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CONTENTS.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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CONTENTS

WE regret to have to send out this week's issue in incomplete form, but what is, through stress of circumstance, omitted, will be made good to our subscribers as soon as we can repair the damage inflicted by the fire on Thanksgiving night which partly gutted the building occupied by the publishers and the Heliotype Printing Company. Architects who are having work carried on in our drawing-office are advised that their work has not suffered, as the loss is confined mainly to our own manufactured and partly-manufactured stock. The publishers would feel relieved and gratified if the supporters of the *American Architect* would at this juncture give proof of their sympathy for undeserved misfortune by making prompt remittance on overdue accounts, and would remit now for next year's subscription rather than delay doing so until this year is actually ended. As for the editors, it is not possible for them to know just now what damage has been done to the negatives and other work in preparation, and consequently, they would be more than ordinarily grateful for contributions of drawings and manuscripts.

IT will be remembered that the authorities of the Metropolitan Museum of Fine Arts, some time ago, prepared a tentative list of objects of art, of which it would be desirable to possess casts, and sent it, for criticism and suggestion, to the heads of most of the great museums in Europe, at the same time making an effort to collect a fund for paying for the casts, whenever the best selection of subjects should have been made, and arrangements perfected for procuring them. These judicious proceedings have now borne excellent fruit. Mr. Edward Robinson, of the Boston Museum of Fine Arts, who acted last summer as the purchasing-agent of the Metropolitan Museum in Europe, reports that the tentative list excited great interest among those to whom it was sent, and that the intention which it showed, of acquiring for New York the largest and best collection of casts ever got together, would be warmly favored by those who were best able to render assistance. It had been estimated that the cost of the complete collection of casts would be about a hundred thousand dollars, of which only sixty thousand have been as yet raised; but it is probable that there will be no great difficulty in securing the remainder, and many casts have already been procured, or ordered. Among the more important objects which it is intended to have represented by casts in the New York collection are portions of the frieze of the palace at Susa, discovered by M. Dieulafoy a few years ago, in which the color of the original enamelled bricks will be represented by painting the plaster of the cast; the pediment groups from the temple of Zeus at Olympia; the Eginetan statues; all the sculptures of the Parthenon; the reliefs from the Pergamon altar, and a great number of Roman, Romanesque, Mediæval and Renaissance works. With the Willard Collection of architectural casts, and the casts of sculpture already provided, at an expense of some ten thousand dollars, by Mr. Henry G. Marquand, the Metropolitan Museum, if its plans are carried out, will be rich indeed in a most instructive sort of artistic wealth.

THE Boston Board of Survey, to whose excellent work we have several times referred, is, we understand, disposed to consider suggestions in regard to the promotion of the purposes for which it is formed, and we therefore venture to call its attention to a matter which we have already mentioned. Although the Board of Survey is concerned, strictly, only with the laying out of new streets, the public certainly looks to its experience for assistance in promoting needful alteration of old ones, and we would therefore like to call again to mind what seems to us the economical and judicious practice in France, when a street needs to be widened, of condemning the land needed to carry out the alteration, and paying for the land alone, at a fair valuation. The buildings existing on the land are not disturbed, but the owners of the estates, in consideration of the purchase of the land, are prohibited from making any alteration in their buildings which will prolong the existence of the portion standing on the condemned land. In the rapid changes which go on in city life, it is seldom necessary to wait many years before the owner finds it for his interest to alter or reconstruct his building, and the land previously condemned is then thrown open to public use. As matters are now conducted in Boston, much more than half the cost of a street-widening or extension in the city lies in the damage inflicted upon the buildings, and if this outlay could be avoided, without reducing the amount fairly assessable as "betterment" on neighboring estates, and at the cost only of a few years' interest, many needed improvements might be put in the way of being effected, at small expense.

SOME excitement has been caused by the arrest of Mr. Joseph Pennell, the well-known artist, by the Russian authorities, while sketching at Berdichev, in Russian Poland. Mr. Pennell was detained in custody for thirty-six hours, and then ordered to leave Russian territory. Sketchers in Europe, of late years, have found this sort of adventure inconveniently common, in other places besides Russia. All over the Continent, a morbid fear seems to prevail, lest some one should "sketch fortifications," or in some other way reveal military secrets to a possible enemy, and tourists often have to suffer in consequence. Mr. Pennell himself was arrested a few years ago in Italy, perhaps as much on account of his appearance on a bicycle as because of his sketching; but the late Ernest Hartwell was arrested in France, while sketching, conducted before a magistrate, and ordered to leave town within a certain number of hours.

MR. CHARLES COTARD contributes to *Le Génie Civil* an extremely interesting "*Causerie agricole*," in which, among other things, he speaks of the advantages of artificial irrigation, of which he has long been an earnest advocate. In his opinion, the "fundamental evil" which afflicts agriculture in France, and which is of incomparably greater importance than any question of protection by tariffs, is the lack of water on the high lands, and the increasing "torrentiality" of the rivers, which follow the extirpation of the forests. Within the last decade, even, meadows, which ten years ago were of great value for their sure and excellent crops of hay, have become useless, on account of the increasing danger of sudden inundations, which often destroy the whole crop; while the more elevated tracts, near by, have become too dry for cultivation. Naturally, his suggestion for curing both these troubles is to restore the water to the high lands, and restrain it from overflowing the low land, partly by restoring the groves and forests, and partly by raising water from the rivers, and distributing it over the high lands by irrigation; but he sees in

this process special advantages which are not always considered. If a farm, consisting of barren hills, and valleys liable to sudden floods, could be subjected to a rational system for taking water from the portions which had too much, and giving it to the parts which had too little, not only would the meadows resume their ancient fertility, but, as he says, their productiveness would appear unimportant as compared with that of the high lands under the system. It is a familiar fact that, for most crops, a soil, moist, but well-drained, the pores of which are supplied with damp air, but not clogged with water, is the most favorable; and, with proper cultivation, a soil naturally dry, but judiciously irrigated, is capable of producing almost any result known to agriculture. It is curious, to us, to find such earnest advocacy of artificial irrigation in France, which we generally suppose to be a country of almost unlimited fertility; but if it will pay to irrigate the French farms, by comparatively small isolated systems, it must be still more profitable in this country, where the vastness of scale on which irrigation can be applied greatly reduces the cost. M. Cotard thinks that the Government should help in the work, and it is impossible, in reflecting on the enormous importance of agricultural products to any country, not to agree with him. Very few people realize that, although less than one-sixth of the area of the United States, exclusive of the Indian Territory and Alaska, is under any sort of cultivation, and the cultivation of much of that is of the most scanty kind, the value of our agricultural products last year was about two thousand million dollars. This year, owing to more abundant rains in the dryer parts of the West, it is estimated that our farms will earn for us at least seven hundred millions more than last year; so that, even with slight cultivation, one-sixth of our territory will bring us more value this year in farm crops alone than has been produced by all our gold and silver mines put together in the last forty years. Our great Dakota and Nebraska wheat farms produce at present only about one-fourth as many bushels of wheat to the acre as a French or Belgian farm, or one of the old-fashioned kind in the Mohawk Valley, while millions of acres in Colorado, Texas and western Kansas only need irrigation to exhibit astonishing fertility. If a few showers on the edge of the arid region can add in a single year seven hundred millions to the value of our agricultural products, one can hardly guess what might be done by systematic provision for a much larger territory. If the cultivated area could be doubled, which would be an easy matter, since even on the present farms only half the land is, on an average, under any kind of cultivation, the increase in the value of products would amount, if farming methods were not improved, to about forty dollars a year for each inhabitant. If, with this, agricultural methods could be improved so as to make the Western farms produce half as much per acre as the best Eastern ones, which does not seem an extravagant hope, the annual value of our wheat, corn, beef, butter, cheese, vegetables and other farm products would be more than ten thousand millions of dollars. This is more than the value of all the gold and silver that have been found in the United States since the time of Columbus, and the proceeds, if distributed equally among the present population, would give to each man, woman and child about a hundred and sixty dollars a year, or about eight hundred dollars a year to each household. No doubt, there would be difficulties to overcome before this prospect could be realized, but there is no question that the land is there, and that no extraordinary productiveness would be required to enable it to fulfil such expectations; and if there is any public money to spare for works of general utility, it could hardly be spent for a better purpose than in these great works for the promotion of agriculture which cannot be carried out by private enterprise. M. Cotard reminds his French readers that "from the soil are drawn the surest elements of security and prosperity"; and, for Americans, perhaps Mr. Ruskin's aphorism is suitable — that "Food can only be got out of the ground, and happiness only out of honesty."

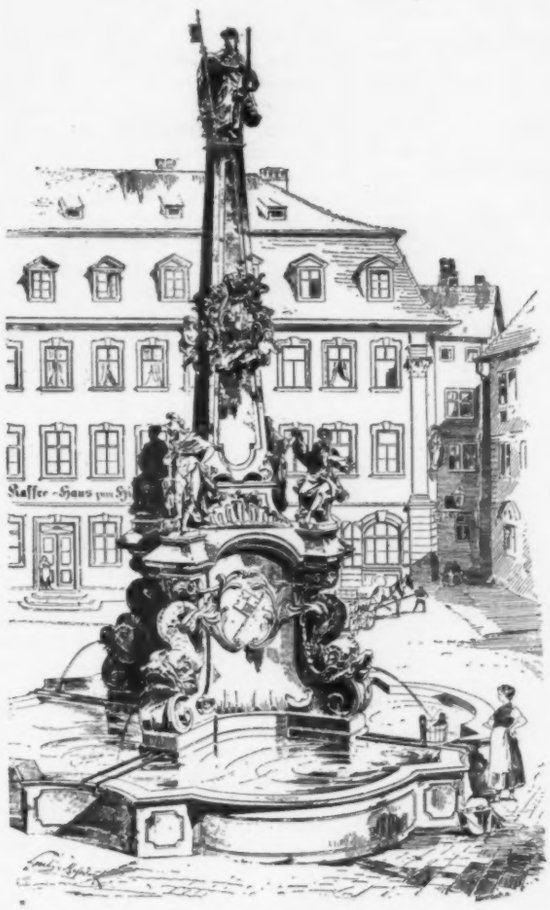
PROBABLY most of our readers remember the terrific picture of a Patagonian native which used to illustrate South American ethnology in the geography-books of their school-days, and they will hardly be prepared to hear that both Patagonia and Terra del Fuego are now prosperous regions, in a condition of civilization not very different from that of Dakota or Labrador. Patagonia belongs to Chili, which appropriated it some years ago, and is coming into note as a grazing country. Until recently, the Chilian Government made grants of land to settlers, but no more public land is now given away, and settlers are obliged to lease such tracts as they wish for, at the moderate rental of four-fifths of a cent an acre per annum. A twenty-year lease is given, and as the profits of stock-raising are very large, the tenant can generally secure a fortune before his lease expires. The method of doing this is to select a tract of perhaps fifty thousand acres, the rent of which will be four hundred dollars a year. Four thousand ewes, with young, are then purchased, at an average of three dollars apiece, and turned out upon the land. At the end of a year, there will be eight thousand sheep, besides a crop of eight thousand fleeces of wool. The wool, owing to the coldness of the climate, is long, and of good quality, and the fleeces are heavy, weighing six to eight pounds each, and worth, on an average, eighteen cents a pound in England. The next year, the ratio of increase will not be so large, but an average of sixty per cent annual profit can be counted upon.

BESIDES sheep, horned cattle are raised, but at less profit, since there is no market for the beef, and the hides are the only salable part. The climate, however, is so well suited to the business that it is proposed to establish a canning factory in Terra del Fuego, and utilize the meat, as well as the hides of the animals. For those who prefer aquatic exercises, the seal-fishery offers handsome rewards. Once a year, in June, the female seals land upon the coast with their young ones of the year before, and leave them there, to shift for themselves. The fur of the young seals is more valuable than that of the old ones, and at these seasons the hunters hide themselves near the water's edge, and, when a sufficient number of seals has landed, rush out, and kill them in great numbers, a single boat's crew sometimes returning with four thousand skins, which are worth six or eight dollars apiece. The skins are not cured, but are simply salted, and sent to London, where they are manufactured into the commercial seal fur.

ONE of the advantages of the English plan of railway cars is illustrated by a case which was brought into court a few days ago. Every one knows that the English railway companies, as well as those on the Continent, have of late years, finding that their passengers objected to being robbed, assaulted and burned to death, without any means of communicating their condition to the train officials, connected their cars by a bell-cord, which passes through them like the bell-cord in an American train. The sense of safety conveyed by this contrivance is, however, somewhat modified by placards, posted in each compartment near the rope, and threatening terrific penalties upon any one who touches it "without necessity," a matter of which, naturally, the railroad company would be the judge; and, in England, it appears that the cord is generally broken, or out of order, somewhere in its course, so that pulling it has no effect upon anything. A compartment in a train in this condition, occupied by peaceful passengers, was entered at a certain station by a man with a huge bull-dog. The occupants of the compartment were somewhat alarmed at seeing a four-legged passenger of this sort ushered in among them, and their nervousness was not diminished when the bull-dog's master proceeded to unchain the beast, announcing that he should "fix" any one who dared to object to his proceedings. After a time, the society of the two brutes became insupportable, and one of the peaceful passengers mustered up courage to try to call the attention of a "guard" by pulling the bell-rope, The bell did not respond to the pull of the rope, and the "guard" remained, in consequence, oblivious of the appeals of his charge. Not so, however, the owner of the bull-dog, who, noticing the movement, at once carried out his promise to "fix" persons dissatisfied with his conduct by falling upon the puller of the rope and pounding him. In an American car, even if the dog were endured, any such demonstration on the part of his master would be immediately followed by his elimination, dog and all, through the most convenient window or door; but the small number of decent passengers in the compartment did not feel equal to engaging the man and the dog together, so they suffered in silence until the train arrived at a station, and the door was unlocked. Then the tables were turned. A policeman was immediately found, and the dog owner was hauled before a magistrate. Complaint and trial followed in due course, and British justice "fixed" the haughty enemy of critics, who was a man of independent fortune, by sentencing him to a month's imprisonment, with hard labor.

ITALIAN ARCHITECTURE.[1]— III.

THE MIDDLE AGES. — (*Continued.*)



The Vierrohren-Brunnen Wurzburg. [The Figures by W. v. d. Anvera.] From *Architektonische Rundschau.*

BUT to return to Rome, where, in common with other parts of Italy, Lombard influence made itself more or less felt. The province of Rome possesses only a few examples of Lombard art; however, those remaining in the neighboring territory of Viterbo are so well preserved and so interesting that we may gain from them a good idea of the style. The city of Viterbo still exhibits in its cathedral, in Santa Maria Nuova and in Sant' Andrea, numerous features of the primitive Lombard church.

At Vetralla we also note the church of San Francesco; at Corneto, that of Santa Maria di Castello, and at Toscanella, San Pietro and Santa Maria Maggiore, both of which have roused much interesting discussion. San Pietro, which seems to be older than Santa Maria, witnessed the consecration of its high altar in 1093. This date and the fact that there were a great many Lombards at Viterbo in the eleventh and twelfth centuries have given rise to the supposition that both edifices, which are very similar in style, as well as the other churches of the same type in the neighborhood, belong to the end of the eleventh century and the beginning of the twelfth. However this may be, Santa Maria di Castello, at Corneto, the basilican plan of which reveals the effect of Latin traditions, is much more Lombard in character than the churches of Toscanella. It was begun in 1121, on the remains of another older structure, and is not only remarkable on account of its architecture, but also on account of the works due to the Roman *marmorai*, to whom our attention must now be directed.

Before speaking of the Cosmati it may be well to recall the fact that the taste for Lombard art was carried into the Abruzzi, "where the Lombards had for some time the exclusive control of constructive activity" (Bindi "*Mon. st. e artistici degli Abruzzi*," Naples, 1889, p. 584). See the Cathedral of Atri, by Raimondo di Poggio and Rainaldo Atriano (1285–1305), the basilica of San Clemente in Casauria [twelfth century], the façade of Santa Maria Maggiore, at Lanciano [twelfth century], and the church of Santa Maria di Collemaggio [thirteenth century], at Aquila.

The Cosmati were a family of Roman artists who flourished from the twelfth to the fourteenth century, and who greatly developed the architecture of their native province, impressing upon it a singularly original character. At Rome and in its province we find in the monasteries and churches admirable specimens of what may be termed a mosaic architecture. These represent a Roman-Byzantine art of the twelfth to the fourteenth century. At Rome, the oldest mosaic marble-work dates back to the early part of the twelfth century, and, for this very reason, its relationship to similar work in the south of Italy seems to-day more than ever evident. Its origin is apparently Oriental. Moreover, it developed at Rome after the Byzantine artists, whom the Abbé Didier summoned to Monte Cassino from Constantinople, had executed there works of striking merit. This conclusion is not, however, universally accepted. Yet it seems to me that no one can seriously maintain that the Roman art in question was wholly unrelated to the art of Southern Italy. If the columns of the cloister of Monreale (about 1174) be compared with those in the two magnificent Roman cloisters of St. John Lateran and St. Paul, such a relationship will certainly be demonstrated.

Among the chief works executed in this manner, the cloister of St. John Lateran takes first rank. It had always been attributed to one of the Cosmati family until Signor de Rossi proved conclusively that it was by an artist named Vassalletto, working in connection with his father (*Bull. d'Arch. Crist.*, 1875, p. 129). Of this little-known but very meritorious architect other works are still preserved; for example, the pulpit of Sant' Andrea, at Anagni (1263). The Lateran cloister is supposed to have been constructed in the first-half of the thirteenth century.

The cloister of St. Paul's without the Walls is another admirable monument of the same style. It was begun by Pietro of Capua and completed under Giovanni of Ardea, both abbots of the monastery. Its construction was then comprised between the early years of the thirteenth century and the year 1241, the date of the death of Giovanni of Ardea. The resemblance between the Lateran cloister and St. Paul's is most striking.

The cloister of Sassovivo, near Foligno, is less known than it merits; it has been made the subject of an analytical study by Signor Faloci-Pulignani ("*Del Chiostro di Sassovivo nell' Umbria*," Foligno, 1879), who has proved it to be the work of the *magistro* Pietro de Maria, a Roman. This appears from an inscription bearing the artist's name and the date 1129. The cloister of Sassovivo was therefore already built when the two splendid cloisters of Rome were being erected.

Other excellent examples of this mosaic style in architecture and decoration may be seen at Civita Castellana, in the porch of the cathedral, which is very beautiful in design and workmanship. The name of the celebrated Cosmati family is connected with this work. The activity of the Cosmati in the thirteenth century was wonderful. Two different periods may be distinguished in the progress of their development. In the first, Roman elements predominate; in the second, the Gothic system makes its appearance. In the first, there are but few traces of the Lombard manner and in some of the decorative features a southern influence manifests itself; in the second, local traditions give way to foreign influence. Whether they are the productions of the Cosmati or not, to the first of these periods belong the façade of the cathedral of Falleri, the porch of Civita, Castellana, the cloisters of St. John Lateran and St. Paul at Rome, and of Santa Scholastica at Subiaco; to the second, may be referred the ciboria by Adeodatus, in St. Paul's and Santa Maria in Cosmedin, and the tombs in Santa Maria sopra Minerva and Santa Maria Maggiore by Giovanni, brother of Adeodatus.

By the side of the Cosmati family, must be placed the Oderisi, who worked in the same manner, both in Italy and abroad. At Rome, San Niccolo di Prefetti and at Viterbo, the monuments of Clement IV († 1268) and of the Prefetti di Vico, in the church of San Francesco, recall the Oderisi. The monument of Clement IV bears the name of one *Petrus Oderisii*, who had already signed the tomb of Edward the Confessor (1269) in Westminister Abbey. The time of this *Petrus Oderisii* corresponds with that of the "Pietro" and of the "Oderico" who worked in London. We have not space to devote to this family, for details concerning whom one should

[1] From the French of Alfredo Melani, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 830, page 113.

consult the study of Mr. Stevenson in the third number of the *Bullettino d'Arch. Crist.* A. 1, 1882, and the researches of M. Salazaro: "*Studi sui monum. dell'Italia merid.*," P. II, p. 51 and following. Sicilian architecture has been noticed in the discussion of Byzantine art in Italy. To complete our survey of the mediæval styles, we must glance at the architecture arbitrarily called Gothic, but which we will term Pointed.

Two different factors interfered with the development of this style in Italy; namely, the character of the climate and the nature of the Italian people, who have always inclined toward Classic art. It was due to these causes that our mediæval architecture disappeared without having attained full maturity; and, in truth, no one can help awarding the palm in Italian architecture to the structures that have immortalized Brunelleschi, Bramante, Alberti, and Michelozzi.

The greatest Gothic temple in Italy, the Cathedral of Milan, was but just founded in 1386, when the Classic forms had already begun to show themselves at Florence in Santa Maria del Fiore (founded 1296). In fact, the portions of the gallery constructed in 1367 above the tribunes and the naves of the Florentine cathedral exhibit forms which are somewhat Classic. And there is no question as to the Classicism of the two stone cornices of the inner galleries, running above and beneath the polygonal plan on which the dome rises; the oldest of these was constructed between 1400 and 1405, when the Gothic was in its full vigor everywhere else. This remark is made here to remind the reader that Brunelleschi (1376–1446), who is regarded as the architect that contributed most to the triumph of Classical architecture in Italy, may have been preceded by others in this revival work.

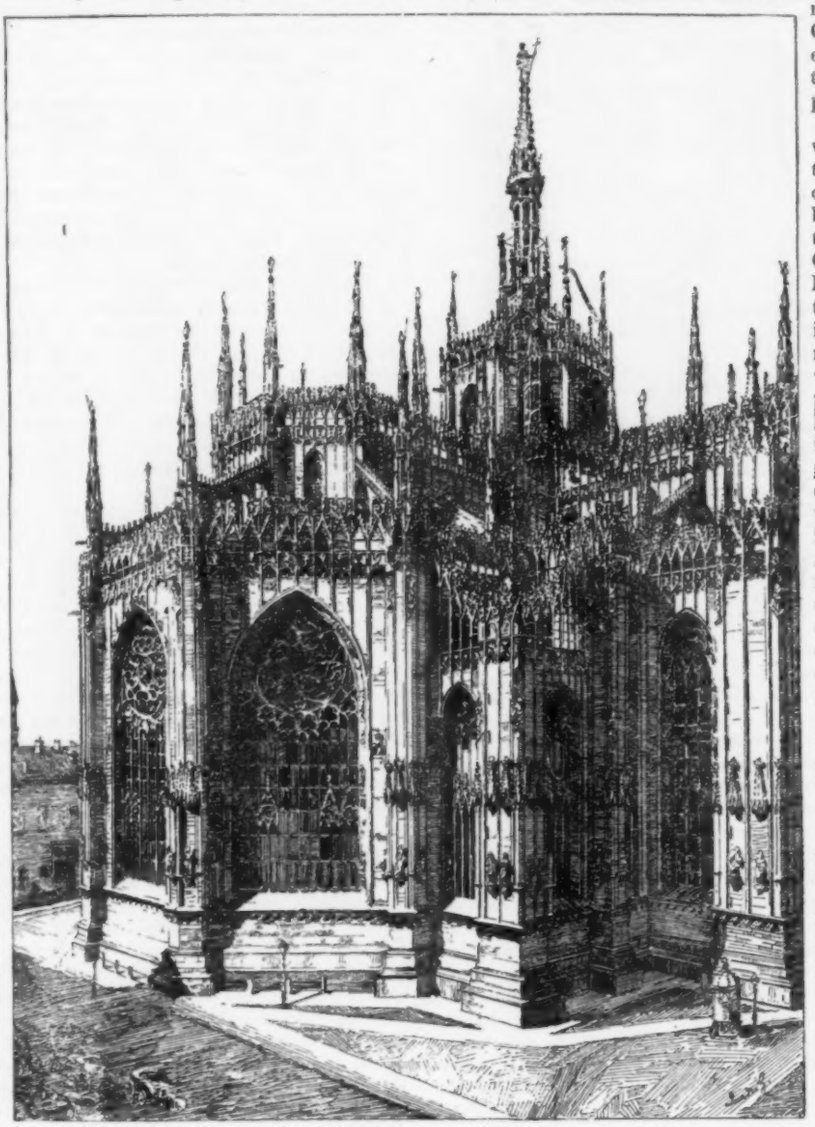


Fig. 8. Apse of Milan Cathedral.

It may be said that it was impossible for Gothic architecture to develop in Italy on account of a premature reaction toward pagan art. In Piedmont alone did it exhibit real life, and there it flourished as an exotic. Piedmont was a frontier province, governed by a family whose capital for a part of the year was beyond the Alps, and who formed frequent domestic alliances with the house of Valois; it was naturally slower then to adopt the precepts of Classic art than were the other provinces.

Gothic forms thus determined the general character of the Piedmontese art of the fifteenth century; and in this way the style predominated in Piedmont, while, in the rest of Italy, the semicircular arch had victoriously driven out the pointed; the Gothic of Piedmont recalls the French Gothic, more especially in its fifteenth-century manors, two of which, at Fenis and Issogne, in the valley of Aosta, have preserved their original exterior and interior aspect.

The climate of Italy, as was remarked above, was unfavorable to a natural development of the Italian Gothic, and though a vindication of this statement may appear superfluous, I wish to call attention to the fact that pointed forms are wholly inharmonious in a country where the climate is mild and the sun intense and brilliant. The ogival arch calls for peaked roof, pointed pediments, slender spires and so forth. But peaked roofs, pointed pediments and slender spires can never constitute organic forms of an Italian style of architecture. The one Italian monument in which the Gothic impress is deepest and most justifiable, the Cathedral of Milan, has nothing genuinely Gothic about it except the multitude of its slender pinnacles.

Until recently it was supposed that the design of this cathedral was made by a Suevian architect, Henry Arler of Gmünden; but the latest researches on the subject leave us in doubt as to the name of the artist who drew the first plan. We know, however, that Italian and foreign engineers (they were called *engineers*) were engaged in its construction. Among the most remarkable Italian engineers at first employed, were Andrea Degli-Organi, ducal engineer, Simone da Orsenigo (living in 1395), Giacomo da Campione, Matteo da Campione († 1395), Giacomo de Grassi, who was engaged in the work until 1389, and who was known principally as a painter, and Filippino Degli-Organi, son of Andrea, who was engaged from 1400 to 1448. These engineers contributed extensively to the erection of the magnificent edifice, which was reared in the face of the most violent opposition, especially from the foreign artists, — a fact easily explained. These foreigners naturally objected to everything that was done in accordance with the local traditions, which were radically different from their own. The first foreign engineer employed on the cathedral was a Frenchman, Nicole de Bonaventuri, who came to Milan in 1389. Next we find there John Firimburg, after 1391. Toward the close of the same year Henry Arler of Gmünden, arrived from Suevia; then, in 1394, came Ulrick of Füssingen or Ensingen, and, finally, another Frenchman, Jean Mignot; Mignot was the last great foreign engineer to take part in the discussions raised over the construction, rather than in the practical work. He was in Milan in 1399. Engineers of the fifteenth and sixteenth centuries and even of the seventeenth, eighteenth and nineteenth, have been employed here, and the exterior has been adorned with spirelets

and the central needle in recent times. The peculiar originality of its style gives this cathedral a unique place in the history of architecture (Figure 8). The following observations may not be out of place here: Italian art has never yielded tractably, in its architectural creations, to the teachings of foreign schools, and local taste in the end always asserts itself; so that imported methods, if not rejected at once, have, at least, always undergone a transfiguring and transforming process that has made them national, This is forcibly demonstrated by the fact that, although Gothic architecture was a hot-house plant in Italy, it nevertheless possessed characteristics of its own there, which were due to the national traditions. The basis of the Gothic system of vaulting is recognized by everybody. Now, Italy has always had a decided leaning in favor of vaults on a square plan. This was derived from Classic tradition and is very ancient; an example of it is seen in the old basilica of San Ambrogio, at Milan, to say nothing of the Cathedral of Modena, and many other churches. If we compare the system of vaulting on a square plan with the rectangular system employed by the peoples of the North, the difference in effect appears at once, and we find new proof of the fact that Italy has never been able to forget the ancient traditions of Roman architecture. In Italian churches, we almost never see apses with radiating chapels, a common disposition in the French Gothic, but unknown in Germany, except in a few instances in which French influence predominated in the construction. The apses of Italian churches are polygonal. At Venice, we have the church of Saint Stephen and that of the Frari; at Verona, San Fermo and Santa Anastasia; at Bologna, Saint Francis and St. James the Elder; at Sienna, the church of the Holy Spirit; at Florence, Santa Croce and Santa Maria del Fiore, etc.

Returning to our main argument, let us glance at the church of St. Francis of Assisi, one of the most purely Gothic of Italian monuments. It is a well-known basilica comprising two superimposed churches and a crypt. It is celebrated less for its architectural value than because it was the source of that wonderful Italo-Christian art, which, beginning with Cimabue and coming down through the majestic compositions of Giotto, culminated in the paintings of the *Stanza della Segnatura* at the Vatican. The basilica of Assisi was attributed by Vasari to Jacopo, a German, and by its historian is termed Opus Teutonicum; but it looks more like the work of a Lombard artist from the *Comacino* territory. However this may be, unquestionably the corner-stone was laid in 1228, and the first architect, Jacopo, was superseded in the direction of

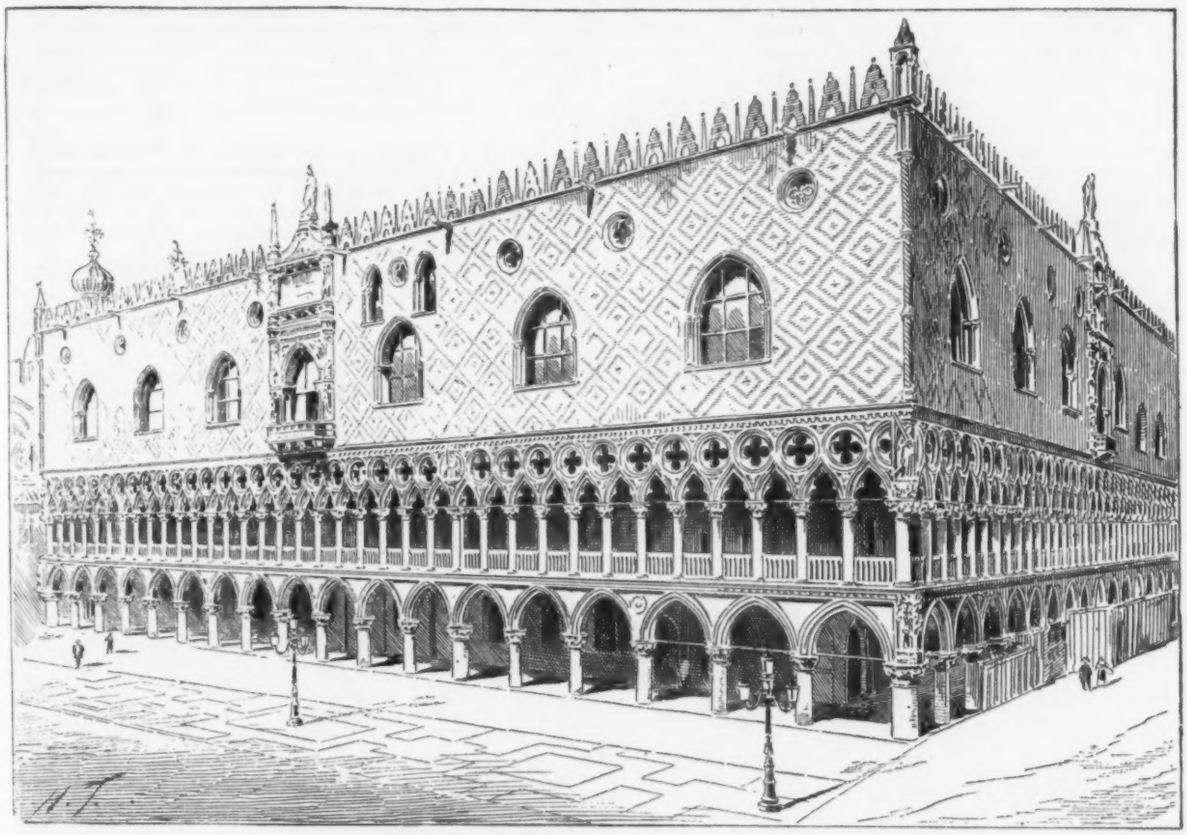


Fig. 9. Doge's Palace, Venice.

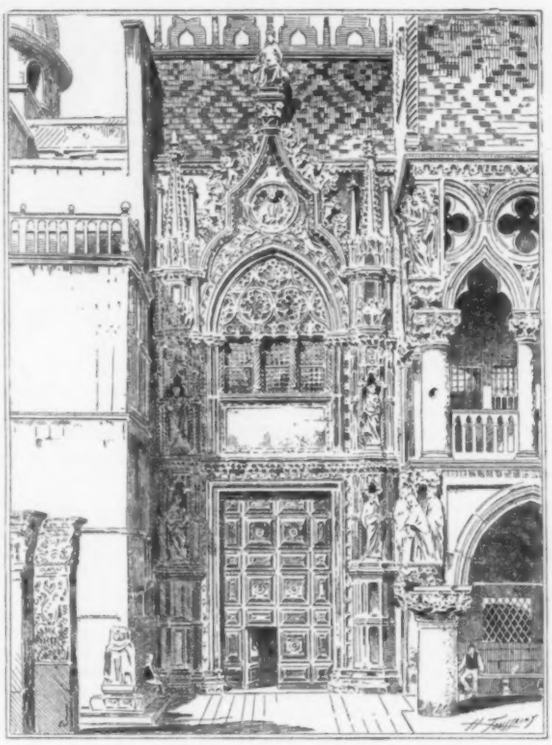


Fig. 10. Porta della Carta, Doge's Palace, Venice.

the work by his disciple Fra Filippo de Campello. The monument is remarkable for the simple elegance of its pillars and the soaring character of the vaults, which are painted.

Turning to the north of Italy, after noting the Gothic

interior of the Certosa of Pavia, which no artist could suppose inspired by the genius of the mists, let us glance at Venice, or more properly, Venetia; we find here a considerable number of Gothic edifices both religious and civil, of a light and florid character, whose gaiety has an Oriental air. The Venetian-Gothic is, in fact, an Oriental Gothic, an Arabian Gothic; and its peculiar features lie more in the decoration and workmanship than in the essential organism of the style.

In proof of this, we may cite the Ducal Palace (Figure 9), falsely attributed to the architect Filippo Calendario († 1424) and especially the so-called "della Carta" door, which is one of the most ornate specimens of the Italian Gothic (Figure 10). The architect, Mastro Bartolomeo Bon, was the most illustrious member of a family of artists who did honor to Gothic art at Venice, and he was perhaps the author of the Foscari

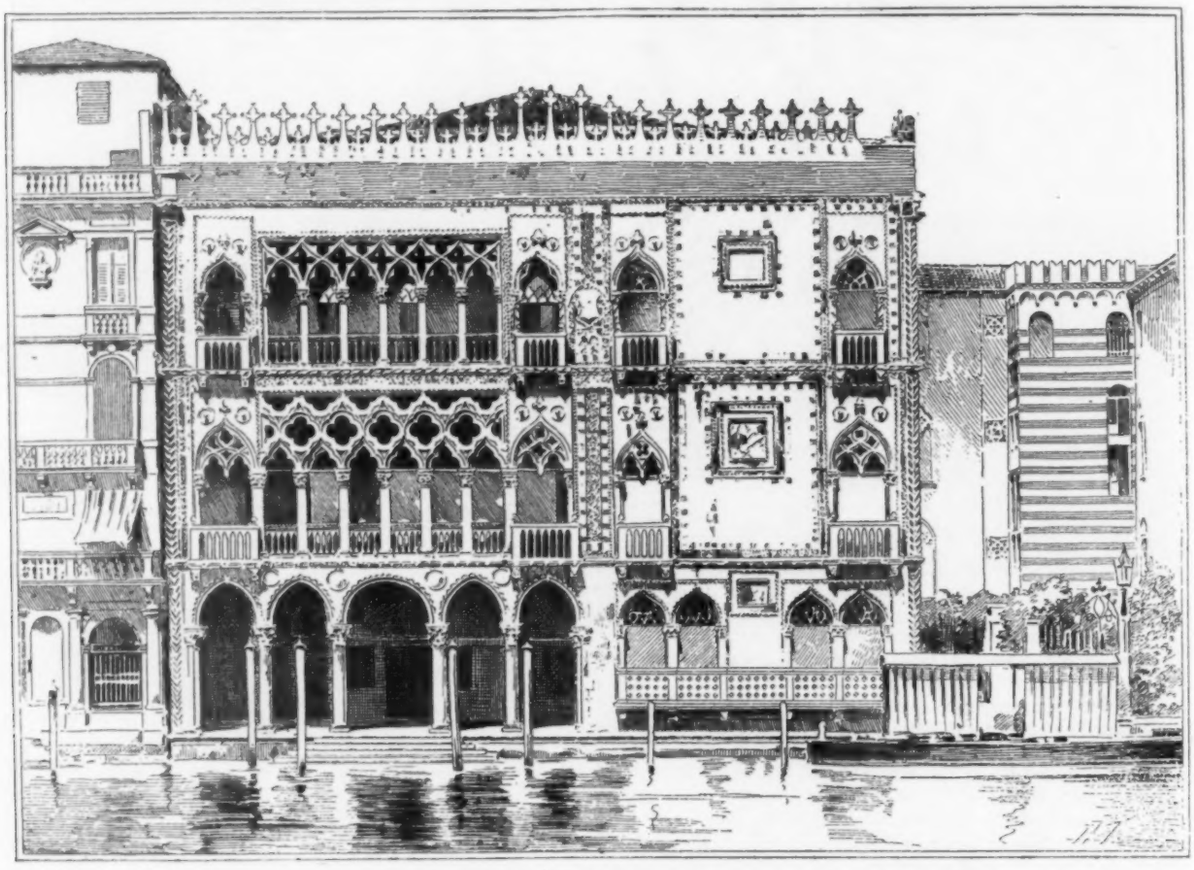


Fig. 11. The Cà d'Oro at Venice.

Palace, on the Grand Canal — another gem of the Gothic style, but deeply influenced by Arabian art.

Nor can we pass unnoticed the Cà d'Oro (Figure 11) the Church of the Frari, begun in 1280 — though not, as has been asserted, after the design of Niccola Pisano — and the Church of SS. Giovanni e Paolo (1390–1430) perhaps by Fra Benvenuto della Cella. A long list might be made of superb Venetian Gothic structures.

[To be continued.]

OLD COLONIAL WORK OF VIRGINIA AND MARYLAND.[1] — VII.

In the course of our wanderings we had come down to old Norfolk towns to hunt up such bits of the Colonial work as had, perchance, survived the march of progress and the destroying hand of time, that devourer of things, in the ancient borough.

We had known that the place was old, as antiquity goes in America, its existence running as far back as the year 1682, in which far-away time the site was chosen on the spot where, an hundred years before, there had gleamed the wigwams of a large village of the Chesapeake Indians.

In the year 1585 Captain Ralph Lane had reached this point in his exploration of the country to the northward of Roanoke Island, on whose sandy shores had landed a detachment of the Sir Richard Greville expedition, sent out by the great Raleigh to finally struggle to this haven, after suffering hardships unnumbered and a long chapter of "moving accidents by flood and field."

Nearly a century had rolled away into the mists since that portentous landing on a low, marshy island in yellow Powhattan, in 1607, of Captain John Smith and his band of adventurers, and the growing port had assumed such importance as to warrant a formal establishment by an Act of the Colonial Legislature at Williamsburg, approved by the brilliant Spottswood in 1705.

In 1736 a Royal Charter was granted to the Borough of Norfolk under the hand and seal of the last Sovereign of the House of Stuart, Queen Anne.

It was the sole seaport of the great colony of Virginia, and there had grown up a considerable commerce upon which the subsequent substantial prosperity of the town was builded. In 1728 the little town was already become "the most city-like town in Virginia." This was in the reign of the second George, "the most prosperous period," says Hallam, "that England had ever known," and in the golden days of Hume, Smollett, Harry Fielding, Doctor Samuel Johnson, Pope, Sir Joshua Reynolds, Sir Christopher Wren. Keeping pace with the growth of the colony, the town was waxing rich and great.

In 1769 the imports of Virginia, passing through the port of Norfolk, amounted to as much as eight hundred and fifty-one thousand pounds sterling. In 1776 the population numbered about six thousand souls, and Norfolk was a city of prosperous merchants, "many of whom possessed affluent fortunes," albeit the affluence of the day was expressed in figures which would represent a very modest competence in our times.

In that disastrous year, however, the War of Independence had begun, and the fortunes of Norfolk received a terrible check in the bombardment by the fleet of Lord Dunmore, the last of the Royal governors, dislodged by the rebels from his palace at Williamsburg and smarting to avenge his recent discomfiture at Great Bridge. The great warehouses and stores of the place, filled with the riches of the West Indian and Colonial trade, went up in the flames, together with the elegant mansions of the wealthy merchants and the humbler homes of the townsfolk. The loss of property amounted to upward of three hundred thousand pounds sterling, and great distress ensued, the fortunes of the town only beginning to recover from the blow toward the close of the war.

There remains to-day, therefore, very little of the old work worth studying.

Almost the only public building of any consequence to escape the general ruin was the old parish church, built in 1739, now Saint Paul's, the chief Episcopal church in Norfolk.

The old church itself is of small interest. We had expected to

[1] Continued from No. 805, page 135.

find in the gates of the wall enclosing the yard some remnant of good old wrought-iron work, but on examination were forced to set them down as somewhat commonplace and uninteresting. Inside the gates, however, lies the ancient City of the Dead, about two acres in area and very beautiful. Here and there among the shrubbery one stops to make out the nearly effaced inscriptions of an old headstone. There are no tombs, however, so rich in design or in carvings of mortuary emblem and heraldic device as those we sketched in the shady, vine-grown God's half-acre of old Benton Parish: the honest burghers of Norfolk sleep under much less pomp and state of monument and epitaph than was thought due the aristocratic manes of the grandees of the old Colonial capital.

The church is disappointing from an architectural point of view, and is only saved from ugliness by the rich masses of ivy clinging to its walls. The verger pointed out the date, 1739, cut in the bricks, with the letters S. B., presumably meaning St. Bride's, the original title of the parish.

Set as a panel in the outer wall is an ancient headstone from Wyanoke-on-the-James, bearing the date 1637, and high up in one corner, just under the cornice, a well-rusted cannon-ball is half embedded in the bricks, fired from one of Dunmore's ships on the night of the bombardment. Inside the church there is not much to see. Architecturally, indeed, the interior is devoid of interest.

Rambling about among the older streets, one is halted here and there by the discovery of a fairly good bit of old work, a doorway,

The Hall at Shirley.

perhaps, the portico enclosed with wrought-iron railings of simple forms, set between gracefully-tapering fluted columns which support the shingled roof, the small gable or pediment, displaying often some detail of delicate beauty, and the broad panelled door, flanked by carved pilasters, a good fan-light filling the round arch above, the woodwork in old white, the door of sombre green from which gleam the polished brasses of knocker and knob.

The house we illustrate with this paper is by far the most interesting example of Colonial work to be found in Norfolk, and though built at the close of the war, it is distinctly in the style in its very completest development. It stands upon the corner of Freemason and Bank Streets, and is a charming old bit of architecture, well kept up and intelligently guarded from modernizing innovations by the appreciative good taste of the owners, Mr. and Mrs. Barton Meyers.

The illustrations elsewhere in this issue are clear enough to set forth the good points of their ancestral mansion, without much introduction, and so we will content ourselves with a word or two.

The walls are laid up in a coarse, large brick, which were doubtless moulded near by. The joints are coarse and the bricks are laid in the Flemish bond with alternating headers and stretchers, each header coming over the centre of the stretcher below.

The window-heads are reinforced by flat arches of cut-stone in voussoirs. The sills are of wood. The portico is all in wood except the platform and steps, which are of marble. All woodwork outside, except the mahogany doors, is painted white.

The hall is large and imposing, showing a very beautiful frieze and cornice, and an effective ceiling decoration of plaster in half-relief. The staircase is broad but plainly treated. There is a very graceful mantel in the parlor, our illustration of which gives very complete detail of the splendid enrichment and carvings. The floors throughout the house are noticeably hard, smooth and well-preserved. They are in quartered oak about four inches wide.

The walls of the house have evidently endured the indignity of many whitewashings at the hands of the several generations of the descendants of the founder, who have dwelt within their hospitable shelter. It is a pity that they should not be rendered less scaly by a good scraping and afterwards treated to a light wash of a quiet colonial yellow over a strong glaze, the rich plaster-relievos on the ceilings and over the mantels and elsewhere, being left white, would come away more satisfactorily.

The dining-room, opening out of the parlor, is a great generous room and full of light The octagonal end, pierced with three ample windows beneath which a seat runs, gives quite a character to the stately room.

In two wide but shallow recesses over which the plaster forms a round arch, stand a pair of richly blackened mahogany sideboards, bearing a great wealth of handsome old silver and glittering old cut-glass.

At the end opposite the windows is the fireplace, which has a facing of white marble pilasters surmounted by three panels, those at the ends having heads carved upon them, and that in the centre a reclining female figure. There is no shelf and this facing is low.

All the heavy interior doors are made in six panels, and are painted in a dark tint upon which the great shining brass rim-locks, with quaint and graceful drop-handles, shine out with great richness of effect.

The dado in the hall and principal rooms is about 2′ 6″ high, without panels. The baseboard is 4″ high, painted black, and finished with a moulding in white, about 2″ high. The cap of the dado is about 2″ deep including a frieze of delicate flutes. The casings of doors and windows are about 4½″ wide, and are noticeable for a delicate little rounding dentiform member.

The ample hall extends across the full width of the house on the first and second floors, the stairs swinging up across one end of it. Beside the front door, which opens in the middle of the façade, there is a door giving upon the garden, under the stairs, and, in the opposite end of the oblong, another opening upon the side-street.

Doors open directly into the parlor and library, which together occupy the full width of the house. It is my impression that there is no door between these rooms.

There is a door on either side of the parlor fireplace opening into the great dining-room already described, and from the library there is an inferior passageway to the dining-room also, but I think that this is really a sort of pantry, and that the only way to the dining-room is through the parlor. The plan upstairs is about the same,

except that from the hall, which swings across the whole front, there leads off at right angles, a passageway on either side of which are the chambers.

In some of these there are rich woodwork and decorative plaster relievos.

The floor-plan of Shirley on the James, a handsome old Colonial mansion, built almost a century earlier, already described in a former paper, was much more happily conceived than this of the house, builded in Norfolk town by the Colonial merchant nabob, Moses Meyers. At Shirley all the principal rooms open upon a great hall occupying one corner of the house and about one-fourth of the first floor-area; and the drawing of the Hall of Shirley, will convey a not inadequate impression of the dignity of the grand old room. It is to be regretted that a hesitancy to invade the more sacred privacy of the sleeping-rooms above, has left us to guess at the arrangement.

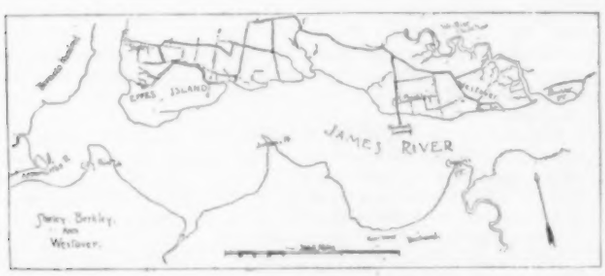
Among the treasures of Mr. Barton Meyers's ancestral house, there is much good old furniture and not a few old canvases of interest, with a lot of fine antique plate and cut-glass. The three leather-bottomed, black mahogany chairs standing in the hall, and fortunately coming out pretty distinctly in the photograph, are very pleasing examples of Heppelwhite work: the forming of the curved members of their shield-shaped backs, and the carving of the festoons and other decorations is excellent. The legs are kept plain and strong.

The lounge by the side-door in the hall, at the back of the picture, is also very interesting. The design is good, the piece making its effect by means of simple flowing curves and a certain austerity of form and gracefully reserved sweep of lines. The three little balls in the cross-brace at each end, those under the feet and under the long arms, forming the back of the seat, are of yellow bronze, as are also the ornaments along the front of the lounge.

A similar piece of furniture in the parlor is very beautifully inlaid and has bronze wreaths affixed to the ends of the arms. This belongs to the last period of the eighteenth century. It is perhaps a few years younger than its compatriot, the Marie Antoinette chair, standing near it. If these exiled aristocrats of France, *bien conservées*, occasionally, in the silent midnight, exchanged a courtly word or two of chat, what wonderful reminiscences one might hear from them of that intense electric time of their youth, when they were in the front of fashion. The Louis Sixteenth revival of Pompeian schemes for furniture and interior decoration, and the later Classicism of the First Empire filled the popular mind in the heyday of their glory, the latter part of the century.

In England especially, everything tended toward an imitation of the purest Classic work in those days, and the movement in France and England has given us examples of household furniture and ornament, unexcelled in purity of line, in dignity and strength combined with marvellous lightness of structure, and in elegance and grace of decorative treatment.

About the time that the Elgin marbles were brought to England — one of the greatest results of the passion for Classic exploration and discovery which had taken such a hold upon the cultivated classes of the time — Mr. Hope published his book about "*Furniture and Internal Decoration*," from one of the chapters of which is taken this



quotation — I found it in an old *Harper's* the other day, — a description of one of the rooms in his splendid house carried out in the style of the day:

"The central object in this room is a fine marble group, executed by Mr. Flaxman and representing Aurora visiting Cephalus on Mount Ida. The whole surrounding decoration has been rendered in some degree analogous to these personages, and to the face of nature at the moment when the first of the two, the goddess of the morn, is supposed to announce approaching day. Round the bottom of the room still reigns the emblems of night. In the rail of a black marble table, are introduced medallions of the god of sleep and of the goddess of night. The bird consecrated to the latter deity, perches on the pillars of a black marble chimneypiece, whose broad frieze is studded with golden stars. The sides of the room display, in satin curtains draped in ample folds, over panels of looking-glass and edged with black velvet, the fiery hue which fringes the clouds just before sunrise; and in a ceiling of cooler sky-blue are sown, amidst a few unextinguished luminaries of the night, the roses which the harbinger of day in her course, spread on every side around her. The pedestal of the group offers the torches, the garlands, the wreaths, and the other insignia belonging to the mistress of Cephalus, disposed around the fatal dart of which she made her lover a present. The broad band which girds the top of the room, contains medallions of the ruddy goddess and of the Phrygian youth intermixed with the instruments and the emblems of the chase, his favorite amusement. Figures of the 'Youthful Hours,' adorned with wreaths of foliage, adorn part of the furniture, which is chiefly gilt in order to give more relief to the azure, the black and orange compartments of the hangings."

The quaintly-conceived adornment of this wonderful room, every detail of which played its part in making the whole a perfectly harmonious setting of the idea wrought out in the marble group of "Aurora and Cephalus," might well be termed the ultimate expression of the passionate Classicism of the period.

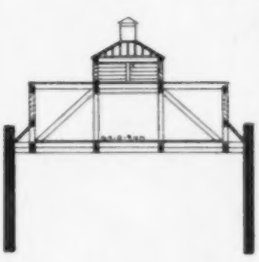
At first reading, the fiery-red walls, the light-blue ceiling studded with gilt stars, and the azure, orange and black of the hangings, would seem likely to strike the modern eye as rather garish, but the difficulty of expressing color in words must be taken into account, and it may have all really come together very nicely.

The fashion of the day, however, hardly reached the Colonies in the full severity of its academic correctness though its tendency was felt on this side long after London was revelling in Gothicism, Mediævalism, and in all those marvellous distorted developments of the later schools of design.

[To be continued.]

THEATRICAL ARCHITECTURE.[1] — IV.

VENTILATION.



Wooden Roof and Ventilator over Stage.

VENTILATION is required in theatres for two very important ends, to provide fresh air and to reduce the fire-risk. Everybody will admit that perfect ventilation is more needed where large numbers congregate in a public building than anywhere else, yet in how many old theatres is ventilation left to chance. It is well known that the smoke from a fire kills more people than the fire itself. If it were not for the presence of smoke, and could such control be brought to bear upon the people that panic would be avoided, fires would do little harm beyond destroying property, for the people would have plenty of time to get away long before the flames touched them. The danger to be guarded against is that of asphyxia, which so closely attends the presence of the gas generated by combustion, that in the well-known case of the Vienna Ring-Theater disaster many corpses were actually found seated in their places, sudden death having prevented any effort on their part to use the means of escape provided for them.

Ventilation is also needed from another standpoint, the keeping of bodies cool, for many substances, which are incombustible under normal conditions, become inflammable at a high temperature; every means should therefore be adopted to allow of a free circulation of air to all parts of the building.

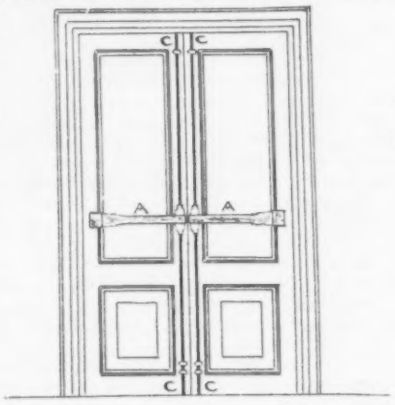
Fires in theatres may be said to always originate on the stage, and in order, therefore, to draw off the smoke so that it may not enter the auditorium, huge ventilators should be constructed over the stage. In all new London theatres the authorities insist upon a ventilator, one-tenth the area of the stage-floor, to be placed in the stage-roof at the back of the stage, such ventilator should have the sides fitted with louvers and the top of glass. In Austria where the importance of ventilation is studied, two shafts of iron are required, each one-fortieth the area of the stage, with flaps so arranged as to drop by their own weight when released, and worked by wire ropes from the floor of the stage, close to the machinery for lowering the metal curtain. In St. Petersburg, Paris and Brussels, like precautions are insisted upon. Some authorities go so far as to assert that although the roof of the auditorium and all adjuncts should be constructed of fire-resisting materials, the roof over the stage should be of wood, so as to allow of its being easily burned away, and thereby form a large space for the escape of flames and smoke, but it would appear that the fact is forgotten, that where a roof, such as one over a stage, is on fire, much heavy and "live" material would necessarily fall and spread the fire most rapidly. The ventilators should be made sufficiently large to do the work alone.

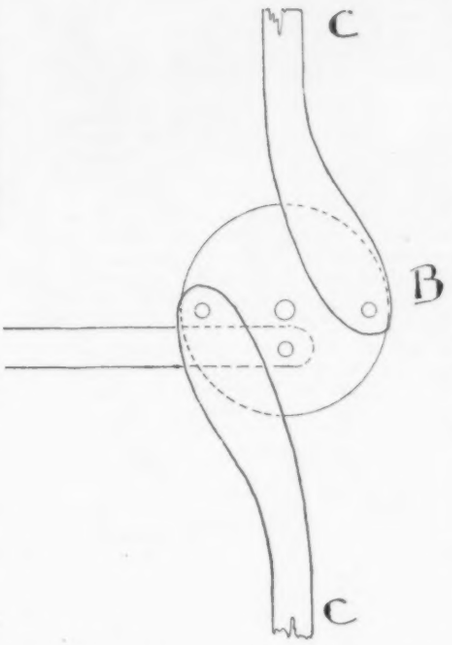
[1] By Ernest W. E. Woodrow, A. R. I. B. A. Continued from No. 829, page 100.

The ventilation of the stage must be so carried out as to allow of no down-draught to shake the scenery, for, should this wave against any of the hanging gas-battens, they would be sure to ignite it. To keep an up-draught through the ventilators a gas-jet should be kept burning, which could be regulated by the gas-man from the gas-plate on the stage below.

Fresh air should be admitted into the auditorium near the floor-level by numerous inlets, and the foul air be drawn off by exhausts at the ceiling-level under each tier, and in the ceiling over the auditorium by sunburners; extract-shafts should also be placed over the back of the gallery for in it, being the highest part of the house, collects the vitiated air, and special attention should be given to render this part of a theatre fresh and cool; as a rule, it is unbearably hot and foul.

Perfect ventilation is imperceptible: to acquire such ventilation is a hard task, for draughts of cold air must not be felt, and overheated buildings must not exist. This foul, poisonous and heated air must be extracted, and, especially in the winter months, fresh and warm air must be admitted. In cities such as London, where fogs are of frequent occurrence, the air should be filtered before it is admitted into the house. In our Houses of Parliament, the air passes through "fog-filters" of cotton-wool previous to being forced into the chambers, and it is thus freed from all impurities and sulphurous gases.





By Pressure on the Wooden Bars *A A* the Plate *B* Revolves and Releases the Bolts *C*.

Copping's Patent Automatic Bolt.

The number of deaths caused by breathing impure air in crowded assemblies is far in excess of those caused by fire. I may not be believed at first in my statement, till it is considered how many colds are caught in overheated rooms, which are but the origin of consumption, and so the cause of death.

It is not my intention to advocate any special system of ventilation; it must be left to the architect, aided by his own experience, to choose whether the vacuum or natural system, or the plenum or mechanical system, will meet the requirements of a building such as a theatre or music-hall: suffice to say that all parts must be efficiently ventilated.

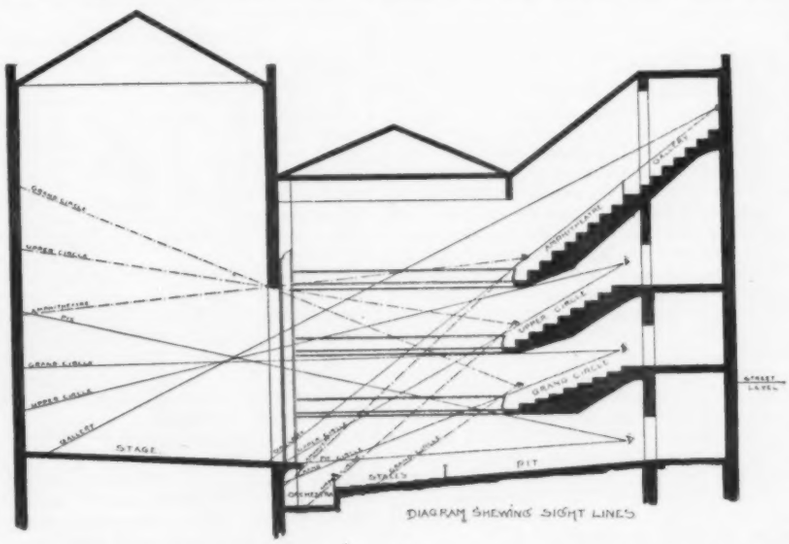
We have considered the audience; now we must give our attention to those behind the curtain. Dressing-rooms without light or air are too frequently to be found. The air in a dressing-room becomes most foul, first, from the number of gas-jets that are necessary over each "make-up" table, and, secondly, from the way in which they are overcrowded. To provide ventilation in dressing-rooms, no better means could be adopted than giving plenty of windows that will open freely, and it should be a standing order to the "dresser" to air the room whenever the occupant is engaged upon the stage.

I may, perhaps, be allowed to support my theory — that ventilation is necessary to prevent some causes of fire — by quoting an instance that some time back came under my notice. A pile of new play-bills, wet from the printers, was stowed away in a dark, unventilated cupboard in a London theatre. The printing oil and the damp paper commenced to heat, like a haystack that has been made of damp hay, and a hole smouldered right through the whole heap, till at last it fired. But for the timely discovery by the fireman, the theatre would have been burned to the ground, for it was an old building. Had there been ventilation, the bills would have dried, and spontaneous combustion would have been impossible.

WARMING.

In a cold country like England, it is necessary to adopt some artificial means of warming a theatre: old theatres were seldom warmed; they became, through the non-provision of ventilation, hot enough before the evening was over with the foul gas-fumes; but new theatres are lighted by electric-lamps, have attention paid to their ventilation, and do require warming. Looking for a moment at what is done on the Continent, we find different countries adopting different methods of warming public buildings, for instance in Paris, no theatre may be warmed except by air gratings, the furnace for which must be placed in the basement. In Brussels the system is left to the architect, but the heating apparatus must be non-explosive, and placed in a vault separated from the rest of the building by double doors.

In London, we compel the architect to place his furnace in a separate building, entered by a separate entrance from the street, and not connected by any opening with the theatre. The method allowed in St. Petersburg is either steam or hot-water, and in Berlin, where hot-air is enforced, the gratings have to be protected by wire-netting of close mesh and no objects of an inflammable nature are permitted near the gratings. Where hot-air is used the conduits must be constructed of iron, or of earthenware, two and a half inches thick, including the coating. The openings to admit the hot-air should be one foot above the floor-level and six inches from any woodwork. Where hot-water is used it should be on the low-pressure system, as the high-pressure endangers the building from fire. The low-pressure is the system used in London theatres. Open fireplaces are objectionable, but are sometimes necessary, as in offices and dressing-rooms of the principal actors. Where they are used, they should be protected by a fixed iron-wire guard and fender. No fireplace should be allowed in the dependencies of the stage, and no store or workshop should have a fireplace or stove; stoves should be constructed of earthenware.



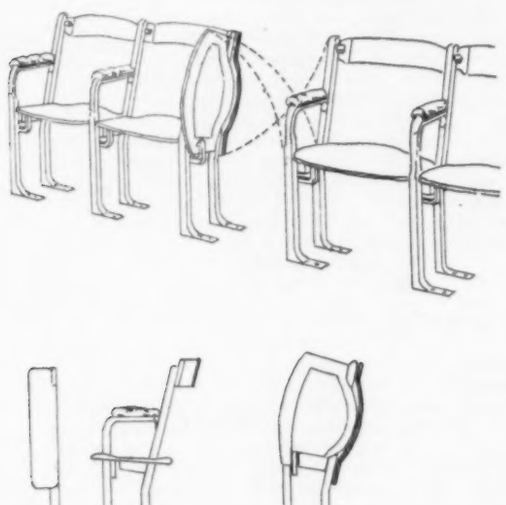
Special attention and care must be given to the building of flues

and chimney-stacks; faulty flues are the origin of many fires: they should be kept clean and swept periodically, and enclosed by not less than nine inches of brickwork. Iron flues should under no circumstance be allowed.

SIGHTING THE AUDITORIUM.

Here the architect will find he has a great difficulty to overcome. No one, except those who have designed and built a theatre, will ever understand how fearfully hard it is to provide a house in which the audience will be able to both see and hear from *every* seat in the auditorium. It is not enough to be able to see part of the stage, but the whole of the performance should be witnessed with as much comfort and ease from the side seats, as from the middle ones, from the back row as from the front; no obstructing column should impede the sight and no projecting ornament should destroy the waves of sound.

Seats from which only a partial view of the stage is obtained are a disgrace to the architect, an annoyance to the manager, and a fraud on the public. Every seat can be made equally good if the architect only knows his work, and it is his duty, before commencing to build, to test by sectional drawings the sight-line of every seat in the house, so that the feet of the dancer may be seen from the front row of the stalls and at least twelve feet high of the back of the scene by those in the last row of the gallery. If these two rows can see this much, it is a sure test that the house is well sighted, as they are the most difficult seats to sight and upon them depends the possibility of seeing from the whole of the other rows of seats. If you start



Patent Theatre Chair invented by Regierungs-Baumeister W. Schleicher, Dusseldorf. A Back View; B Side View (seat down); C Side View (seat up).

This automatic chair is made so that the seat rises sideways and the back falls simultaneously as the occupant gets up, leaving the gangways the full width of the chair between adjacent standards. In addition to passing along the rows the audience can pass through them. Every chair is made to lift automatically leaving the standards in rows like poles in a hop-field.

wrong the mistake will become multiplied again and again, with each successive row, in the endeavor to give each occupant a view over the heads of those in front: if too low, the "boards" will not be seen from the stalls; if too high, the theatre will increase in height, row after row, till it is dangerously out of all proportion, for the second row must be high enough to see over the heads of the first, and the third over the second and so on. Practice will alone give the rules for sighting, practice I mean by sectional drawings, for it is impossible to practise with actual buildings. Measure other people's work and make drawings of the rise of one tier above the other, and compare the variations in different theatres. No two will be found alike, so many details govern the line of sight — the width of the proscenium-opening, the height of the stage above the stalls, the height of the proscenium-frame and other dimensions. Remember one-half, or even one-quarter, of an inch wrong at the beginning will ruin the whole theatre, not only for seeing, but for acoustic properties, as it will destroy the proportion. The side seats it will be found will have to be higher than the middle seats, and the floor should therefore be dished-up towards the side walls, the additional height should never be obtained by single steps but by gradients.

It is not within my province to enter on a treatise upon acoustics. I can only advise the careful reading of the text-books upon this science, and encourage the architect by saying that the best theatres in London for speaking in, or hearing in, are those that look right, that is, those that are of good architectural proportion.

[To be continued.]

ANCIENT ARCHITECTURE FOR STUDENTS.[1] — XV.

ETRURIA AND ROME.

CHRONOLOGICAL NOTES.

	B. C.
Etruscans migrate from Asia Minor,	12th Century.
Rome founded,	753
Tarquinius Priscus (Etrurian ruler),	616
Roman Empire founded,	330

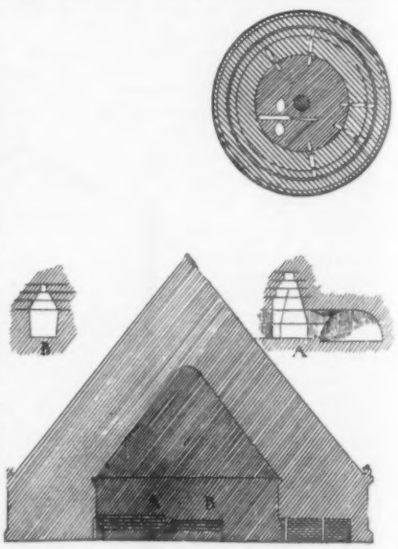
Principal Chamber of Tomb of Regulini Galeassi.

WE have now to consider the history of the most remarkable empire that ever existed. Remarkable, because of its singular origin. All previous empires had their beginnings in the consolidation of numerous tribes, usually through the conquest of one more powerful than the others, or on a greater scale, one nation swallowed up others and ruled over them all. But with the Romans, their empire had a very small beginning, the possession of a very small area and in a few years springing into the mastership of the whole world.

The Etruscans, the inhabitants of the greater part of Italy, were a Turanian people, migrating from Asia Minor about the twelfth century, B. C. Etruria occupied much the same position with reference to Rome and the history of Roman art, as Lydia did to Greece and her art. Like other Turanian tribes, their religion took the form of the worship of the dead, consequently it is the tomb, and not the temple, that we find their best work. Dyonisius speaks of a temple of Etruscan origin erected at Rome about 616 B. C., to Jupiter Capitolinus, but no trace of it remains except in the pages of history. Vitruvius tells us they had temples square, rectangular and circular, and we can trace here the origins of those forms which, under the Roman Empire, became of so much importance, such as the Pantheon and the basilicas. Etruscans obtained their rudimentary civilization through contract with the Hittites, and it may have been on account of Hittite invasion and oppression that they migrated from their neighborhood.

The earliest examples of Etruscan tombs are the rock-cut, very similar to those of the Lydians, an ornamented façade with a sepulchral chamber, hollowed out of the rock behind it. Later, the sepulchral chamber became larger, and the rock forming its roof was supported by columns internally, but like the Phœnicians, these columns were not constructed, but were left as the excavation proceeded, and afterwards ornamented and shaped, their detail being Egyptian in character.

Their structural tombs were like that of Crœsus, King of Lydia, circular on plan, built of masonry to a certain height, on the top of which they piled an immense amount of earth, forming a "tumulus." The most remarkable is the one known as the Regulini Galeassi tomb, from the names of its discoverers. It consisted of one tumulus constructed or piled up over another of about half the size of the finished structure; the later, or enclosing tumulus, contained five tombs of small dimensions, radiating from the centre, and years ago these were discovered and rifled of their contents. But the existence of a tomb in the inner mound was unsuspected, and when recently discovered and opened it was found to contain ornaments and vessels in gold and bronze, shields and weapons particularly interesting in character. At Vulci was another tumulus of much greater dimensions. Its diameter was 240 feet, and although its height is only about 60 feet now, it must have been at least 100 feet originally.



Plan and Sections of Regulini Galeassi Tomb. From Canina's Etruria Antica.

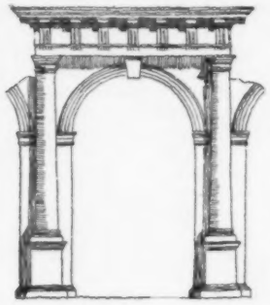
A small and singular tomb answering to the description given by Pliny of the tomb of Porsenna, has a square base rising about thirty feet, ornamented with a plinth and a dentil cornice and supporting five circular cones, a large one in the centre and four smaller ones at the corners.

That the Etruscans were great builders may be seen from their

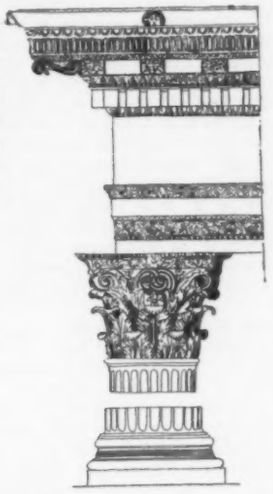
[1] Continued from No. 825, page 40.

bridges, gates and aqueducts, and that they used the round arch with radiating joints and voussoirs, is gathered from these remains, but the pointed arch they constructed rudely with horizontal beds. Here we see the influence brought to bear upon these people through the commerce of the Phœnicians.

The Romans were of Phœnician origin, an Aryan people, and they lived side by side of their Turanian neighbors and were dominated by them for a couple of hundred years after the foundation of Rome, 753 B. C. Throwing off the Etruscan rule and changing regal Rome into a republic, constantly and victoriously warring with all neighboring countries, east, west, north and south over the Mediterranean, Rome became the very centre of the world. Conquering Carthage,



Doric Arcade.



Corinthian Order for the Temple of Jupiter Stator.

her rival in commercial interests, overrunning Greece and turning Egypt into a Roman Province, sending her armies to Spain, France and England, she became almost at one instant, the great emporium of the world, the market-place for the treasures of all known countries and the centre and storehouse for all the wisdom, the science and art of the age.

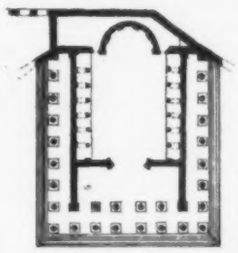
Rome with her temples, theatres, baths and all buildings erected for public use or private luxury presents a spectacle such we have seen in no former empire. In Greece we have seen architecture emancipated from the trammels of its youth and attaining a marvellous perfection. In Rome we see this art adapted to every conceivable kind and form of building requisite to that hardy, bold and warlike but luxurious and pleasure-loving people.

Naturally, then, Rome is the scene of a great struggle, the purity of art in contention with unprincipled adaptation to the requirements of the day, and the severe Classic suffered in consequence and deteriorated when made subservient to everyday purposes. Roman architecture is a combination of Greek and Etruscan rectangular Classic adapted to circular Etruscan plans. To the circular Etruscan temple was added a Greek colonnade and the column was used in conjunction with the arch. Thus a new line was prepared which speedily developed into "Italian."

It was left for the Romans to develop the Corinthian order of the Greeks, but the result of their treatment was very different from the probable result of the direction in which it tended in the hands of the Greeks. For the Roman order proper is not a column and entablature but it is an arcade consisting of columns set at a greater distance apart than they have heretofore been met with, raised on pedestals, backed by solid piers from which spring a round arch giving support to a heavy cornice or entablature. They used and adopted the Doric and Ionic orders but it is their development of the Corinthian that is characteristic of themselves, and upon this their energies were expended with a national affection.

The finest example of a Roman Corinthian temple is the Temple of Jupiter Stator, a little more florid than their later examples, but

Corinthian Base. Church S. Prassede, Rome.



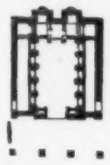
Temple of Mars Ultor. From Cressy's Rome.

which for richness of detail and for its proportions surpassed any building previously erected.

A more pleasing example is the portico of the Pantheon erected 13 B. C., less elaborate in its carving and therefore possessing a simple dignity, felt by the Romans themselves to be more suitable to their objects.

A column base of the Roman Corinthian order was found in the Church of St. Prassede, though to what building it originally belonged is unknown; it is a beautiful adaptation of the Persepolitan bases, but it is a form that they paid little further attention to, confining their efforts to moulded bases mounted on pedestals. The development of the Roman order is very striking; taking down the pillars from the pedestals they took away the supporting pier from their backs, and the arch instead of being made to spring from the piers, rises from the tops of the capitals instead and forms the main feature above the caps, instead of the cornice

From the Temple of Diana at Nimes.



Plan of Temple of Diana at Nimes.

which it was formerly introduced to support. The cornice now runs above the arch, sometimes however, following the curve of the arch and making a finishing feature to the wall.

The Romans were not a religious people, they were like the Phœnicians essentially commercial, all their aggressive wars were for the benefit of their own commerce, and for the overthrow of those nations whose interests rivalled theirs. Hence the temple was an insignificant building while the basilicas, or business halls, and seats of justice took a far more important place. The most remarkable of their temples was the one already alluded to, Jupiter Stator, with its façade of eight columns, forty-eight feet high, raised on a base or platform twenty-two feet high and ninety-eight feet wide. Upon the caps was an entablature, rising twelve feet or thirteen feet above them and over this again was the pediment. The general plan of a Roman temple is a porch and a cella or hall sometimes terminating in an apse and sometimes by a straight wall. Externally they were either surrounded by detached columns or the walls would be relieved by pilasters. The Temples of Jupiter Stator, Jupiter Tonans and of Mars Ultor are destroyed, but the remains of the latter are sufficient to render a restoration possible and it proves to be a fine example. Its porch consists of a double row of six pillars, the outer two of the back row forming the termination of the porch side-walls. This temple has a peristylium of eight columns and a pilaster on either side, the first two columns on each side being the continuation of the columns of the principal façade which is therefore octastyle, or of eight columns wide. The cella with internal shafts along two sides, terminates in a apse which is distinctly Roman in origin and became an important feature in all their business buildings.

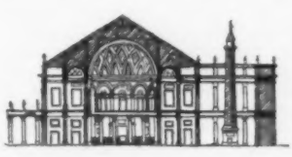
It is with the older works of Rome rather than with the later, that we have now to do, the scope of our subject limiting us to heathen architecture, although we shall see how the work of the heathen became the work of the Christians, and how the art of the new era sprang from the art of the old.

One more temple, however, first merits our attention, the temple of Diana at Nimes. There is a freedom of treatment that we have not met with before, but perhaps its most striking feature is the stone-vaulted roof, great arches being turned from side to side, forming ribs, with simple tunnel vaulting between them.

The vaulted roof is entirely distinct from the walls as far as design goes; surrounding the temple internally are columns against the walls, enclosing the cella, which with the help of the walls give support to a heavy cornice. In the face of the walls between the columns are square-headed sinkings ornamented with pediments, alternately of rounded and angular detail.

Plan of the Basilica at Treves.

To describe all the principal buildings of Rome would be an undertaking outside the purposes of this book, and they, with



Section (restored) of Trajan's Basilica.

their objects of interest and the adaptation of architecture to them, would, to describe, take up too much time at the present.

Circular temples, amphitheatres, baths, triumphal arches are foreign to my purpose here. We have to do with those temples and the basilicas that were the origin of the Christian church plans.

As a typical Basilica we will take that of the Emperor Trajan, erected

117 A. D. Very little remains of it now, but it must have been a very fine building judging from the details that have come down to us. "The rectangular part was 180 feet in width and a little more than twice that dimension in length, but the ruins at neither end having been excavated its exact longitudinal measurement has not been obtained. It was divided into five aisles, by four rows of columns each about thirty-five feet high, the centre aisle being eighty-seven feet wide, and the side aisles twenty-three feet four inches each. The centre was covered with a wooden roof of semicircular form, covered, apparently, with bronze plates richly ornamented and gilt. Above the side aisles was a gallery, the roof of which was supported by an upper row of columns. From the same columns also sprung the arches of the great central aisle. The total internal height was thus probably about 120 feet.[1] At one end was a great semicircular apse, the back part of which was raised and approached by a semicircular range of steps. In the centre of this raised part was a throne in which sat the quæstor or other presiding magistrate. On either side of the throne were seats for the assessors or others engaged in the business to be transacted. In front of them was placed an altar where sacrifices were performed before commencing any important public business.

"Externally, the Basilica could not have been of much magnificence. It was entered on the side of the Forum by one triple doorway in the centre and two single ones on either side, covered by shallow porticos of columns of the same height as those used internally. These supported statues, or rather, to judge from the coins representing the building, relievos, which may have set off but could hardly have given much dignity to a building designed as this was. At the end opposite the apse a similar arrangement seems to have prevailed."

By a very little modification of plan, this plan became that of a Christian church. Remove the columns passing across the front of the apse, take away the magistrate's seat and substitute for it the altar removed from the entrance of the apse, and thereby raising the level of the floor of the nave for a few bays to form the choir or chancel, we have a church complete.

As we have inferred, this chapter is not intended to be a history of Roman architecture. The art of this empire and this period only concerns us in this inquiry so far as it has reference to the Christian religious buildings, and because we leave the subject here it must not be supposed that there is nothing else worthy of our consideration in Roman art. From this period indeed the development of the art becomes if possible even more interesting than that of the ancient art we have considered. The arch we have seen was by the Romans brought into prominence, not merely as a piece of construction but as an architectural feature, and if we followed up the history of the arch we should find that from the position of insignificance that we have found it occupied before Christ, it had arisen to the highest pitch of importance, scientifically and artistically, that it was the key of the art in the future, and that its employment changed the whole spirit of architecture.

The work of the ancients was the construction of gigantic solid masses. The work of the moderns was the construction of framework, lofty and light. The art of the Romans was the hinge between the two phases of the art.

To Rome all the work of four thousand years has tended and from Rome all future work springs. In Rome the art is raised from the demoralizing surroundings of heathen practices and passes onward in the light of Christianity, and for the first time exhibits the fact of its divine origin unquestionably and unswervingly. We have traced it for a period of nearly four thousand years, through all the course of its extraordinary career, carefully noting all concerning it that discoverers have brought to light or historians handed down for our benefit; but as the works of exploration are continually proceeding in conclusion, we would urge the student not to rest satisfied with what he has read herein, but to improve upon the knowledge he has gained, by keeping up a careful record of all future discoveries.

R. W. Gambier-Bousfield.

[The end.]

A Customs Decision as to what Constitutes a "Collection." — Common-sense seems to be insidiously insinuating itself into our Treasury Department's official intelligence. The Department has not yet got so far as to regard all art as a blessing, but it is loosening up its old grip on the throat of the antique end of it. Mr. R. Hall McCormick, of Chicago, who has been making a private collection of old paintings abroad, wrote to the Department on October 22, saying that two of his pictures were held at the Chicago custom-house and two in New York, because the customs officers were not sure that, coming by twos, the paintings could be admitted as a "collection" free of duty. Mr. McCormick wrote to say that he had one painting yet in London which had not been shipped, and unless it could be brought over as part of a collection of twenty which he was making for his residence, it would be necessary for him to export all those he had already received and have them re-imported together as a collection. As a result of the appeal, I see by the *Daily News* of Chicago, that Secretary Spaulding has instructed Collector Clark to admit Mr. McCormick's paintings, and that he cites the decision of Judge Latrobe, of New York, to show that articles intended to form a collection of antiquities may be admitted free of duty either singly or as a collection. — *The Collector.*

[1] Fergusson.

ACOUSTICS.[2]

The theory of sound has been pretty well worked out; but the difficulty lies in applying it to the endlessly varying sizes, shapes, materials and details of different buildings. It is not so much that the principles of acoustics are unknown, as that the working-out of their results in any but the very simplest cases forms too complicated a problem for practical solution. Some writers on the subject, though not usually the scientific ones, profess great faith in strict numerical relations between the length, width and height of an interior. They would have us believe, for instance, that if a building is 80′ long, 60′ wide and 40′ high (or if its length, width and height are other multiples of 4, 3 and 2) it is sure to be successful for speaking in. Practice, as might be foreseen, does not support this fancy, and in the case supposed everything would really depend on the materials, and on the treatment of the internal surfaces. Moreover, the taking away of 2′ or 3′ either from length or width of such a building, which on this supposition ought to destroy its acoustic merits altogether, is, in fact, more likely to improve them. And, again, the principle, such as it is, becomes unworkable when one has to apply it to any but a plain, oblong room with a flat ceiling, a room which, of all places, is apt to be the worst for speaking in. What, for instance, are we to consider the length, and what the width, of such a plan as A or K or L, and at what points must they be measured? Yet such plans as these are incomparably better, as regards acoustics, than the plain oblong which the hypothesis presupposes.

But, on the other hand, a building which is to be successful for speaking in must have all its dimensions within certain *general* limits, regulated by the distance to which an average voice can be distinctly heard. Sir Christopher Wren considered this distance to be at least 50′ in front of the speaker, 20′ behind him, and 30′ on each side. This is doubtless, as regards the length, a very moderate estimate, and might fairly be increased by 20′ or more. At the Metropolitan Tabernacle, Newington, which is 80′ wide from wall to wall, and 150′ in extreme length, internally, an exceptionally good voice is audible throughout. In this case there is, in the upper part of the building, a length of nearly 120′ in front of the speaker. On the ground floor and lower gallery, however, the extreme distance from him is only about 100′.

In buildings of a length like this, the chief difficulty is to conduct the sound to the farther end, and by all practicable means to prevent its being lost and deadened. For this purpose, wooden linings to the walls have been employed, and a ceiling semicircular in section. Echoes have also to be carefully guarded against, especially from the end facing the speaker. But, in places of a smaller size, and of moderate height, means for conducting sound are not required, and echo and reverberation are the real dangers to be feared. In an interior where the farthest seat is not more than 60′ or 70′ from the minister, everybody may be considered within direct range of his voice. Wooden wall-linings would do more harm than good, but careful study is needed to prevent the voice from being reflected back.

Echo and reverberation, which is only an echo or series of echoes, within too small a compass to be clearly heard as such, come mainly from even and unbroken surfaces. The surfaces may belong to either walls, roofs or floors. Echoes from a floor, which are very common, are much lessened by chairs or pews, and destroyed by the presence of a full congregation, and by the use of carpets, cushions, etc. These, therefore, are comparatively harmless. The troublesome echoes are those from walls, and roofs or ceilings.

A flat, unbroken end-wall, facing the pulpit, is pretty sure to reflect sound unpleasantly. This fact is so well known that an end gallery is often put in, less for its utility than with a view of preventing this evil. Any scheme, however, which will break the wall surface up into projections and recesses will answer the same purpose, and perhaps in a more architectural way. The corners of an oblong building, too, are great lurking-places for echoes, particularly if the building is destitute of columns. For this reason, corners of this sort are sometimes cut off obliquely, and at other times are broken up with projecting piers, which will have the same effect in a different way. The sides of deep transepts, again, facing the speaker, are likely to act as a flat end-wall does if proper precautions are not taken. And if, as occasionally happens, the building narrows, even a very little, from one end to the other, or, in other words, is slightly wedge-shaped, there will be much danger of reverberation from the side-walls, if the pulpit is put at the wider end. With a pulpit at the narrower end, wedge-shaped buildings have the reputation of being acoustically good.

A curved wall facing the speaker is commonly as bad as, or worse than, a flat one, provided, of course, that it is not effectually broken up by projections or recesses; and the same thing may be said of a polygonal one. It has been assumed, so far, that the building is without columns. For though columns when ill-placed cause much obstruction to sight, they do make considerable atonement for this fault by breaking up and doing away with echoes. Moreover, it is quite possible to get the good from them without the evil, although, on the other hand, with unskilful treatment, it may happen that the evil remains without the good. The same principles that apply to

[2] A portion of a paper in *Building News* on "Nonconformist Church Building," by James Cubitt.

walls apply to roofs and ceilings. All planes that face the speaker should be thoroughly broken up, and no flat or concave surfaces should be allowed in this position. The right angle between a wall and a flat ceiling is usually as bad for sound as the right angle between two walls, and should be got rid of in an analogous way. An angle at the ridge of a roof also leads to confused echoes, unless the pitch of the roof or ceiling be extremely low. Very obtuse angles are not objectionable. Anything like a large internal dome should be greatly broken up by ribs, coffers, or similar features, or it will be likely to reflect the voice like a concave mirror. And internal roofs or ceilings should not be too high. A lofty space behind the pulpit is particularly bad, unless it has an open or closed screen across it, or is occupied by an organ.

BESSEMER IRON AND STEEL.

Hasselbach Fountain, Magdeburg. From *Deutsche Bauzeitung.*

AT the last meeting of the Iron and Steel Institute, says the *Architect*, Sir Henry Bessemer described an extension of his original process by which large plates as well as bars, rails and ingots can be produced. It is advantageous at such a time to study the original description of the Bessemer process by which, as was announced, malleable iron and steel can be produced without the direct agency of fuel. The following paper by the inventor was read at the meeting of the Brittish Association at Cheltenham in 1856:

The manufacture of iron in this country has attained such an important position that any improvement in this branch of our national industry cannot fail to be a source of general interest, and will, I trust, be a sufficient excuse for the present brief and, I fear, imperfect paper. I may mention that for the last two years my attention has been almost exclusively directed to the manufacture of malleable iron and steel, in which, however, I had made but little progress until within the last eight or nine months. The constant pulling-down and rebuilding of furnaces and the toil of daily experiments with large charges of iron had already begun to exhaust my stock of patience; but the numerous observations I had made during this very unpromising period all tended to confirm an entirely new view of the subject which at that time forced itself upon my attention, namely, that I could produce a much more intense heat without any furnace or fuel than could be obtained by either of the modifications I had used, and consequently that I should not only avoid the injurious action of mineral fuel on the iron under operation, but that I should at the same time avoid also the expense of the fuel. Some preliminary trials were made on from ten pounds to twenty pounds of iron, and, although the process was fraught with considerable difficulty, it exhibited such unmistakable signs of success as to induce me at once to put up an apparatus capable of converting about seven hundredweight of crude pig-iron into malleable iron in thirty minutes. With such masses of metal to operate on, the difficulties which beset the small laboratory experiments of ten pounds entirely disappeared. On this new field of inquiry I set out with the assumption that crude iron contains about five per cent of carbon; that carbon cannot exist at a white heat in the presence of oxygen without uniting therewith and producing combustion; that such combustion would proceed with a rapidity dependent on the amount of surface of carbon exposed; and, lastly, that the temperature which the metal would acquire would be also dependent on the rapidity with which the oxygen and carbon were made to combine, and consequently that it was only necessary to bring the oxygen and carbon together in such a manner that a vast surface should be exposed to their mutual action in order to produce a temperature hitherto unattainable in our largest furnaces.

With a view of testing practically this theory, I constructed a cylindrical vessel of three feet in diameter and five feet in height, somewhat like an ordinary cupola furnace, the interior of which is lined with fire-bricks, and at about two inches from the bottom of it I insert the five tuyere pipes, the nozzles of which are formed of well-burnt fire-clay, the orifice of each tuyere being about three-eighths of an inch in diameter; they are so put into the brick lining (from the outer side) as to admit of their removal and renewal in a few minutes when they are worn out. At one side of the vessel, about half-way up from the bottom, there is a hole made for running in the crude metal, and on the opposite side there is a tap-hole stopped with loam, by means of which the iron is run out at the end of the process. In practice this converting vessel may be made of any convenient size, but I prefer that it should not hold less than one, or more than five tons, of fluid iron at each charge. The vessel should be placed so near to the discharge-hole of the blast-furnace as to allow the iron to flow along a gutter into it; a small blast cylinder will be required capable of compressing air to about eight pounds or ten pounds to the square inch. A communication having been made between it and the tuyeres before named, the converting vessel will be in a condition to commence work; it will, however, on the occasion of its first being used after relining with fire-bricks be necessary to make a fire in the interior with a few baskets of coke, so as to dry the brickwork and heat up the vessel for the first operation, after which the fire is to be all carefully raked out at the tapping-hole which is again to be made good with loam. The vessel will then be in readiness to commence work, and may be so continued without any use of fuel until the brick lining in the course of time becomes worn away and a new lining is required. I have before mentioned that the tuyeres are situated nearly close to the bottom of the vessel; the fluid metal will therefore rise some eighteen inches or two feet above them. It is therefore necessary, in order to prevent the metal from entering the tuyere holes, to turn on the blast before allowing the fluid crude iron to run into the vessel from the blast-furnace. This having been done, and the fluid iron run in, a rapid boiling-up of the metal will be heard going on within the vessel, the metal being tossed violently about and dashed from side to side, shaking the vessel by the force with which it moves. From the throat of the converting vessel flame will then immediately issue, accompanied by a few bright sparks. This state of things will continue for about fifteen or twenty minutes, during which time the oxygen in the atmospheric air combines with the carbon contained in the iron, producing carbonic-acid gas, and at the same time evolving a powerful heat.

Now, as this heat is generated in the interior of, and is diffusive in innumerable fiery bubbles through the whole fluid mass, the metal absorbs the greater part of it and its temperature becomes immensely increased, and by the expiration of the fifteen or twenty minutes before named, that part of the carbon which appears mechanically mixed and diffused through the crude iron has been entirely consumed. The temperature, however, is so high that the chemically-combined carbon now begins to separate from the metal, as is at once indicated by an immense increase in the volume of flame rushing out of the throat of the vessel. The metal in the vessel now rises several inches above its natural level and a light frothy slag makes its appearance, and is thrown out in large foam-like masses. This violent eruption of cinder generally lasts about five or six minutes, when all further appearance of it ceases, a steady and powerful flame replacing the shower of sparks and cinders which always accompanies the boil. The rapid union of carbon and oxygen, which thus takes place, adds still further to the temperature of the metal, while the diminished quantity of carbon present allows a part of the oxygen to combine with the iron, which undergoes combustion and is converted into an oxide. At the excessive temperature that the metal has now acquired, the oxide, as soon as formed, undergoes fusion, and forms a powerful solvent of those earthy bases that are associated with the iron. The violent ebullition which is going on mixes most intimately the scoria and metal, every part of which is thus brought in contact with the fluid oxide, which will thus wash and cleanse the metal most thoroughly from the silica and other earthy bases which are combined with the crude iron, while the sulphur and other volatile matters, which cling so tenaciously to iron at ordinary temperatures, are driven off, the sulphur combining with the oxygen and forming sulphurous acid gas.

The loss in weight of crude iron during its conversion into an ingot of malleable iron was found on a mean of four experiments to be twelve and one-half per cent, to which will have to be added the loss of metal in the finishing rolls. This will make the entire loss probably not less than eighteen per cent, instead of about twenty-eight per cent, which is the loss on the present system. A large portion of this metal is however recoverable by treating with carbonaceous gases the rich oxide thrown out of the furnace during the boil. The slags are found to contain innumerable small grains of metallic iron, which are mechanically held in suspension in the slags, and may be easily recovered. I have before mentioned that after the boil has taken place a steady and powerful flame succeeds, which continues without any change for about ten minutes, when it rapidly falls off. As soon as this diminution of flame is apparent the workman will know that the process is completed, and that the crude iron has been converted into pure malleable iron, which he will form into ingots of any suitable size and shape by simply opening the tap-hole of the converting vessel and allowing the fluid malleable iron to flow into the iron ingot moulds placed there to receive it. The masses of iron thus formed will be perfectly free from any admixture of cinder, oxide or other extraneous matters, and will be far more pure and in a forwarder state of manufacture than a pile formed of ordinary puddle-bars. And thus it will be seen that by a single process, requiring no manipulation or particular skill, and with only one workman, from three to five tons of crude iron passes into the condition of several piles of malleable iron in from thirty to thirty-five minutes, with the expenditure of about one-third part the blast now used in a finery furnace with an equal charge of iron, and with the consumption of no other fuel than is contained in the crude iron.

To those who are best acquainted with the nature of fluid iron it

may be a matter of surprise that a blast of cold air forced into melted crude iron is capable of raising its temperature to such a degree as to retain it in a perfect state of fluidity after it has lost all its carbon and is in the condition of malleable iron, which in the highest heat of our forges only becomes softened into a pasty mass. But such is the excessive temperature that I am enabled to arrive at with a properly-shaped converting vessel and a judicious distribution of the blast that I am enabled not only to retain the fluidity of the metal, but to create so much surplus heat as to remelt the crop-ends, ingot-runners, and other scrap that is made throughout the process, and thus bring them without labor or fuel into ingots of a quality equal to the rest of the charge of new metal. For this purpose a small arched chamber is formed immediately over the throat of the converting vessel, somewhat like the tunnel head of the blast furnace. This chamber has two or more openings on the sides of it, and its floor is made to slope downwards to the throat. As soon as a charge of fluid malleable iron has been drawn off from the connecting vessel the workman will take the scrap intended to be worked into the next charge, and proceed to introduce the several pieces into the small chamber, piling them up around the opening of the throat. When this is done he will run in his charge of crude metal and again commence the process. By the time the boil commences the bar ends or other scrap will have acquired a white heat, and by the time it is over most of them will have been melted and run down into the charge. Any pieces, however, that remain may then be pushed in by the workman, and by the time the process is completed they will all be melted, and ultimately combined with the rest of the charge, so that all scrap-iron, whether cast or malleable, may thus be used up without any loss or expense. As an example of the power that iron has of generating heat in this process, I may mention a circumstance that occurred to me during my experiments. I was trying how small a set of tuyeres could be used, but the size chosen proved to be too small, and after blowing into the metal for one hour and three-quarters I could not get up heat enough with them to bring on the boil. The experiment was therefore discontinued, during which time two-thirds of the metal solidified and the rest was run off. A larger set of tuyere pipes were then put in, and a fresh charge of fluid iron run into the vessel, which had the effect of entirely remelting the former charge, and when the whole was tapped out it exhibised as usual that intense and dazzling brightness peculiar to the electric light.

To persons conversant with the manufacture of iron it will be at once apparent that the ingots of malleable metal which I have described will have no hard or steely parts, such as is found in puddle-iron, requiring a great amount of rolling to blend them with the general mass, nor will such ingots require an excess of rolling to expel cinder from the interior of the mass, since none can exist in the ingot, which is pure and perfectly homogeneous throughout, and hence requires only as much rolling as is necessary for the development of fibre; it therefore follows that, instead of forming a merchant bar or rail by the union of a number of separate pieces welded together, it will be far more simple and less expensive to make several bars or rails from a single ingot; doubtless this would have been done long ago had not the whole process been limited by the size of the ball which the puddler could make.

The facility which the new process affords of making large masses will enable the manufacturer to produce bars that on the old mode of working it was impossible to obtain; while, at the same time, it admits of the use of some powerful machinery whereby a great deal of labor will be saved, and the process be greatly expedited. I merely mention this fact in passing, as it is not my intention at the present moment to enter upon any details of the improvements I have made in this department of the manufacture, because the patents which I have obtained for them are not yet specified. Before, however, dismissing this branch of the subject, I wish to call the attention of the meeting to some of the peculiarities which distinguish cast-steel from all other forms of iron, namely, the perfect homogeneous character of the metal, the entire absence of sand-cracks or flaws, and its greater cohesive force and elasticity as compared with the blister-steel from which it is made, qualities which it derives solely from its fusion and formation into ingots, all of which properties malleable iron acquires in like manner by its fusion and formation into ingots in the new process. Nor must it be forgotten that no amount of rolling will give to blister-steel (although formed of rolled bars) the same homogeneous character that cast-steel acquires by a mere extension of the ingot to some ten or twelve times its original length.

One of the most important facts connected with the new system of manufacturing malleable iron is that all the iron so produced will be of that quality known as charcoal iron, not that any charcoal is used in its manufacture, but because the whole of the processes following the smelting of it are conducted entirely without contact with or the use of any mineral fuel; the iron resulting therefrom will in consequence be perfectly free from those injurious properties which that description of fuel never fails to impart to iron that is brought under its influence. At the same time, this system of manufacturing malleable iron offers extraordinary facility for making large shafts, cranks and other heavy masses; it will be obvious that any weight of metal that can be founded in ordinary cast-iron by the means at present at our disposal may also be founded in molten malleable iron, and be wrought into the forms and shapes required, provided that we increase the size and power of our machinery to the extent necessary to deal with large masses of metal. A few minutes' such reflection will show the great anomaly presented by the scale on which the consecutive processes of iron-making are at present carried on. The little furnaces originally used for smelting ore have from time to time increased in size until they have assumed colossal proportions, and are made to operate on two hundred or three hundred tons of materials at a time, giving out ten tons of fluid metal at a single run. The manufacturer has thus gone on increasing the size of his smelting furnaces, and adapting to their use the blast apparatus of the requisite proportions, and has by this means lessened the cost of production in every way; his large furnaces require a great deal less labor to produce a given weight of iron than would have been required to produce it with a dozen furnaces, and in like manner he diminishes his cost of fuel-blasts and repairs, while he insures a uniformity in the result that could never have been arrived at by the use of a multiplicity of small furnaces. While the manufacturer has shown himself fully alive to these advantages, he has still been under the necessity of leaving the succeeding operations to be carried out on a scale wholly at variance with the principles he has found so advantageous in the smelting department. It is true that hitherto no better method was known than the puddling process, in which from four to five hundredweight of iron is all that can be operated upon at a time, and even this small quantity is divided into homœopathic doses of some seventy or eighty pounds, each of which is moulded and fashioned by human labor, carefully watched and tended in the furnace, and removed therefrom one at a time, to be carefully manipulated and squeezed into form. When we consider the vast extent of manufacture, and the gigantic scale on which the early stages of progress is conducted, it is astonishing that no effort should have been made to raise the after processes somewhat nearer to a level commensurate with the preceding ones, and thus rescue the trade from the trammels which have so long surrounded it.

Before concluding these remarks, I beg to call your attention to an important fact connected with the new process, which affords peculiar facilities for the manufacture of cast-steel.

At the stage of the process immediately following the boil, the whole of the crude iron has passed into the condition of cast-steel of ordinary quality; by the continuation of the process the steel so produced gradually loses its small remaining portion of carbon, and passes successively from hard to soft steel, and from soft steel to steely iron, and eventually to very soft iron; hence, at a certain period of the process any quality of metal may be obtained. There is one in particular, which, by way of distinction I call semi-steel, being in hardness about midway between cast-steel and soft malleable iron. This metal possesses the advantage of much greater tensile strength than soft iron; it is also more elastic, and does not readily take a permanent set, while it is much harder, and is not worn or indented so easy as soft iron; at the same time it is not so brittle or hard to work as ordinary cast-steel. These qualities render it eminently well adapted to purposes where lightness and strength are specially required, or where there is much wear, as in the case of railway-bars, which, from their softness and lamellar texture soon become destroyed. The cost of the semi-steel will be a fraction less than iron, because the loss of metal that takes place by oxidation in the converting-vessel is about two and one-half per cent less than it is with iron; but, as it is a little more difficult to roll, its cost per ton may fairly be considered to be the same as iron; but, as the tensile strength is some thirty or forty per cent greater than bar-iron, it follows that for most purposes a much less weight of metal may be used, so that taken in that way the semi-steel will form a much cheaper metal than any we are at present acquainted with.

In conclusion, allow me to observe that the facts which I have had the honor of bringing before the meetings have not been elicited from mere laboratory experiments, but have been the result of working on a scale nearly twice as great as is pursued in our largest ironworks, the experimental apparatus doing seven hundredweight in thirty minutes, while the ordinary puddling-furnace makes only four and one-half hundredweight in two hours, which is made into six separate balls, while the ingots or blooms are smooth even prisms, ten inches square by thirty inches in length, weighing about equal to ordinary puddle balls. — *The Architect.*

NOTE: — The lateness of the hour when fire attacked our office and destroyed more or less of the edition of plates allows only of time to insert the statement that the illustrations named below will be found not in this but in later issues of the *American Architect*.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF MR. BARTON MEYERS, NORFOLK, VA.

[Grano-chrome, issued with the Imperial and International Editions only.]

See article on "Old Colonial Architecture" elsewhere in this issue.

HOUSE OF MR. BARTON MEYERS, NORFOLK, VA. — THE FRONT DOOR.

[Grano-chrome, issued with the Imperial and International Editions only.]

HOUSE OF MR. BARTON MEYERS, NORFOLK, VA. — THE PARLOR MANTELPIECE.

HOUSE OF MR. BARTON MEYERS, NORFOLK, VA. — THE HALL.

THE HOUSE OF MR. OLIVER W. MARBLE, ARCHITECT, CHICAGO, ILL.

THIS house, No. 4221 Drexel Boulevard, is built of Indiana-stone and cost about $20,000 including hardwood finish, electric-lighting, plumbing, heating, etc.

HOUSE FOR AUGUSTUS THOMAS, ESQ., HUGUENOT PARK, N. Y. MR. G. K. THOMPSON, ARCHITECT, NEW YORK, N. Y.

PASSENGER STATION, LINDEN RAILWAY & MO. PACIFIC R. R., ST. LOUIS, MO. MR. T. C. LINK, ARCHITECT, ST. LOUIS, MO.

SKETCH FOR FOUR HOUSES. MESSRS. J. R. & W. P. RICHARDS, ARCHITECTS, BOSTON, MASS.

MORTUARY CHAPEL, FOREST HOME CEMETERY, MILWAUKEE, WIS. MESSRS. FERRY & CLAS, ARCHITECTS, MILWAUKEE, WIS.

THE building is of brown sandstone from Lake Superior. The building stands on a slope making the basement at the rear level with the surface of the ground. The chapel proper is thirty-one feet by fifty-two feet with the chancel ten feet by seventeen feet. At each side of the chapel is a conservatory twenty-one feet wide and the same length as the chapel and separated from it by leaded-glass screens in the arched openings between the two. The lower sash is seven feet high in these screens and can be raised, thus throwing the chapel and conservatories together. The entire interior of the building is finished in a pinkish-buff pressed-brick up to the roof-line, cornices and mouldings all being in brick, trusses and ceilings and wainscoting of the chancel are in quartered white oak. All glass with the exception of the chancel window is clear glass, leaded, chancel glass in color. The bier stands on a platform, which rises flush with the chapel floor and descends to a receiving room below, and a piston elevator is used avoiding the appearance of any machinery in connection with same. Adjoining the receiving-room is a vault-room finished in enamelled-brick, the vaults being made of slate. The building is heated by steam, and two sets of boilers are provided to avoid any danger of freezing the plants in case one boiler should break down.

[Additional Illustrations in the International Edition.]

RUINS OF VIEUX SAINT-VINCENT, MACON, FRANCE.

[Photogravure.]

LIBRAIRE LEVASSEUR AND CIE, PARIS, FRANCE. THE FACADE ON THE COURT.

[Etching.]

THIS fragment of a publisher's establishment is built upon the site of a Dominican convent in the Rue Jean de Beauvais, and this has suggested to the architect to give his building a monastic air which is in ill-keeping with its mercantile occupation.

THE PALAIS DES BEAUX-ARTS, BRUSSELS, BELGIUM. M. BALAT, ARCHITECT.

[Gelatine Print.]

A DETAIL of this building was published in the *American Architect* for August 23, 1890.

THE MAHARAJAH'S PALACE, BANGALORE.

IN 1874 a bungalow was purchased by the Government of Mysore, and by means of numerous alterations and additions, which cost upwards of 100,000Rs., and occupied three years in execution, was adapted as a residence for His Highness, the Maharajah.

Soon after the occupation of the building the want of a Durbar Hall was much felt, and the reception wing to the south of the palace was commenced in 1880–1881 and completed in 1882–1883, at a cost of 120,000Rs. — the rate per square foot of area covered being 10.5Rs.

In 1887–1888 the Zenana wing, situated in the north, and a new wing on the western side were commenced, and completed in 1889–1890 at a cost of 203,000Rs.

The palace is constructed throughout of coursed rubble in mortar. The exterior mouldings are of finely-dressed ashlar, and the interior ones of shell-lime and powdered quartz, commonly known as "Madras plaster." The roofing of all rooms is of pucca terrace; flooring of lower floor principally of encaustic tiles and marble, and that of upper floor 1½" teak planking. Scantlings, doors, windows and, in fact, all woodwork, with the exception of staircases, is of teak.

The total cost of the palace, inclusive of a handsome conservatory recently constructed, is 439,600Rs.

This plate is copied from *Indian Engineering.*

CENTENARY HALL, BATTERSEA RISE, S. W.

THIS is an illustration of a portion of the important additions to the Royal Masonic Institution for Girls, recently opened by H. R. H. the Prince of Wales, who was accompanied by the Princess and her daughters, as a commemoration of the centenary of its foundation and to the memory of Chevalier Ruspini, its founder, in 1788.

It is a red brick building, with Bath-stone dressings, having deep buttressess on each side, which are utilized by enclosing nearly the whole depth of buttress, with a wall to the height of twenty feet from the floor, thus forming deeply-recessed bays, with a fireproof floor inserted about ten feet high, and projecting over each bay into the hall. This is approached by a turret-stair at each angle, the buttresses being pierced at this level to form an ambulatory as well as galleries in the triforium, connecting the main gallery with the Minstrels' gallery, and encircling the building.

The dimensions are 104′ 6″ long by 40′ 6″ wide between the main walls, arcaded in seven bays, and 50′ high from floor to the centre of the elliptical ceiling, supported by deep coves on each side, formed with modelled fibrous plaster, carried by a light iron-framed and truss roof, designed by Mr. H. G. Huxley, C. E.

The walls are lined to the height of twelve feet six inches, with a teak dado and balustrading to gallery-fronts, executed by Mr. T. Gibbons, of Dunmow. The windows are all filled with stained-glass, containing in cartouches the shields of the various subscribing lodges, with the exception of the large west window, which, being the gift of the Grand Lodge of England, contains the portraits and shields of the grand officers, with panels representative of the Virtues, etc. This work has been executed by Mr. Ed. Frampton, of Buckingham Palace-road. The heating and ventilating work has been executed by Messrs. Haden, of Trowbridge; and the general contract was carried out by Mr. B. E. Nightingale, of Albert-embankment, Mr. Wm. Tookey acting as clerk-of-works, the erection of the hall being under the superintendence of Mr. Fred. G. Knight, architect.

The whole of the works were under the immediate superintendence of Messrs. Henry Arthur Hunt and Ralph Clutton, the honorary architects of the institution.

The drawing, by Mr. F. G. Knight, was hung in the Royal Academy Exhibition, and is here reproduced from the *Builder.*

KONIGLICHE BILDHAUERSCHULE, BUDA-PESTH, HUNGARY.

THIS illustration is copied from *Architektonische Rundschau.*

BRONZE FOUNTAIN GROUP, CARLSRUHE.

THIS illustration is copied from *Zeitschrift für Bildende Kunst.*

SOME OF SIR CHRISTOPHER WREN'S TOWERS, LONDON, ENG.

THIS illustration is copied from *Specialties.*

THE NEW STADTTHEATER, ZURICH, SWITZERLAND.

THIS illustration is copied from *Schweizerische Bauzeitung.*

HOTEL IN THE AVENUE BOIS DE BOULOGNE, PARIS, FRANCE.

THIS illustration is copied from *La Construction Moderne.*

"EAGLE HOUSE," WIMBLEDON. THE HOUSE OF MR. T. G. JACKSON, ARCHITECT.

EAGLE HOUSE, WIMBLEDON, ENG. VIEW FROM THE KITCHEN-GARDEN.

PLANS OF THE SAME.

THE DINING-ROOM, EAGLE HOUSE, WIMBLEDON, ENG.

THE LIBRARY, EAGLE HOUSE, WIMBLEDON, ENG.

EAGLE HOUSE, WIMBLEDON, ENG. "PITTS ROOM."

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE RIGHT TO EXCAVATED MATERIAL.

NEW YORK, Nov. 14, 1891.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — May I ask your opinion on the settlement of a dispute which has arisen between the owner of a $7,000 frame country house I have in hand, and the mason-contractor. The specifications call for foundation-walls to be of local stone, eighteen inches thick, and under head of "Excavation" read as follows: "Soil from excavations to be placed on the site within seventy-five feet from house as directed. If any rock is found in excavating, state in estimate a

price per cubic yard for removing same." The mason agreed to do this for $2.00 per yard. In excavating more than half was found to be of rock and this was blasted out (for doing which mason was paid as above), and a portion of it used by him in building up the walls. After walls were up, mason removed several loads of the stone still remaining. The owner claims that he had no right to do this and that the same should have been deposited on the site where directed — mason on the other hand claims that he is entitled to the rock as his price $2.00 per yard, was for *removing* same. Your opinion will greatly oblige Yours truly,

SUBSCRIBER.

[Our opinion is decidedly that under an agreement for "removing" the rock, as distinguished from the "earth," which was to be deposited on the lot, the mason is entitled to carry it away. — Eds. American Architect.]

SUGGESTIONS ASKED.

KNOXVILLE, TENN., November 17, 1891.

To the Editors of the American Architect:—

Dear Sirs, — I have a very large and interesting collection of gelatine plates published by you in the last few years. I keep them at present in boxes and portfolios and cannot get at them handily for studies. Would it be too much to ask, through your journal, different architects to give their ideas of the best method of arranging these for handling and for studies. I do not like to paste them in books, and would like to know of some way of arranging them in book-form, and in a way that they could be handled without injury and be easily manipulated. Anything you can do for me in this line will be greatly appreciated. Long life to the International edition. Very respectfully yours, GEORGE F. BARBER.

NOTES AND CLIPPINGS

Trade-Union Tyranny. — A building of some importance in North London was begun last autumn, and was being rapidly completed when the ever-famous blizzard came and prevented all operations. Through no fault of master or man the entire body of workmen was forced into idleness. It will be remembered that after the blizzard passed away there came a brief spell of extremely fine weather. The men engaged in this particular task came back eager for work, bored with leisure. Some of them had been reduced almost to the point of destitution. When they resumed their labor they took counsel together, and went unanimously to the foreman asking him, as they had rested so long, as their means were so near exhaustion, and as the building itself was behindhand, to permit them to work overtime. So far as he was concerned this meant extra hours without pay; but he felt for the men, and gave them a permission which they hailed with delight. A few days afterwards there came along a new hand seeking a job, possibly, and even probably, an emissary of the union. He went speedily to the foreman and pointed out that the rules of the union were being broken by overtime. He was told that there was no compulsion on any man to work beyond the regular hours, and that he, himself, might throw down his tools at the end of his ordinary day's labor. "That won't do for me, mate," was the reply. "Unless you stop the overtime, I shall report the case to the union." "This is a free country," replied the foreman; "I am not going to stop men from working who have big losses to make up." The case was reported to the union. The union forbade the overtime. The unionists perforce submitted. But the non-unionists went on working. Again the man went to the supervisor. "These blacklegs must stop or I shall call a strike." "You may call what you like," replied the foreman; "I shall neither order the men to cease from working nor dismiss them for trying to pay the debts they have incurred during a period of enforced idleness." There was another report to the union, another warning sent to the foreman, which he disregarded, and then the strike was ordered. It was not settled when the larger strike occurred in which now it is merged — *Liverpool Mercury.*

To Explore Honduras Ruins. — By a decree issued in July last, the Government of Honduras placed all the ancient ruins within the borders of the republic in the care of the Peabody Museum of American Archæology and Ethnology, of Harvard University, for a period of ten years; giving to the museum not only the charge of the antiquities of the country, but also the exclusive right of exploration and the permission to take away one-half of all the objects found during the excavations. The museum, on its part, is to carry on explorations each year during the term covered by the decree. Professor Putnam, the director of the Honduras expedition, being unable to leave, is to be represented in the field this year (1891-1892) by two of his students — M. H. Saville, a private student and an assistant in the museum, and J. C. Owens, a student in the graduate school of Harvard, taking the course of archæology and ethnology under Professor Putnam. The expedition is thoroughly equipped, and the intention is to carry on for ten years a thorough archæological investigation at this place. The material collected this year is to be exhibited in Professor Putnam's department of the World's Columbian Exposition. — *Exchange.*

Experiments in Spontaneous Ignition. — Some interesting experiments were recently made in Boston by Edward Atkinson, to determine some questions relating to the spontaneous ignition of wood-pulp. According to an exchange the experiments were made in an Alladin oven with a thermometer to indicate the temperature. Two slabs of wood-pulp were tied in the oven, one in contact with a loose iron shelf, the other without any contact. The first ignited at 370, the last at 430 degrees. In two previous tests the oven was opened when the thermometer reached 425 degrees, but the pulp did not take fire until the introduction of air, when it ignited instantly. In speaking of the matter Mr. Atkinson says: "We have been able heretofore to imitate spontaneous combustion by putting animal or mineral oil on fibrous substances; we have tried experiments by mixing mineral or paraffine oil with animal oil to determine the exact point or proportion at which the paraffine or mineral oil will prevent oxygenation of animal or vegetable oil, but there has been no apparent means of making this oxygenation visible until the present test. This test may explain the causes of many fires. Heretofore there has been no knowledge of the ignition by rapid oxygenation of a highly-heated substance, mainly carbon or almost pure cellulose, without any admixture of grease or chemical. It would appear that finely-divided and moderately-heated carbonaceous material, holding air in its pores, may ignite at a relatively lower temperature than ordinary wood. It would seem well, therefore, to avoid the use of sawdust for sweeping floors, and its storage near hot kitchens. Ice-houses are known to be bad risks. A little gudgeon-grease in the sawdust and some fresh air may explain the reason."

House-numbering in Alaska. — "This system of numbering your streets by commencing every block with a new hundred," declared a guest at the Girard House to a Philadelphia friend last evening, "is an admirable plan, but the Indians of Alaska have the most novel method of house-numbering on the entire continent. When I was in Sitka this summer, I was inexpressibly amused during my stroll along the water-front. It is along that that these Indians have built their houses. Being half-civilized they are imbued with a laudable desire to emulate their white cousins, but being only thus half-civilized their application of their half-way notion of numbering their houses is a most laughable affair. They have evidently appreciated the fact that the house-numbers should grow larger as they progress, but the regular increase of numerals seems to have been baffling to their untutored minds. The first house we noticed started in an indefinite way with the number 500, the second was 600, the third 750, the fourth 1,000, the fifth 1,075, and so on. The jumps were most erratic, an undeniable merit, however, being that they certainly increased steadily. At the end of the brief row of houses we had reached some number away up in 3,000 The houses of every Indian town throughout Alaska are numbered in the same unique manner." — *Philadelphia Record.*

TRADE SURVEYS

There has not been a time, perhaps, for two or three years when those who live by lending and investing money were more undecided as to just what was the proper and best thing to do at this time. Two rather antagonistic facts are presented; namely, an abundance of money in savings banks and other banks available for investment, and a remarkable stringency in collections in nearly all avenues of business throughout the country. These facts afford arguments for those who assert that enterprise has reached a point where it should stop and rest, and to those who argue that the existing dulness in the commercial world is due to a scarcity of money. Having such a short view of things as we do, it is difficult to draw conclusions from facts. Whether it is proper to invest heavily and quickly is a question which some of the best business men of the East are not clear on. There is not material upon which to form a sensible opinion. The fact is, conditions are changing more rapidly than people can keep track of, and conclusions which are correct one month are, perhaps, not correct the next. There is a vast amount of money available for investment, either in railroad building, in land-buying, in building operations, in mining or manufacturing operations, in ship-building, in providing material for equipments of all kinds, and in a multitude of other directions. Yet it is to be noted, especially during the past two or three months, that new enterprises are mostly entered into on a small scale and with great care. Two or three years ago trade combinations were multiplying, but within a year a check has been given to that tendency, for some reason. We were assured there would be vast railway combinations, and a dangerous combination of manufacturing interests, trusts and one thing and another, but the public has not been treated to this sweeping commercial revolution. The fact is susceptible of easy explanation. Competitive agencies prevented; then, again, natural desire for individual control over investment asserted itself. Within the past year, there have been more little businesses and enterprises started with a capital of five to ten thousand dollars than there have been in any one year in our history. That tendency is growing rapidly, and the feature of the next year or two will, perhaps, be a multiplication of little concerns. Big corporations are not seeking to combine with others, but are contenting themselves with the establishment of more friendly relations. Whether there will be an extraordinary investment of money next year it would be useless to predict. The only facts we have to stand upon are a large amount of money for that purpose and a keen, sleepless vigilance on the part of the money-makers. People are simply waiting for developments. One danger to be apprehended is a rush, which would give capacity an undue strain for awhile. Manufacturers see this possibility. The agricultural interests are preparing to enlarge their efforts, and will do so, to the advantage of all connected and dependent interests, provided, of course, a sufficient market will absorb the increased volume. The general business of the country is on a more solid foundation than for many years. There are those in banking circles who are inclined to controvert a statement of this character, and there are some reasons for so doing, but they are not deep. The country is paying off its debts faster than ever, and assuming new obligations more slowly. This fundamental fact is our protection. The railroads are doing a heavy business, but manufacturers are not. Investors find it necessary to go slowly, without quite understanding the reason. Consumers in all channels buy carefully, and refuse to cover future wants without being able to assign very clear reasons. All these things are working for good. Speculative feeling is at a low ebb; very few railroad securities are now selling above their market value. Buyers have better means of judging of market values than they ever had.

S. J. Parkhill & Co., Printers, Boston.

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