middle of the floor thickness, enveloped with not less than one inch of some fire-proof, non-conducting material, securely held to the shaft by buttons or ribs imbedded in the material. The capital and base should be of cast or sheet iron, fastened to lugs or bosses cast on the shaft and long enough to pass through the envelope (see Figs. 6 and 7).

CAST-IRON COLUMNS.
No portion of the constructive iron-work exposed.

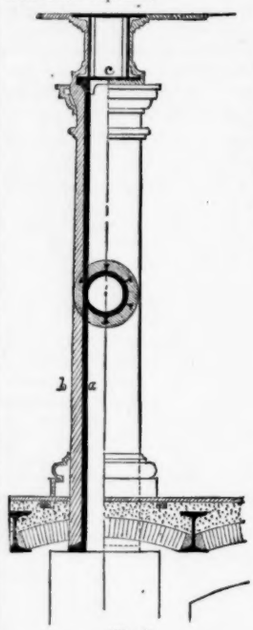


Fig. 6.
Inner shell of shaft *a* of cast-iron; *b*, protecting envelope of a fire-proof, non-conducting material.

If light partitions are required, such as do not start from the foundation, and for which common brick would be impracticable by reason of its weight, hollow terra-cotta tile or brick can be used. Another method, more expensive, but admitting a construction which is self-supporting, consists of

SECTION ELEVATION.
No part of the iron exposed.

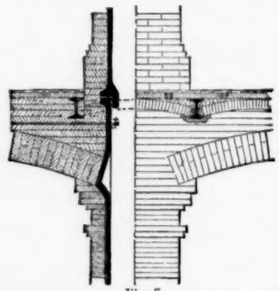


Fig. 7.
Cast-iron column protected by 4½ ins. of brick. Instead of girders, brick arches are sprung between columns for supporting the floors.

light I-beams, generally four inches deep, placed vertically two feet from centres, with the ends riveted or bolted to plates or channel-irons secured to the floor and ceiling; to these beams the iron lath is bolted for receiving the plaster. These partitions can be readily trussed, so that they add no weight to the floor from which they start.

All steep parts of slated roofs are provided with rolled iron purlins, T or L shaped, weighing about two pounds per linear foot, riveted to the jack-rafters or trusses. The spans of these purlins should not exceed six feet for slate weighing ten pounds each. The distance between centres of purlins depends upon and is always equal to the weathering of the slate; one purlin is required for each line of slate; for example: A slate 12 x 24 inches, showing ten inches to the weather, with four inches lap, requires the purlins to be ten inches from centres. The slate is fastened to purlins by No. 16 B. W. G. copper wire passing through two holes in the tail of the slate and around the purlin (see Fig. 8). Another method, more expensive, but in proportion to its greater security, consists of two $\frac{8}{16}$ inch diameter bolts with heads countersunk in the slate, and fastened with a nut to a hook hanging to the purlins (see Fig. 9). Instead of purlins, corrugated sheet-iron is sometimes used, running from rafter to rafter; to this the slate is fastened by wrought-iron pins, countersunk and passing through the slate and corrugated sheets, where they are bent so as to form a hook or clinch; the slate may also be bedded in a layer of cement applied to the corrugated iron (see Fig. 10).

SLATED ROOF.

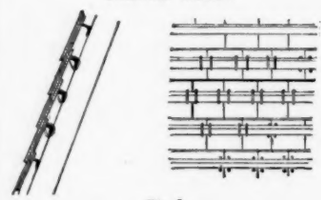
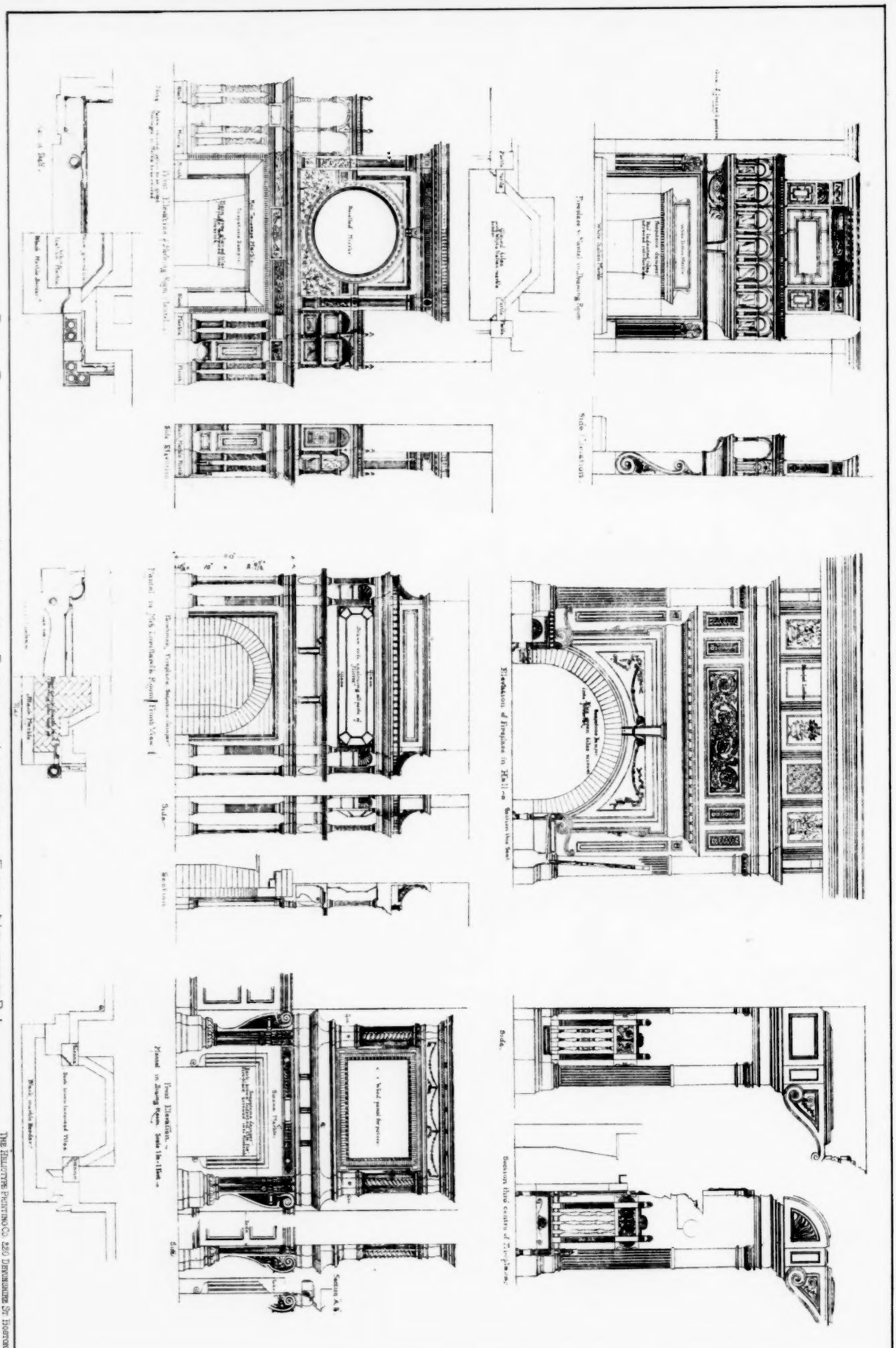


Fig. 8.
INSIDE VIEW OF SLATE AND PURLINS.
Slate fastened to L or T shaped rolled iron purlins with No. 16 B. W. G. copper.

Fig. 9.
Wrought-iron countersunk bolt, 3-16″ diameter, and hook, 1″ x 1-8″, hanging to purlin.

Fig. 10.
Slate fastened to corrugated sheet-iron by wrought-iron countersunk pins. Slate is also bedded in a layer of cement applied to corrugated iron.

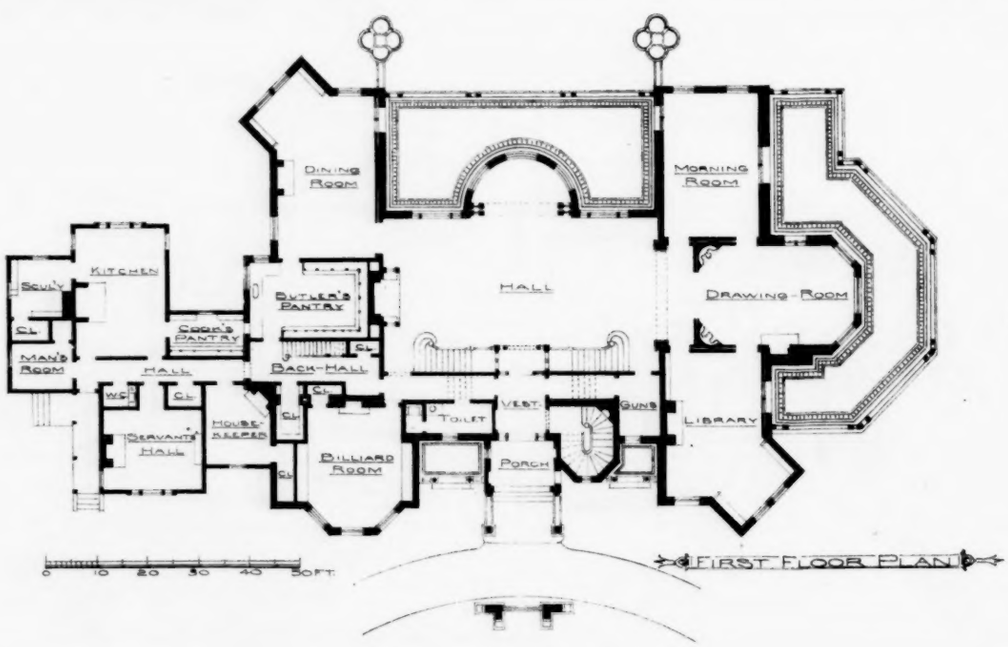
[1] A paper by F. Schumann, C. E., read at the last annual convention of the American Institute of Architects.



— FIRE-PLACES IN THE HOUSE OF PIERRE LORILLARD, ESQ. NEWPORT R.I. —
— PEABODY & STEARNS ARCHTS. —

THE HELIOTYPE PRINTING CO. 620 ATLANTIC AVE. BOSTON

HOUSE for PIERRE LORILLARD ESQ^R NEWPOR



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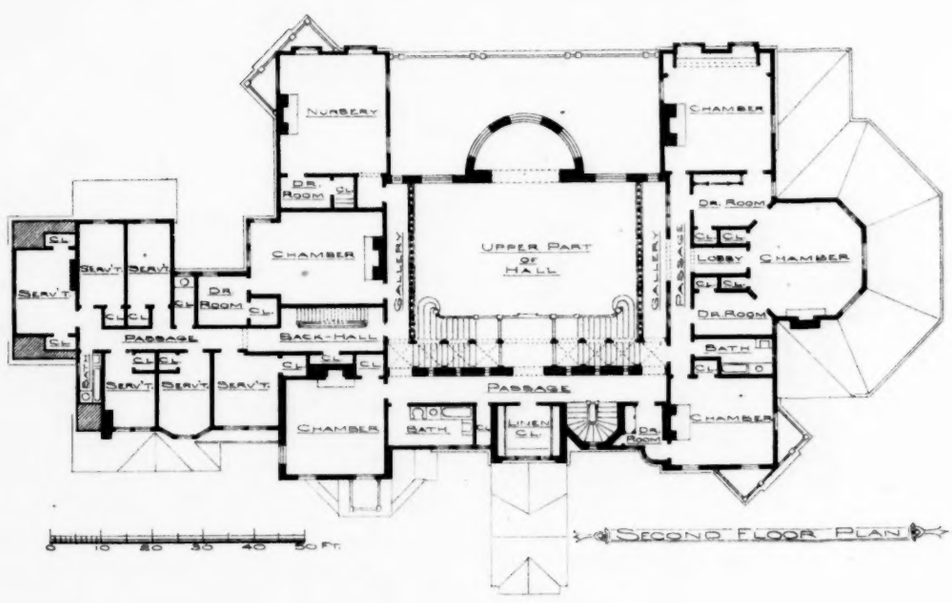
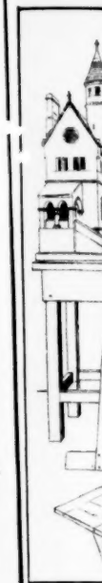
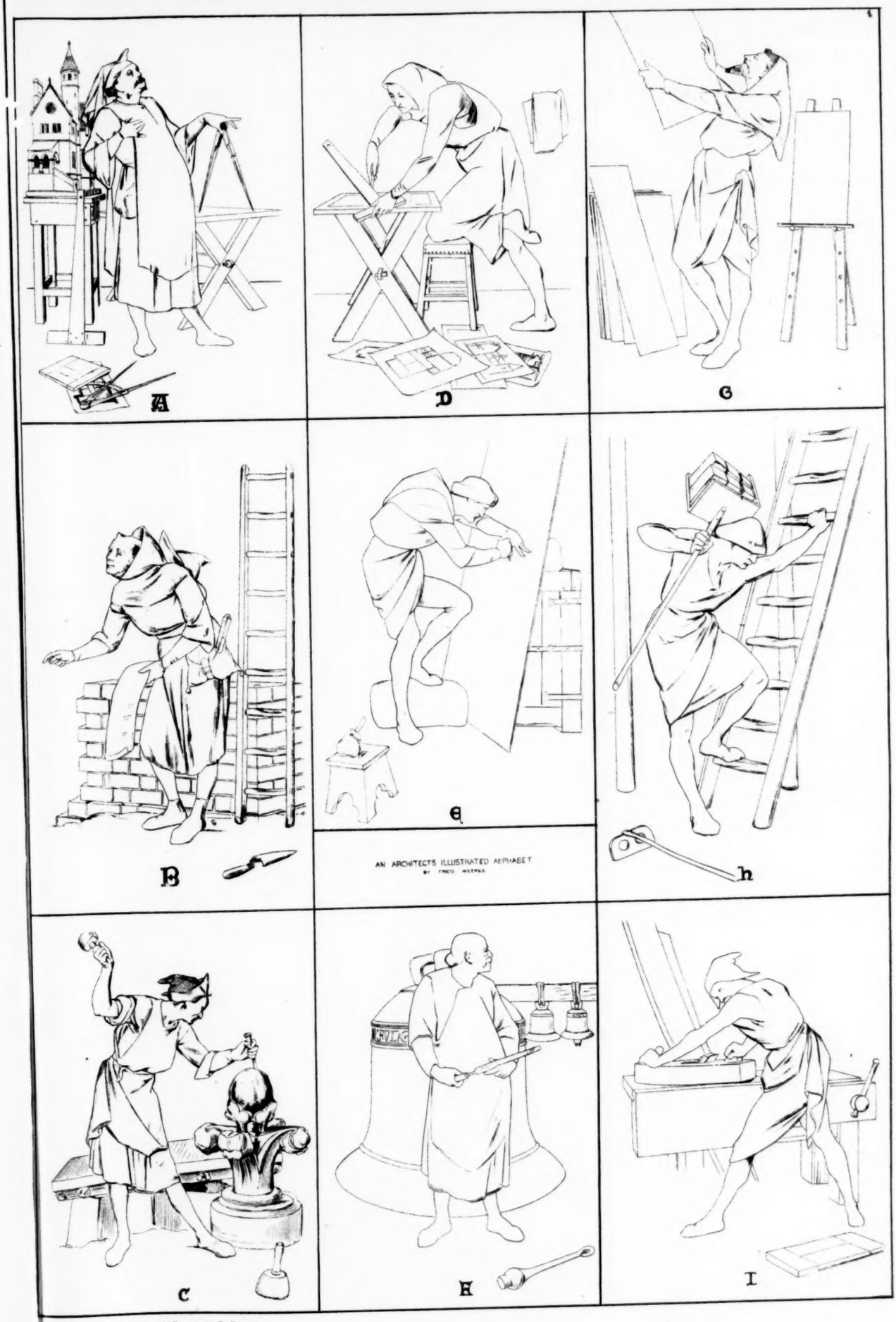


THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON





The Heliotype Printing Co. 220 Devonshire St. Boston

FLAT ROOFS COVERED WITH METAL SHEETS OR CEMENT.

Fig. 11.

ARCHES OF CORRUGATED SHEET IRON NO. 20 B. W. G. Weight of construction from 40 to 60 lbs. per sq. ft. *a*, corrugated iron arch; *b*, rolled beams; *c*, concrete filling; *d*, layer of cement; *e*, metal tags for fastening metal cover.

Flat parts of roof are covered with either cement, copper, lead, zinc, tin, or galvanized sheet-iron; either one of the metal coverings are fastened to a layer of cement, about one inch thick, overlying concrete supported by corrugated sheet-iron arches, by the tags imbedded therein (see Fig. 11). The supporting material may also consist of burnt clay tile, resting on T-irons (see Fig. 12). Another very good method consists of metal boxes filled with fire-proof material; the boxes are about two feet wide, from two to three inches deep, and of lengths up to eight feet spans; the bottom, sides, and ends are formed of galvanized sheet-iron, and the top of copper or galvanized sheet-iron; the boxes are placed alongside of each other and fastened to the beams of the roof. This method possesses an advantage in that it is light, strong, overcomes the difficulties from expansion and contraction, and forms a smooth ceiling (see Fig. 13).

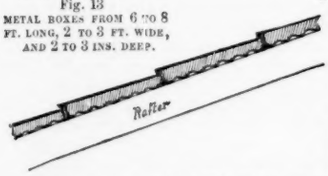
Fire-proof doors and shutters are indispensable. They consist either of sheet-iron boxes filled with fire-proof material, or layers of corrugated sheet-iron riveted together; they are also made of a sheet-iron plate surrounded by an iron frame forming an open box, into which a fire-proof preparation is filled and secured by lath of a peculiar construction; this is an effective shutter or door, in that the fire-proof material is directly exposed to an encroaching fire and no part of the metallic construction is in danger of warping and the material falling out. It is essential, to insure a proper working condition of shutters in warehouses or factories, to so construct the shutter that it can be attached to the glazed sash, and that both will slide on the same bar or track, so that the sash cannot be opened without also moving the shutter. In buildings where subdividing fire-walls are made use of, it would be well to so arrange the shutters that they can be operated from an adjoining room or compartment by means of rods or endless chains.

Fig. 12.

BURNT CLAY TILE, ABOUT 16 INS. SQUARE AND 3 INS. THICK. Weight of construction from 15 to 20 lbs. per sq. ft. *a*, tile; *b*, rolled T-irons weighing from 3 to 6 lbs. per linear ft.; *c*, layer of cement about 1 in. thick.

Fig. 13

METAL BOXES FROM 6 TO 8 FT. LONG, 2 TO 3 FT. WIDE, AND 2 TO 3 INS. DEEP.



Weight of construction from 12 to 15 lbs. Boxes are filled with non-conducting fire-proof material.

Class III. All girders, joists, struts, and roof timbers to be of wood and, if possible, of large scantling. All floors to be counter-ceiled so that not less than two inches of non-conducting material will lie between the flooring and counter-ceiling. The spaces between the scantlings of partitions to be filled with mortar or a mixture of clay and cut straw not less than one foot above the floor level (see Figs. 14, 15, 16).

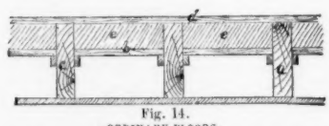


Fig. 14.

ORDINARY FLOORS. Maximum weight 40 lbs. per sq. ft. The filling may consist of clay mixed with cut straw. *a*, joist; *b*, counter-ceiling; *c*, wooden ceiling; *d*, flooring; *e*, fire-proof, non-conducting filling.

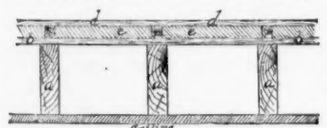


Fig. 15.

ORDINARY FLOORS. Maximum weight 30 lbs.; is more effective than Fig. 14 against fire from below

The roof construction may be of wood. For the slated parts strips of wood 2 x 2 inches are nailed horizontally to the sheathing boards; the spaces between strips being filled, level with their tops, by a mixture of clay and cut straw or any other fire-proof non-conducting preparation. The same method is also used for flat parts of roofs; the metal tags for holding roof covering being nailed to strips.

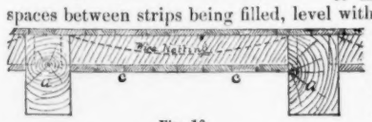


Fig. 16.

SUITABLE FOR HIGH ROOMS. Joist of large scantling from 4 to 8 ft. apart. Maximum weight 50 lbs. The dotted line represents a continuous coarse wire netting, nailed to joist and imbedded in the filling; it is for the purpose of retaining the filling in place should the ceiling boards be burnt through.

The sketches hereto attached illustrate the various methods described.

AMERICAN VERNACULAR ARCHITECTURE. IV.

PUBLISHERS of the experience of Messrs. A. J. Bicknell & Co. probably have excellent business reasons for printing such compilations as their Specimen Book of One Hundred Architectural Designs,[1] which by the by does not fulfil the promise of its ample title, either in respect to the number of the designs, of which there are by no means one hundred, or as regards bills of materials, of which there are but two and these useless, or as regards specifications, of which there are none at all. But it is not easy for the general or the professional reader to understand why the market, already overburdened apparently with such works, should be charged with this new fardel. It is a disjointed and illiterate collection of wood-cuts mostly blurred by long usage, borrowed from a dozen authors, and each accompanied by a brief description in various types, giving also the price and title of the work from which it is extracted. It is in fact an illustrated catalogue of such works as Bicknell's "Village Builder," Cumming's "Architectural Details," Atwood's "Modern American Homesteads," Hursey's "Home Buildings," Croff's "Progressive American Architecture," Allen's "Rural Architecture," Gardner's "Home Interiors," and Woolett's "Villas and Cottages." Two dilapidated wood-cuts out of Withers's "Church Architecture" are not sufficient to redeem the collection from its essential character of vulgarity. The book, however, has the curious advantage of presenting to the student a clear proof of the essential unity of our Vernacular Architecture. The many minds herein represented as working upon the American theme of house building have fairly kept to the dead level. Scarcely has one succeeded in extricating himself from the strong entanglement of "the popular styles." The best of these designs are the simplest; the worst are those which are most freely given up to decoration. In the latter we recognize an extraordinary unanimity of bracketed cornices; steep bastard French roofs in every variety of simple and complex curvature, fretted with cheap finials and crestings, and broken with compound gables, dormers, and towers; windows with every form of arch, and enclosed with architraves and cornices such as the carpenters' fancy so lavishly bestows upon our suburban villas; porches and verandas richly jig-sawed; and, in short, all those features made familiar to us in the neighborhood of every large American town, and to be seen nowhere else in the wide world.

In the presence of such diverse witnesses it cannot be denied that we have an architecture of our own, with its distinct characteristics, based, as we have more than once had occasion to say, upon legitimate conditions of living and material, but developed by untrained hands into painful absurdities and exaggerations. We leave it to others to draw inferences as to the significance of these developments in their relation to national character. We do not believe, however, that a careful tracing of effects back to causes would flatter our self-esteem.

Concerning the function of the architect under such circumstances we have no question: it is plainly to simplify and to purify; to distinguish his work by self-denial and reserved force; to chasten and correct this national exuberance of fancy. He may be assured that every builder in his neighborhood will have his eye upon the new idea which is thus taking shape, and the lesson will not be lost. The characteristics of our popular architecture which we have noted are for the most part grafted upon a good stock. The ground-work and plan of our common dwellings are reasonable for the most part, and a natural growth out of our habits and necessities; but this architectural blossoming is extraneous, and for it we are primarily indebted to the influence of untrained architects. There are now in the profession men of education, sufficient in number, though few, to leaven the whole lump, if they will only keep free from the affectations of their knowledge, will not masquerade with foreign shapes unsuited to our conditions and strange to our customs and climate, and will content themselves with developing our own natural and proper heritage. The vast majority of house-building people do not employ architects but are satisfied with the services of carpenters and builders. These are prompt to borrow from the works of the nearest architect, such decorative ideas as they can comprehend, and although, by passing through the alembic of untutored imaginations, these ideas become naturally somewhat distorted and vulgarized, yet, if the ideas are good in the beginning, the result of this irregular copying is of course less liable to be bad than if it started from an indifferent original. The responsibility of the architect therefore seems to extend far beyond his own immediate interests or those of his client. It is for him to assist in moulding the vernacular architecture into shapes consistent with the higher civilization. It is from this that the first impulse of improvement must come, and if, in his designs, he is loyal to the conditions of life by which he is surrounded, he becomes a direct and active agent of reform.

Let us then respect the vernacular forms.

THE VENTILATION AND HEATING OF SCHOOL BUILDINGS.[1]

VENTILATION.

PURE air contains about .04 of one per cent of carbonic acid gas; the vitiated air of close rooms contains from .07 to .2 per cent of this gas, and other impurities in proportion. This increase in the quantity of carbonic acid is due to the breath of the occupants, which contains about 4 per cent thereof. Although this gas is not the only impurity with which the air is vitiated, and not so injurious to health as some other exhalations from the human body, yet, as it is easily

[1] Specimen Book of One Hundred Architectural Designs, showing Plans, Elevations, and Views of Suburban Houses, Villas, Sea-Side and Camp-Ground Cottages, Homesteads, Churches, and Public Buildings, including Specifications, Bills of Materials, etc.; also Several Original Designs for Modern Styles of Mantels and Furniture, prepared especially for this work. New York, A. J. Bicknell & Co. 1878.

[1] Condensed from the *Educational Monthly*.

obtained by test and is supposed to be generated in about the same ratio as the others, it is taken in chemical analysis as an indication of the various impurities given off into the air by the occupants of a room. It is not well to allow the proportion of carbonic acid in the air to reach more than .07 per cent. When it does become more the impurities will be evident to the senses, and it is essential to health that the ventilation receive attention.

The most accessible test for the impurities in the atmosphere is an active sense of smell. It is true that a person may remain so long in a vitiated atmosphere, or the air may become foul so gradually, that this sense will become inactive and not warn him of the existing condition; but upon reëntering a room after a few minutes spent in the outer or a purer atmosphere, the impurities will be evident if they exist to an injurious extent.

Another easy method of determining whether air contains an injurious amount of impurities is based upon the fact that a certain amount of carbonic acid is necessary to cause a visible precipitate in a certain amount of lime-water. When to a bottle holding 12.58 oz. of air half an ounce of lime-water is added, it will give a precipitate if the air contain .07 per cent of carbonic acid. A bottle holding 10.57 oz. would give a precipitate with the same amount of lime-water, if the air contained .06 per cent. of carbonic acid. A larger bottle and more lime-water could be used if the proportions were preserved. The lime-water should be added by means of a pipette holding the exact quantity. The use of this test, which requires no skilful manipulation or troublesome calculations, might be adopted with advantage in school-rooms.

In some kinds of buildings natural ventilation alone is sufficient to supply the wants of the inmates during the summer months; but for schools, where so many persons are congregated in one room, artificial assistance is needed at all times.

The watery vapors from the lungs of the occupants of a room absorb the various organic impurities with which they come in contact, and when the former are condensed upon the walls and furniture the latter are deposited with it, and remain there after the moisture is evaporated again. The floors, wood-work, furniture, and all other possible parts should be frequently and thoroughly scrubbed and dried, and all unpainted walls and ceilings should be wiped with dry cloths. Old furniture, books, clothing, sweepings, or any kind of rubbish should never be allowed to accumulate anywhere about the building. The yard and entire premises should be kept clean and free from dust and every impurity by which the air may become contaminated.

There are two systems of artificial ventilation: the *vacuum* system, or that of extraction, which by means of heated shafts or chambers draws the air out of an apartment, openings being provided for the admission of fresh air; and the *plenum* system, or that of propulsion, which forces the air into an apartment by means of a fan or other apparatus, and provides openings for the escape of the foul air. The latter system is seldom necessary in the ventilation of buildings. It may be used with advantage in hospitals, and also in mining operations, and in certain manufactories; but in the ventilation of school buildings the vacuum method is altogether the more desirable, being economical and effective.

The supply of twenty cubic feet of fresh air per minute to each of the occupants of a room is sufficient to keep the air pure. In school-rooms fifteen cubic feet[1] per head per minute, in addition to that which is furnished by natural movements of the air, is ordinarily sufficient.

In removing the foul air from an apartment, it should be taken as nearly as possible from where it is generated. It is well to provide openings in or near the floor for its exit. By this plan the air is constantly settling downward over the occupants, taking with it the exhalations from their bodies, and removing at once any odors from the dampness or filth brought in upon their feet. These openings should be of such size as to be depended upon entirely during the winter months; for if outlets were placed near the ceiling, the warmed, fresh air, which finds its way at once to the upper part of the room, would escape without mixing materially with the foul air. During the summer months it would be theoretically correct to place the openings for the exit of the foul air near the ceiling, the cool air coming in near the floor and rising towards the ceiling and taking with it the warm exhalations from the bodies of the occupants. But it is found in practice that with the temperature of the air not far removed from that of the human body it may be drawn in any direction, and with the aid of the natural ventilation afforded in warm weather the exact position of the entrances to the ducts is of little importance. It is well to place them near the floor, on account of the downward tendency of those organic impurities which are held in suspension by the air. A current of air flowing at the rate of one and one half feet per second does not produce an appreciable draft. If the current at the openings for the extraction of the air is not over four times this, there will be little danger of unpleasant drafts toward them.

If the velocity of the current in the duct is six feet per second, and each person needs twenty cubic feet per minute, or one third of a cubic foot per second, there would be needed by each occupant of a room one eighteenth of a duct the cross-section of which measured one square foot. If there were a duct to every ten persons its cross-section should measure eighty square inches. If the current is slower, the ducts should be correspondingly large. It is not best to have the ducts smaller in proportion and the currents correspondingly faster than those spoken of above, as there would be danger of unpleasant drafts toward the openings into them.

The ducts should be lined with tin or iron their entire length, unless they are built in a brick wall, as they may endanger the building from fire. They should lead to an upright shaft extending to the outer air above the roof. This shaft, the capacity of which for extraction depends upon the difference in weight of the air inside and outside of the building, should be of such size that the area of its cross-section will equal three fourths of those of all the ducts emptying into it, if the current in the ducts is about as mentioned above. The ducts should enter the shaft in an upward direction, that the current from them may not be checked by that from below, and should be supplied with dampers, that their currents may be regulated, as ducts from the nearer rooms are inclined to furnish an undue amount of air, which the shaft extracts.

The best shaft consists of a brick stack extending from the ground to above the roof. By applying heat at the bottom of this form of shaft the column of rarefied air will be the whole height of the building. If the entrances of the ducts into the shaft are properly secured from danger, the fire for rarefying the air can be kindled in the shaft, and the smoke-pipe from the heating apparatus may be turned directly into it. If the building is a large one the smoke from the heating apparatus is usually taken to the top of the ventilating shaft in a cast-iron flue; but in a brick stack, with walls of sufficient thickness and properly built, this may be unnecessary. However, it is best, in any case, to extend the smoke-pipe up, after it enters the shaft, to above the entrances of the ducts from the first floor, in order to give the current of smoke the proper direction and the air in the shaft the benefit of the asperating effect of this rapid current from the furnace. Another method is to brick up a flue for smoke beside the air shaft, building the partition between the two with bricks set on edge, thus making a partition through which sufficient heat passes to aid materially in rarefying the air.

If the shaft and the ducts leading to it are of sufficient size there will be no need for heat during the larger part of the year. In a shaft of good size a current of ten feet per second is common. However, the provisions for heating must in no case be omitted, as the draft is as sure to be downward when the air in the shaft is cooler than that outside as it is to be upward when the opposite condition prevails. During the spring months, it very often happens, in a building that is not constantly occupied, that the walls are colder than the external atmosphere.

Sometimes, as in the remodelling of an old building, a brick shaft is not available. In this case a short shaft can be constructed, extending from the floor of the attic to above the roof, and the flues be all taken to that. It may be heated at its lower part, and some of the ducts may be separately heated by steam-pipes or gas-jets. A shaft built in this manner should equal in its cross-section the combined area of all the ducts emptying into it.

The amount of cubic space required by the occupants of a room is of less consequence than is generally supposed. If there is abundant provision for ventilation, all that is necessary being enough to enable the occupants to keep out of the drafts; and without ventilation, no obtainable amount will be sufficient to keep the air pure through a session of a school. The greatest need of space seems to occur during the summer months. About two hundred cubic feet per person will be enough in the ventilated school-room.

There should be some means provided for the ventilation of the cellar at all times. Its ground air and mould are particularly unwholesome, and if not attended to find their way continually to the rooms above. The cellars can be ventilated by making connection with the main ventilating shaft, or by a separate duct to the open air above the roof. The air should be taken from near the floor. In case there is no cellar the space beneath the lower floor should be ventilated.

HEATING.

It is essential to the health and comfort of the occupants of a room during the colder months that heat be applied in two ways: first, the air should be slightly warmed before it reaches the lungs; and second, the building, that is the walls, ceilings, furniture, etc., should be heated to a degree higher than that of the air. Air receives its heat by contact alone, the radiated heat from any source passing through it without materially increasing its temperature; and it is practicable to warm the walls of a building from the inside without heating the air to the same extent.

Any apparatus for furnishing heat that is not used in conjunction with a plentiful supply of fresh, warmed air is incomplete and unhealthful; and any apparatus that furnishes heated air alone, and does not provide for the direct radiation of heat to the walls, is also unhealthful, unless peculiarly and carefully managed. The reason for this lies in the fact that in order to furnish all the warmth required in an apartment by supplying heated air it must be heated to a degree too hot to be breathed with comfort. Under these conditions (the walls receiving their heat from the air, and consequently remaining always the cooler) the occupants give off too much heat by radiation from the surface of their bodies to the walls, and too little by means of exhalation from their lungs. The use of an ordinary air-tight stove is one example of the improper method of warming

[1] This strikes us as a small allowance. We should rather double it.— Eds. American Architect.

without ventilating, and that where steam radiators placed about a room without connection with an air passage is another. The ordinary hot-air furnace is an apparatus that furnishes air warmed to too high a degree.

Stoves are a very economical kind of apparatus for heating small school buildings, and if properly constructed and managed will warm the incoming air to a healthful degree. A ventilating stove consists of the necessary parts of an ordinary stove, and in addition a metallic casing enclosing a space around the ordinary outer parts. This space, which is open at the top, is connected with the outer air by means of a duct entering it near the bottom. If practicable, the casing is arranged so as to enclose most parts of the stoves except those doors and dampers by means of which the fire is fed and managed. Stoves of this description are manufactured in some parts of this country, and many stoves of ordinary patterns may be made into ventilating stoves by adding the metallic casing. If necessary, this casing may be made to enclose the whole stove, and a large door be provided through which the fire can be reached.

A valve should be provided in the fresh-air duct, by means of which some of the supply from the outer atmosphere can be cut off and a part of the air be taken directly from the room. This will check the exit of the air through the foul-air flues, and that in the room may be warmed to a higher degree. This arrangement can be used with advantage to heat the walls of the room before it is occupied, the cooler air being turned on after the session begins.

The warm-air furnace is like a large ventilating stove set in the basement, the outer casing being of metal or brick. Their action is somewhat similar, but the direct radiant heat from the apparatus is lost to the apartments above. The greatest objection to the furnace lies in the fact that with the usual management the air is admitted at too high a temperature during the sessions of the school.

If a furnace were properly constructed and managed, a current of hot air might be introduced before the sessions begin, and a current of cooler air while the room was occupied. By this method, or if used in connection with stoves situated in the apartment, which furnish radiant heat, the use of the furnace may be healthful. To enable the furnace to supply hot air before the room is occupied a connection could be made from the school-room to the fresh-air duct, so that a current would be established similar to that spoken of in connection with the ventilating stove.

With furnaces, ventilating stoves, or any apparatus to which air is conveyed by means of ducts, the greatest annoyance usually comes from the impurities which collect therein, and being burned or heated by the furnace generate offensive gases. The channels for fresh air should be made so as to receive no part of their supply from the basement, but from that source where its purity can be best secured. They should be so constructed that they can be easily opened and thoroughly cleaned.

The necessary sizes for fresh-air ducts can be estimated by a process similar to that for the foul-air ducts, taking the velocity as found by experience. They are usually too small.

The passage of warmed air to a room through upright passages and ducts forms a means of propulsion which assists the drafts in the foul-air ducts.

For heating large buildings there is no apparatus so complete as a system of steam-pipes and radiators. If they be properly arranged they will furnish radiant heat to the walls and will warm the air to any degree desired. The best way of using steam apparatus in school buildings is to place radiators in different parts of each room, and to provide openings near them from the outer air. By this plan the incoming air is warmed by flowing around the pipes of the radiators, and the walls are warmed by radiated heat. To make this plan complete there should be screens in front of the radiators to protect the scholars from the direct radiated heat and from the currents of incoming air.

F. A. COBURN.

COMPETITION IN INTERIOR DECORATION.

V. THE VESTIBULE OF A CITY HOUSE.

THE subject of the fifth competition will be the interior of the entrance-vestibule of a city house. In plan it will be ten feet by twelve, and it will be fourteen feet high. By day it is to be well lighted by transom or side-lights; and as it must be lighted at night, special attention must be paid to the chandelier, gas-brackets, or other attributes of artificial lighting. Required: A plan showing the arrangement of coat-closets, and the design of the floor-tiling; an elevation looking towards the street, a section, and details to a larger scale. Or instead of this, a plan, a perspective view of the interior and details, will be accepted. Drawings must be received at the office of the *American Architect and Building News* on, or before, August 20.

NOTES AND CLIPPINGS.

THE NOISE OF THE ELEVATED RAILWAYS. — The New York *Evening Post* suggests that a remedy for the annoyance caused by the noise of the elevated railroads may be had by following the example of bee-hunters, who, when they find a honey tree on land whose owner would object to the felling of the tree, gird it tightly about with an ox-chain. This is said to so deaden the sound of blows that a tree may be chopped down unknown to the owner, though within easy ear-shot.

SOME WATER-TESTS FOR LAYMEN. — The need of simple tests for the more deleterious substances to be found in potable water, have been often felt, we doubt not, by many of our readers. The presence of a few undesirable salts and acids are discoverable by simple means. Among these are the nitrates, nitrites, chlorates, and chlorides. Ammonia can be easily detected, if in excess. The presence of nitrates shows that organic matter has been acted upon, and *may be present*. The salts are not dangerous; the danger lies in their source, and this should, if possible, be ascertained. The presence of a nitrate may be readily detected by the following reaction: Place a small quantity of the water to be tested in a test tube; add an equal quantity of pure sulphuric acid, using care so that the fluids shall not mix: to this add carefully a few drops of a saturated solution of ferrous sulphate (sulphate of iron). The stratum where the two fluids meet will, if nitric acid be present, show a purple, afterwards a brown color. If the nitric acid be in minute quantities, a reddish color will result. The presence of ammonia, if in excess, can be determined by treating the water with a small quantity of potassic hydrate. Ammonia, if present, will be liberated and may be recognized by its odor, or by the white fumes of ammonic chloride when a glass-rod wet with hydrochloric acid is passed over the mouth of the test tube. Why chlorine is present in any form in water used for drinking should always be ascertained. In itself, its presence is evidence that sewage contamination in some form exists. The presence and amount of chlorine may be ascertained by the following simple method: Take 9 grains of argentic nitrate (nitrate of silver), chemically pure, and dissolve it in 200 units of distilled water. (We have found the cubic centimeter to be a very convenient unit, perhaps the best.) One unit of the solution will represent 1-100th of a grain of chlorine. Take a small measured quantity of the water to be examined, and put it into a glass vessel so that the reaction may be readily observed. The vessel should be more than large enough to hold the water. Add to the water a *small* quantity of the solution; if chlorine be present, a white precipitate will result. Repeat the addition, after short intervals, until no precipitate results. The analysis is then complete, and the units of the solution used will determine the hundredths of a grain of chlorine present. If more than a grain of chlorine in a gallon be present, reject the water, unless it can be clearly determined that the excess does not come from sewage. The water should be slightly acidulated with nitric acid before the test is applied.

We will conclude by recommending Heisch's sugar test for the presence of dangerous organic matter. It is mentioned by high authority as a simple and sufficient test: Place a quantity of the water in a clean, glass-stoppered bottle: add a few grains of pure sugar and expose to the light in the window of a warm room. If the water becomes turbid even after exposure for a week, reject it. If it remains clear it is safe. — *Engineering News.*

A NEW MAMMOTH CAVE. — At Glasgow, Ky., a cave has been discovered within a short time which will probably outrival the famous Mammoth Cave of the same State. It has been explored for a distance of twenty-three miles in one direction and sixteen in another. The avenues are so wide and the bed so good that a span of horses can be driven through them for a distance of eleven miles. Three rivers flow through it by different channels; one of them is navigable for a length of fourteen miles. Aside from the natural interest attaching to the discovery of such a place, the discovery promises to be of some ethnographical importance, for in one of the large chambers of the cave were found several mummies, which were enclosed in rude stone coffins. It is said that they are not dissimilar in appearance to Egyptian mummies. The cave has been named the Grand Crystal Cave.

A NEW THEORY REGARDING MUMMIES. — Having observed that Egyptian mummies could be divided into two classes, one embracing those bodies which had been embalmed intact, and the other including those bodies which had been eviscerated, Dr. Gauselbach, a Swedish chemist of repute and professor in the University of Upsal, has formed the opinion that the mummies of the first class are not really dead, but are only in a condition of suspended animation; though, unfortunately for historians, the secret of bringing them again to life has been lost. In support of this theory he adduces the results of his own researches and experiments, one of which consists in submitting a snake to a process, the details of which are of course kept secret, which petrifies it. In this condition it has been laid aside for a year or two at a time, and is then restored to life by some equally mysterious vivifying process. This has now been during a space of fifteen years, and the snake does not seem to dislike it. Dr. Gauselbach is said to have applied to the Swedish Government for leave to experiment on a condemned criminal, the understanding being that if the experiment is successful the criminal shall receive pardon, because of the service thus rendered to science, and, possibly, to humanity.

MAKING CEMENT FROM SEWAGE. — The London *Pall Mall Gazette* says: "Among the many devices for the utilization of sewage that of converting it into cement is not the least curious, and it has actually been put into practice at Burnley. The town sewage runs into settling tanks, being mixed on the way with 'lime cream.' After settling, the sludge is dried, and finally packed in kilns and burned, no other fuel being necessary than just sufficient coal and shavings to set it alight. 'Cement clinkers' are the result; and these ground into coarse powder make the cement, which is salable as Portland or other hydraulic cement. Either Portland or Roman cement, or agricultural lime, is produced according to the quantity of lime employed. The corporation of Burnley are said to be satisfied with the purification thus effected of the sewage, and the company working the invention (General Scott's Cement Process) find it profitable. The system is alleged to be applicable to London."

THE INDIANA HOSPITAL FOR THE INSANE. — The new Indiana Hospital for the Insane, which is about ready for the reception of inmates, contains 20,000,000 bricks, 80,000 panes of glass, and 400,000 square feet of flooring, the outside line of the walls being one and one eighth mile in length. The building's estimated cost was $850,000, but it will be completed for $650,000. The architect is Mr. Edwin May, the same who is to build the new State House.

A New Fire-Proof Floor. — A test of a fire-resisting flooring was on Thursday week made in Victoria Street, Westminster, for the information of the Metropolitan Board of Works. The Board has the power to refuse leave to architects to erect buildings of greater height than 100 ft., and objection was made to the block called the "Members' Buildings" in Victoria Street, on the score of the insecurity of life in case of fire. The objection was met by the provision of fire-resisting floors, and to prove that the means taken were secure was the purpose of Thursday's experiment. A square building with 9-inch brick walls had been erected on the open space to the west of the Westminster Palace Hotel, the building representing the floor of a house with windows, doors, and a corridor. A room in this building contained the materials for a fire carefully laid, many timbers being so placed as readily to catch in flame, and shavings being heaped round the apartment. The material was then fired, and as there was a through draught from window to door a fierce fire soon raged. The flooring to be tested formed the roof of the building, consisting of ordinary wooden joists, cased with terra-cotta tiles, and there are in the system three open spaces between the ceiling of the one room and the flooring of the room above, the room above in the experimental room being, of course, open. While the fire was raging in the room and throwing out an intense heat, the gentlemen witnessing the experiment walked above the lighted room, and proved, by the application of the hand to the topmost terra-cotta tiles, that the heat had not penetrated, though the fire had burnt for upwards of an hour. Mr. Vulliamy, the architect of the Metropolitan Board of Works, expressed himself quite satisfied with the experiment, and considered that buildings protected with this flooring would cause fires to be limited to the room in which they commenced. Mr. Francis Butler is the inventor. The invention is said to be inexpensive, costing about 50 *s.* for 100 ft. square. — *The Building News.*

Steel Bronze. — The London *News* says that the Austrian gun-makers seem to be able to make bronze as hard as steel, and as capable of resisting the wear and tear of rifled projectiles, since it would be altogether impossible to pierce armor plates with a bronze gun made in the ordinary way. If we are to believe the last reports of their big gun experiments, the bore of the weapons after some three hundred rounds had sustained no injury at all, notwithstanding that comparatively heavy projectiles were fired, and with battering charges of gunpowder. But the most surprising feature about the Uchatius gun is the fact of its secret having been so closely kept. The Austrian Government has placed no difficulty in the way of an inspection of its guns, and has permitted even the presence of foreign military attachés in the government work-shops. Nay, more, samples of the wonderful steel-bronze metal have been freely distributed, and chemists have tried their best to discover its mode of preparation by analysis. All has been in vain. Despite fair means and foul, the secret of the Uchatius metal still remains a mystery, and bids fair to be so, until its inventor divulges the composition himself.

Prison Bars. — The *Scientific American* says that a recent patent by a Western jail-builder consists in using steel bars with a wrought-iron core, and after cutting them to desired lengths and drilling them, heating them to a red heat and immersing them in water, while tightly held in clamps of the exact size, so as to render the edges of the bars as hard as flint, perfectly resisting the file or chisel, and impossible to be broken on account of the iron core. The clamp holds the bar so that warping is prevented.

The Motive Power of Niagara Falls. — We have mentioned (*American Architect* for May 5, 1877) the suggestion of Dr. Siemens, that the Falls of Niagara could be turned to practical use for manufacturing purposes, by causing the stream to work dynamo-electrical machines, which could transmit the force to towns at a distance. the *Buffalo Commercial* now states that a company has been formed who are going to use the Fall to make compressed air, which is to be the means of transmitting motion to a distance. In this scheme the canal built by Mr. Day at a cost of about a million dollars will play an important part. "It is 33 feet wide by 11 feet deep, and leads from a point just above the rapids a mile across to the back below. At its lower end is a large basin 70 feet wide and 800 feet long and 11 feet in depth. From the basin a flume 300 feet long is digging to the edge of the precipice. At the mouth of the flume will be a massive iron gate with an 8-foot opening. The water from the flume will pass into the reservoir, which will be connected with the air receptacles below (iron cylinders 6 feet in diameter and 70 feet long) by means of large pipes siphon-shaped. Attached to the cylinders will be a requisite number of large automatic valves, to let the water run out of the cylinders after the compressed air has been allowed to escape. The practical working of the machinery will be briefly as follows: After the water in the reservoir on the top of the bank is high enough to reach the bend of the siphon it will escape down the pipe to the air cylinders below. The pressure thus obtained very soon closes the automatic valves. There being no escape for the water which continues to pour into the cylinder (each has its own feeder), the air which it contains is compressed by the volume of water from above, until it has as much expansive power when released as steam. The capacity of the reservoir and of the cylinders is so arranged that the reservoir will be exhausted by the time the desired compression has been obtained below. While the reservoir is again filling with water, that in the cylinder is escaping, so that when the bend in the siphon is reached the contents of the cylinder is exhausted, and it is ready for another charge. Thus the operation is repeated at regular intervals in each cylinder, and there being several of them, a continuous charge of highly compressed air is secured."

Utilizing the Electric Light. — The intensity of the shadows caused by the electric light is one of the great disadvantages which prevent its introduction into general use. A French woollen manufacturer has successfully lighted his spinning-room, which measures 140 feet by 35 feet, by placing two electric lights at a height of six feet from the floor, and projecting their light upon white-washed walls and ceiling by means of conical reflectors, which are so arranged that the room is lighted by reflected light alone.

The Sutro Tunnel. — For some time past heavy blasts in the header of the Sutro tunnel have loosened blocks of rock weighing as much as a ton from the drift from which the Savage Company is running to connect with the tunnel. The men in the Savage have been withdrawn from the face to the drift. The tunnel is believed not to be further away than eighty feet, and it may be that connection will be made by the Fourth of July.

A Salt Mine. — A mine of pure rock salt has been discovered at Wyoming, N. Y., 1,200 feet beneath the surface. It was discovered while sinking an oil well. The stratum is said to be 100 feet thick. There are but few extensive mines of pure salt in the world. There is one in Valencia, one in Poland, and one in Armenia, near Mount Ararat.

The Cost of Fencing. — According to United States statistics, worm or Virginia fence costs 95 cents, post and rail $1.35, board fence $1.26, and stone wall $2.34 per rod. This estimate is based upon boards at $16 per thousand and rails at $56. From the same source it would seem that of our fences 65 per cent are of the kind known as worm or snake fence, 17 per cent of post rail, 12 per cent of board, and only 4 per cent of permanent stone wall. The returns embrace 156,377,721 rods of fence, enclosing 16,374,641 acres, at a cost of $179,834,494, or at the rate of 955 rods to each 100 acres. Each dollar's worth of live-stock requires one dollar's worth of fence to keep it in bounds.

Powerful Engines. — In the United States steamer Wampanoag, possibly the fastest steamer afloat, are a pair of "hundred inch" engines, each of which is said to be six times as powerful as the great Corliss engine, which was one of the mechanical wonders of the Centennial Exhibition. These engines were built about fourteen years ago together with six others, one pair of which, built at a cost of $250,000, has never been placed in a vessel, but still lies at the Washington navy-yard.

Chemical Process for covering Zinc with the most Brilliantly-colored Coatings. — The articles of zinc are first brightened by vigorous scouring with quartz sand, moistened with dilute muriatic acid, putting them quickly in water and then wiping dry most carefully with white blotting-paper. To insure success, however, it is necessary to employ zinc as free as possible from lead, and to have it bright like a mirror. When these conditions are fulfilled, the metal may be coated with a variety of most beautiful colors by immersion in a solution of alkaline tartrate of copper for a shorter or longer interval of time, depending on the color that is desired. The solution is made by dissolving three parts of air-dried tartrate of copper in caustic soda lye containing four parts of hydrate of soda to forty-eight parts of water. If the zinc is dipped in that liquid at a temperature of 10° C. (=50° Fahr.), it appears violet after two minutes, takes a splendid dark-brown in three minutes, changes to green in four and a half, to golden-yellow in six and a half, and to purple in eight and a half minutes. If the liquid be employed at another temperature than that given above, the appearance of the different colors will also vary in other short periods of time. If the zinc be left longer than eight and a half minutes in the copper liquid at 10° C., the last-mentioned purple color disappears, being replaced by one or another of the preceding hues, depending on the time; but then they are never of the same brilliancy, and will continually diminish, until after some days' immersion the zinc is covered with a miscolored suboxide of copper. For this reason the articles are removed from the bath as soon as the desired color is fairly developed, and rinsed immediately in water. After careful drying, the metal may be coated with a good varnish, to make the colors more durable. — *Engineering and Mining Journal.*

What becomes of the Gravestones. — The correspondent of the *Sheffield Independent* says it has often been regarded as a mystery what becomes of all the pins that are manufactured, but it has puzzled him scarcely less to know what becomes of all the gravestones erected during past years over the remains of departed relatives. Recently he came upon a clew likely to solve the mystery. He was in a remote Derbyshire village which has an old church and a very well filled churchyard. The late rector was both squire and parson, and as squire he owned some farms. What did he pave his farmyards and farm buildings with? With gravestones; and so little was he ashamed of the process, that the stones were laid with the inscriptions upwards, telling their own tale. Take another example. A somewhat famous Derbyshire church, lying about seven miles eastward from Chesterfield, has lately been undergoing the process usually known as "restoration;" that is to say, things have been pretty well knocked about. The work is now approaching completion. Indeed, the workmen are engaged in laying down the floor. The aisles are being paved with stone obtained, you say, from some quarry famous for its flagstones? Not at all. There is an illegitimate quarry nearer at hand with stones already worked. The churchyard is being resorted to, and gravestones are pulled down, cut into convenient sizes, and laid down in the aisles.

Michelet's Tomb. — The monument to Michelet will soon be erected, about $8,000 having been subscribed for the purpose. It will represent the historian lying on his tomb. The Muse of History, rising to Heaven, writes on the stone, "History is a Resurrection." From the pedestal of the monument is to spring the fountain which is to keep ever fresh the flowers with which Michelet asked his tomb to be covered.

The Largest Cask. — The largest cask in the world is that at Königstein, which was finished in 1725 after three years' work. This cask, as soon as finished, was filled with 6,000 quintals of good Meissen wine, which cost £6,000 sterling. It contains 649 hogsheads more than the famous tun of Heidelberg. The top is railed in, and affords room sufficient for fifteen or twenty persons to stand.

A Monument to Victor Emmanuel. — King Humbert has set apart $200,000 out of the income of his civil list towards the monument to his father to be raised in Turin.