

LIBRARY OF CONGRESS
COPYRIGHT
MAR 10 1890
WASHINGTON

790 v 2

PRICE 13 CENTS.

MARCH 8, 1890.

THE
AMERICAN ARCHITECT
AND BUILDING NEWS

VOL. XXVII.

* REGULAR EDITION *

NO. 741.

ARCHITECTURE

ENGINEERING

DECORATION

TICKNOR & COMPANY

CONSTRUCTION

BOSTON MASS.

CONTENTS.

EDITORIAL SUMMARY.
FUNERARY ARCHITECTURE.—IV.
HISTORY OF HABITATION.—I.
THE BUREAU OF ETHNOLOGY'S FIFTH ANNUAL REPORT.—I.
NOTES BY OUR TRAVELLING-SCHOLAR.—I.
THE DISTRIBUTION OF HYDRAULIC POWER IN LONDON.
THE SEWAGE OF RIO DE JANEIRO.
STEAM-PIPE COVERINGS.
THE SCHNEIDER FIREPROOF FLOOR.
BUILDING LAW.
COMMUNICATIONS.
NOTES AND CLIPPINGS.
TRADE SURVEYS.

MAIN UNIVERSITY BUILDING, STRASBOURG, ALSACE.
BLOCK OF HOUSES AT KEARNEY, NEB.
HOUSE AT MINNETONKA BEACH, MINN.

Additional Illustrations in the International Edition.

FACADE OF THE OLD ECOLE DE MEDICINE, PARIS, FRANCE.
[Gelatine Print.]
PORTICO ON THE COURT-YARD OF SAME.
[Gelatine Print.]
HOUSE IN THE RAUCHSTRASSE, BERLIN, GERMANY.
[Gelatine Print.]
GRAND HOTEL, VIENNA, AUSTRIA.
[Gelatine Print.]
"WINTER": FROM THE PAINTING BY N. LANCRET.
HOUSE, FERNDAL, TUNBRIDGE WELLS, ENG.
HALL PLACE, TONBRIDGE, ENG.—ENTRANCE FRONT.
GARDEN FRONT OF SAME.
THE TERRACE OF SAME.

ILLUSTRATIONS.

OSBORN HALL FOR YALE COLLEGE, NEW HAVEN, CONN.
[Gelatine Print, Issued only with the Imperial and International Editions.]
SUCCESSFUL DESIGN FOR THE AMERICAN ARCHITECT TRAV-
ELLING-SCHOLARSHIP, 1889-90.

THE SANITAS
"RIGHT-HAND" TRAP.



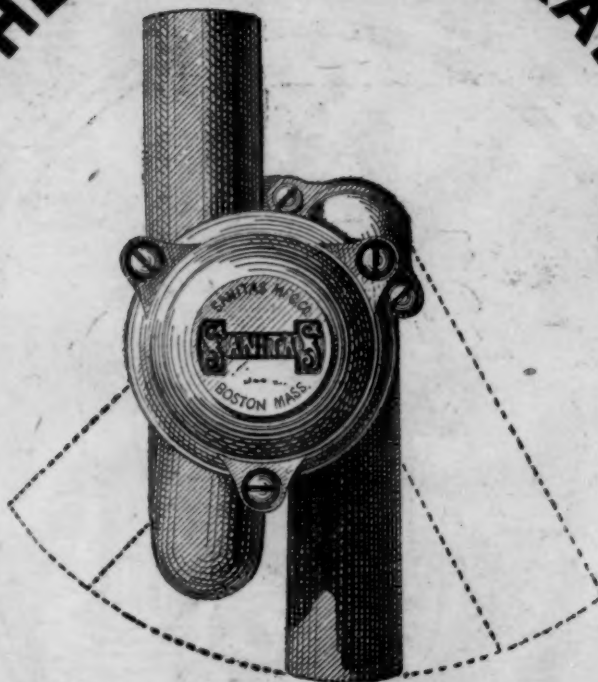
THE SANITAS
"LEFT-HAND" TRAP.



THE SANITAS TRAP.



The Sanitas
Full S Brass Trap.



Sanitas Trap - Cup, Partition,
and Washer.



RUNNING TRAP.

THE SANITAS ADJUSTABLE TRAP.

The Sanitas Trap is made in various forms to suit varying positions of the fixture, outlet and waste-pipes. The Sanitas "Right" and "Left-Hand" Traps are the forms which will be found most convenient when the waste-pipe must be carried laterally to the right or left respectively. The Sanitas adjustable or universal Trap is designed for use where the position of the waste-pipe is not known beforehand, the outlet arm being constructed with a novel swivel joint made tight in the same manner as the clean-out cap on the body, with an ordinary screw-driver, or it can be soldered. The Sanitas Traps are not only the easiest to set, but are the only perfectly reliable anti-siphon self-cleaning, traps known.



HALF S TRAP.

This Trap, whether vented or unvented, is a perfectly safe barrier against Sewer-Gas.

THE "SANITAS" MANUFACTURING CO., 207 TREMONT ST., BOSTON, MASS.

Branch Offices: 54 Gold St., New York, N. Y. 239 Lake St., Chicago, Ill. 511 Walnut St., St. Louis, Mo.

Sole Agent for Canada: O. Higman, 236 Sparks St., Ottawa, Canada.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXVII.

Copyright, 1890, by TICKNOR & COMPANY, Boston, Mass.

No. 741.

Entered at the Post-Office at Boston as second-class matter.

MARCH 8, 1890.



SUMMARY:—

Death of Mr. Jules André, Architect.—The Grant Monument Competition.—An Artificial-ice Skating-rink in Paris.—Insurance on Property not Affected by Absence of the Fire Apparatus from Town.—Architects and Chimney-flues.—Painting on Cemented Surfaces.—A Cheap Paint for Underground Work.—Sir Frederick Leighton on a Device of Spanish Architecture.—Architectural Exhibition at the Philadelphia Art Club.	145
FUNERARY ARCHITECTURE.—IV.	147
HISTORY OF HABITATION.—I.	149
THE BUREAU OF ETHNOLOGY'S FIFTH ANNUAL REPORT.—I.	151
NOTES BY OUR TRAVELLING-SCHOLAR.	153
THE DISTRIBUTION OF HYDRAULIC POWER IN LONDON.	155
THE SEWAGE OF RIO DE JANEIRO.	156
STEAM-PIPE COVERINGS.	156
ILLUSTRATIONS:—	
Osborn Hall for Yale College, New Haven, Conn.—Successful Design for the American Architect Travelling-scholarship, 1889-90.—The Main University Building, Strasbourg, Alsace.—Block of Houses, Kearney, Neb.—House at Minnetonka Beach, Minn.—Façade of the Old Ecole de Medicine, Paris, France.—Portico on the Court-yard of the Ecole de Medicine, Paris, France.—House in the Rauchstrasse, Berlin, Germany.—The Grand Hotel, Vienna, Austria.—"Winter": from the Painting by Nicholas Lancet.—House, Ferndale, Tunbridge Wells, Eng.—Hall Place, Tonbridge, Eng.—Entrance Front.—Garden Front.—Terrace.	157
THE SCHNEIDER FIREPROOF FLOOR.	158
BUILDING LAW.	158
COMMUNICATIONS:—	
Duties of a Clerk-of-the-Works.—The Understanding between Architect and Client.—The Open Fireplace Throat.	159
NOTES AND CLIPPINGS.	159
TRADE SURVEYS.	160

IT is with very great regret that we learn of the death of M. Jules André, one of the most distinguished of the great architects who have made the teaching at the Ecole des Beaux-Arts in Paris famous throughout the world. M. André, who, although more than seventy years old, was in active charge of his atelier until the time of his death, had devoted nearly all his life to teaching, and his executed works are few, although they show that originality and fire which he was so successful in communicating to his pupils. It is interesting to remember that the great American master, Mr. H. H. Richardson, was for seven years a favorite pupil of André's, who showed him great personal kindness, and, although Richardson came from the School of Fine Arts a Classical designer, his most original Romanesque work, after he had chosen a more congenial style, often recalls most curiously the elements of strength, simplicity and breadth of light and shade, on which André insisted, and which appear in his own designs, and in those of his other pupils, under Classical clothing. André was idolized by his pupils, and was, in return, warmly attached to them, and his kindness and enthusiasm won for him friends and honors all through his life. He had the rank of Commander of the Legion of Honor, almost the highest that Republican France can bestow, and was also a Member of the Institute and Inspector-General of Civil Buildings.

THE annual meeting of the Grant Monument Association was held in New York recently, and the most interesting business transacted was the examination of the competitive designs and the reading of the report upon them prepared by the expert jury. Every architect will remember the unsatisfactory character of the circular of invitation, and it is refreshing to find that the jury, which consists of Messrs. N. Le Brun, George B. Post and James E. Ware, and Professors William R. Ware of Columbia and Solomon Woolf of the College of the City of New York, say, without circumlocution, that the results of their examination show that the terms of competition "did not offer sufficient inducements to lead men of established reputation and experience to undertake the labor and expense of preparing drawings," and that, in consequence, "only a very few of the schemes submitted are worthy of serious consideration." As it was necessary to award the prizes, five designs were selected out of the sixty-five submitted, and the

names attached to them will show plainly enough that, as the experts say, the terms of competition did not warrant any great outlay of time or study on the designs, so that even the best of them "consist either in a general plan which is good, coupled with details which are commonplace, if not actually bad; or radically bad general schemes, with well studied and rendered details." The first place among the five is awarded to one of the two designs submitted by Cluss & Schulze, of Washington, who receive the very inadequate premium of fifteen hundred dollars; the second place, with one thousand dollars, is assigned to Mr. J. Philip Rinn, of Boston, the designer of the Bennington monument; the third, with five hundred dollars, to Haran & Werkelmann, of Leipsic, Germany; the fourth, with three hundred dollars, to Mr. J. A. Schweinfurth, of Boston; and the fifth, with two hundred dollars, to Mr. Herbert A. Gribble, of London, the well-known architectural draughtsman and designer of a few years ago, and now the architect of the beautiful Church of the Oratory at South Kensington. The report of the experts was very favorably received, both by the Executive Committee and the Association, which declared the first competition closed, but voted that the payment of the premiums should not commit it to the adoption of any of the designs. It is said to be probable that a second competition, better arranged, will be invited later. Meanwhile, the monument fund has grown to nearly one hundred and forty-two thousand dollars, and an effort is to be made to obtain further contributions on the occasion of General Grant's birthday, which occurs on the twenty-seventh of April.

THE *Gran Plaza de Toros*, in Paris, where innocent bull-fights were exhibited with great success through the summer and autumn, has now been transformed into a "real ice" skating-rink, after a fashion which seems to be new in France, although it is tolerably familiar here and in England. As arranged for bull-fights, the circular arena, containing nearly thirty thousand square feet of surface, was open to the sky, but, as this would obviously be unsuitable for winter, a roof has been put over it, framed with straight wooden lattice girders, meeting in the centre, and joined and stiffened laterally by purlins, and covered with a thick cloth, in colored patterns, treated with oil in some way, to make it waterproof. To prepare the floor for skating, a thick layer of concrete has been put over it and perfectly levelled, and on this is laid a network, containing ten miles of iron pipes, through which is pumped, according to *La Semaine des Constructeurs*, liquid ammonia, the vaporization of which in the pipes produces cold intense enough to freeze the water which is allowed to stand over them to a depth of about seven inches. It seems not impossible that the liquid flowing in the tubes is really glycerine, or perhaps alcohol, previously chilled by ammonia, instead of the liquid ammonia itself, the vaporization of which might be difficult to control; but, however that may be, the system of circulation is worth remembering. As all the pumps for maintaining the circulation are at one point, on the side of the arena, all the pipes must start from that point. There are fourteen distinct coils, or "circulations," as our steam-fitters would call them, and each coil makes fourteen circuits before it returns to the pumps. As the diameter of the arena is about one hundred and sixty-five feet, this brings the rows of cooling pipes only about five inches apart from centre to centre, and the water is very quickly and uniformly frozen. The room is brilliantly lighted by electricity, furnished by the surplus energy of the engines which drive the pumps, and it is said that the portion devoted to the spectators is intended to be warmed by means of ten thousand cans of hot water distributed among the seats, while twenty charcoal braziers around the ring will enable the skaters to warm their hands. M. Chevallier, of Nice, writing to *La Semaine* about the matter, says that in 1876 he went to England, where he examined a similar ice-rink at Chelsea, the water in which was frozen by means of glycerine and sulphurous acid traversing copper tubes. This rink was a private one, being maintained and used only by two very aristocratic associations, the Ice Club, consisting of twenty-seven members, all gentlemen, and the Glaciarium Club, with forty-seven members, about half of whom were ladies. The club assessment in each case was fifty dollars a year, and this entitled the member to two hours' skating a day in the rink. Several persons belonged to both clubs, and had

four hours' skating a day in consequence. Each member enjoyed the right of bringing two spectators with him, who were, however, obliged to pay sixty cents apiece for their seats. The rink was a very small one, but the effect of size was cleverly obtained by means of mirrors, extending to the surface of the ice, and scenery, painted to represent a snowy landscape. Another rink was at the same time advertised in London, intended to be open to the public, but it proved a total failure, the water in it refusing to freeze. Three or four successful ones were, however, established in other towns in England. About the same time, a similar rink was, as many of our readers will remember, set up in New York, in Gilmore's Garden, if we are not mistaken, which proved very popular, although our recollection is that the ice was not all that it might have been.

WE are glad to have a very kind answer in the *Spectator* to the inquiry which we suggested some time ago, whether it was, or was not, true that insurance companies would refuse to pay losses by fires occurring in small towns, while the town fire-department was absent, assisting the department of some neighboring community. The *Spectator* says that this question comes up regularly every three or four years, and it has been informed, since we asked it the last time, by the presidents of several prominent New York fire-insurance companies, that the matter is so well settled that they did not care to be mentioned by name in the reply. Their unanimous opinion was that in such an event the liability of the companies "could not, and would not, be disputed," and that "the policies would be paid without question." As to whether the absence of the usual extinguishing apparatus constituted a change in the circumstances affecting the risk, within the meaning of the usual clause in the policy, the presidents said that the policy clause referred only to changes "in the construction, equipment and occupation of the building insured, or in the environment." The individual insured "has no personal control over the public fire-apparatus," and "there is no contract between the company and the town," the underwriters simply making the best estimate of municipal arrangements that they can, before fixing the premium rate. This is quite reassuring, and we are sure that architects, to whom fire-insurance affairs are matters of serious importance, will be pleased to have the question so satisfactorily settled.

FIRE AND WATER has a singular idea of architects.

Speaking of the fire in the palace of Laeken, near Brussels, it says that "the architects who, under the direction of Queen Maria Theresa, planned the building, had put several whole oak-trees bodily into the walls of the chimneys, a performance about on a par with the habits of some of our architects, who let the ends of floor-beams extend into the flues." Now, in regard to the antics of "architects" who build oak-trees into the walls of chimneys, and do their planning "under the direction" of Queens, we have nothing to say, such performances being altogether beyond our comprehension; but the "habits" of American architects are tolerably well-known to us, and we say with confidence that there never was one, and probably never will be one, who "let the ends of floor-beams project into the chimney flues," or who did not provide that the contractor should agree not to do so, or who did not, if he saw the contractor's agents violating the agreement, call their attention to the requirements of the contract. The men who build floor-beams into chimneys are journeymen carpenters and masons, not architects. As a rule, they do such things out of pure incapacity for thinking what they are about, or for reflecting on the consequences of their stupidity. Occasionally, they do them under the compulsion, and with the assent of a dishonest contractor, who hurries them along, without allowing them time to think, or thinking or caring himself, whether the work is properly conducted; but no architect in America ever yet planned to put woodwork into flues, or gave permission to the contractor to do so.

THE *Wiener Bauindustrie-Zeitung* gives some useful information about painting on surfaces plastered with cement.

As every one knows, oil-paint on a cemented surface is likely to be thrown off by the formation of crystals beneath it; while, if it stays in place, it usually presents a mottled appearance, owing to the unequal absorption of the oil from the paint by the cement. The common way of remedying both

these difficulties has been to wash the cement surface with acid before painting it. This dissolves any crystals that may have formed, and acts upon those spots in the cement which have become slightly carbonated by the action of the atmosphere, so as to restore the absorbent quality, which the formation of a superficial carbonate tends to diminish. Where acid is used, it should be sulphuric acid, made very dilute. Muriatic or acetic acid, which are often employed, leave the cemented surface impregnated with chloride of calcium, or acetate of lime, both of which are very deliquescent, and, by keeping the surface damp, prevent proper adhesion of the paint. A better application, even than sulphuric acid, is, however, to be found in carbonate of ammonia. The crystals of the ammonia carbonate should be exposed to the air, until they effloresce partially into a white powder, which is a bicarbonate, and more suitable for the purpose than the original carbonate. One hundred grammes of the ammonia salt—about a quarter of a pound—should be dissolved in nine quarts of cold water, and the cement surface washed with the solution. As soon as it is dry, the paint may be applied, and will adhere well, and resist the action of the atmosphere. The carbonate of ammonia is best applied when the cement surface is about three weeks old. For preparing surfaces, perhaps older than this, or more exposed to the weather, silicate of soda is sometimes useful. This should be prepared by dissolving the syrupy silicate of soda of commerce in four times its bulk of water. Three coats should be applied, and, after the last, the wall must be thoroughly washed, so as to remove every trace of silicate from the surface, or it will effloresce, and throw off the paint.

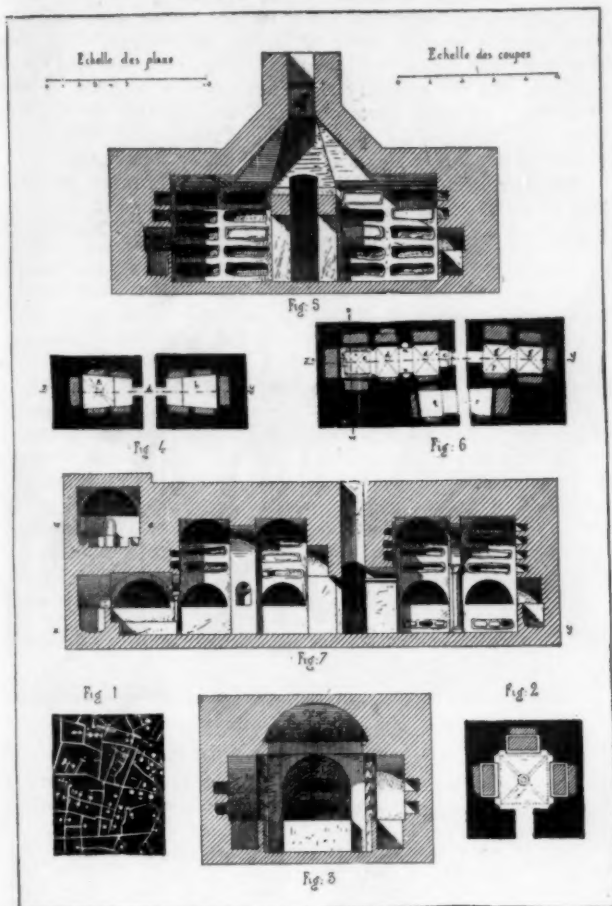
THE same excellent journal gives a recipe for a cheap paint, which will for a long time prevent wood to which it is applied from rotting, even in the ground. The paint is made by putting fifty parts of rosin, forty parts of ground chalk or soapstone, three hundred parts of sand and four parts of linseed oil into an iron pot, and adding, after the mixture is hot, two parts of sulphate of copper. The whole is to be well stirred, thinned with linseed oil if necessary, and applied hot with a brush. The wood to which it is applied is better unplaned, as the rough surface of sawed lumber holds the paint more tenaciously. The appearance of the paint is not unpleasant, and it is extremely durable, while, applied to fence-posts and other woodwork buried in the ground, it prevents rotting for a long time.

SIR FREDERICK LEIGHTON, in an address delivered to the students of the Royal Academy upon Spanish architecture and sculpture, made a suggestion which would occur to a painter more quickly than it would to an architect, but which is well worth remembering by the latter. Speaking of the churches of Catalonia, which are remarkable, even in Spain, for the smallness of their windows, and the darkness of their interiors, he expresses the opinion that this darkness was intended by the architect, and that it was by no means a mere shading of the interior for the sake of coolness, but a highly-studied device for obtaining picturesque effects of lighting in the interior. In the Cathedral of Barcelona, particularly, which he mentions as one of the most solemn and impressive in effect in Spain, an octagonal lantern is placed over the western bay of the nave, so that the visitor, on entering, finds himself in a flood of light, beyond which stretches the long, sombre nave, terminating in part at the choir, which, as in all Spanish churches, is raised very high above the nave floor, thus making the service at the altar, even in the darkness, extremely conspicuous, while the still deeper gloom of the eastern portion of the sanctuary completes the effect. We should pity an architect who, in his artistic zeal, should design an American or English church in such chiaroscuro that the people could not read their prayer-books equally well in any part of it, but even under this condition, there would be opportunity for many beautiful effects of contrasted light and shadow which have never yet been dreamed of.

THE Art Club of Philadelphia is to hold an exhibition of architectural drawings, decorative sculpture, and so on, from March 27 to April 17, at its club-house, 220 South Broad Street. Architects from all parts of the country are expected to contribute drawings, and the exhibition will have much interest.

FUNERARY ARCHITECTURE.¹—IV.

THE PRIMITIVE CHRISTIANS.



Catacombs.

FORCED by persecutions to flee to abandoned quarries for a chance to hold their religious gatherings, the primitive Christians did not fail to make use of these subterranean retreats as burial-places for the remains of their martyrs.

Bestowing upon these henceforth sacred relics a worship far more materialistic in character than that accorded to the dead by their pagan contemporaries, and urged on by the very human desire to take a course opposed to that of their persecutors, they renounced the practice of cremation: it must also in justice be admitted that the custom had already fallen somewhat into disuse.

These circumstances were destined to give birth to what has been styled Christian art, and which

was, at least in early times, nothing more than a degraded form of Roman art accompanied by new symbols. It is in the catacombs in general, and in those of Rome in particular, that we encounter the results of the first attempts of Christian art.

¹ From the French of Pierre Benouville in Planat's "Encyclopédie de l'Architecture et de la Construction." Continued from No. 740, page 135.

Certain authors affirm that the catacombs were wholly excavated by the Christians. There is, however, good reason for assuming that they took advantage of the galleries of old quarry workings, and that their work was limited to making these more symmetrical and adapting them to new purposes. An inspection of the accompanying plan of a part of the Catacombs of St. Agnes [Catacombs, Figure 1] shows that they constitute an intricate network of narrow galleries; these are 13 or 14 feet high. In the walls are roughly cut cells, each containing one body, and in some cases two, three, or even four, bodies. Archaeologists have termed these graves *loculi*; they were closed by marble slabs or by huge tiles rudely cemented together with an ample supply of mortar. The barbarous inscriptions, formless *graffiti* traced on them, prove abundantly how few resources were at the command of these clandestine grave-diggers. In some places there are five or six tiers of *loculi*; the number of bodies thus buried has been estimated at six millions.

Here and there, recesses of different sizes, called *cubicula* or crypts, open on the galleries; they are named major or minor according to their dimensions. These crypts were evidently excavated by the Christians: they exhibit peculiar arrangements and are decorated with carvings or with paintings frescoed on the stucco coating of the tufa walls. They doubtless served not only as tombs for Christians distinguished by their virtues or by martyrdom, but also as meeting-places for religious services and for Eucharistic celebrations. We give three different examples of these crypts.

Under the name of *arcasolium* are designated the burial-places capable of holding several bodies, cut, like the others, into the tufa and divided into several compartments; this term was applied to them because, above the marble table which serves as a cover to the graves, there is a niche, or rather a deep semicircular arch, likewise executed in the rocky mass. The rear of the niche is usually occupied by *loculi*. In Figure 2 the *arcasolia* and the *loculi* are readily distinguished. In Figure 6, *c* designates the entrance to the major crypt [the jambs of this recess are of travertine], *d* the assembling-place for the men, *e* the choir reserved for the officiating priests, *g* the minor crypt assigned to the women, *h* the pontifical seat, *i*, *j* sarcophagi serving as seats for the acolytes, and *m*, *n* niches for statuettes. The flooring of the crypts still shows traces of mosaic tiling: each bay is occupied by an *arcasolium*.

Sarcophagi are sometimes found in the catacombs with decorations after pagan subjects; whether sarcophagi from other tombs were utilized, or whether such articles formed then as now a part of current commerce, apparently no effort was

made to efface the heathen symbols which were so out of harmony with the Christian faith.

If the *arcasolium* which we have just described was the indisputable prototype of the first Christian altars, we believe we may safely say that the crypts of the primitive churches (the *confessions*), were unquestionably only a survival of the catacombs.

When persecutions ceased, the custom of interring the dead in the catacombs was still maintained, and it was only gradually

that recourse was had to other ways of sepulture.

The first centuries of Christianity were far from fruitful; owing to the prevailing barbarism scarcely any funerary monuments worthy of notice were erected. We must come down to the sixth century to discover the earliest important tomb due to Christian art: we refer to the remarkable tomb of Theodoric at



Tomb of Theodoric.

Ravenna. Our illustration renders a detailed description of it unnecessary. The enormous dome covering the decagon is a monolith; the stairs are, of course, modern, and there is good reason for supposing that the upper story, which held the sarcophagus, was inaccessible. On the exterior walls there are traces of arches which have disappeared. The interior is cylindrical in



Mausoleum of Taghlak.

shape, and it was doubtless decorated with mosaics. Although the monument is of mediocre dimensions, its proud, wild aspect produces a most profound impression on the beholder.

In this same city of Ravenna also exist the interesting Tombs of Galla Placidia, of her brother, the Emperor Honorius, and of her second husband, the Roman general Constantius. The three enormous sarcophagi are placed in a small edifice in the form of a Greek cross, the walls and vaulting of which are covered with admirably-preserved mosaics. This structure, which antedates by nearly a century the one just described, recalls in its arrangements and appearance certain crypts of the Catacombs.

The Tomb of Galla Placidia was not destined exclusively for burials; it was likewise a chapel dedicated to SS. Nazarus and Celsus.

We are already nearing the period when tombs cease to be isolated constructions, and become simple memorials placed in the interior of religious edifices.

Before entering upon this period, it seems advisable, in order to complete the study of purely sepulchral monuments, to glance at the funerary architecture of the Eastern Asiatic nations and of the peoples that became the ardent and fanatical defenders of Islamism.

INDIA.

There are certain very ancient monuments in India which seem to belong to the Buddhist period. They are known

under the name of *topes*, and consist of huge *tumuli*, generally built of brick, and surrounded by an enclosure. Are the *topes* tombs? Although they have every appearance of being such, the question has been a matter of dispute among scientists who have made a special study of Indian archæology. No one however, has apparently reached any very decided conclusions, and we certainly shall not essay a solution of the problem. In some parts of India, and notably in Ceylon, there are monuments quite strongly resembling these, and known as *dagobas*, which are unquestionably sepulchres.

Whether owing to the Hindoo custom of throwing the dead into streams, or for some other cause, the tombs of India — recognized as such — all seem to pertain to the Mussulman



Tombs in India.

epoch. Notwithstanding marked distinctive characteristics, they present strong likenesses to similar structures of other Moslem peoples.

Among these monuments we call attention to the royal tombs at Golconda, which are familiar to us in photographs and engravings, the tombs at Baroda, of the Queen at Ahmedabad, of Muhammad Ghaus at Gwalior, of Akbar at Secundra, of Humayun at Delhi, and of Altamsch at the Kutab. The mausoleum of the Emperor Taghlak at Taghlakabad is an extraordinary specimen, imposing in aspect, and resembling purely religious edifices much less than do the generality of these tombs.

The next cut gives a still better representative of those Indo-Mussulman tombs which consist of a cubical or prismatic basement supporting a sort of kiosk with a bulb-shaped dome borne

on four or twelve columns, these being so placed as to form a square or an octagon. The group of royal tombs at Maha Satti, near Udaipur, is a fine example of this variety.

The other peoples of Eastern Asia scarcely offer specimens of funerary architecture worthy to figure in this short study.

ORIENTAL PEOPLES.

Sepulchral chapels, known as *turbés*, exist either as isolated structures or as adjuncts of mosques in all countries that have



Tombs of the Caliphs at Cairo.

come under the sway of Islamism. Though often of modest dimensions, they are sometimes comparatively important edifices, as in the case of the Tombs of the Caliphs at Cairo. They are covered by a dome. They always exhibit the same general features, but with varying degrees of ornateness. Broad apertures closed by open-work gratings give the passer-by an opportunity to look into the richly-decorated interiors. The bodies rest in sarcophagi covered with sumptuous draperies; plants, carefully cultivated and trained, lend an air of cheerfulness to these buildings, and the wonderful light of the Orient clothes them with all its magic enchantment.

In viewing the Tombs of the Sultans at Constantinople, one is impressed by the tone of quiet serenity which pervades them, and he understands, better than by all his reading of philosophical treatises, the calm fatalism with which the Mussulmans face death. These monuments have, of course, undergone modifications according to their situations and the periods of erection, but the essential characteristics are still unchanged.

In Northern Africa, the tomb-chapels of the Marabouts resemble the *turbés*. The name *kuba* has been applied to them.

Naturally, this kind of burial was, and is still, reserved for persons distinguished by their rank or their presumed sanctity. Vast cemeteries receive the remains of common mortals. In these there are no important monuments. The graves are covered with simple slabs, at the head of which are erected stele of singular form, and terminating with an ornament which recalls more or less faithfully the head-wear of the deceased. The celebrated cemeteries of Constantinople have been so often described that we will merely add that, like the *turbés*, their countless tombs, enshrouded in verdure, call up no mournful associations.

[To be continued.]

HISTORY OF HABITATION.—I.

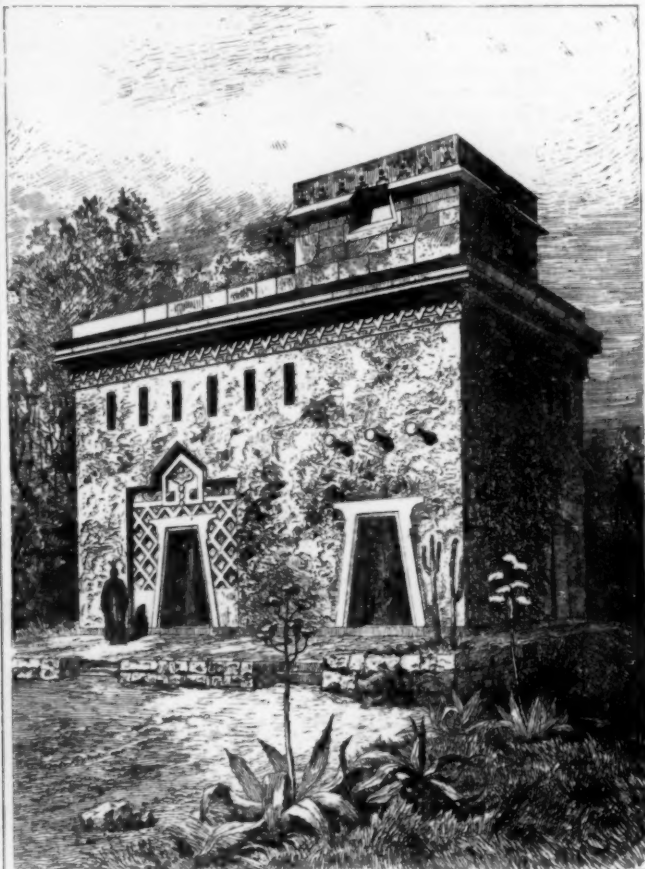


Pelasgian Hut: from the *Moniteur des Architectes*.

CHARLES GARNIER is one of the greatest architects of modern times, and he does honor through his talent to the country which saw his birth. I consider him an artist of the highest merit, although I have not for the Opera-House at Paris, of which he is the creator, that unreserved admiration which some of his adorers profess; but I am willing to pay to his erudition and his intelligence the homage which is their due, so that there may not be attributed to a *parti pris* on the part of the critic the feelings and observations which I shall have occasion to formulate apropos of the History of Habitation, which has been one of the greatest attractions of the late Paris Exhibition. The idea was in itself a great one. What more interesting and more marvellous than to see collected within a definite area a fairly complete collection of specimens, which allow us to see, across the veil of years, the different developments which the human dwelling has undergone in its enlargement, its embellishment, its perfecting, while being transformed from a simple cavern or hut into a palace. The stages followed by man over this route mark in some sort the different phases of progress, and each amelioration introduced responds to a victory gained by civilization. From the cave to the hut, from the hut to the cottage, from the cottage to the farm-house, from that to the mansion, and from the mansion to the monumental palace there are as many transformations as the troglodyte passed through before becoming the polished and elegant being that we know to-day. The history of habitation

is then in certain respects the history of civilization, and we can say to a man: "Tell me where you lodge, and I will tell you what you are." The habitation is so characteristic of the social state that the patient archeologist has been able to reconstruct the history of vanished and forgotten nations through merely interpreting the principal traits of their customs from the débris of walls again brought to light. The wall of the human dwelling is a book from which a philosopher and historian can read as clearly as from the page of a treatise. It is precisely this which rendered difficult the realization of the idea conceived by M. Garnier, towards which the Republic lent him the largest assistance. However large the area granted by the State might have been, however considerable might have been the appropriations set aside for the purpose, the result accomplished must inevitably have been beneath the undertaking, and this not only because there are considerable *lacunæ* in the knowledge which we have of this complicated question of habitation, but also because the things which we already know form a mass of ideas of such size as to make it impossible to include them within the always narrow limits of an exhibition.

This material difficulty once understood, and it could not have escaped the perception of the great French architect, he must perforce impose upon himself a synthetic plan, and limit himself to a



A Dwelling of the Incas: from the *Moniteur des Architectes*.

choice of types or groups forming, should I say, the culminating point of the *mise en scène* which he desired to create. As a fact, he divided his exhibition into three sections, the first of which included the prehistoric habitations; that is to say, those belonging to the time which elapsed from the appearance of man upon the earth up to the beginning of history. The second section embraced the dwellings of the races who, from the beginning of the historic period, have pursued an upward march and have striven for the moral and artistic elevation of their race. Finally, the third and last section was reserved to the peoples and tribes who have been willing to live apart, and who, while they have attained, like the Chinese, for instance, a certain degree of refinement, have never been willing to mingle in human intercourse with others; or who, like the negroes scattered in the depths of the African continent, have never emerged from barbarism.

In my opinion, this distribution was erroneous, and could result only in arbitrary classifications and groups. What in common, for instance, can there be between the cottage of the Kafir and a Chinese pagoda? And the types of habitation belonging to backward races, would they not be better placed amongst the prehistoric collections, since they belong to peoples who have not yet any history, rather than by the side of the models from the Celestial Empire, which, in fine, represent a very advanced stage of perfection, although for a long time stationary?

M. Garnier's fundamental error—almost unpardonable—consists in this, that he has been willing to give to his work an ethnographic signification, while the problem which he had to solve was a different one. I have said above that the history of the dwelling is the history of civilization; but, if one takes the trouble to go to the bottom of this definition, it will be found that the history of the dwelling is, first and above all, the history of architecture. It is certainly regrettable that it should be an architect who forgot this truth. If M. Garnier had wished to make known to us the origin of styles, the sources of the architectural beauties which represent in this branch of art scholastic principles clearly defined, he could have, without contracting his frame, without diminishing his idea, made a more logical work, more interesting, more practical and more scientifically true, than this which he has accomplished.

It is not that I am a great admirer of that which is called style in architecture, but, after all, there are certain data which are definitely fixed in our art, the autonomy of which no one denies, even those who contest its utility and beauty. It would have been more interesting to show how the hut of reindeer-skin became the Gothic dwelling-house; how the Arab tent was transformed, little by little, into a Moorish dwelling; how the hut of the first inhabitants of Peloponnesus could, in the passage of ages, become a rich palace, ornamented with Ionic, Doric or Corinthian colonnade; through what comminglings the Byzantine house arose; to make us see the different phases through which the lake-dwellers' habitation passed before it finished in the creation of that marvel of the world which is called Venice, that type of city which had its cradle on the brink of the marshes where dwelt on piles the first men; while the Florentine palace of the Renaissance is only a derivative from the hovel covered with lime which sheltered the shepherds in the Golden Age.

Nevertheless, once given the ethnographic principle which M. Garnier selected as his guide, I am happy to bear witness that he has followed it with scrupulous fidelity, and that the work thus conceived lacks neither grandeur nor interest. He has allowed us to pass in review all the human races, to take a bird's-eye view

of the customs of each people, to surprise, so to say, in the intimacy of their homes the tribes and nations which have furnished the types for his collection. I confess, for my part, that I have been very much interested by the collection of the habitations of the prehistoric age, which were subdivided into two categories—

that of the natural shelters and that of artificial shelters.

The series begins with a camp formed with a trellis-work of peeled branches arranged about the foot of a tree, and belonging to a race of nomadic hunters armed with flint-stone weapons. Later, when the immense rivers of the early ages ebbed, they left uncovered, as they subsided, vast fissures in the rocks, where man, always in search of shelter, hastened to take refuge, and, behold, the cavern of the troglodyte explained. The first step on the way to civilization is made, for savage man, provided with a permanent dwelling, which defends him from the weather and the attacks of ferocious beasts, finds

leisure and repose which he will utilize for the perfecting of his arms, and for substituting in their fabrication the polished stone for the unwrought stone. At the sight of one of these caves one experiences a very

lively emotion, and, must it be said? a movement of compassion mingles with respect for these inhabitants of the land who were our own ancestors. The idea that one ever had as the head of his family a troglodyte may, perhaps, wound aristocratic prejudices; but I prefer, for my part, to descend from the cave-man rather than from the ape, and I can better console myself with having in my genealogical tree a nomadic hunter of the age of stone than to see perched there a chimpanzee.

Without doubt, the most attractive section was that consecrated to the white race, which is, after all, the only one which has seriously labored for civilization, and, consequently, for the progress of the arts. This race was subdivided according to Biblical traditions into three branches: that of Ham, represented especially by the Egyptians; that of Shem, to which belong the Syrians, the Phœnicians, the Israelites, the Pelasgians and perhaps, also, the Etruscans; and, finally, that of Japhet, from whom we Westerners, we who are most commonly designated under the name of Aryans, are descended.



The Egyptian House, from the *Moniteur des Architectes*.



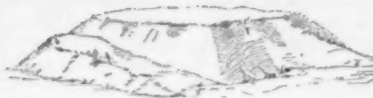
Gallo-Roman House, from the *Moniteur des Architectes*.

The Semitic race and the descendants of Ham halted abruptly on the road of progress, and for nearly two thousand years they have ceased to contribute to the cause of civilization. The descendants of Japhet are the ones who have pursued and still pursue the task abandoned by the other members of the white race.

Amongst the habitations which belong to the race of Shem, we could remark a splendid Assyrian house, with severe and sombre lines, built of massive stone, and forming a compact and heavy whole, while just beside it could be admired a Phœnician house, the rich carpentry work of which and the admirable work of the balconies, ornamented with blinds, showed that formerly these people knew how to join elegance with solidity. From the richness of these accessories and the variety of ornament, one judged that he was standing before the dwelling of a member of a race of rich merchants, who, in the course of their excursions, were able to lay-in abundant store of the cedars of Lebanon. A little distance away one saw a tent and a Hebrew house. The tent was of leather, and dated to the epoch when the Children of Israel were forced to live before the birth of Moses, a life of vagabondage on the banks of the Nile. The house, formed with a flat roof and a parapet, and enriched with beautiful decorations, was contemporaneous with the reign of David, whose reign marked the most splendid epoch in the career of the elected people. The dwellings of the Pelasgians and Etruscans were also there, and recalled to us that, before the

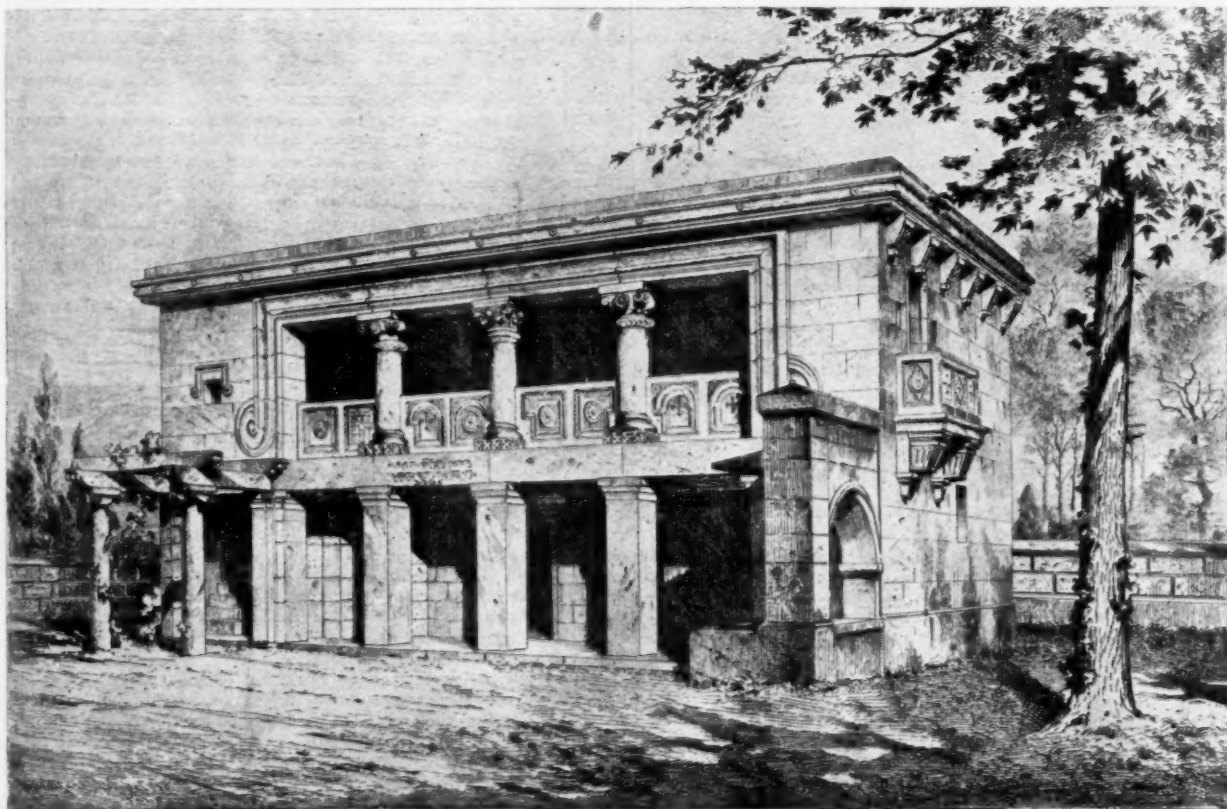
THE BUREAU OF ETHNOLOGY'S FIFTH ANNUAL REPORT.—I.

ON BURIAL MOUNDS, BY PROF. CYRUS F. THOMAS.



THE Fifth Annual Report of the Bureau of Ethnology again illustrates the inexhaustible richness of the material existing within our national domain, both in the remains of ancient

racés and in the opportunities for research afforded by the living representatives of primitive cultures. These publications under the auspices of our national Government are of such value as to justify fully the establishment of the system; their character is thoroughly appreciated by European scientists, as the writer had occasion to observe at the International Congress of Americanists at Berlin last year, where eminent men took pains to speak to him with the warmest recognition of the work of Major Powell as Director of the Bureau, and grateful appreciation of the generosity of our Government in distributing its publications, so elaborately prepared, among foreign institutions and investigators. Such work, they said, was bearing worthy fruit in the importance to which the primitive races



Byzantine House: from the *Moniteur des Architectes*.

dawning of the Roman Empire, and at the very time when Greece plumed itself on possessing a monopoly of the arts, there were already people who possessed a relatively refined conception of the beautiful.

At this point ceased the efforts of the children of Shem and of Ham, the former, as, for instance, the Pelasgians and the Phœnicians, disappeared mid the human currents with which their commercial instincts too directly mixed them. The others, like the Israelites and Etruscans, were crushed out by the Roman domination, and suffered atrophy through unceasing servitude.

H. MEREU.

[To be continued.]

NEW YORK MONUMENTS.—The New York *Evening Post* for February 11, publishes the following statement showing the progress New York has made in its several attempts to erect monuments in that city. The Hospital subscriptions should go a long way toward silencing the sneers of outer barbarians in other parts of the country: To date (official subscription), World's Fair Guaranty Fund, \$6,150,119.

To date—since May, 1889, Washington Memorial Arch Fund, \$70,257.41.

To date—since 1885, Grant Monument Fund, \$141,248.

To date—since Christmas, Hospital collections \$63 795.10.

of America had been raised as offering the best existing field for ethnological studies.

The present volume ranks with its predecessors in the beauty of its illustrations and its letter-press. The subjects treated cover a wide range in space, time and race: the Mound-builders, the Cherokees, the Navajos, the Seminoles and the Zuñis. The last-mentioned, however, might better have been omitted; the treatment of the subject is so superficial as to make it unworthy a place in a publication that places the stamp of scientific authority upon its contents. With this exception the various essays are careful and able efforts, mostly the results of long and exhaustive studies in their respective fields. Major Powell's editorial comments on the papers in the volume are, as usual, instructive reading, often helping the reader to a more complete understanding of the former by showing the light in which they appear to a most earnest investigator.

Major Powell also gives an interesting review of the extensive work of the Bureau, both office and field, and he shows how, in the latter department, extensive and systematic work is important, since "the study of these subjects cannot be pursued from the accounts (however invaluable) of the early explorers and the precious vocabularies of pioneer missionaries, without the interpretations and corrections to be obtained among existing tribes by the latest scientific methods of research."

The first paper in the volume is an elaborate study of "The

Burial Mounds of the Northern Sections of the United States," by Prof. Cyrus F. Thomas, who is at the head of the field-work of the Bureau east of the Rocky Mountains. He classifies the mound-regions of the United States into eight distinct sections, according to the nature of the remains brought to light during their investigation, the differences between these warranting the conclusion that the respective areas were occupied by different peoples or tribes. In general terms these areas are designated as: [1] the Wisconsin District; [2] the Illinois or Upper Mississippi District; [3] the Ohio District; [4] the New York District; [5] the Appalachian District, including the mountain region of North Carolina, Tennessee, Virginia and Kentucky; [6] the Middle Mississippi area or Tennessee District; [7] the Lower Mississippi District; [8] and the Gulf District, including the Gulf States east of the Mississippi. Professor Thomas's conclusions are concisely summed up as follows:

"First. That different sections were occupied by different mound-building tribes, which, though belonging to much the same stage in the scale of culture, differed in most instances in habits and customs to a sufficient extent to mark, by their modes of burial, construction of their mounds and their works of art, the boundaries of the respective areas occupied.

"Second. That each tribe adopted several different modes of burial, depending, in all probability, to some extent, upon the social condition, position and occupation of the deceased.

"Third. That the custom of removing the flesh before the final burial prevailed very extensively among the mound-builders of the northern sections, the bones of the common people being often gathered together and cast in promiscuous heaps, over which mounds were built.

"Fourth. That usually some kind of religious ceremony was performed at the burial, in which fire played a prominent part; but, notwithstanding the very common belief, there is no evidence whatever that human sacrifice was practised.

"Fifth. That there is nothing found in the mode of constructing these mounds, nor in the vestiges of art they contain, to indicate that their builders had reached a higher culture-status than that attained by some of the Indian tribes found occupying the country at the time of the first arrival of Europeans.

"Sixth. That the custom of erecting mounds over the dead continued to be practised in several localities in post-Columbian times.

"Seventh. That the character and condition of the ancient monuments and the relative uniformity in the culture-status of the different tribes, shown by the works and the remains of art found in them, indicate that the mound-building age could not have continued in this part of the continent longer than a thousand years, and hence that its commencement does not antedate the fifth or sixth century. Nothing has been found connected with the mounds to sustain or justify the opinion, so frequently advanced, of their great antiquity. The calculations based upon the supposed age of trees growing on some of them are fast giving way before recent investigations in regard to the growth of forests, as it has been ascertained that the rings of trees are not a sure indication of age.

"Eighth. That all the mounds which have been examined and carefully studied are to be attributed to the tribes found inhabiting this region and their ancestors."

Regarding the seventh of these propositions, Major Powell offers the suggestion that an attempt to fix the duration or beginning of the mound-building period is inadvisable in the absence of evidence not yet obtained and which may never be forthcoming, and it is also suggested that there is not yet sufficient evidence to justify any decided view as to the routes by which the several Indian tribes reached their historic seats.

There has, indeed, been too great a tendency to look upon the mounds as the work of an entirely different people from any of the races now inhabiting this continent, forming a mighty empire and standing on a greatly superior grade of culture. So far as investigations have led, however, this continent appears not to have been inhabited by any other branch of the human family than that known as "Indian."

In stating his position upon this point, Professor Thomas says concerning the former view: "So strong, in fact, is the hold which this theory [in the broad sense including also the Toltec and Aztec theories] has taken of the minds of both American and European archaeologists, that it not only biases their conclusions, but also moulds and modifies their nomenclature, and is thrust into their speculations and even into their descriptions as though no longer a simple theory but a conceded fact. Hence it is necessary, before a fair and unbiased discussion of the data can be had, to call attention to the fact that there is another side to the question. Unless some protest is presented, or some expression of opinion is made on this point in my paper, the facts I give will be viewed through the medium of this 'lost race' theory. This I desire, if possible, to prevent, and whether the Indian theory proves to be correct or not, I wish to obtain for it at least a fair consideration. I believe the latter theory to be the correct one, as the facts so far ascertained appear to point in that direction, but I am not wedded to it; on the contrary, I am willing to follow the facts wherever they lead. Although additional data will hereafter be obtained, and many new and important facts be brought to light, yet, as I believe, sufficient evidence has been collected (though much of it remains unpublished) to indicate what will be the final result so far as this general question is concerned."

In the acceptance of this view, however, there is the same danger of being carried too far, and pursuing investigations upon the reformed lines to conclusions equally erroneous, as has proved the case with the unquestioning acceptance of the broad theory laid down by the late Mr. Morgan as the result of his invaluable studies. The outcome of the latter was, as we have seen, that Mr. Morgan's followers were inclined to test everything by the inflexible formula of "communal organization," unnecessarily depreciating everything characterizing the indigenous cultures of America as the outcome of "a low stage of development," reducing all institutions to a uniform pattern that brought the Algonquins and the Iroquois into the same category as the Aztecs, the Mayas and the Incas, thus giving unintended aid and comfort to the orthodox Classical archaeologists in their scorn for the great field presented by the western world.

In fact, however, the romantic hue that has been cast over the mysterious past of the aboriginal races of America, ascribing to them empires and kingdoms, with monarchs and princes and all the pomp and splendour of a European state, has an almost exact parallel in the false glamour with which the conditions of the early Classic ages were surrounded, and which has not yet been removed. An examination of the cultures of the Homeric periods would show that their petty kingdoms with their warfares must be reduced, also, to their tribal districts with their feuds and all the institutions of a primitive "communal culture." Mr. Cushing, in reading the Homeric poems in the light of his Zuni researches has found in the former the most astonishingly exact parallels with the conditions of a Pueblo culture. Neither must we forget that in the ceremonials and customs attending the life of the Aztecs, the Incas and other high-American cultures of the pre-Columbian days there must have been a formality, an exactness of etiquette, a splendour of paraphernalia and a pomp of observance comparable, in impressiveness, with the state of a mediæval European court; while for a parallel to the unpleasant circumstances which have been pointed to as indicating a low order of development — we would not have to go back more than three or four centuries in the history of even our ancestral England, where the environment of even the higher classes would exhibit much that would be unspeakably repugnant to us of to-day. The veil of romance that has been draped over the antiquity of both Old World and New is a result of the same tendency to glorify the past which appears common to mankind everywhere, and which leads the savage to elevate his ancestors to the rank of gods. With us the romantic view persists in the case of a Classical antiquity, because we have been accustomed to behold it through the medium of the grandest poetry, and because it developed into an era of the noblest art as well as of intellectual achievement.

Therefore, because of what the latter led to, we have been disposed to regard it as essentially different from what it was in reality.

So, while, undoubtedly, this entire continent was occupied by the great branch of the human family known as "Indian," exhibiting very likely everywhere certain culture-traits common to all, just as corresponding traits will be found in common throughout all the Aryan nationalities, yet there will be found among the various Indian peoples of America characteristics just as distinct as among the Aryans or the various Asiatic peoples — for instance, the English as contrasted with the Spanish, the Scandinavian with the Italian, or the French with the Bulgarian, and in Asia, the Japanese with some wandering tribes of the Siberian steppes.

We see by the researches of Professor Thomas that there must have been marked differences among the various mound-building peoples, and therefore there were in all likelihood strongly distinct nationalities and probably varying grades of culture. The extent and magnitude of their remains indicate that they must have been a very numerous and powerful people at one time, carrying on a commerce more or less considerable between the various sections of the country, as shown by articles found in the mounds brought from regions often many hundred miles apart. With their number and extent it is probable that their social structure was more highly organized than among the Indians occupying the country at the time the Europeans came. The fact that one of the great regions where the remains of the mound-builders are the largest and most extensive — ranging from the great lakes southward beyond the Ohio into Kentucky and Tennessee — was almost uninhabited at the time of European occupation, though finely endowed by nature to meet the wants of man, seems to tell that the people who built the mounds must have been either exterminated, or driven to other parts of the continent, by invaders who, as is apt to be the case, were of a lower degree of culture.

Therefore, while subsequent populations in a region may be of the same general race as their predecessors, it by no means follows that they are the descendants, even though they may to some extent have customs and traits in common with the older occupants of the soil. There are reasons for doubting the theory of the degeneracy of a people whose national integrity has been maintained — a degeneracy manifest in inferior accomplishments and culture. Such attainments would not easily be lost except through radically changed environment and national disintegration. Common traits may be heritages from the period before the differentiation of the racial stock, and this would account for the similarities together with the inferior culture of a subsequent wave of population from the parent-source overwhelming a more advanced and kindred people, just as the Apaches may have overwhelmed the town-dwelling populations of the

Southwest, bringing with them many things from common ancestors, and acquiring other fragments of the superior culture during the long periods they lived in the neighborhood of their more civilized brothers, through contact and the absorption of captives and renegades, or of remnants of exterminated populations. In this way it was that the Pimas, in the Southwest, probably acquired traits of the ancient town-dwelling populations whose country they now occupy, the possession of which naturally led some investigators to infer that they were degenerate descendants of their predecessors. Had they been descendants, however, they would not be likely to show such a deterioration. Even the New England Pilgrims acquired certain things by contact with the aborigines, such as the use of beans, pumpkins and Indian-corn, the making of "succotash" and "nocake," and the great festal institution of "clam-bakes." Yet they could hardly be called descendants.

Attentive observers may see this process of acquisition of institutions from another people still in operation among the Indians. To "steal the magic" of another nation is considered a great achievement. Mr. Cushing took two of the Zuñis to the scene of his excavations in the Salado and Gila valleys in Arizona, and they were wont to lurk around the meeting-places of the Pima medicine-men, listening unperceived to their songs and memorizing them to carry back to Zuñi in triumph. In this way similarities of ritual, etc., among unrelated tribes, may to a considerable extent, probably, be accounted for.

Professor Thomas gives an interesting explanation of the building up of a large mound over the body of a man of high rank as illustrated in a mound excavated at Naples, Ill., where a large shell was found on the earth just over the head of the skeleton, with a number of bone awls sticking in the sand around. Much light is thrown on this by the reproduction of a quaint plate from Part II of De Bry's "Brevis Narratio," with a very Renaissance-looking circle of savages conducting a ceremonial around a very small mound surmounted by a large shell and surrounded by arrows stuck in the ground. A similar ceremonial was undoubtedly performed at the great Naples mound at the stage when the shell was placed above the body.

Many of the articles from the mounds built by the people of the highest culture show such a resemblance to the work of the Mexican and Central American peoples that it could not be accidental; there must have been some close connection, probably of race and certainly of culture. A comparison of Figures 42, 43 and 46, depicting engraved copper and shell articles taken by Mr. Rogan, one of the

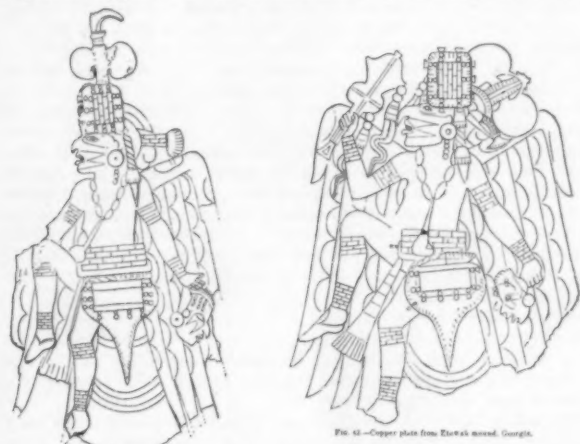


FIG. 42.—Copper plate from Etowah mound, Georgia.

FIG. 43.—Copper plate from Etowah mound, Georgia.

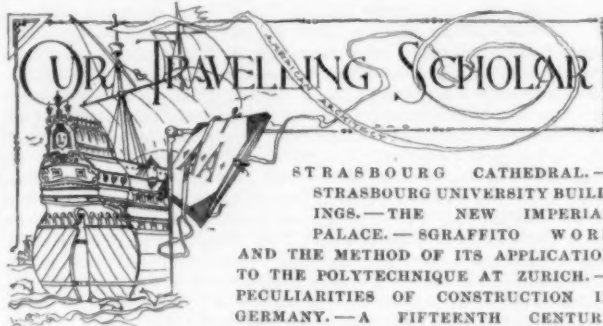
Bureau assistants, from a large burial-mound at Etowah, Ga., with similar work from Mexico and Central America, is sufficient to show this. Professor Thomas finds in this work "a combination of Central American and Mexican designs: the graceful limbs and the ornaments of the arms, legs, waist and top of the head are Central American, and the rest, with the exception, possibly, of what is carried in the right hand, are Mexican." There is, however, a radical difference in the connection of this people with the Mexican and Central American cultures and that established by Mr. Cushing as existing between the ancient populations of the southwest of this country and the same; while the "Aridian," or "Shiwan" culture, as he has called it, is the parent of those to the south, that of these mound-builders is evidently subsequent to that of the Aztecs and Mayas, and derivative from them; a fact that Mr. Cushing has observed in his studies of the lines of culture-influences in the New World. Professor Thomas's paper has a highly important supplemental note in the shape of a straightforward and detailed account of the burial ceremonies of the Hurons, translated by Miss Nora Thomas from the "Relations des Jesuites," written by Jean de Brebeuf in 1636.

It is to be hoped that the researches of the Bureau of Ethnology in the great territory covered by the remains of the mound-builders may be prosecuted without a recurrence of the interference that took place last season in the district outlined in Ohio by Professor Putnam for the Peabody Museum at Cambridge. The field is so vast that there appears no good excuse for interference in the region selected by Professor Putnam for the careful and exhaustive investigations

already so fruitful in results. There are but few archaeological undertakings in the field in this country, and it would be well if there could be some agreement entered into by which the territory and the activities of each could be defined and understood mutually, with conferences from year to year for the interchange of views and information as to results. There is no scientific excuse for rivalry in this work. The archaeology of primitive races has almost just begun to assume the form of a real science. There is ample opportunity for high honors to all earnest workers. There is, also, a great advantage in separate investigations under distinct auspices, and the establishment of separate collections in various parts of the country, or even in proximity. We thus have explorations conducted by different methods, and things found from different points-of-view, while in the separate collections we have the opportunity for a wider acquaintance with the facts they illustrate as well as their exhibition under the aspects of different systems of arrangement and classification. All this could not fail to increase the illumination of the subject, just as our acquaintance with a statue is so much more complete if we behold it in the centre of a room with the light cast upon it from all sides instead of placed in a corner with the light all coming from one direction, leaving the other parts in obscurity. Preëminently, in this work what is done by each is for the good of all.

SYLVESTER BAXTER.

(To be continued.)



IT has been held that the greater height and slenderness of the Ionic column, with its more delicate detail as compared with the Greek Doric order may be ascribed to the fact that the Ionians themselves could boast of a greater stature than the originators of the latter order; and that, furthermore, a comparison made between the outlines of their bodies would result much as the one so often made between the delicate Ionic and its predecessor, the refined and sturdy Doric order. If the one who views the façade of the cathedral at Strasbourg for the first time accepts this statement as a rule and applies it here, he will, of needs, laugh aloud; for he will see as builders of this wonderful cathedral the most wire-drawn and elongated specimens of the human race imaginable. The most corpulent of the people these builders must have seen about them would certainly have carried off the palm in a contest with some of our leading and most popular "ossified men." However, be that as it may, one is impressed at the first glance with the thinness and attenuated character of the front of this cathedral. One can hardly believe that the screen which covers the windows of the west façade is of stone, for the piers or rather the bars of this tracery are so painfully thin. I could not refrain from tapping these abnormally long supports to see if they were really of stone and not of iron.

The climb up the tower by the spiral staircase, which is entirely open, is most delightful, for at each step the view changes. The city with its several rivers, canals and fortifications and the Vosges Mountains in the distance makes a most beautiful picture. While in the foreground on one side is the Frauenhaus, the only remaining specimen of very early Renaissance in the city, on the other is an old half-timbered house, quite attractive with its quaint roof and carving. It is the oldest one in the city, and it was in it that Gutenberg experimented with his printing-press.

The foreigner, let him be from whatever land you choose, if he will betake himself to the cathedral when the stiff-limbed apostles take their noon-day journey from one side of the clock to the other and the cock professes to crow, will be sure to find one of his countrymen lost in admiration of this "wonderful astronomical clock," not perhaps because he sees any reasons for such emotions, but because he believes it due to the past generations who have stood in this self-same spot with similar feelings.

At twilight the effect of the interior is most wondrous. The last rays of the setting-sun, softened and faintly colored by the stained-glass of the windows, but dimly light the interior; while the windows themselves remain brilliantly illuminated.

Opposite the south front of the cathedral is the Frauenhaus, which contains a collection of the original plans and old drawings of the cathedral together with plaster-casts, models, etc. Also the bits of carving, statuary and such like which were broken off during the bombardment in 1871. A most beautiful spiral staircase is to be found in this building, partly late Gothic and partly Renaissance. I wanted much to get a sketch of it, but sketching is strictly forbidden; so many poor sketches have been exhibited, all of which

claimed to be this staircase that, in a moment of compassion for the unknown architect, the authorities have decided to prohibit henceforth all sketching in the building.

Of modern examples of architecture there are, besides the depot and the new palace, the buildings of the Strasbourg University. The main building of this group is perhaps of the most interest. It was the outcome of a competition in which some of the best-known architectural talent of Germany participated, and which resulted in the adoption of the design submitted by Professor Worth, of Karlsruhe. [See Illustrations.]

The approach is through a park with beautifully kept lawns enlivened with flower-beds and shrubbery. Then, after ascending the broad flight of steps, one enters through one of the five double-doors, carved and enriched with wrought ironwork, and finds himself in the entrance-hall—a space of some 30 x 55 feet, frescoed and vaulted, the vaulting being supported on three rows of columns whose bases are of sandstone, shafts of gray granite and caps of bronze. To the right (58) is the porter's room, to the left are toilet-rooms and a lounging-room for the use of the professors. A few steps higher, on one hand, lies the corridor which leads to the various lecture-rooms and seminaries. On the corridor in the other direction open the rooms of the faculty; 15, 16 and 17 are those of the secretary; 12 and 13 are small committee-rooms; while Nos. 10 and 11 are placed at the disposal of the treasurer. The room indicated as No. 32 is the general reading-room, containing, however, only the daily papers and periodicals, the University library being in a separate building. One now enters the court, perhaps the most imposing feature of the whole building, a space 75 x 95 feet, lying three steps lower than the adjacent halls and corridors, surrounded on all sides by arcades and covered by a huge skylight of colored glass. The arcades are of stone, not of concrete, a material so generally employed in Germany that whole fronts are covered with pilasters, consoles, corbels and decorative panels cast in this material and painted to imitate stone.

Broad staircases of stone, with treads curiously tooled in very low-relief to imitate a mosaic pattern, lead on either side of the stair-hall (2, 3, 4) to the floor above. On this floor, rooms 35 to 42 are given up to a collection of plaster-casts. The remaining rooms are classrooms with one exception, the Aula, where such meetings as are usual between the faculty and the student-body are held. This is a hall most elaborately decorated in white-and-gold in the style of the modern Renaissance, with richly carved caps, wainscoting and an ornamental plaster ceiling.

An examination of the first-floor plan shows, roughly estimated, a floor-area, under roof, of 58,500 square feet. Including the court (which is virtually nothing but a thoroughfare, but also having use as a light shaft) a total of 25,700 feet is given up to hall-space, stairways, vestibules, etc., or approximately 44 per cent of the total floor-area. If, however, we exclude the court which could, without injury to the plan, be left without a covering, there still remains an area of 18,575 square feet used for hall-space, or 32 per cent. We may draw our own conclusion from these figures. Magnificent vestibules, halls and courts are undoubtedly very nice, but they "come high."

The building, I am told, is most excellently heated throughout by hot-air. Two gas-engines, of from nine to ten horse-power each, are used to force the cold air through ducts placed under the cellar-floor to the five heaters, which are placed at appropriate points in the cellar. The cold air after having been heated by contact with the steam-coils enters a large hot-air duct, which runs along under the first-floor joists, and from it is distributed by smaller pipes to the rooms above. A second duct into which cold air is forced and which can be placed in connection with the hot-air duct just spoken of, so that the air in it may be partially heated, is also provided. Likewise through smaller pipes this partially heated air can be brought into the rooms, and thus their temperatures can be regulated to a nicety without at any time either stopping the influx of the heated air, or passing cold air into the room. No artificial ventilation is used, the air simply escaping through registers near the ceiling. A most ingenious use is made of this apparatus during the hot months of the year. The gas-engines are again put in motion and the air which has been cooled in the following manner is forced through the pipes:

The cold-air duct opens into a cement basin extending some six feet below the surface and covered by a cage eight feet high, the sides of which are of netting while the top is covered with sod and plants. In this structure is placed a series of screens covered with a porous, absorbent cloth upon which water is constantly allowed to drip from a network of pipes above. The current of air which is forcibly drawn through these cloths is rapidly cooled by contact and distributed throughout the building. By this method the temperature in a room can be lowered from ninety to seventy degrees Fahrenheit.

Leaving the University again by the main entrance one sees directly ahead the new Imperial Palace, a typical example of one division of the modern German Renaissance. It is built of buff sandstone, the first story rusticated, the second decorated with shields and panels and pilasters, and all sorts of the choice bits of decorative work invented for the use of the architect who has more money at his command than he can conveniently use.

The staircase hall which is entirely of stone and marble is very pleasing. One flight leads to the first landing, where the stairs divide in two parts to reach the floor above. On each side of the first run is a cascade; the water spouts from lions' heads at the top, only to reach the pink marble basin below after having passed over a series of steps of the same beautiful material.

The chandeliers, all of wrought-iron, fire-gilt, show wonderful skill in the use of that material.

In Munich the frequency of frescoed façades attracts the attention of the traveller who has just left behind him the monotonous blocks of Paris. This art probably owes its popularity to the great use which is made of concrete, a material which owes its existence largely to the lack of proper building-stone in the vicinity, and a disinclination to use brick and terra-cotta. Of brickwork one sees very little, it being seldom exposed, even in the rear walls of buildings, as it has been found cheaper and better to cover the brick with a thin layer of mortar than to point and finish it so as to make it presentable. Besides the stereo-chromic fronts which, by the way, have since the introduction of water-glass, almost entirely replaced the old manner of frescoing (i. e., of putting on the color while the plaster is still soft so that it may enter into combination with the lime to form a durable and peculiarly pleasing crystalline surface), there is the so-called sgraffito method of decorating plastered exterior wall-surfaces. It is not now very extensively used and seems to have outlived its popularity. This popularity, which it held for many years until the inborn love of color again cropped out and entered into all the decorative arts, as well as its durability and beauty may warrant me in devoting a few lines to its history and application.

Sgraffito is essentially the method of producing a design in monochrome on plaster by partly scratching away an upper covering layer in such a manner as to expose an underlying surface of a different color.

In following this art it may be of interest to note that the Greeks and Etruscans, to whom we may ascribe its origin, applied this decoration to their vases and pottery in general. Whether at this period it was also used in house-decoration is not known: in buildings of the Middle Ages, however, a few traces of it have been discovered. But we may say its first appearance was in Italy, during the fifteenth century; soon afterward, gaining ground, it made its way northward to the cities of southern Germany,—Augsburg, Munich, Ulm, etc., and also to Prague. In France it seems never to have taken any hold.

The success of sgraffito not only depends upon the drawing and the design but also quite as much upon the proper preparation of the surface to be worked. The essential qualities of this coating are, that it must dry slowly, in order that the artist may have ample time for completing his work, and secondly, the separate layers must, in drying, unite to form a solid, homogeneous mass which will neither crack nor peel.

On the building of the Polytechnique, at Zurich, the following method of procedure was very successfully used.

The first coating is the ordinary rough-cast, to each ten parts of which one part of cinders were added, to give the succeeding layers a better hold. This coat was perfectly dry before putting on the second coating, consisting of the following mixture:

Five parts of slaked lime.

Six parts of clean, sharp, brown sand.

Two parts of cinders (crushed to pieces of about the size of bird-shot). This was then put on in a layer sufficiently thick to cover all the projecting and uneven points of the previously applied layer. While this was still wet, a third coating of the same thickness as the latter was applied. This consisted of:

Three and one-fourth parts slaked lime.

Four parts of cinders (very finely crushed).

Two parts of sand.

One part of pulverized charcoal.

One-eighth part of lamp-black.

The finishing coat, which is of the same composition as the one just described, with the exception that one part in place of two parts of sand is used, was then applied.

Prepared in this way, these several layers dry to a mass as hard as glass, which never cracks nor peels; it is even more durable than cement-mortar. The final top coating consists of a wash of milk-of-lime, to which either yellow ochre or asphalt has been added to remove the glaring whiteness.

It may be observed here that the cinders are not only added because of their quality as a coloring matter, but also to give hardness to the composition, the lime seeming to have some chemical effect upon the silicates in the vitrified coal. On the other hand, the charcoal as well as the lamp-black are purely and simply coloring substances.

Immediately after the lime has been put on (three coats are usually given with a brush), the design is transferred to the surface to be decorated. This is either accomplished in the manner customary in fresco-painting (with stencil and a bag of charcoal-dust), or, better, by slightly indenting it upon the surface by tracing the design, which has previously been prepared full-size, with a blunt instrument. The artist now, with the tools which are at his disposal, rapidly outlines and shades the picture, which now appears dark on a white surface. To be successful, the work must not appear labored or overworked, but be bold and dashy; this depends to a great extent upon the design, which must lend itself to such treatment.

Often the opposite method is employed, resulting in a design upon a black background. Naturally, the design must be more heavily drawn than in the first case, in which the light surface tends to make the lines appear even heavier than they really are.

A third method is that in which the design is drawn in outline and then cross-hatched.

It is not well to attempt the imitation of carving in relief, rustic

stonework, etc., in sgraffito: greater success is obtained by allowing it to hold its individuality simply as a surface decoration.

A few remarks upon the tools used in this art may not be out of place. Steel points having various degrees of bluntness, six inches long and about as thick as a carpenter's lead-pencil, one with a spoon at one end, and shaped like a spatula at the other, and a few small scoops constitute the equipment. An instrument for drawing parallel lines and one for describing concentric circles are very convenient at times. If any mistakes in drawing occur, the wrongly-exposed parts may again be whitened without detriment to the work, provided the under surface has not already hardened.

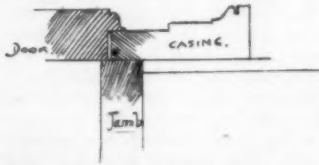
In Southern Switzerland, farm-houses are sometimes seen decorated with primitive but often effective sgraffito-work, produced by covering the wall-surface, which is of a dark-brown tint, with lime, and proceeding as above.

At the Polytechnique at Zurich, five thousand cubic feet of this ornamentation were applied, involving an expenditure of eight thousand francs, six thousand of which the artists received. The friezes on the north and south wings of the Polytechnique at Munich are also quoted as good examples of sgraffito-work.¹

I entered on several occasions houses in the process of erection, and was surprised to note how much the usages of common house-construction in Germany differed from those in America. An ordinary floor, instead of being built of "2" x 12," 16" centres," is built of 6 x 6 inch beams placed about two and one-half feet from centres. A cleat is then nailed along the sides, near the bottom, of each beam, extending its whole length; the spaces between the beams are then floored and filled with sand, or some other deadening material, to the top of the joists, upon which the rough and then the conventional hard-wood floor is fixed. Matched flooring-boards are but seldom used; in the kitchen and halls, where the pine floor is to be left exposed, the boards, which are about ten inches wide, are simply laid with close joints and nailed at the intervals determined by the beams. The great width of the boards and the distance between the points of nailing, together with vigorous scrubbing and baths they are subjected to, tend to make an uneven and warped floor rather the rule than the exception in Germany. Very often a base is not used, a simple quarter-inch round or ogee moulding sufficing to cover the joint between wall and floor. Such luxuries as casings around windows, aprons under the sills, etc., are often done away with. On the other hand, a most unnecessary amount of material is heaped about the door-openings; almost always there is a heavy casing, architrave, frieze and a shelf supported by brackets, carved or plain. Brackets of plaster, to imitate carving, and then painted like the rest of the finish, I have often seen.

Their manner of building partition-walls appears to me worthy of notice; the result not only being a fireproof one, but also one of strength as well as cheapness. It is but an application of the ordinary half-timbered wall. A framework with braces of timber of the same width as a brick is erected, the spaces in between are then filled with brickwork, to which the plastering is directly applied resulting also in the saving of laths. The term plastering-reeds would be more proper, for, reeds about six feet long fastened together by wire are used instead of laths. These reeds already so prepared are taken to the building in rolls. All that is then necessary is to unravel the roll, and fasten the screen with staples or hooks to the ceiling. In a remarkably short time a room may thus be lathed.

Door-jambs are not rebated like ours, but are kept plain; the door, however, is the rebated member and is finished with a moulding. The sketch shows how the casing is put upon the door-frame. It will be seen that in this way a double rabbet is obtained without any extra work.



THE "WORKING-DAY" IN THE FIFTEENTH CENTURY.

Extracts from the contract between Jacob Russ, the carver of the Rathaus at Abergler and the city authorities: (Translated from a manuscript.)

"Item:—During the summer months, I, Jacob Russ, master-carver agree to begin the day's work at four o'clock A. M., and to continue working until seven o'clock P. M., with an allowance for meals as shall be hereafter stipulated. During the winter months the hours shall be from five until seven o'clock with an allowance for meals as shall be hereafter stipulated."

"Item:—I am to be allowed: For breakfast, one-half hour; for dinner, one hour; for lunch, one-half hour; for supper, one hour. Further, during the winter, I agree to dispense with the supper-hour

¹ I am indebted for much of this information to a Munich decorator, who has successfully used the method, which appeared in an article by Gottfried Semper in the *Zeitschrift für die bildende Kunst* of 1868. Gottfried Semper, the famous author of "Der Stil," etc., professor and architect, is also the architect of the Polytechnique at Zurich, already spoken of, and where this method was revived after it had lain dormant for centuries.—T. F. L.

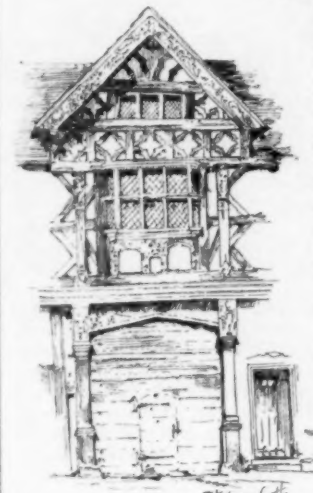
² Lest it be thought that the workmen of the fifteenth century kept body and soul together with one cheese-sandwich a day or some other delicacy as can in these days be procured for five cents, I quote the following statistics, which I take from my note-book: "A dinner with a whole chicken and a quart of wine together with stabling and food for a horse, could be got for seven cents. A garment and head-dress such as peasant woman wore at that time cost seventy-five cents." Albrecht Dürer was offered by the city of Antwerp a yearly salary of \$225, which was more than he earned at Nuremberg. This was in the first part of the sixteenth century. T. F. L.

as heretofore stated and to take lunch at the time customary for those in the city's employ."

"Item:—For food, my employers are to give me the sum of 15 kreutzers (about 7½ cents) a day and each of my men ten (about 5 cents) kreutzers." ³

(To be continued.)

THE DISTRIBUTION OF HYDRAULIC POWER IN LONDON.



FEW Londoners (writes a correspondent of the *Times*) are aware that there are now under the streets of the metropolis forty miles of pipes charged with a pressure of 750 pounds per square inch. These are the mains of the London Hydraulic Power Company, which now extend in a perfect network throughout the City, and from the docks at one end of London to Victoria at the other. Compressed air has been largely used for transmitting power in this country, notably in Birmingham, on the Continent, and in the United States; and electricians are working hard with a view to the introduction of electricity as the agent. But in London the system of hydraulic power is virtually having its own way.

It is now more than half a century since Lord Armstrong first directed his attention to the utilization of water-pressure and its transmission for mechanical purposes. For the past thirty or forty years hydraulic machinery has been in use at docks, at railway goods-stations, in warehouses, and elsewhere. But Lord Armstrong's enthusiasm led him to anticipate the time when the practice would be widely extended, when hydraulic power would be drawn from a common centre, especially for fluctuating and intermittent purposes. That dream has been realized. By the system which was established at Hull in 1876, under the direction of Mr. E. B. Ellington, by the system which has been organized in London by the same engineer, and by a similar undertaking at Liverpool, a service of high-pressure hydraulic power is now at the command of the public, of consumers large and small, the cost of the power being in direct proportion to the work done.

The mains in London are of cast-iron, varying in internal diameter from seven inches to two inches, and are kept charged constantly at a pressure of 750 pounds per square inch by powerful engines located at Blackfriars and Westminster. The engines at the Blackfriars station can pump 3,000,000 gallons per week, and those at Westminster 2,000,000 gallons; and the rapidly-increasing demand for power has necessitated the construction of a pumping-station at Wapping which will deliver 4,000,000 gallons per week. The present supply to consumers amounts to about 3,750,000 gallons weekly. This is consumed by somewhat over a thousand machines, and there are at the present time 200 applicants for machines to be connected with the mains. This power is supplied direct to lifts, presses, and other purposes of a similar character without the use of any engine or power-producing machinery, and can also be used for driving engines of special construction in the same way as steam or gas. Many such engines are now at work grinding coffee, ventilating, working elevators and crushers, driving dynamos and general machinery; but hydraulic power is chiefly used for machinery which is used intermittently. For pumping it is also valuable. No engine is required, only small direct-acting rams, which may be allowed to run without attention. The quantity of power used is measured in gallons by meters, and is charged for on a sliding scale, commencing with a minimum of 1*l.* 10*s.* per quarter for 3,000 gallons or under, down to about 2*s.* per 1,000 gallons in the case of large consumers. The power is available day and night and on Sundays, all the year round. There it is, to be had by the simple turning of a tap. There is no getting up of steam, no filling of tanks for one's own hydraulic supply. As has been indicated, it is where power is required intermittently that it is cheaper to use hydraulic power than to set up one's own gas or steam engine. The engineer of the Company considers that, taking all the circumstances into account, it can hardly be a profitable operation to supply public power under conditions similar to those which exist in London at less than 2*d.* per indicated horse-power per hour. This would be from 20*l.* to 25*l.* per horse-power per annum, working from fifty to sixty hours per week. Where the power used is small, that would compare favorably with the cost of steam. The comparison may not, perhaps, be so favorable with a gas-engine working under the most advantageous conditions; but directly the gas-engine is set to do intermittent work the advantage is largely on the side of hydraulic power, while for such purposes as lifting and pressing, the general convenience and simplicity of the hydraulic system are such that its use would, perhaps, scarcely be affected even if there were no direct economy in the cost of working.

Failures of the mains occur occasionally, and, considering the very high pressure with which they are charged, this is a serious matter. The velocity of water at 700 pounds pressure through a free orifice being 320 feet per second, a hole only a quarter of an inch in diameter will pass between 30,000 and 40,000 gallons in 24 hours. The method employed for detecting leakage is based upon an automatic record of the quantity of water forced into the mains. When there is an abnormal increase during any night, particularly during the early hours of the morning, the mains are tested. Pressure-gauges of considerable range are connected to each of the mains radiating from a station. Each main is shut off in succession, and the behavior of the hands of the gauge will indicate whether there is leakage or not. By closing in succession the valves along a main in which a leak has been discovered, and by using a sounding-rod, nearly the exact spot of the leakage may be determined. On one occasion, from the record of the pumping, a leak was supposed to exist in one of the mains running from the Blackfriars station. An observation was made, and the action of the gauge could only be accounted for by a stop-valve about two miles away, supposed to be closed, passing a small quantity of water, and by a machine near the valve having been left working by an attendant. Upon examination at the spot the valve was found leaking, as had been expected, and the machine could be distinctly heard at work. It was a small hydraulic pump, and each stroke was indicated by the gauge.

One important use of this high-pressure water-circulation has not been indicated; namely, its use in case of fire. A small jet of high-pressure water injected into a larger jet from the ordinary water-works mains so intensifies the pressure of the latter in the delivery hose that a jet of great power can be obtained at the top of a high building without the aid of a fire-engine. Captain Shaw has expressed a very decided opinion as to the value of this high-pressure supply of water for the extinction of fire, but though the provision of the necessary injector-hydrant is comparatively inexpensive, the authorities have displayed an apathy on the subject which is difficult to understand. Last year Captain Shaw witnessed a most satisfactory experiment. The jet from an ordinary water-main, having a pressure of about 40 pounds per square inch, rose through a hose to a height of 40 feet or 50 feet. The high-pressure water was then turned on through a three-eighth-inch opening. The jet at once rose to a height of 90 feet or 100 feet, which, in the opinion of Captain Shaw, would have been as useful as any fire-engine for extinguishing a fire. It has been stated that in Manchester, after the introduction of high-pressure hydrants, the loss from fire was reduced by six-sevenths. In Liverpool the loss was reduced to one-fourth of what it was previously. If the annual loss from fire in London amounts, as is calculated, to over 2,000,000*l.*, and if the saving effected by an efficient system of hydrants were only one-fourth or even one-tenth of the saving effected in the cities mentioned, it would amount to hundreds of thousands of pounds annually.

THE SEWAGE OF RIO DE JANEIRO.



principal function is to control and utilize the entire sewage of the city, subject only to the supervision of Government inspectors, and they are under heavy penalties should they neglect their duties or cause an avoidable nuisance. For this work they are paid an annual subsidy by the Government and to every new house that is built they have to make the drains to the main sewer. They also either supply the sanitary fittings to the house or see that those placed in it are of suitable character, and not likely to cause offence or danger to the inmates. The company have six pumping-stations in different parts of the city, all abutting upon the bay, with wharves, on which are unloaded all their appliances and materials.

"The mode of treatment of the sewage is as follows: The sewage from a certain district is brought in a main to its station; here, as it enters the company's premises, it is treated with a mixture of lime, sulphate of alumina, and charcoal; it then passes on to precipitating-tanks of the usual character, and, after precipitation has been effected, and the effluent been allowed to travel through a series of narrow canals, it is discharged into the bay, inodorous and of a standard of purity which I was informed by Mr. Benest, the courteous managing director of the company, was much higher than required by the Rivers Pollution Committee in England. Without going into further details, I can safely say that, from whatever point-of-view it may be

FROM a letter written from the capital of Brazil to the *Sanitary Record*, we extract the following regarding the disposal of sewage in that city:

"The Rio Improvements Company is responsible for the proper disposition of the entire sewage of the city.

"This company, an English one, received their charter, or concession, from the Brazilian Government so far back as the year 1857, but it was 1862 before their various works were built and they commenced operations. Their

criticised, the mode of treatment of the Rio sewage is as good if not better, than the most approved arrangements we have.

"The residuum is dried and burned twice. The first burning gives back a lime, which the company either use for their own purposes or sell, if they have an excess. The second burning reduces it to a hard clinker; this is ground, and, I am assured by the managing director, makes as good a cement as the best Portland they can purchase. In Brazil manure is not required, but as nearly every house is faced with cement, there is an enormous demand for the article; hence, by utilizing the sewage in this manner, the company obtain a valuable marketable commodity. I must say, I was much astonished at finding in this much-abused place so perfect a system of sewage-disposal, so admirably carried out without nuisance to the inhabitants. I was, however, surprised to hear how little some of the leading inhabitants knew of the manner in which their sewage was disposed of, some of them believing that it was discharged into the bay in its normal condition. I mentioned this to Mr. Benest, who smilingly replied: 'From what I have shown you, you must see that the sewage is too valuable an article for us to throw away if we can avoid it, but you shall see and judge for yourself.' He then explained to me that in time of excessive rains, owing to the flat surface of the city, the storm water (which goes into the sewers) would soon cause an inundation if it were not allowed to escape, consequently arrangements have to be made for its disposal at each station. In such cases it is necessary for a time to open a sluice, instead of attempting to pump it into the tanks, and allow the whole to run into the bay. But whenever it is found to be necessary to do this, the fact has to be immediately notified to the Government Inspector, who visits the station, and when the penstock is closed, writes down the day and date on which it was opened, and signs the document. It is then affixed in such a manner that the penstock cannot be lifted without destroying the notice, and the Government seal is affixed to it."

STEAM-PIPE COVERINGS.

BOSTON MANUFACTURERS MUTUAL FIRE INSURANCE CO. — SPECIAL CIRCULAR NO. 27.



"All the Modern Improvements." — No. 3.

A FEW years since a very exhaustive investigation was made at the instance of the Boston Manufacturers Mutual Fire Insurance Company by Prof. John M. Ordway, then of the Massachusetts Institute of Technology, upon the non-heat-conducting properties of various materials, some of which may be used for covering steam-pipes and boilers, while others, owing to their liability either to become carbonized or to take fire, cannot be directly applied to such use.

There are, however, other problems in preventing either the escape of heat or the ignition of woodwork by the impact of heat, for which purposes various substances are or may be offered to our members. It may not be assumed that because a given material is incombustible it is therefore not a quick conductor of heat. Neither may it be assumed that because a material is a quick conductor of heat it may not be made use of in some cases for protection against fire.

For instance, given the problem of making a fire-door. If the door be made of two thicknesses of solid wood so adjusted each to the other as not to be liable to warp, this door may be encased in sheet-iron or tinned plates with the joints carefully locked, and it will become a good fire-stop, although both the sheet-iron and the tin-plate are good conductors of heat. The reason of this is, that while the wood, which is in immediate contact with the metal, will be carbonized, yet even the sheets of hot metal, if thoroughly locked, and therefore thoroughly encasing the wood, keep out the oxygen; then, for want of sufficient air to ignite the carbonized wood, the door remains solid and strong for many hours. Thin plates of tinned-iron or steel serve this purpose, where thick plates would warp or bend under heat so as to fail in keeping the door-way tightly closed. Iron doors and shutters are often worse than useless, owing to this tendency to warp or bend, opening a way for fire while obstructing the firemen; also because when heated they do not serve as a guard near which firemen may protect adjacent woodwork. Zinc is worthless as a fire-stop because of its very low melting point. If a door is tinned on one side only, it may be burned about as quickly as if there were no tin upon it, although it may not be ignited quite so soon.

On the other hand, let it be assumed that this same wooden door were encased in asbestos made in thin sheets and strengthened in some way so as to serve the purpose,—yet this covering would be of no value. Asbestos is incombustible, but is rather a good conductor of heat, as will appear from the subsequent tables; also being

porous, so that a free passage of air may be given through the interstices, it will wholly fail to prevent a wooden door or surface of wood from being quickly consumed, when laid on in thin sheets or put between floor-plank and boards.

In order that the relative merits of the different substances which are offered to our members for preventing the escape of heat from boilers and steam-pipes, or as substitutes for wire lathing and plastering, or for tin-plates in the protection of elevator shafts, or of wood-work nailed closely to walls, the following tables are submitted. These tables and extracts are taken from a later report made by Professor Ordway to the undersigned. It will be observed that several of the incombustible materials are nearly as efficient as wool, cotton, and feathers, with which they may be compared in the following table. The materials which may be considered wholly free from the danger of being carbonized or ignited by slow contact with pipes or boilers are printed in Roman type. Those which are more or less liable to be carbonized are printed in italics.

Professor Ordway's report is as follows: "Careful experiments have been made with various non-conductors, each used in a mass one inch thick, placed on a flat surface of iron kept heated by steam to three hundred and ten degrees Fahrenheit. The following table (with which the graphical lines in the next column correspond) gives the amount of heat transmitted per hour through each kind of non-conductor one inch thick, reckoned in pounds of water heated ten degrees Fahrenheit, the unit of area being one square foot of covering.

"The first column of figures of results, therefore, gives the loss by the measure of pounds of water heated ten degrees. The second column gives the amount of solid matter in the mass one inch thick. The third column gives the amount or bulk of included or entrapped air." In the graphical table, the value of the non-conducting material is, therefore, in inverse proportion to the length of the line, the short lines showing but a small amount of transmitted heat; the long lines showing the larger amounts.

Substance 1 Inch Thick. Heat applied 310° F.	Pounds of Water Heated 10° F., per Hour Through 1 Square Foot.	Solid Matter in 1 Square Foot 1 Inch Thick. Parts in 1000.	Air Included. Parts in 1000.
1. Loose Wool.....	8.1	56	944
2. Live Geese Feathers.....	9.6	59	950
3. Carded Cotton Wool.....	10.4	20	980
4. Hair Felt.....	10.3	185	815
5. Loose Lamp-black.....	9.8	56	944
6. Compressed Lamp-black.....	10.6	244	756
7. Cork Charcoal.....	11.9	53	947
8. White Pine Charcoal.....	13.9	119	881
9. Anthracite Coal-powder.....	35.7	506	494
10. Loose Calcined Magnesia.....	12.4	23	977
11. Compressed Calcined Magnesia.....	42.6	285	715
12. Light Carbonate of Magnesia.....	13.7	60	940
13. Compressed Carbonate of Magnesia.....	15.4	150	850
14. Loose Fossil Meal.....	14.5	60	940
15. Crowded Fossil Meal.....	15.7	112	888
16. Ground Chalk (Paris White).....	20.6	253	747
17. Dry Plaster-of-Paris.....	30.9	368	632
18. Fine Asbestos.....	49.0	81	919
19. Air Alone.....	48.0	0	1000
20. Sand.....	62.1	327	471

There are some mixtures of two materials which may be quite safe, although consisting in part of substances which may be carbonized. It must also be considered that a covering for a steam-pipe or boiler should have some strength or elasticity, so that, when even put on loosely and holding a great deal of entrapped air, it may not be converted into a solid condition by the constant jar of the building, then becoming rather a quick conductor. This warning may be applied especially to what is called "slag wool," which consists of short, very fine threads of a brittle kind of glass. The following table, giving the figures on which the graphical table is based, has been submitted by Professor Ordway, with the following explanation:—

"The substances given in the following table were actually tried as coverings for two-inch steam-pipe, but, for convenience of comparison, the results have been reduced by calculation to the same terms as in the foregoing table."

COVERING.	Pounds of Water Heated 10° F., per Hour, by 1 sq. ft.
21. Best Slag Wool.....	13.
22. Paper.....	14.
23. Blotting Paper wound tight.....	21.
24. Asbestos Paper wound tight.....	21.7
25. Cork strips bound on.....	14.6
26. Straw Rope wound spirally.....	18.
27. Loose Rice Chaff.....	18.7
28. Paste of Fossil Meal with Hair.....	16.7
29. Paste of Fossil Meal with Asbestos.....	22.
30. Loose Bituminous Coal Ashes.....	21.
31. Loose Anthracite Coal Ashes.....	27.
32. Paste of Clay and Vegetable Fibre.....	30.9

"Later experiments, not yet published, have given results for still air which differ little from those of Nos. 3, 4, and 6. In fact, the bulk of matter in the best non-conductors is relatively too small to have any specific effect, except to entrap the air and keep it stagnant. These substances keep the air still by virtue of the roughness of their fibres or particles. The asbestos No. 18, had smooth fibres, which could not prevent the air from moving about. Later trials with an asbestos of exceedingly fine fibre have made a somewhat better showing, but asbestos is really one of the poorest non-conductors.

By reason of its fibrous character it may be used advantageously to hold together other incombustible substances, but the less the better. We have made trials of two samples of a "magnesia covering" consisting of carbonate of magnesia with a small percentage of good asbestos fibre. One transmitted heat which, reduced to the terms of the first of the above tables, would amount to 15 pounds: the denser one gave 20 pounds. The former contained 250 thousandths of solid matter; the latter 396 thousandths.

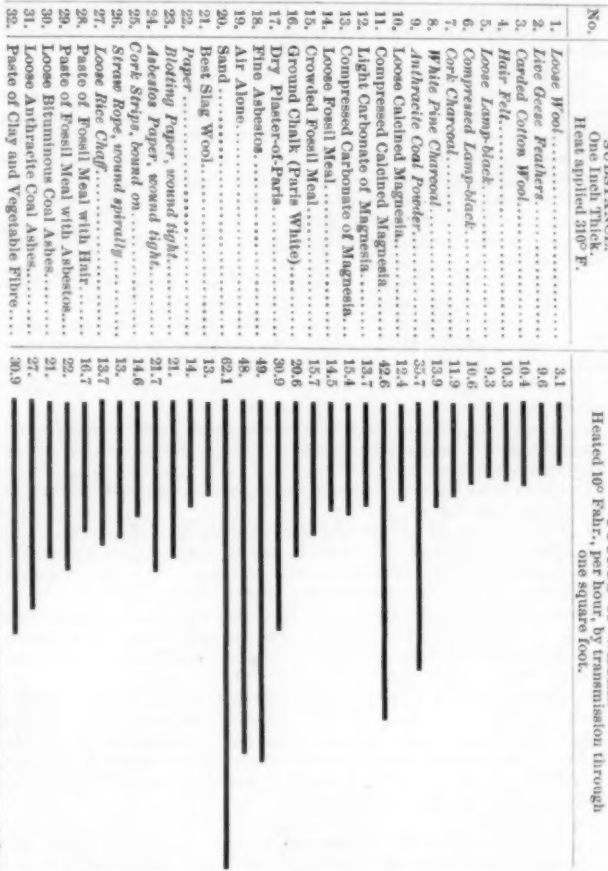
"Charcoal, lamp-black, and anthracite coal are virtually the same substance, and Nos. 5, 6, 7, 8, and 9 show that non-conducting power is determined far less by the substance itself than by its mechanical texture. In some cases when a greater quantity of a material is crowded into the same thickness the non-conducting virtue is somewhat increased, because the included air is thereby rendered more completely fixed. But if the same quantity is compressed so as to diminish its thickness, its efficiency is lessened; for the resistance to the transmission of heat is nearly—though by no means exactly—in proportion to the thickness of the non-conductor. Hence, though a great many layers of paper, as in No. 23,—prove to be a tolerably good retainer of heat, one or two layers are of exceedingly little service. Any suitable substance which is used to prevent the escape of steam heat should not be less than one inch thick.

"Any covering should be kept perfectly dry, for not only is water a good carrier of heat, but it has been found in our trials that still water conducts heat about eight times as rapidly as still air."

Respectfully submitted,
EDWARD ATKINSON, President.

Boston, December, 1889.

RELATIVE EFFICIENCY OF MATERIALS WHICH PREVENT THE WASTE OF HEAT IN GREATER OR LESS DEGREE.



The loss is indicated by the length of the lines. Incombustible material designated in roman type; material which may be ignited or slowly carbonized indicated in italics.



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

OSBORN HALL FOR YALE COLLEGE, NEW HAVEN, CONN. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print issued only with the International and Imperial Editions.]

The main fabric of this building is of Stony Creek granite, the

shafts of the columns being polished. Relief is gained by using Long Meadow sandstone for bases, capitals, string-courses, copings, etc.

SUCCESSFUL DESIGN FOR THE AMERICAN ARCHITECT TRAVELLING-SCHOLARSHIP, [1889-90.] BY MR. THEODORE F. LAIST, CINCINNATI, O.

It has seemed to us best to defer till the present time the publication of the design which secured for its author the honor of being the first holder of the *American Architect* Travelling-Scholarship. The design was prepared in conformity with the following programme:

American Architect Travelling-Scholarship Examination.—Third Paper.—Architectural Design.—A Mansion for the President of the United States.

THIS building is to take the place of the present White House, and \$1,250,000 have been fixed as the limit of cost. The building is to provide accommodations for three separate uses:

1. A dwelling-place for the President and his family, containing all the appointments of a private dwelling of the first order and adapted to a family of the ordinary size; who, however, are given to entertaining a constant succession of family friends. This portion of the building must be so arranged that the President's family and his private friends need not be brought into contact with public and official visitors.

2. A second portion of the building must provide a series of apartments suited to the transaction of the President's official business, and must contain the offices of the President, and his private secretaries, clerks, and stenographers. A room for cabinet meetings, reception-rooms, ante-rooms, committee-rooms, toilet-rooms, telegraph-office, etc.

3. A third portion of the building must contain a series of apartments suitable in their design and arrangement to befit the formal state ceremonies which the President's office calls on him to observe. Amongst these rooms must be a hall for state receptions and the receiving of foreign ambassadors, a banquet-hall with the complementary serving-rooms, kitchen, etc., a ball-room suitable for the more select and semi-private festivities the President may choose to indulge in; and also, toilet-rooms, ante-rooms, cloak-rooms, etc.

The area which may be covered by the building does not exceed 80,000 square feet.

REQUIREMENTS: For the preliminary sketch there is required a ground plan, section and elevation to the scale of $1/32'' = 1'$.

For the preparation of this sketch twelve consecutive working hours will be allowed, at the end of which time the sketches must be at once mailed to the *American Architect*, the competitor retaining in his own possession tracings of both plan and elevation as a basis for studying and executing his design at a larger scale.

For the preparation of the final drawings which are to be executed at a scale of $1/8'' = 1'$, the competitor will be allowed to use all or any portion of three weeks' time.

The plan is to be neatly drawn in ink, blacked-in, and the rooms figured and lettered.

The elevation is to be inked-in and rendered with the brush.

A side elevation must be shown in pencil outline, and the section also may be left in pencil with colored sections. The side elevation and the section may be rendered at a scale of $1/16'' = 1'$.

INSTRUCTIONS: The preliminary sketches are to be such merely as will clearly exhibit what is to be the general scheme of arrangement of the plan and the general style of the design which the competitor intends to develop.

In working out his idea the competitor is at liberty to modify, condense, expand in any way, or vary the indicated proportions of his sketch, but he may not actually suppress anything shown in his sketch. The general scheme shown in his sketch must be still the general scheme of the finished drawings and the dominant feature of his design must be kept to the end.

On a scale of 10:

Planning will count	4.
Design will count	3.
Drawing will count	1.
Brush work will count	1.
Constructive possibility will count	1.

Saturday, June 8, 1889.

THE MAIN UNIVERSITY BUILDING, STRASBOURG, ALSACE.

For description see the communication of the *American Architect* Travelling Scholar elsewhere in this issue.

BLOCK OF HOUSES FOR E. K. GREENE, ESQ., KEARNEY, NEB. MESSRS. FRANK, BAILEY & FARMER, ARCHITECTS, KEARNEY, NEB.

THE HOUSE OF MR. A. H. STEM, ARCHITECT, MINNETONKA BEACH, MINN.

[Additional Illustrations in the International Edition.]

FACADE OF THE OLD ECOLE DE MEDICINE, PARIS, FRANCE. [Gelatine Print.]

PORTICO ON THE COURT-YARD OF THE ECOLE DE MEDICINE, PARIS, FRANCE. [Gelatine Print.]

HOUSE IN THE RAUCHSTRASSE, BERLIN, GERMANY. HERREN, KAISER & GROSSHEIM, ARCHITECTS. [Gelatine Print.]

THE GRAND HOTEL, VIENNA, AUSTRIA. HERR CARL TIETZ, ARCHITECT. [Gelatine Print.]

"WINTER": FROM THE PAINTING BY NICOLAS LANCRET.

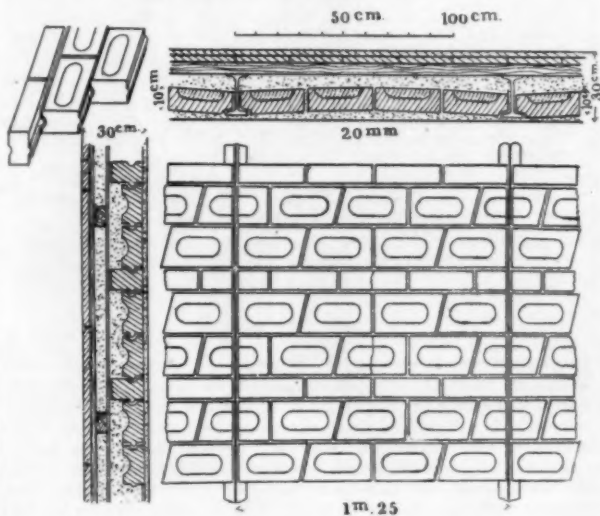
HOUSE, FERNDALE, TUNBRIDGE WELLS, ENG. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG.—THE ENTRANCE FRONT. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG.—THE GARDEN FRONT. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG.—THE TERRACE. THE LATE GEORGE DEVEY, ARCHITECT.

THE SCHNEIDER FIREPROOF FLOOR.



MR. EDWARD SCHNEIDER, City Architect of Vienna, has invented and thoroughly tested a novel floor, which can be easily understood from the accompanying drawings. He employs the usual iron floor-beams, but fills the intervening spaces with a very flat arch of tongued brick. For a span of 6.56 feet, the rise of the arch is only 1.25 inches. Repeated experiments show that these arches break at the crown before the tongues give way. The Vienna laws require floors to be tested with 400 kilogrammes per square metre, equivalent to 81.925 pounds per square foot. The official reports of the tests show no sinking whatever of the crown under this load. By this method of construction, it is claimed that the thickness of floors is considerably reduced. The bricks weigh about forty-two pounds per square foot, single layer, and cost, in Vienna, fourteen cents per square foot. They have been largely used, and give very satisfactory results.



ARCHITECT AND OWNER—RIGHT OF DISMISSAL.

DETROIT, MICH.

Question. 1. I wish to obtain your opinion and advice in relation to the duties of a local superintendent or clerk-of-works. Can he be dismissed by the superintending architect for failure to conform to instructions or to carry out plans and specifications when said

clerk was appointed by a building-committee, consisting of five members of which he is one, the other four being county supervisors, and the work in question a county building? Will it require a majority of the committee to dismiss said clerk?

2. Further can said committee discharge the architect and terminate his contract for the purpose of saving the payment of his fees?

3. Can they be held responsible for full services in same manner as if the building were completed by the architect?

4. Should the building prove a failure and a damage to the architect's reputation through their neglect, could the committee or owners be held responsible for said damages? Is there any law or custom applicable to such cases?

An expression in relation to the above from the *American Architect*, would I think interest many of its Western subscribers.

Yours truly, APPRECIATIVE READER.

Answer. 1. Only the committee can dismiss him unless they have previously given the architect authority to do so, but architects almost always ask for, and have, this authority.

2. Certainly the committee cannot discharge the architect and terminate his contract "for the purpose of saving the payment of his fees." But on the other hand, of course, they would never admit that they were doing anything of the kind; some other and more plausible excuse would be alleged.

3. The dismissal of an architect without cause is a breach of contract, and the measure of damages would certainly be figured at the usual commission on the amount of work actually done. Whether the architect could collect further damages to the extent of the entire loss of the profit which he would have made out of the transaction in case the agreement had been carried out on both sides, depends in the first place upon what kind of an agreement he could prove had been entered into by the parties, and secondly, upon the general and still undecided question of whether the contract of an architect is to be assimilated to mercantile undertakings. The question has been discussed before in these columns. The general drift of legal opinion is to the effect that the contract of the architect is purely a business undertaking. In that view of the case he would be entitled to collect the entire amount of net profit which he could show would have accrued to him from the enterprise if completed according to agreement. This would not, however, mean his "full services" if by that is to be understood five per cent, but would be got at by deducting from the full fee of five per cent, the expenses that the architect would be put to in the way of draughtsmen, etc., in earning it. This view has the sanction of decisions.

4. There is no ground, in our law at least, on which an owner or building-committee can be held responsible for damages to an architect's reputation through violating his opinion and deviating from his plans. In France, where they manage things differently if not better, there is some reason for thinking that an action of the nature indicated would lie; but certainly none could be maintained under the English common law.



[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.]

DUTIES OF A CLERK-OF-THE-WORKS.

ASBURY PARK, N. J., February 17, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,—Reading the article in your issue of February 15, headed "The Clerk-of-the-Works," leads me to ask the question: What are the requirements to fit a man for the position of clerk-of-the-works? As it is generally on very large buildings only that a clerk-of-the-works is employed, there are only a few architects, comparatively, that have anything to do with a clerk-of-the-works, and I think it would be interesting to the bulk of the profession if you would define his duties.

Yours very truly,

J. W. ROBERTS.

[CLERKS-OF-WORKS are usually young architects, recommended for the position by the architect of the building, but there are many professional clerks-of-works, who prefer to devote themselves entirely to that sort of service, and have no other career in view. The duty of a clerk-of-works is to try to detect mistakes or misconduct, if any, on the part of the contractors or workmen, and, in general, to guard the interests of the owner in details which are out of the architect's province, looking out for day-work, keeping a record of progress, and so on.—EDS. AMERICAN ARCHITECT.]

THE UNDERSTANDING BETWEEN ARCHITECT AND CLIENT.

CHICAGO, ILL.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,—I notice in your issue of December 28, a case which was decided against an architect who seems unwittingly to have guaranteed the cost of a building before the builders' estimates were

received. I find in my own practice that it is best to meet the matter at the start, and for the benefit of those who are not afraid of "losing the job" by taking a firm stand, I would say that I find the enclosed form of "Client's letter" to cover most cases.

Very truly yours,

WILLIAM W. CLAY.

CLIENT'S LETTER.

Chicago, ——— 188 .

Dear Sir:—To avoid misunderstandings that sometimes arise between client and architect in regard to compensation in case the client should not proceed with work after drawings are made, either in consequence of an excess in cost or from other causes over which the architect has no control, and because it is impossible to ascertain the cost of any work except by judgment until the plans and specifications have been completed and a basis thereby made for the accurate determination of the cost, I feel that it is but justice to myself and my clients to inform them at the beginning that while I shall earnestly endeavor to secure for them the best result for the least amount of money, I shall expect a reasonable compensation whether the work proceeds or not.

In case the work does not proceed upon the basis of the drawings made, the compensation charged will be two and one-half per cent upon the approximate estimate the same being due when the bids are opened or the decision not to proceed rendered. Should the work progress, three per cent will be due upon the actual estimates furnished, and bills will be rendered not more frequently than once a month during the progress of the work for five per cent upon the expenditure to date less the previous payments. The total compensation being five per cent for full professional services upon the entire cost of the work including the cost of everything necessary to its occupancy for the purposes intended whether contracted or purchased through the architect or by the owner individually; and an additional charge of five per cent will be made for any special designs, as for mantels, stationary furniture, decorations, etc.

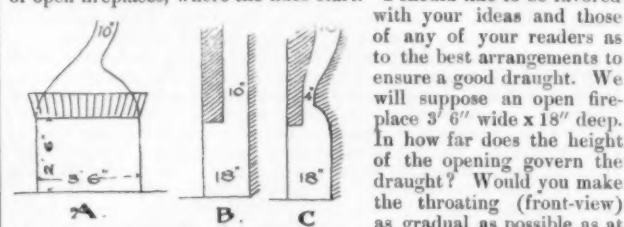
The approximate cost of the work proposed by you is agreed to be \$ ———

Respectfully yours,

THE OPEN FIREPLACE THROAT.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—There are different views as to the best construction of open fireplaces, where the flues start. I should like to be favored with your ideas and those of any of your readers as to the best arrangements to ensure a good draught. We will suppose an open fireplace 3' 6" wide x 18" deep.



In how far does the height of the opening govern the draught? Would you make the throat (front-view) as gradual as possible as at A and full width of flue (there will be 10" diameter of flue-linings) as at B or do you approve of making a long narrow opening to flue by inclining the back forward as at "C." Your comments will be much appreciated.

Respectfully, "SMOKY FIREPLACE."

[Neither of these sections shows a good fireplace. Eighteen inches is hardly deep enough for a fireplace 3' 6" wide: we should make it 20" at least, for the reason that, with such a very wide opening, there is danger that currents of cold air will rush in at the sides of the fireplace, at times when there is only a small fire burning in the middle of it, and rebounding again, bring smoke with them into the room, unless the depth is great enough to allow the column of smoke to move backward and forward without escaping. For the same reason, the height of the opening should not exceed two and one-half feet, as, if it is higher than this, the smoke from coal in a grate, or wood on andirons, will puff out before it can rise high enough to come within the influence of the draught of the chimney. For such a fireplace as is described, moreover, a 10-inch flue-lining is much too small. "Smoky Fireplace" does not say whether he intends a square or round one, but neither would be large enough. The safest way is to make the flue, if nearly straight, equal in sectional area to not less than one-eighth the area of the fireplace opening, and even this is too small if the flue is crooked, or unless it is either lined or smoothly plastered inside. The throat should be drawn in more gradually in elevation than is shown in sketch A. The greater the height that can be given the taper, the better the fireplace will be. In section, both B and C would be bad. A fireplace like B would smoke at all times, as every puff of smoke that happened to come out a little beyond the others would strike on the underside of the opening, and be conducted into the room; while C would smoke whenever a down-draught occurred, which is sure to happen more or less frequently, according to circumstances of proximity of higher buildings, hills or trees. The proper section is like this: The throat should be only two inches wide, to confine the hot gases, and prevent cold air from rushing up the chimney with them; and it should be at least six inches above the top of the fireplace opening. Moreover, there should be a flat shelf behind the throat. Then, in case of down-draught, the current will strike the shelf, and rebound upward, instead of being simply deflected forward into the room.—EDS. AMERICAN ARCHITECT.]



HAY FUEL.—A gentleman who has recently been travelling in Nebraska writes. "I recall, with many pleasant memories, our hunting trips to the great plains in pursuit of the buffalo, elk, deer and antelope.

Do you remember, as the sun sank to rest each night, how we, in the absence of wood, quickly gathered, in the twilight, our stock of unromantic buffalo chips, and how these same despised chips afforded us light, warmth, and the wherewithal to cook our meals? Verily the buffalo and the chip have about vanished from the face of the earth for ever; but, at the town of Pender, Nebraska, these pleasant trips were recalled, by seeing our old friends, the buffalo chips, in an embryonic form as it were, used as fuel. In plain English, the firm of W. B. Warrington & Company was operating a flour-mill at this point, using an 8 1-2 x 8 (35-horse-power) Westinghouse automatic engine to drive the mill, and their fuel was hay. The whole plant was a surprise to me, as I did not before realize that flour could be made profitably on so small a scale, the engine's capacity being about 35 horse-power! Mr. Warrington informed me that coal cost six dollars per ton at Pender, and that his little Westinghouse engine was making forty barrels of flour on 1,800 pounds of hay, costing two dollars per ton. He stated that he also at times used cobs, straw, etc., for fuel, but never coal. It will be noted that this firm makes a barrel of flour on 4.5 cents' worth of fuel, which is not a bad record for any 35 horse-power engine. Mr. Warrington, on being asked to substitute another engine, said, 'My Westinghouse suits me first rate.' — *Invention*.

LAND VALUES IN MILWAUKEE.—Ex-Governor Ludington owns the lot on the northwest corner of East Water and Wisconsin Streets. It has a frontage of sixty feet on East Water Street, and a side front of 143 feet on Wisconsin Street. On this lot stands a building, the value of which, on account of its age, is estimated not to exceed \$20,000. An east side capitalist offered Governor Ludington \$200,000 cash for this corner. The Governor has been considering this offer for two weeks past, in his winter home at Thomasville, Ga., and concluded not to accept it, as he deemed the price insufficient. The person who made the proffer intended to erect a two-hundred-and-fifty-thousand-dollar building on the lot, in which was to be included a superb banking-house. The offer for the land is virtually \$3,000 per foot front, the highest price offered for land in Milwaukee since the foundation of the city, and \$1,000 more per foot than has been offered for any site on the west side. The Ludington corner is a most desirable one, but many think no better than some other corners in our city. Fifty-five years ago a lot for which is now offered \$180,000 sold for \$5,000. As the lot has always brought at least twelve per cent net per annum on the original investment, including the cost of improvements, some will remark that owning a wisely-selected corner-lot in the city of Milwaukee is about as good as owning a California gold mine. — *The Milwaukee Wisconsin*.

THE TEST OF THE FORTH BRIDGE.—The Forth Bridge was tested January 21. The official report is as follows: "Sir John Fowler and Mr. Baker, engineers of the Forth Bridge, have to-day tested the two 1,700 feet spans by placing on the centres two trains, each made up of fifty loaded coal wagons and three of the heaviest engines and tenders, the total load thus massed upon the span being the enormous weight of 1,800 tons, which is more than double what the bridge will ever be called upon in practice to sustain. The observed deflections were in exact accordance with the calculations of the engineers, and the bridge exhibited exceptional stiffness in all directions." The *London Railway News* says the trains were each arranged with two engines in front and one in rear, the length of train being about 1,000 feet. As the north and south cantilevers measure each above 1,500 feet over all, and the Inchgarvie cantilever is 115 feet longer, the trains, when centred on the piers, filled up about two-thirds of their length. When the head engines reached the end of the central or suspended girder, the tail engines had left the centre of the cantilever, the entire weight being thus thrown upon the arm and centre girder. The load put on the bridge was more than double what will ever be upon it in practical use, but it indicates the vastness of the structure to learn that even this exceptional load only amounted to 10 per cent of the gross weight of each cantilever, and about 3 per cent of of the entire bridge. In regard to wind-pressure, it is stated that during a recent heavy gale, when the wind-gauges on Inchgarvie recorded a pressure of thirty-seven pounds per square foot, the maximum lateral movement of the centre cantilever was less than one inch. The bridge is to be formally opened by the Prince of Wales on March 4. — *Engineering News*.

ITALIAN PIRATING OF SCULPTURE.—"Sculptors are greatly annoyed," says the Paris correspondent of the *London Daily Telegraph*, "at the Italian pirates who have been imitating their best works and inundating France, England, and the United States with terra-cotta reproductions of some of the best examples of French statuary art. The visits made by the police to the work-shops of the Trans-Alpine contrabandists have led to some remarkable revelations respecting the ways and means of the 'sculpture pirates.' At the house of one Gasparini, a moulder of Montreuil, there were found eight imitations of Falguière's 'Diana.' Another moulder named Gonella was equally active in audacious piratic operations, but the palm will be accorded to a person called Giacometti, who has realized a considerable fortune by his artistic piracies. Giacometti kept a large establishment on the banks of the river, and made a specialty of reproductions from the Museum of the Luxembourg, which were copied for him by two young sculptors."

SANDY FOUNDATIONS.—A process of preparing foundations has been patented by F. Neukirch, of Bremen. Its object is to make loose sand firm and resisting as solid rock. At present the universal method of doing this work, if under water, is to remove all loose material and then make a beton or other similar sub-structure. The process under consideration, which is only of use where the materials are fairly clean siliceous or calcareous sand, aims at consolidating the grains by covering them with a film of cement, which is forced into the spaces between the particles by compressed air, steam, or water under pressure. Sheet piles are employed to prevent the spreading of the cement over more ground than is necessary. The system has been largely used in the harbor of

Bremen, and is to be tried in preparing dry foundations. — *The Architect*.

THE EXPLORATIONS IN MESOPOTAMIA.—The Americans who are exploring and excavating in Mesopotamia have every reason so far to be satisfied with the results. At Niffer, the Nipur of the ancients, they have laid bare the temple of Bel—a very fine one—and have found inscribed tablets which date back to about 3750 B. C.; and at Ur, in the great temple library, they have discovered many inscribed tablets, cylinders and bricks of first-rate religious and historical importance. — *New York Evening Post*.

A HOTEL AT THE PYRAMIDS.—In Egypt, at the Pyramids of Gizeh, where a hotel has just been built, the temperature for February varies from 49 degrees to 65 degrees in the shade, the average for the month being 57 degrees, and the lowest bedroom temperature without a fire never being below 55 degrees. The humidity is only 60 per cent, and rain and fog are almost unknown. — *New York Evening Post*.

GLASS-LINED TUBES FOR UNDERGROUND WIRE.—Parties have been experimenting for several months at the Pendleton, Ind., gas works, in order to perfect a method of constructing glass tubing or tubes for use of underground wires. On the strength of results a company has been formed representing a capital of \$500,000. — *Sanitary News*.

A PAPER HOTEL.—The experiment of constructing a large building chiefly of paper has been successfully made at Hamburg, where an immense hotel, with its façade and other important parts composed of that material, has been erected. It is claimed that the building is absolutely fireproof and also impervious to the action of the elements which render brick, stone or wood unsightly or unsafe under prolonged exposure. — *Nashville American*.

BERYL OR FLUID MARBLE.—The Austrian sculptor, Friedrich Beer, in Paris, has discovered a process for making marble fluid and moulding it as bronze is moulded. The name of the marble thus treated is beryl. The new product costs little more than plaster and is especially well adapted to the ornamentation of houses and the construction of floors, baths and small pillars. A stock company has been organized in Paris to place beryl on the market. — *Boston Transcript*.

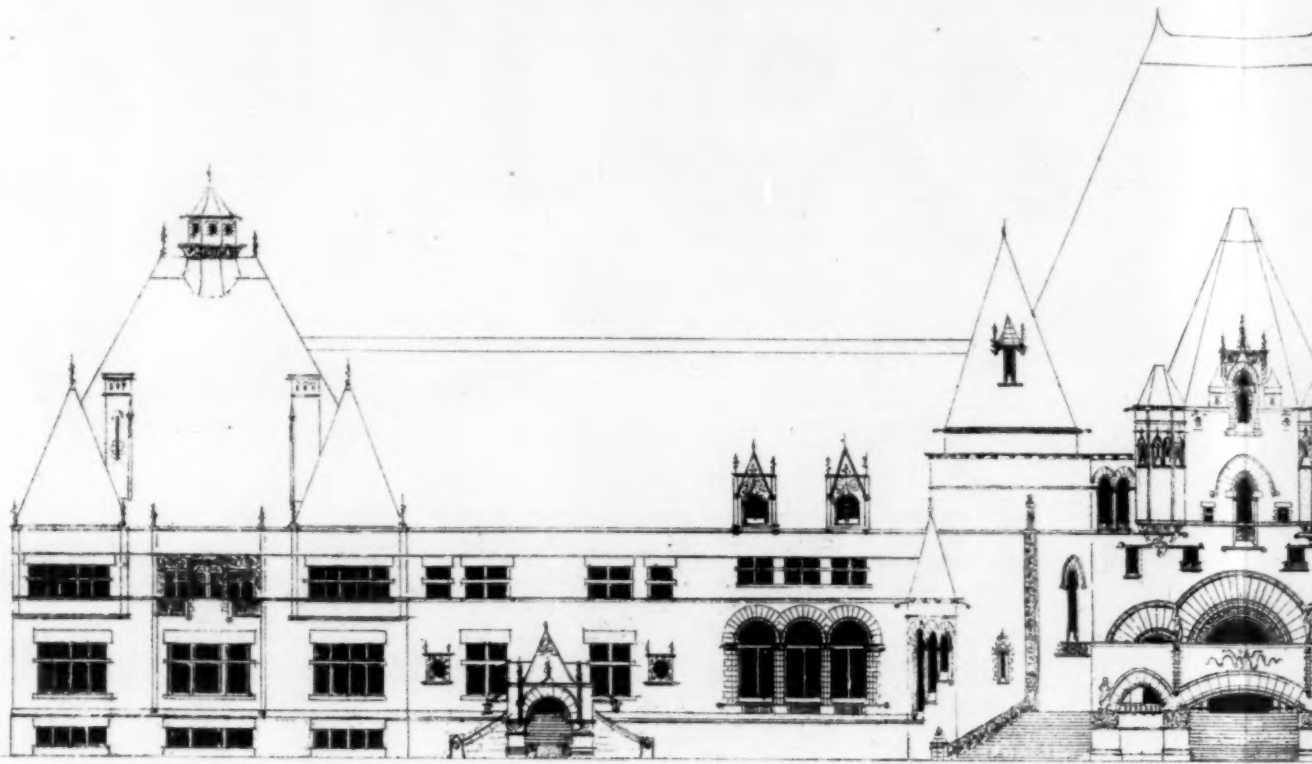
TRADE SURVEYS

THE salient features of the leading markets during the past few days, indicate that there is a growth of the conservative feeling in business circles which began to manifest itself early in the year. Reports from all financial centres show that while there is a sufficient supply of money, there is not enough to admit of speculation. Prices in some directions are weakening, and in others, hardening. According to some authorities, there will be a reaction from present high prices to lower ones; on the other hand, it is claimed that present influences are all working in the direction of a higher range of prices than we have ever yet reached. The intelligent reader of market reports is in a quandary to know what view to take. The fact of the matter is, that the opinions of individuals, no matter how logical they may appear to be, generally rest upon mere surmise, or at best, upon very sandy foundations; there are so many things to consider; so many unexpected influences developed; so many circumstances, unforeseen by the average business man, constantly arising, that it is largely guesswork to say how things are likely to go for the next thirty days. The safer plan is, simply to gather, and as carefully as possible, digest the material available. No matter in what direction we look, we find producing interests actively at work gathering stocks and supplies and equipments for future demands. Fortunately, the great majority of these active individual and corporate managers have money enough to pay wages and buy material, and carry themselves over the waiting period. The general markets are characterized as waiting ones, and in many respects they are; but those who wait the longest, run the greatest risks. The most conservative view of the situation justifies the opinion—although it must be expressed with a good deal of diffidence—that there will be a remarkable expansion of demand during the months of March, April and May; all conditions on the surface point that way. If activity does not result, in these months, the present indications are deceptive.

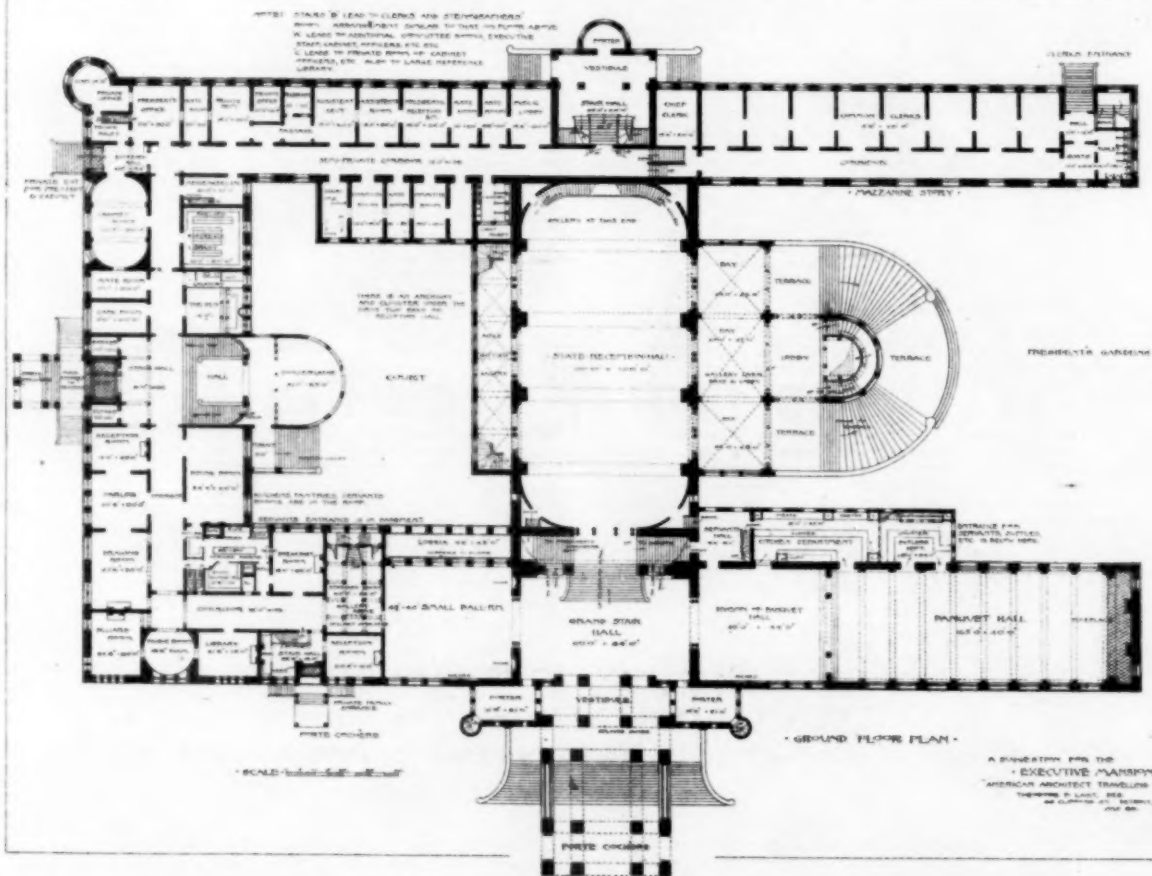
No matter what branch of industry may be taken, or channel of commerce investigated, or avenue of activity considered, the same rush of preparation, the same confidence and energy, are manifested. Even the boot and shoe manufacturers claim to be farther behind their orders than usual. The house-finishers are extraordinarily busy. It is safe to assert that there will be ten per cent more house-room constructed this year than last; it is also safe to assert that the railroad companies will do a great deal more terminal work and track-work than they did last year. All through last year a spirit of unwise, or rather, doubtful, economy ruled in railroad-building circles, but the Boards of Directors, in their meetings held during the past month or two, have directed that a new policy be entered upon, and that more liberal expenditures be made in the way of repairs, equipments and construction requirements. This stimulus has already been felt in the iron and lumber trades, as well as among those who supply equipments and supplies. In the far West, the symptoms, so far as they can be seen, are favorable. In certain quarters, the claim is made that the agricultural interests are suffering from low prices, dull markets and high freight rates. A careful examination of the facts would undoubtedly show that the agricultural interests have been too rapidly expanded, or rather, expanded out of proportion to development of other interests in those sections, as well as in other sections of the country. The miners are generally very busy outside of the anthracite coal fields. The price of coal has dropped in both Western and Eastern markets. Bituminous coal is crowding its way into the New England States, a fact which the anthracite managers are realizing. The iron trade is moderately active; summer requirements are being covered very cautiously.

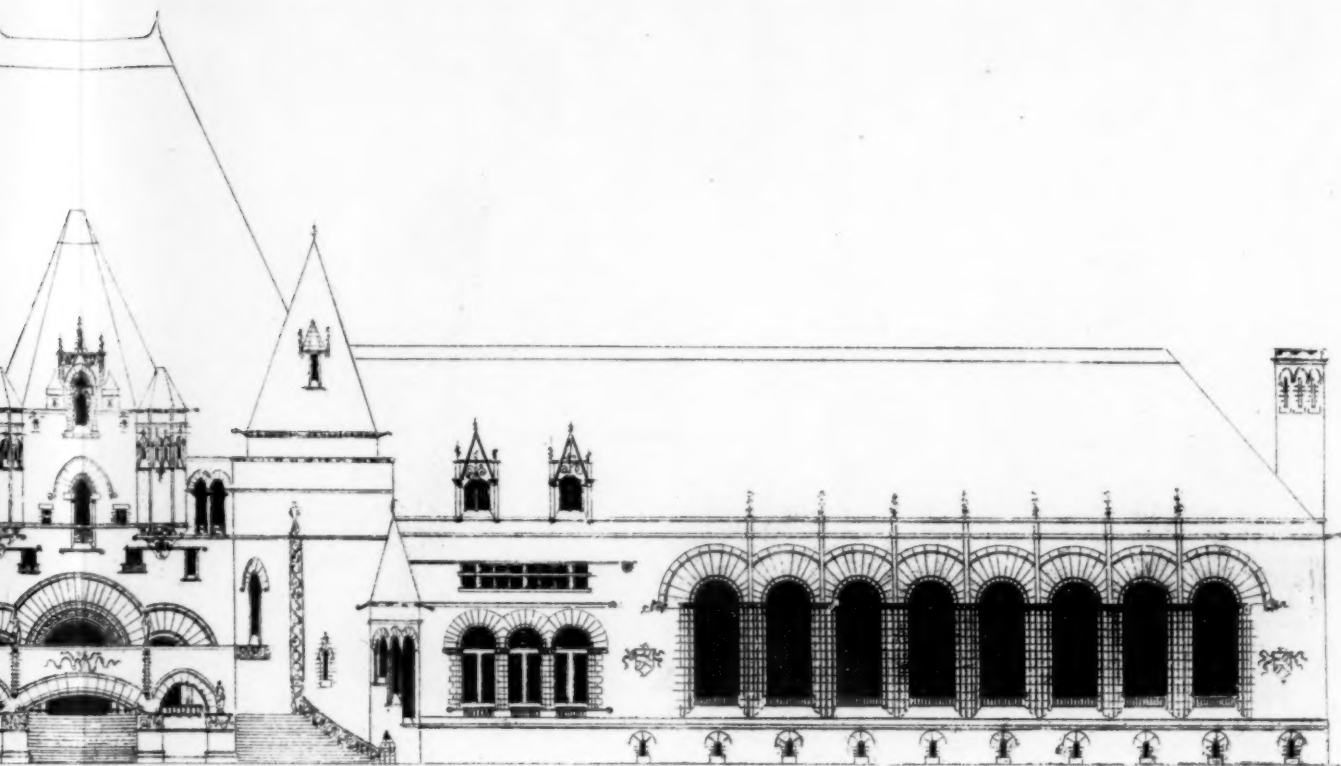
S. J. PARKHILL & Co., Printers, Boston.

The first of these is the fact that the
 I
 nterest rate is not a constant, but
 varies with the state of the
 economy. In a growing
 economy, the interest rate
 is high, and in a
 recession, it is low.
 This means that the
 value of the interest
 rate is a function of
 the state of the
 economy.



THE FRONT.





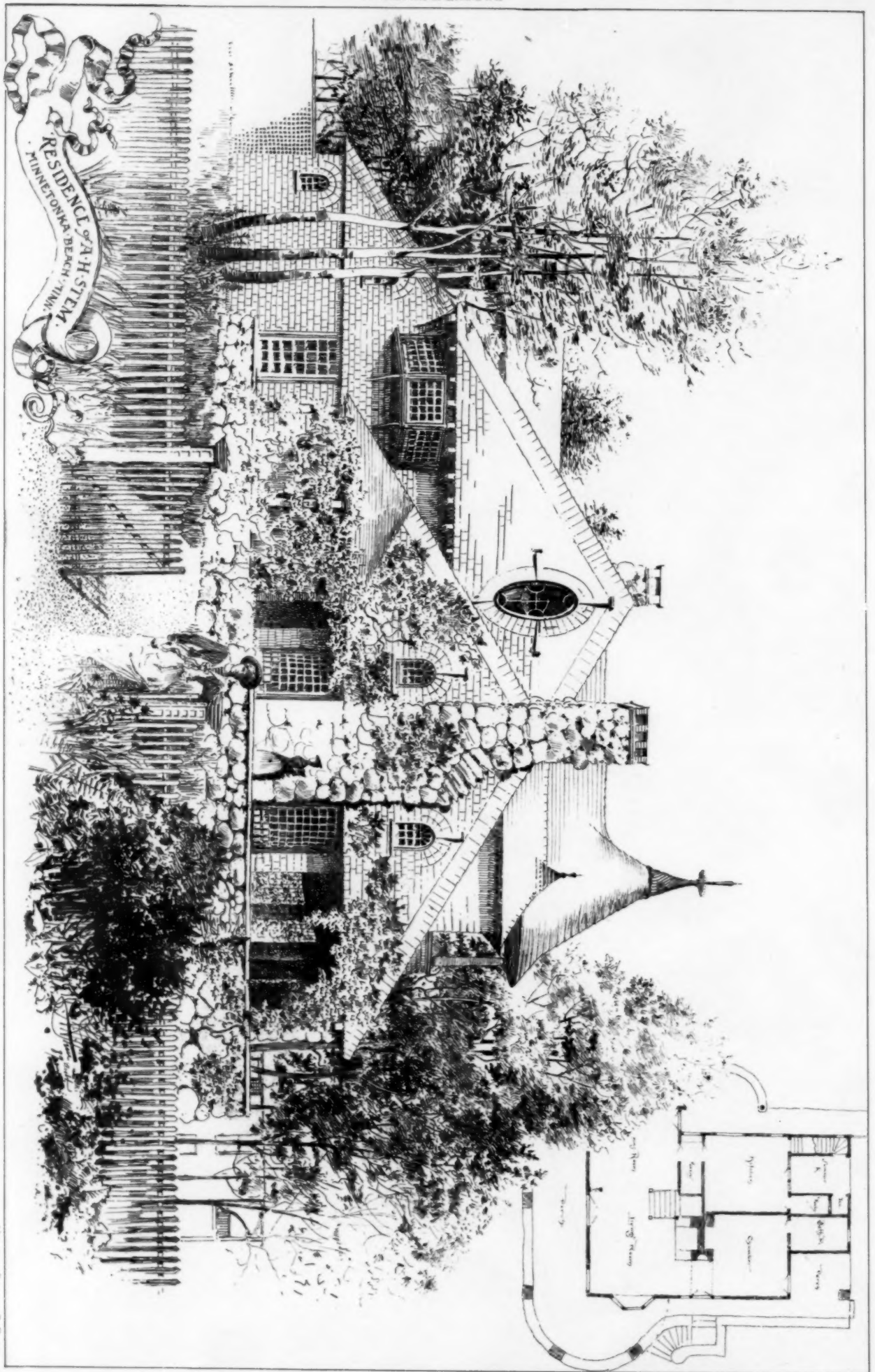
THE FRONT.

AMERICAN ARCHITECT TRAVELLING SCHOLARSHIP EXHIBITION
Theodore F. Laist, Des.
46 Central St. Boston, Mass.
July 1889.

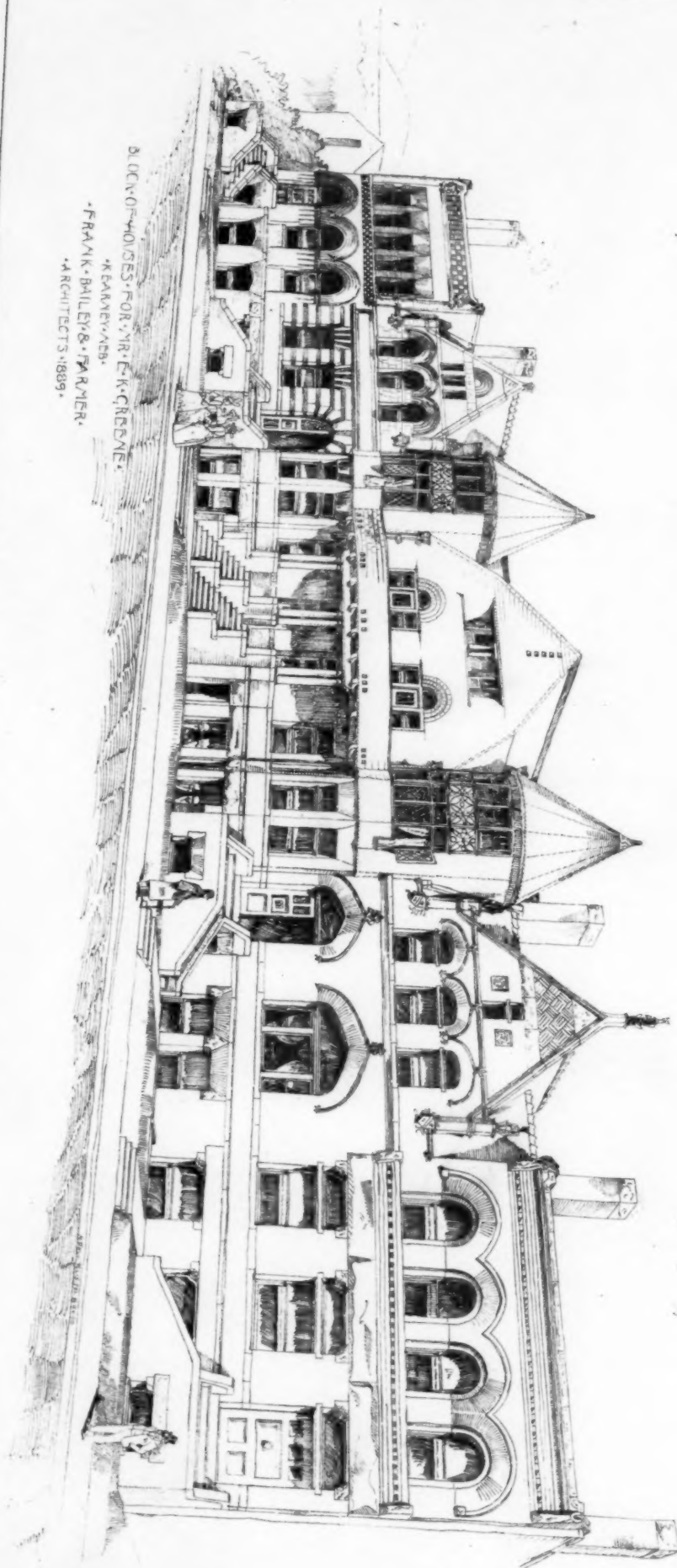


END ELEVATION.

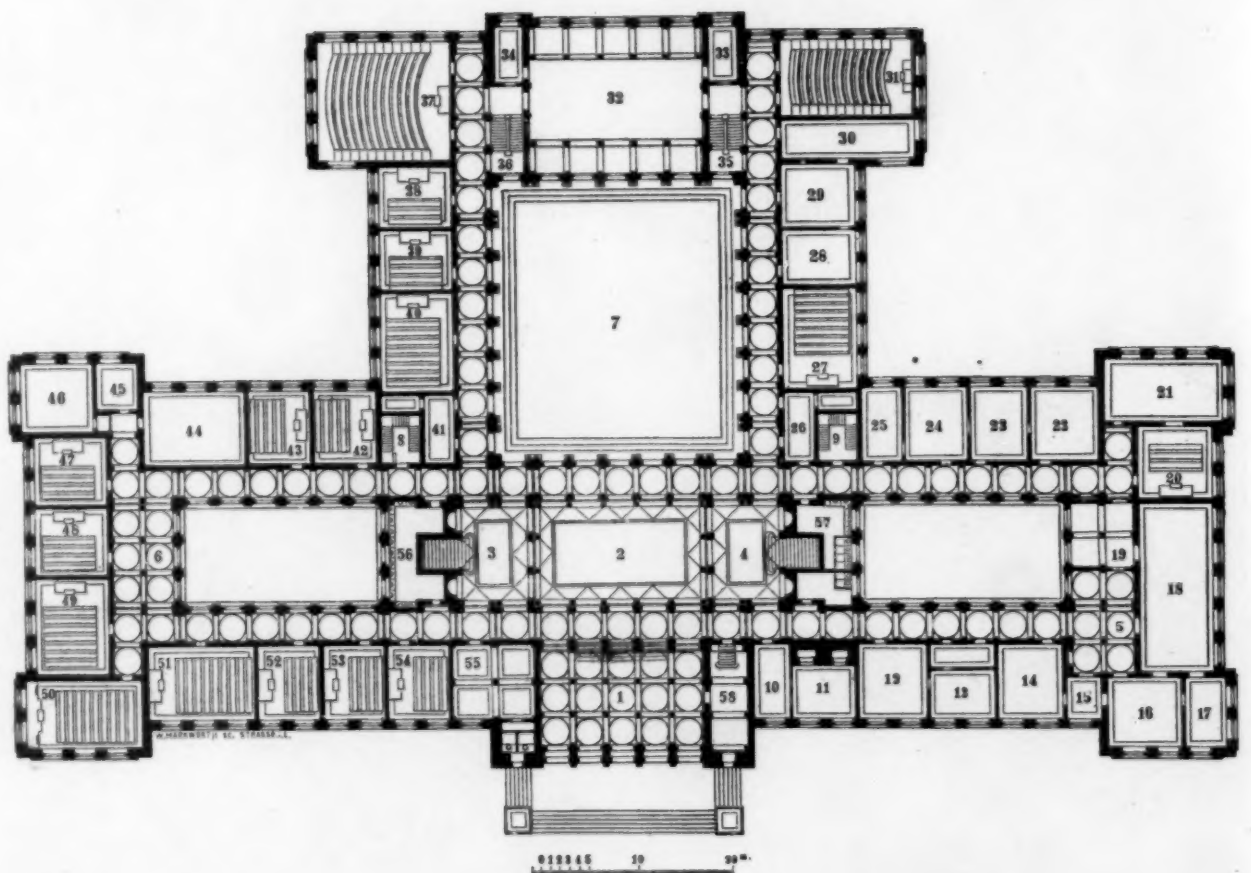
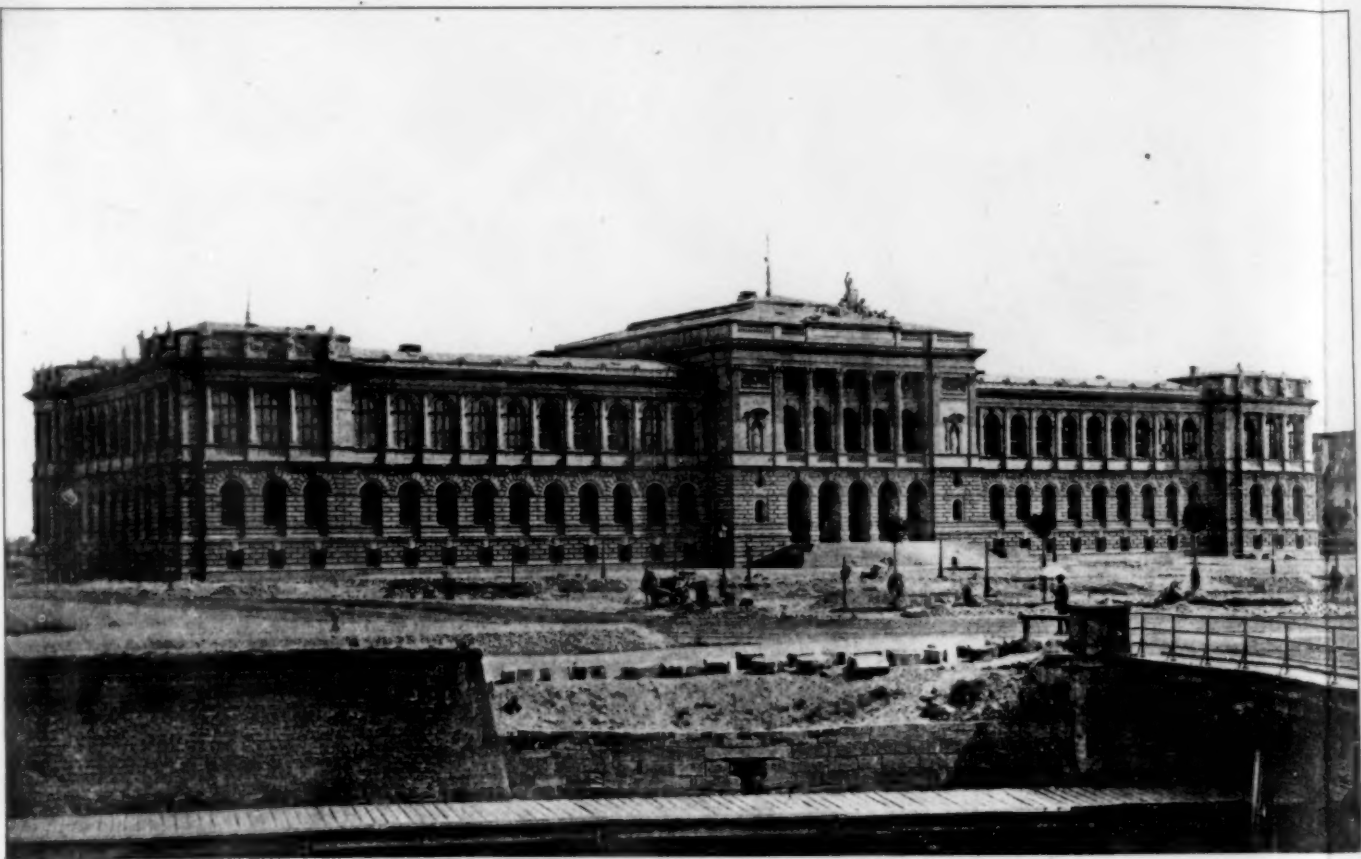
A SUGGESTION FOR THE
• EXECUTIVE MANSION •
"AMERICAN ARCHITECT TRAVELLING SCHOLARSHIP EX."
THEODORE F. LAIST, DES.



COPYRIGHT 1890 BY TUCKER & CO.

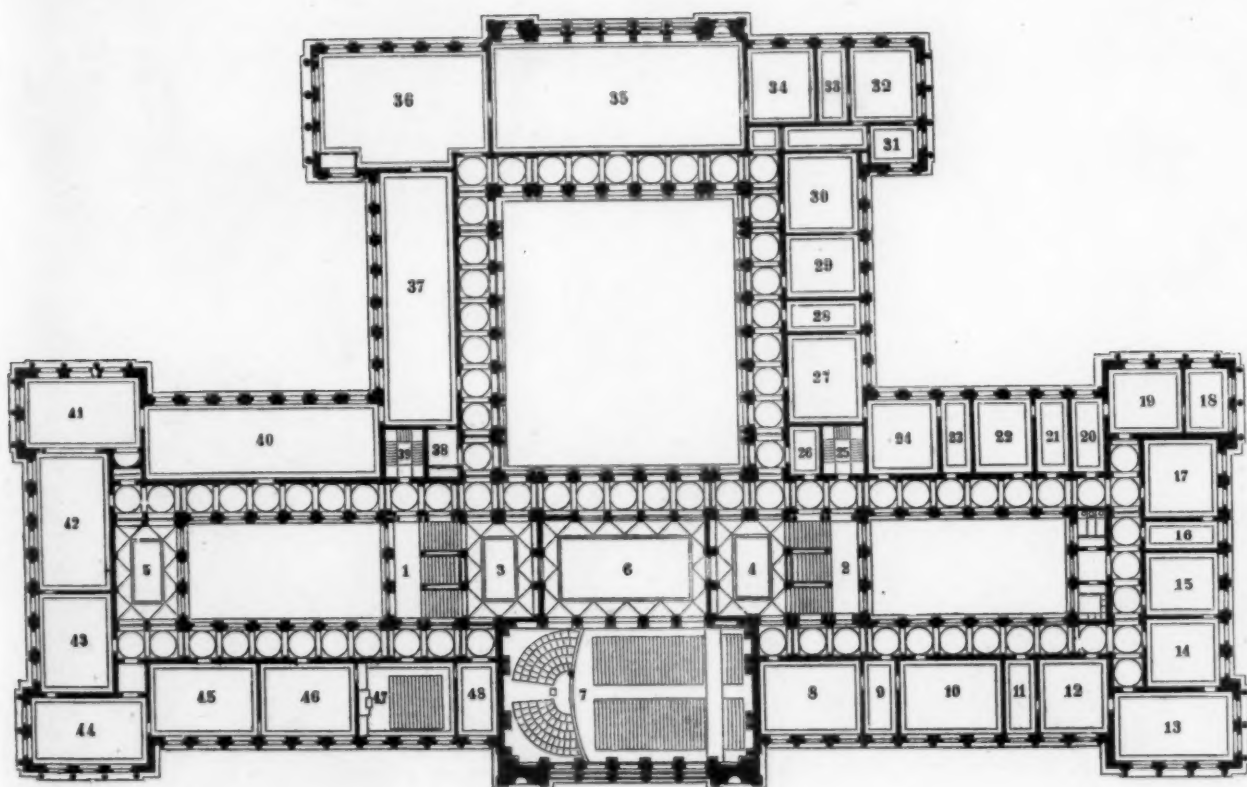
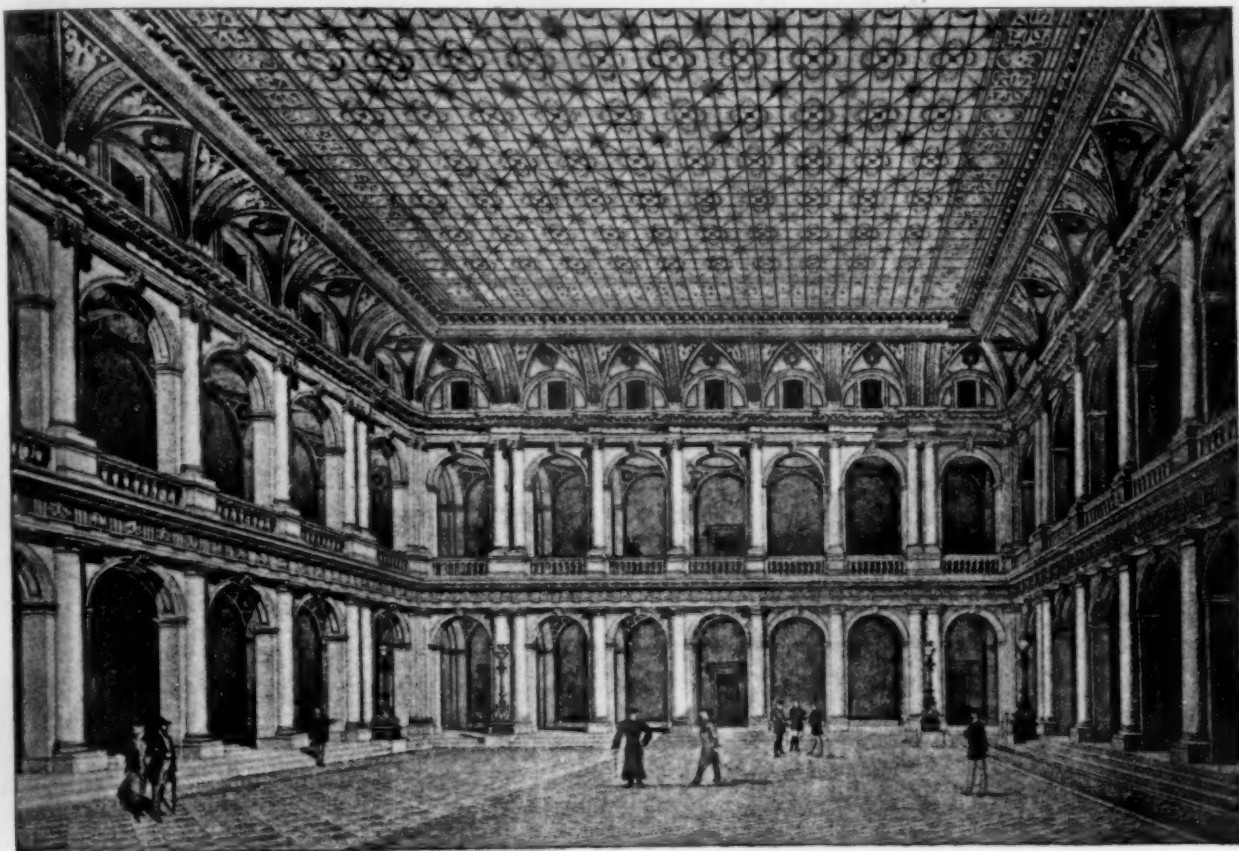


BLOCKHOUSES FOR MR. E. K. GREENE.
KARNEY & CO.
FRANK BAILEY & FARMER,
ARCHITECTS, 1889.



Plan I.

3 MAIN BUILDING OF THE UNIVERSITY



Plan II.