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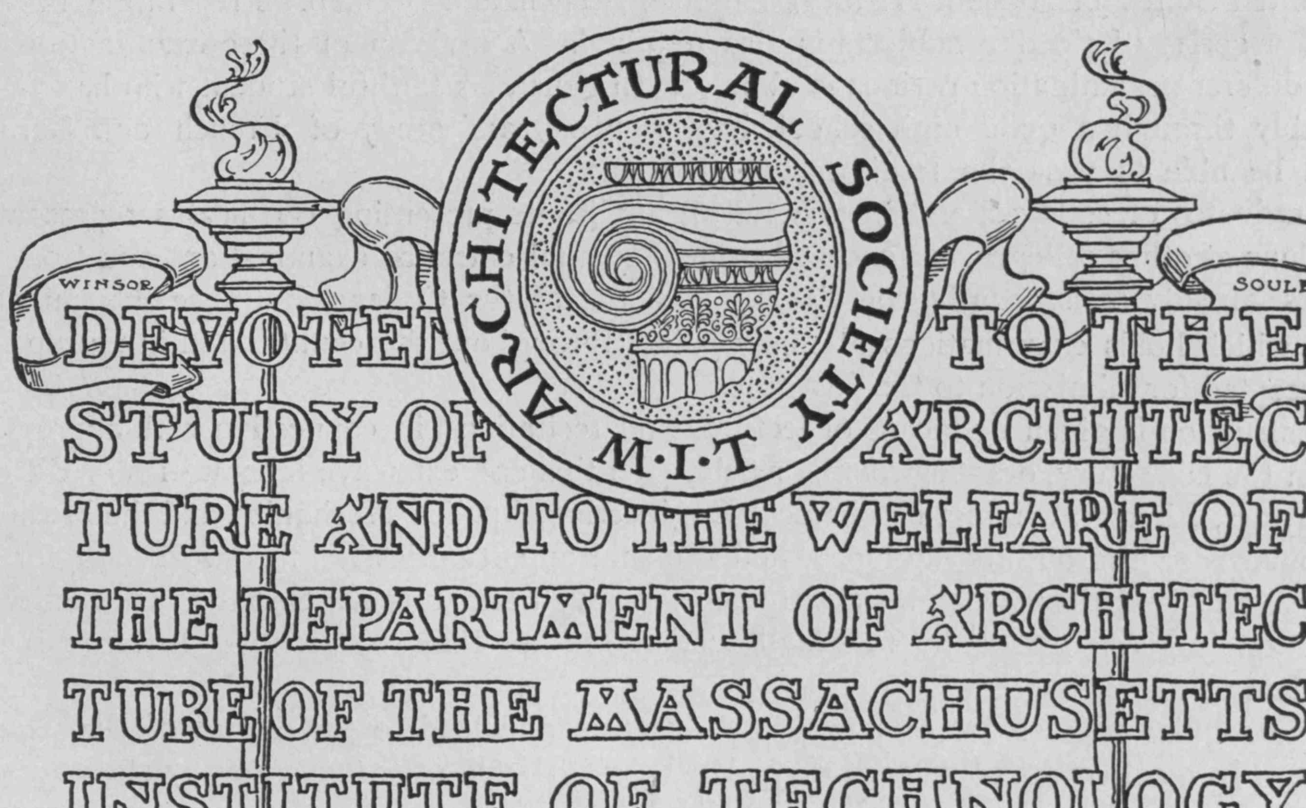
THE TECHNOLOGY ARCHITECTURAL RECORD



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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ARCHITECTURE

General Statement

The Course in Architecture. The curriculum is designed to supply the fundamental training required for the practice of architecture. The reputation of the course has been sustained by the strictest adherence to that high standard of efficiency for which the Institute is noted. The Institute recognizes that architecture is a creative art, and requires more knowledge of liberal studies and less of pure science than the profession of the engineer. This condition has been met through specially prepared courses. Full appreciation of the value of the important study of design is shown by the fact that the instructors who have it in charge are not only highly trained men, but that they have the experience which comes from an active practice of their profession.

Advantages of Situation. The school is in the heart of the city, — a great museum of architecture, — in which one is in close touch with the work of the best architects of the day. Building-operations can be watched from beginning to end. The nearness to architects in their offices is such that they show their interest in the school through constant visits. The Museum of Fine Arts is close at hand, where every opportunity is offered the student to make use of its splendid equipment. The Public Library offers the students the use of its choice architectural library without any annoying restrictions. The Art Club near at hand is an element of instruction, as well as other exhibitions of pictures and fine arts so generally opened to the public.

Equipment. The equipment of the Department consists of a gallery of drawings including original envois of the Prix de Rome, unequaled in this country; as fine a working library as can be desired, containing four thousand five hundred books, sixteen thousand photographs, fifteen thousand lantern-slides, and prints and casts of great value.

Four-Year Course. There is one regular course leading to the degree of Bachelor of Science. This course includes two options. Option I is designed for those to whom the æsthetic side of architecture makes the strongest appeal. It gives the student, however, the necessary training to control intelligently the structural problems occurring in architecture.

Architectural Engineering. Option II is designed for those to whom the structural side of architecture appeals most. At the middle of the third year students of Option II drop architectural design and its allied subjects, and substitute scientific courses, with a thorough course in structural design.

Graduate Courses. Opportunities are offered in each option for a further year of advanced professional work leading to the degree of Master of Science to graduates of the Institute, and to others who have had a training substantially equivalent to that given in the undergraduate course. The value of this graduate work cannot be overestimated. The good results obtained through a year's uninterrupted study of subjects essential to the highest professional success, and for which the previous four years' training has now prepared the student, are in extraordinary evidence. Perhaps the most convincing proof of the increased value of the student due to his year of advanced study is the fact that the practising architect invariably seeks first in the graduate class for his assistants.

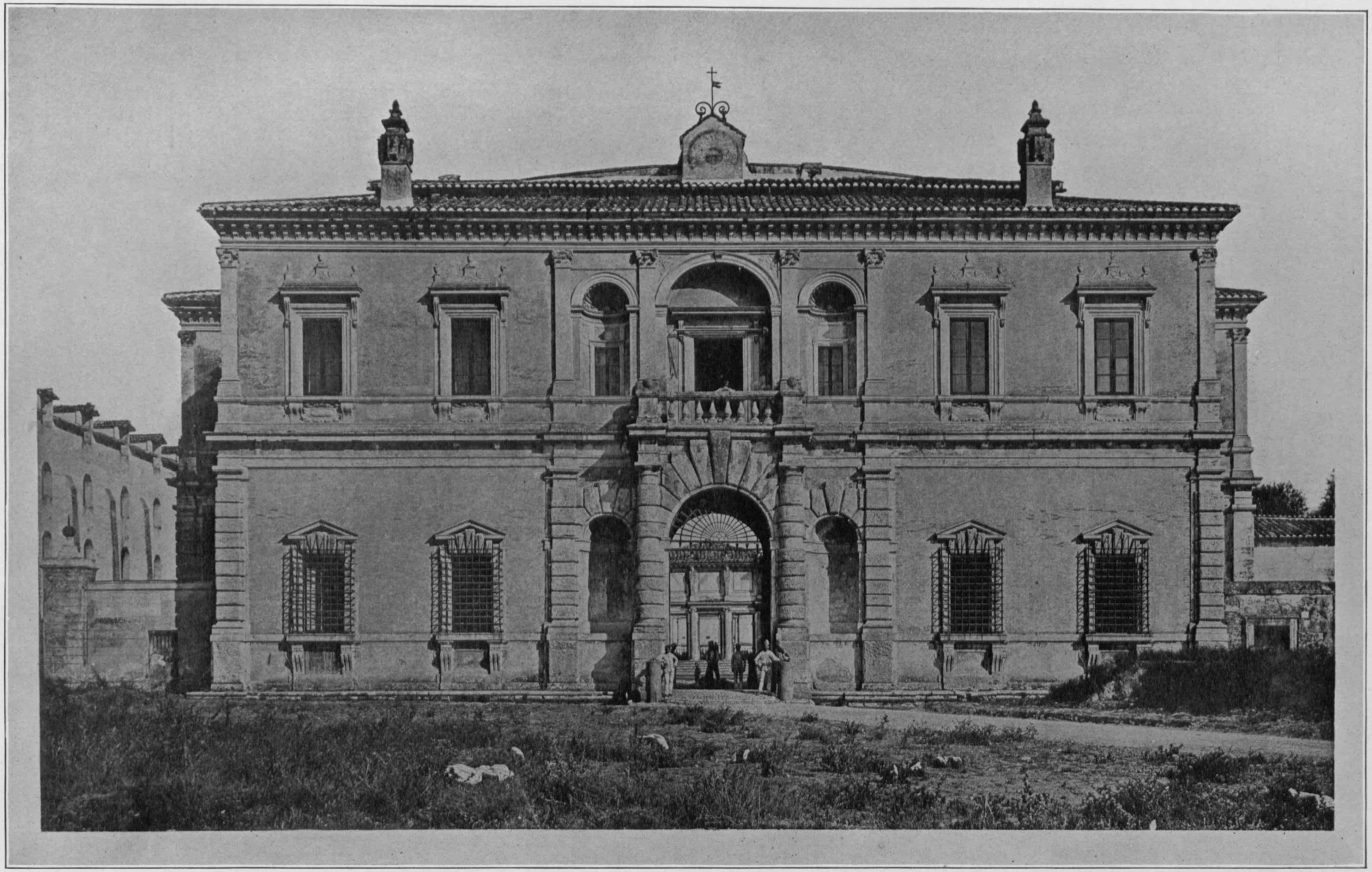
Summer Courses. These courses are primarily for the benefit of the student who wishes to distribute his work over a larger portion of a year, or to gain more time for advanced work in the regular courses. They also offer opportunities to students from other colleges to anticipate a portion of the professional studies of the second year.

Special Students. Applicants must be college graduates, or twenty-one years of age with not less than two years' office experience. Except college graduates, all applicants will be required to pass, before entrance, examinations in Geometry. All must include in their work at the Institute the first-year course in Descriptive Geometry and Mechanical and Freehand Drawing, unless these subjects have been passed at the September examinations for advanced standing. There is no defined course for the special student. He may select, with the approval of the Department, any subject in the regular course for which he has the necessary preparation. He receives no certificate, but on leaving the Institute in good standing he will be given a letter to that effect by the Secretary of the Faculty.

Scholarships, Fellowships, and Prizes. A certain amount of funds is available for undergraduate scholarships and for fellowships for graduate work. Six prizes, varying from ten dollars to two hundred dollars each, are equally divided between the regular and the special student.

The American Institute of Architects accepts the Bachelor's degree of the Institute, in the candidacy for its membership, without the examination ordinarily required.

The Catalogue of the Department, giving more detailed information, will be sent on application to the Secretary of the Institute.



VILLA DI PAPA GIULIO, ROME

The Technology Architectural Record

Vol. VI June, 1913 No. 3

$1.00 per Volume Single Copies, 35 Cents

AN interesting lecture on "Making and Remaking Cities" was given in the Department, on April 2, by Mr. Ewart Culpin, secretary of the Garden City Association of England, and an authority on town planning.

The speaker stated that, although not one of the first countries to take up the question of improved civic conditions, yet by wise legislation Germany had far outstripped all others. It was of particular interest to learn that the cities of that country have not only legally been authorized, but virtually directed, to purchase all the surrounding land that can be obtained at agricultural land prices. The result has been that when great improvements, such as new avenues, new accommodations for docking and shipping, or better housing-facilities, became necessary they have been carried out at little or no expenditure on the part of the citizens. It has even been stated that in some few instances the citizens, in place of being taxed, received a small yearly dividend from such improvements. It was shown that, next to Germany, England had done most in this direction.

Mr. Culpin's idea seemed to be that the proper aim of city planning was not so much the establishment of a civic center, with magnificent streets and public buildings, as the creation of an atmosphere that would elevate socially, morally, and physically all who lived in the place. The first-named features were desirable, of course, but should be subordinate to the last. As an illustration of the economic results of an improved method of living, the lecturer referred to a comparison that had been made between children of the laboring classes whose homes were in the slums and tenements of a manufacturing city and those of similar parentage living in a model suburb of the same place. In the suburb the children averaged thirty-seven pounds heavier and several inches taller than the children of the same age in the city.

The recent exhibition at the St. Botolph Club of the work of Mr. E. I. Williams as pensionnaire of the American Academy in Rome was full of interest, not only to the students in the architectural schools and in the offices about Boston, but in no less degree to practising architects. Throughout Mr. Williams's work there appears a clear understanding of the subject in hand, expressed in a brilliant and intelligent manner.

These fellowships, affording as they do opportunity for the study of the splendid monuments of classical antiquity, promise much for the future architecture of our country, and Technology is fortunate in having had so many winners of this much coveted Rome prize.

Mr. Williams's drawings will eventually come to the Department as a loan collection, and will be hung on its walls.

Boston architects and former associates of the late Professor Despradelle paid tribute to his memory at a meeting in Copley Hall on March 10, where an exhibition of Professor Despradelle's work was opened. The meeting was held under the auspices of the Boston Society of Architects, the Boston Architectural Club, and the Massachusetts Institute of Technology, and was presided over by Mr. R. C. Sturgis. The speakers were President Maclaurin, Messrs. Thomas Hastings, Guy Lowell, the Reverend W. B. King, and the Reverend R. S. Kidner.

President Maclaurin, in referring to the fine character and temperament of Professor Despradelle and the debt that is due him for the many years of service to architecture, said: "He had the clearest understanding of the functions of the teacher, and appreciated to the fullest the great difference between the architect and a teacher of architecture. He was thoroughly conversant with the methods of the French schools, and was wonderfully apt in applying them to the conditions that exist in this country."

On Friday evening of the week of the exhibition Professor Duquesne met the students from the Boston Architectural Club and the Departments of Architecture at Harvard and Technology and briefly reviewed Professor Despradelle's career as a student, a teacher, and a practising architect, and pointed out by reference to the drawings those qualities which made him a master.

In pursuing the course of study at Technology considerable stress has always been laid on the work in free-hand drawing. Through the four years' regular course in Architecture, and afterward in the graduate year, the student is required to attend regular sessions, during which he draws from casts, from objects, and from the living model, under the direct personal guidance of his instructor. In general, the work is confined to the development of a sense of form and proportion by simple studies in charcoal, pencil, or ink; but the method followed is flexible and capable of much variety. For instance, in the last half of the present term the advanced students have been using color, which introduces a somewhat broader medium for the expression of values. They are made to feel that all mediums are akin, and that charcoal, as the mother of the brood, is the only true art basis. It is not an attempt to prove that a brush is a pencil, or that a piece of charcoal is a pen; its purpose is to make the student realize the common principles which underlie the use of all.

One of the drawings reproduced in this issue of the RECORD is a study in charcoal and red chalk; the other, an oil study in color. These are typical drawings, and have been selected from a representative lot with a view to illustrating the method of instruction in free-hand drawing that is now being pursued at the Institute.

Few men teaching this subject in America appreciate its analysis to bare principles as does Professor W. F. Brown; and fewer have, at the same time, the rare ability to impart these principles to the ordinary student. That the course in free-hand drawing has greatly helped men in their subsequent work is a fact to which all graduates agree, and the devotion and enthusiasm of students of the last twelve years for Professor Brown personally are testimony to his unselfish attention and to the value of this course in our Department of Architecture.

The Monumental Qualities in Architecture

By C. H. REILLY
Professor of Architecture, University of Liverpool

UNDER the above heading has recently appeared in *The Architectural Review* of London a very interesting paper. Although written primarily for the English public, much in the article should be equally interesting to us.

Professor Reilly believes that the chief weaknesses of modern English architecture lie in its lack of qualities somewhat vaguely summed up in the word "monumental;" that while the past fifty years are filled with successes in domestic and ecclesiastical architecture, public architecture has been more or less of a failure. He believes this failure to be due to the lack of the right kind of architectural education. In substantiation of this view he refers to the work of John Gandon, a London architect, who flourished in the third quarter of the eighteenth century.

Professor Reilly says: "If any one had at the present moment to choose an English architect for a first-class public building, could he feel sure that the result would compare, for instance, with Gandon's Dublin Customs House or the Four Courts? Personally, I am quite sure it would not." He next asks, "What is it that Gandon had that none of us have to-day?" He will not admit that it was a greater artistic ability. There is plenty of evidence of such ability, but it does not produce Dublin Customs Houses. The real answer lies, he thinks, in the difference in outlook and equipment of a Gandon and of a modern English architect.

Gandon belonged to a united and homogeneous school of thought extending over the whole continent of Europe; the modern architect belongs to a small coterie of architects who believe in the same sort of brick jointing or the same kind of curly gable. The school to which Gandon belonged consisted of all those cultivated men and women — not merely architects, painters, and sculptors, but the great mass of educated people — who looked to Greece, and Greece as amplified by Rome, for inspiration, guidance, and the very meaning of their civilization.

Professor Reilly assumes, therefore, that Gandon had no other thought than that his building, while satisfying all the modern requirements of his day, should conform to the modes of architectural expression founded by the Greeks and expanded by the Romans and their successors, the Italians of the sixteenth and seventeenth centuries. Classical architecture, as he understood it, was capable of satisfying all needs, material and spiritual; everything that was noble could be expressed by it. We must remember that in Gandon's day Greek architecture was hardly known except through Roman work; its chief delicacies and refinements, its subtleties of form and expression, had not yet been discovered. But no amount of scholarship, no minute knowledge of Greek detail and adjustments, will help us if we have not the clear grasp of those ideas of the monument which are at the base of all classical architecture.

In considering the four qualities essential to monumental architecture Professor Reilly continues:

"By the word 'monumental' as applied to a building we mean some quality in it which gives it a peculiar appeal to our imagination. The building must make that single blow upon the mind Sir Joshua Reynolds proclaimed as a necessary condition to any work in the grand manner. The building must appeal to you as a whole — as a unity — not by any special color, texture of materials, conceit of detail, or even by association of ideas. The essence of a monument is that, however large, it is a single object,— a complete unity, from which nothing can be taken and to which nothing can be added. Unity of conception, therefore, we may take as the first necessary quality in any monumental work.

"The second quality is, I think, mass. The Customs House reduced to the size of a model ceases to be impressive. There must be, too, the suggestion, not only of immovability, but of accumulated toil; of labor skilfully directed, but still of labor.

"The third quality is the quality of scale. A large scale is necessary for monumental effect. When a building, however large, is really an accumulation of small parts, like the exterior of Milan Cathedral, it can never give that effect of grandeur which the great scale of a Doric temple at once suggests.

"Lastly, there is that complement of scale,— refinement. The mere enlargement of parts will not give satisfaction. We must have the delicacy which comes from restrained power, from forces held in check. Stonehenge has a big scale, but compared with Pæstum it has the strength of a savage rather than the well-directed energy of a fully developed man. If these, then — unity, mass, scale, and refinement — are the distinguishing marks of monumental architecture, it may be well to examine how they were exhibited in the great formative phases of classical art,— Egyptian, Greek, Roman, and Italian,— and note what each contributed towards the solution of our own problem of giving these monumental qualities to a modern building.

"If we take any of the Egyptian temples of the Middle Empire we find the whole complex scheme laid out on a central axis. That axis is the unifying idea. You approach the temple along it, through an avenue of sphinxes. You pass between the enormous pylons forming the gateway to the first court, to see in front of you along the same axis a similar pair leading to the second court. The scale is everywhere enormous. You pass on again up a flight of steps to the hypostyle hall from sunshine to semi-gloom; but the axis is still strongly marked by the larger columns and the clerestory windows flanking it. Finally, you approach the sanctuary and the mysterious chambers of the priests surrounding it. All the while, however, you have traveled along the same straight line. The unifying idea of the building is this long-drawn-out axis. The building, therefore, is monumental in this aspect. It has unity, scale, and refinement of its kind from one particular point of view. Turn, however, in any other direction and it has neither symmetry nor architectural meaning. Its external walls are of all heights, blank and expressionless.

"To pass from Egypt of the Middle Empire to Greece of the fifth century is to pass from the dim light of a railway tunnel into sunshine. On the Acropolis at Athens buildings were displayed very much as statues,— commemorative monuments, to be viewed from all sides. Individual unity from every external point of view was aimed at and achieved. Hence the simple outlines of the buildings, and their bold masses.

"Until one has seen the ruins of the Parthenon it is difficult to appreciate all that has been said about its perfection; but once it has been seen, no praise is too extravagant, or, rather, all praise is impertinence. The very fragments scattered on the ground are not the crumbled stones of an ordinary ruin; they are pieces from some china vase, broken limbs from some antique statue. These subtile curves, which pervaded every line of the building, seem to have given the structure absolute vitality. Refinement in this case is more than the complement of strength; it is the revelation of it.

"Here, then, we have all the qualities that go to making the complete monument,— perfect unity, mass, great scale, and absolute refinement. Within certain self-imposed limits, then, the problem has been solved. It should be remembered, however, that these limits were very narrow. As in their sculptures, so in their buildings, the Greeks sought to perfect a few simple types. The temple form contains and expresses on the exterior what is, after all, but a single compartment with vestibules. In essence there could be no simpler building problem.

"It is not till we pass to Roman work that we find all the complexities of the modern building. Apart from their absolute size, the plans of the central blocks of the various great Thermæ might be the plans for any great modern public building in which a stately procession of halls is required. Internal unity, not on one axis only, as the Egyptians achieved it, but in both directions and over vastly more complex structures, is the Roman contribution to the problem of monumental building. Not only did the Romans adjust the relations of one chamber to another within the building until a unity was brought about that embraced the most remote, but they adjusted the relations of one building to another within the town till that, too, attained an architectural unity of its own.

"Where the Romans seem to have failed is in the façades of their complex structures, and, of course, in their detail. The internal unity of the great central building of the Baths was not expressed on the exterior. Looking at the plans of the Baths of Caracalla, it is impossible to conceive for them, as they exist, satisfactory elevations.

"It is not, then, until we come to the Italian Renaissance that the total modern problem is solved: façades complete, plans complete, the whole building a unity both within and without. The creation of the façade is the Italian contribution. In the work of San Michele and Peruzzi we have not only great scale, combined in Peruzzi's case with almost Greek refinement, but we have for the first time perfect unity of exterior and interior. Here, then, at last, we have the problem of the modern monumental building completely solved."

Referring again to the architect Gandon, Professor Reilly writes:

"He was the pupil of the great scholar, artist, and gentleman, Sir William Chambers. He was familiar, therefore, with the plans of the Thermæ as given in the various editions of the Palladio. He possessed, or had access to, 'Vitruvius Britannicus' and the other great seventeenth and eighteenth century folios. His books kept him in the great tradition. When surrounded by them no little tricks of design such as disfigure our modern buildings would occur to him. His attention would be concentrated on such fundamental matters as the simplicity of his main and subsidiary masses, the nobility and proportion of his order, the just character of his detail to emphasize but not to conflict with his main conception. How different the result would have been if his drawing-board had been surrounded, as I fear ours often are, with the plates from the modern building papers. It is this practice of living on the tricks of the fashionable draftsman and competition expert, in semi-ignorance of the great achievements of the past, that has been the ruin of our modern English architecture."

Professor Reilly believes that a remedy lies in a return to the study of the classic periods. He refers to the American practice as follows:

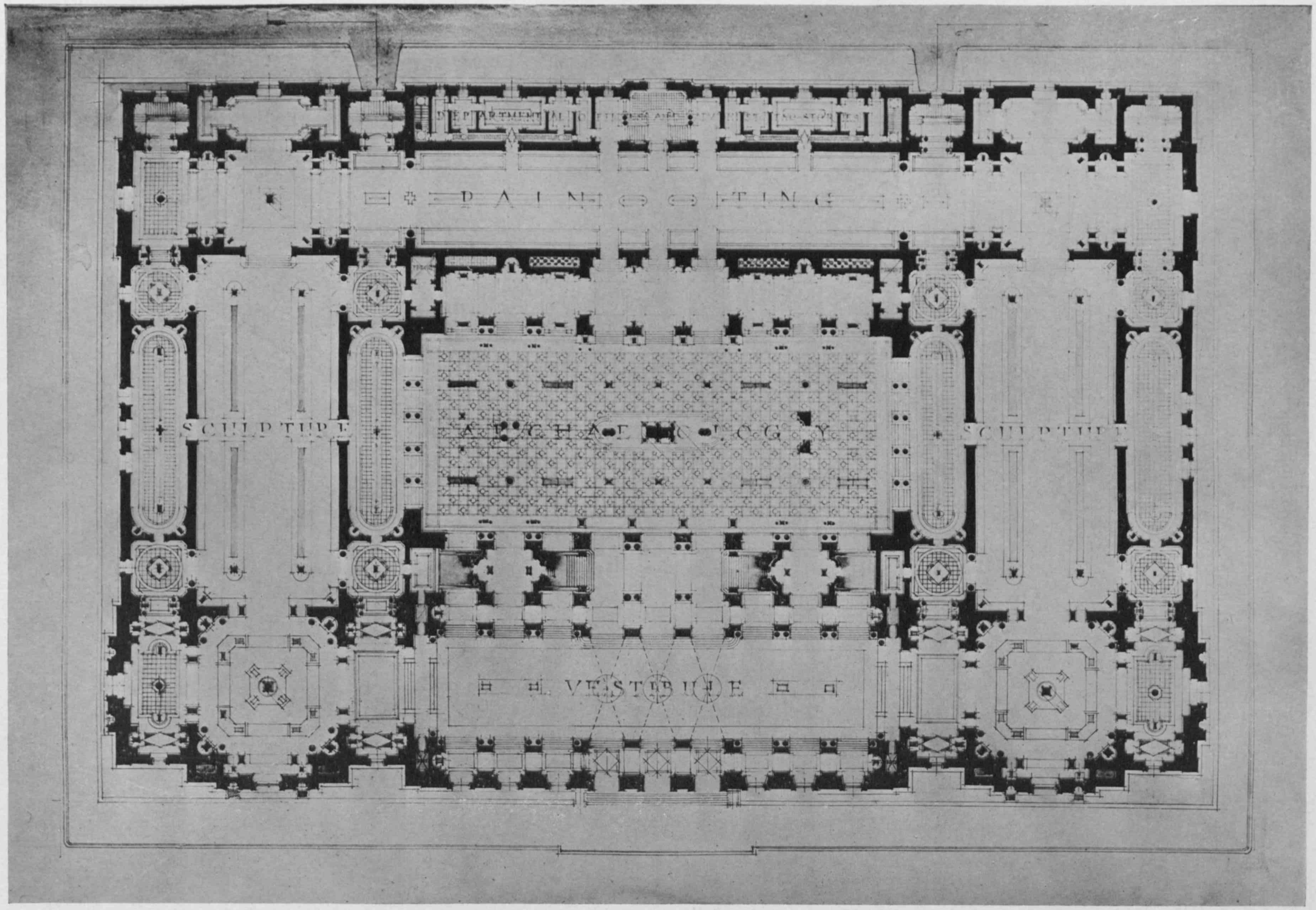
"The great strides American architecture has recently taken are due to such a return. Not only is the young American architect rigorously trained in his school in the elements of the great classical tradition, but when he reaches his modern American office he finds there a similar library to his school library, and is expected to make a similar use of it."

Speaking of the lack of fundamental training among the modern English architects, he says:

"We find the greatest incongruities everywhere. Take the fashionable modern Georgian. It is the commonest thing to find fluted Greek columns used with the coarse plaster wreaths and ceiling enrichments of the time of Wren. Style has been well defined as crystallized character, and until the character of one style is perfectly understood no sense of style can be acquired. One style, however, may well be the key to several. Therefore, from the point of view of the mere gymnastic of training, it probably does not much matter what convention is chosen. If we cannot agree that all our schools should found their training on Greek work, let us have some Greek, some Gothic, some Byzantine, in their outlook. But let us at all costs have done with the false catholicism of taste which sees good in everything and arrives at nothing in the end. The eclecticism of the last twenty years in England has not led architecture forward. What progress has been made has been in France and America, where there exists a much more positive spirit. The average man, when once a standard of taste is established, is only too anxious not to go outside it and betray himself. When there has been little cohesion among architects, the average man, on the other hand, is tempted to think himself a genius, and to turn things upside down for the mere fun of it.

"If, therefore, the argument holds, we must be prepared to relate the cottage, the church, and the country house to the methods of Greece and Rome, as much as the bank and the town hall. We must do for these classes of buildings what the Italians of the great period did, and the Americans to-day are doing, for larger structures.

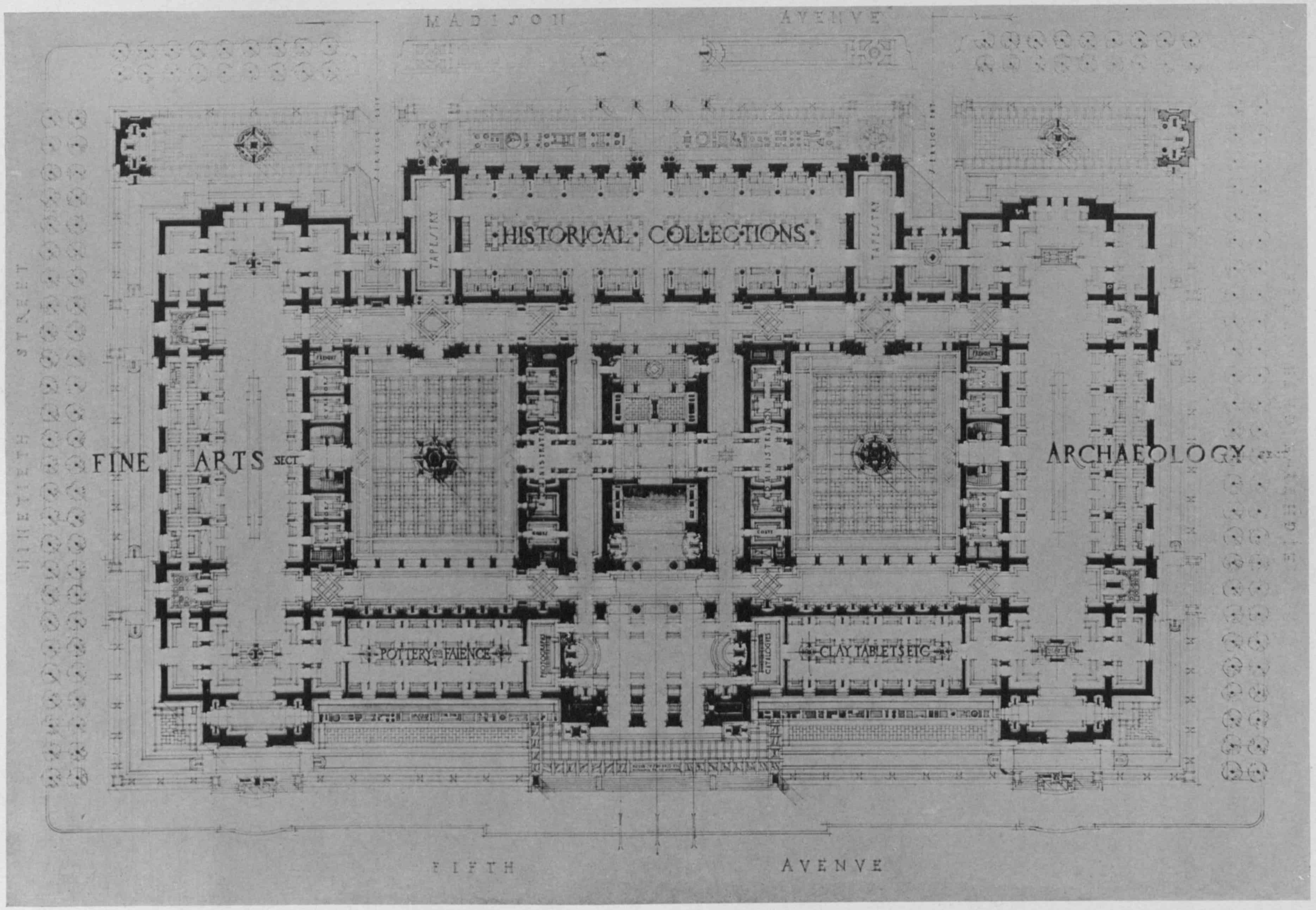
"There is no reason why the ordinary dwelling-house should not have rooms of exact and simple proportions, simply related to one another, any more than the public building. In no past period of architecture did we have one style for cottages and another for mansions. The charm of the former — their character — often lies in their implicit relation to larger buildings. There is no reason, therefore, why, in the pursuit of a more monumental and more worthy architecture for our public buildings, all classes of buildings should not profit."



FOURTH YEAR OF DESIGN

A. CORRUBIA

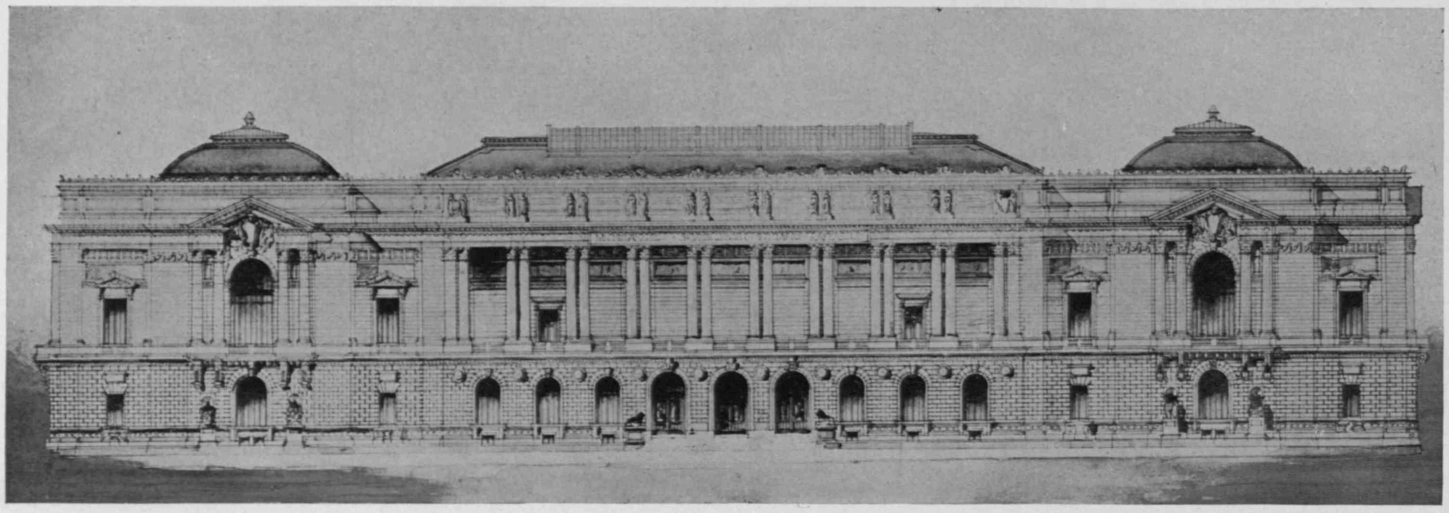
A MUSEUM OF ART



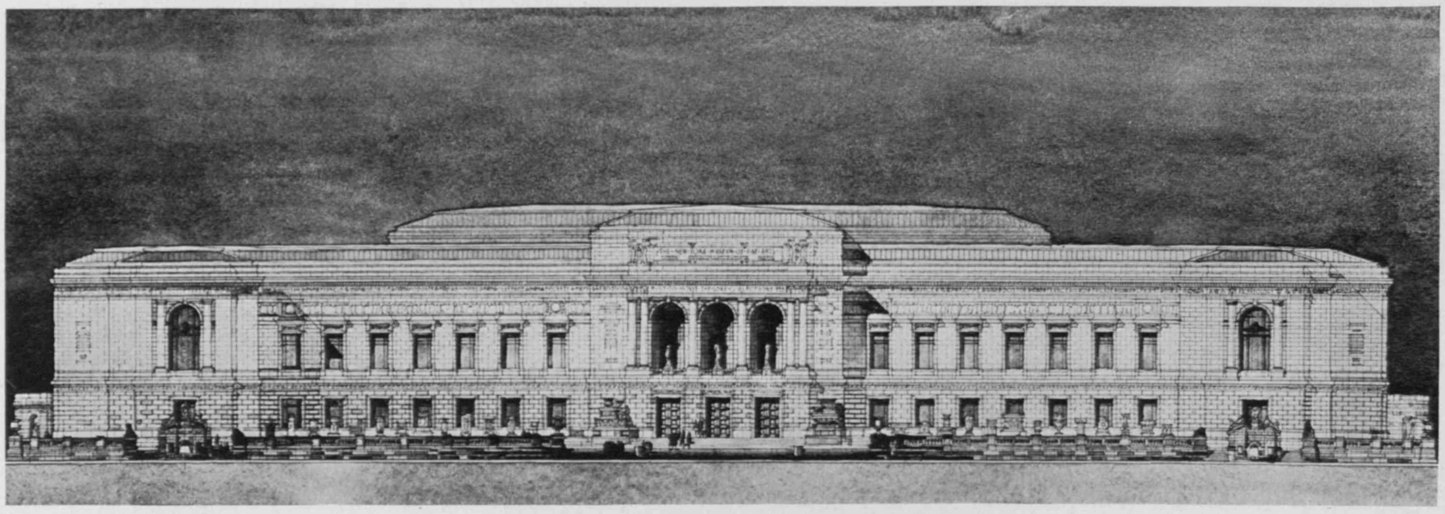
THIRD YEAR OF DESIGN

A MUSEUM OF ART

L. C. ROSENBERG

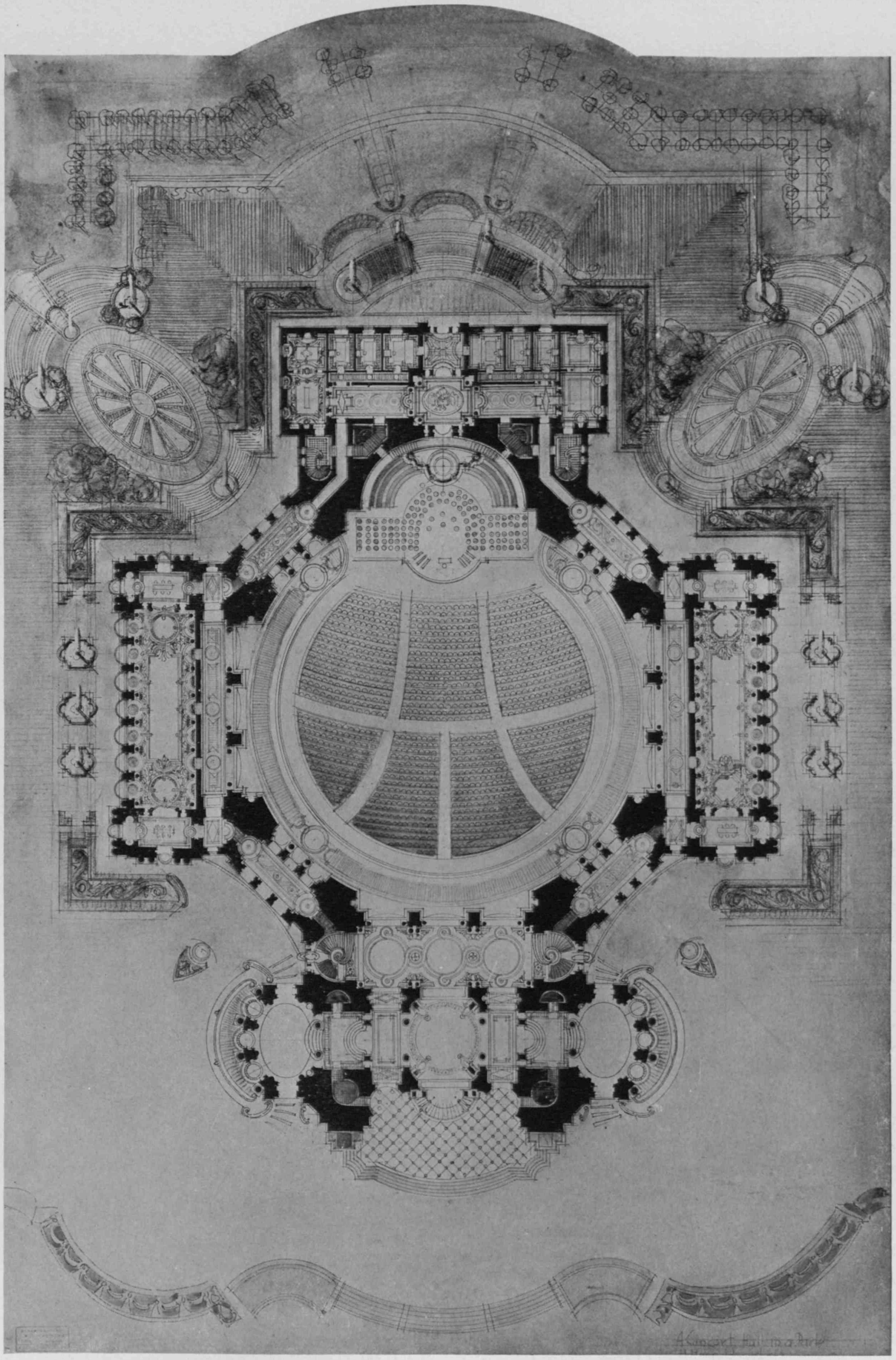


FOURTH YEAR OF DESIGN A. CORRUBIA



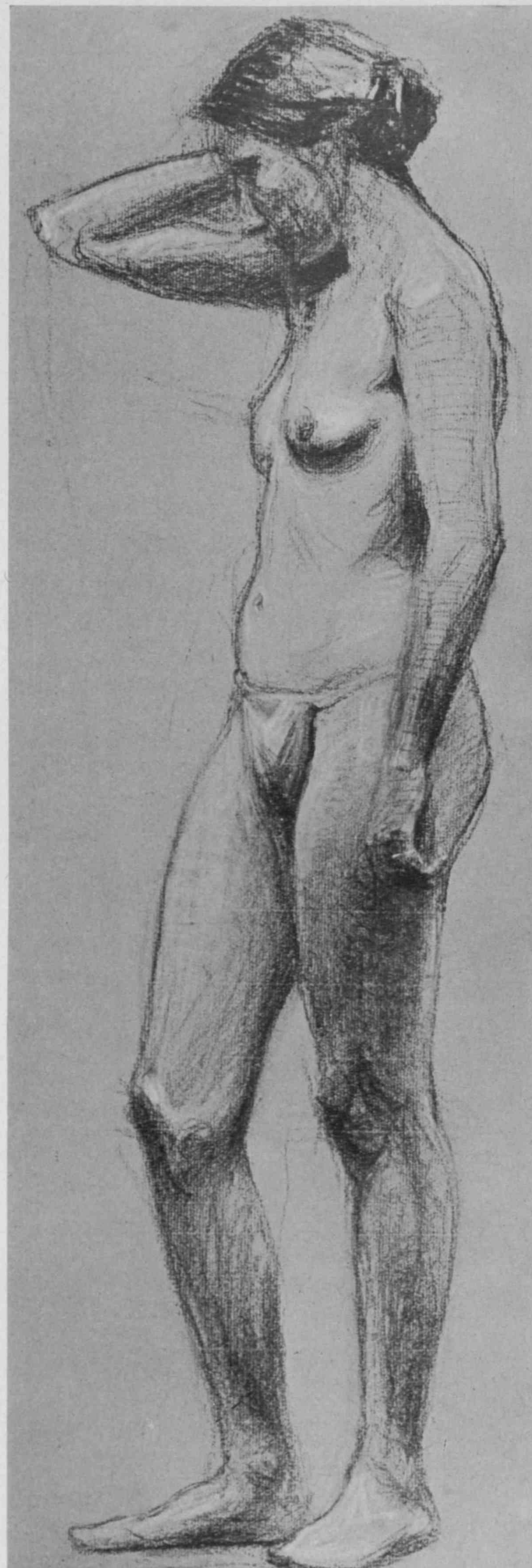
THIRD YEAR OF DESIGN I. C. ROSENBERG

A MUSEUM OF ART



FOURTH YEAR OF DESIGN — A HALL FOR POPULAR CONCERTS

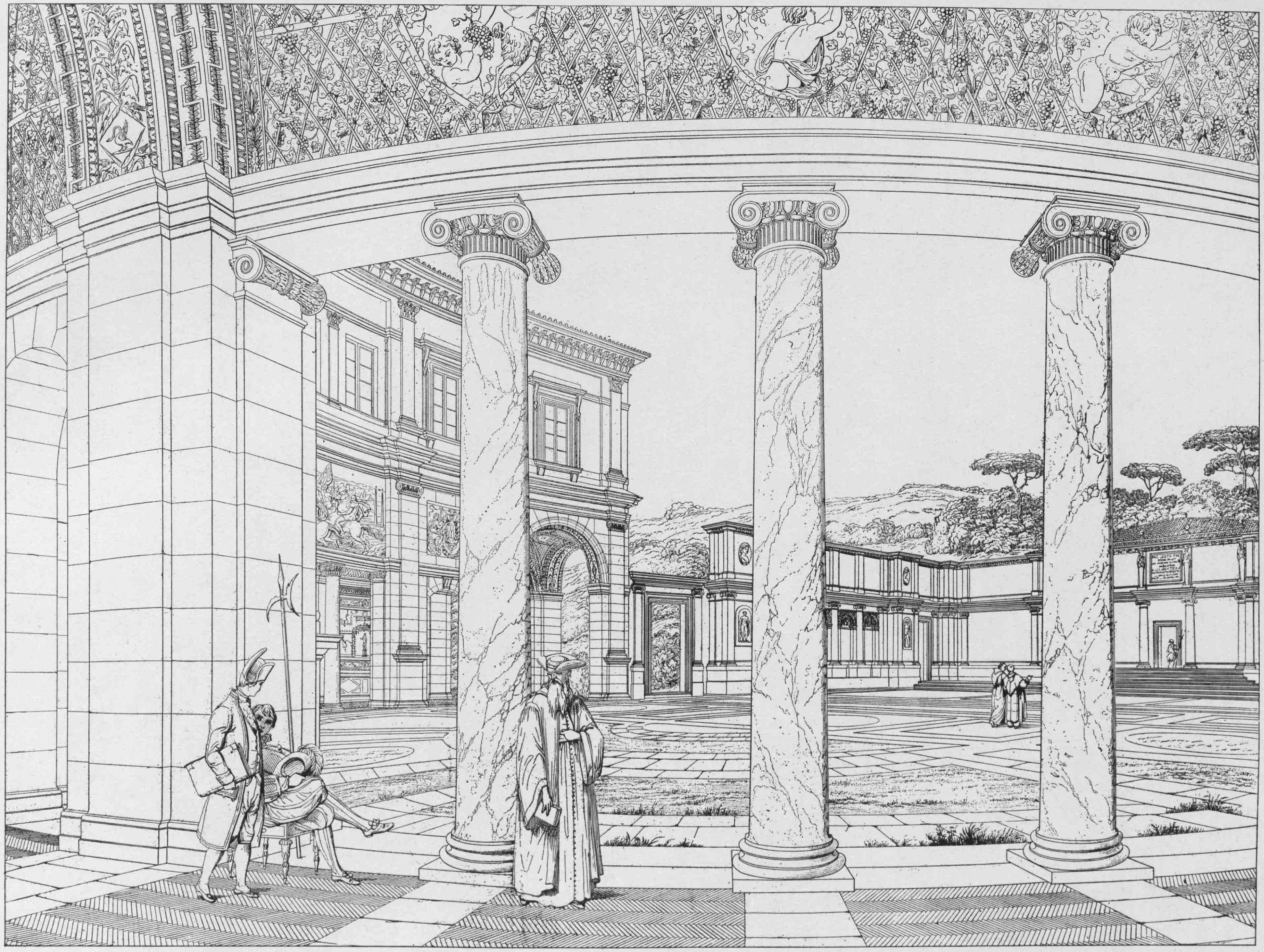
T. H. MACE, JR.



ADVANCED FREEHAND DRAWING STUDIES

F. N. BREED

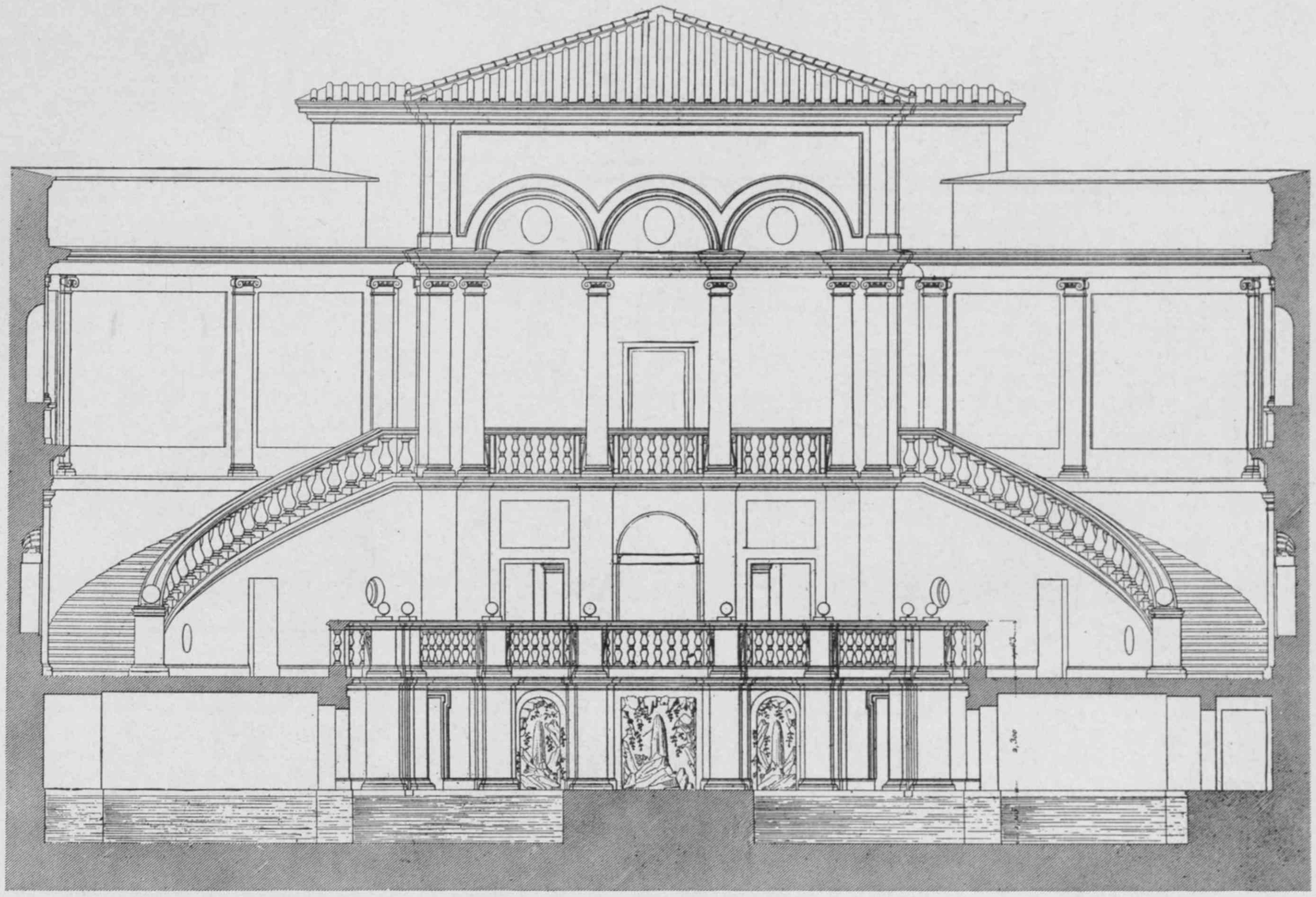
H. O. GLIDDEN

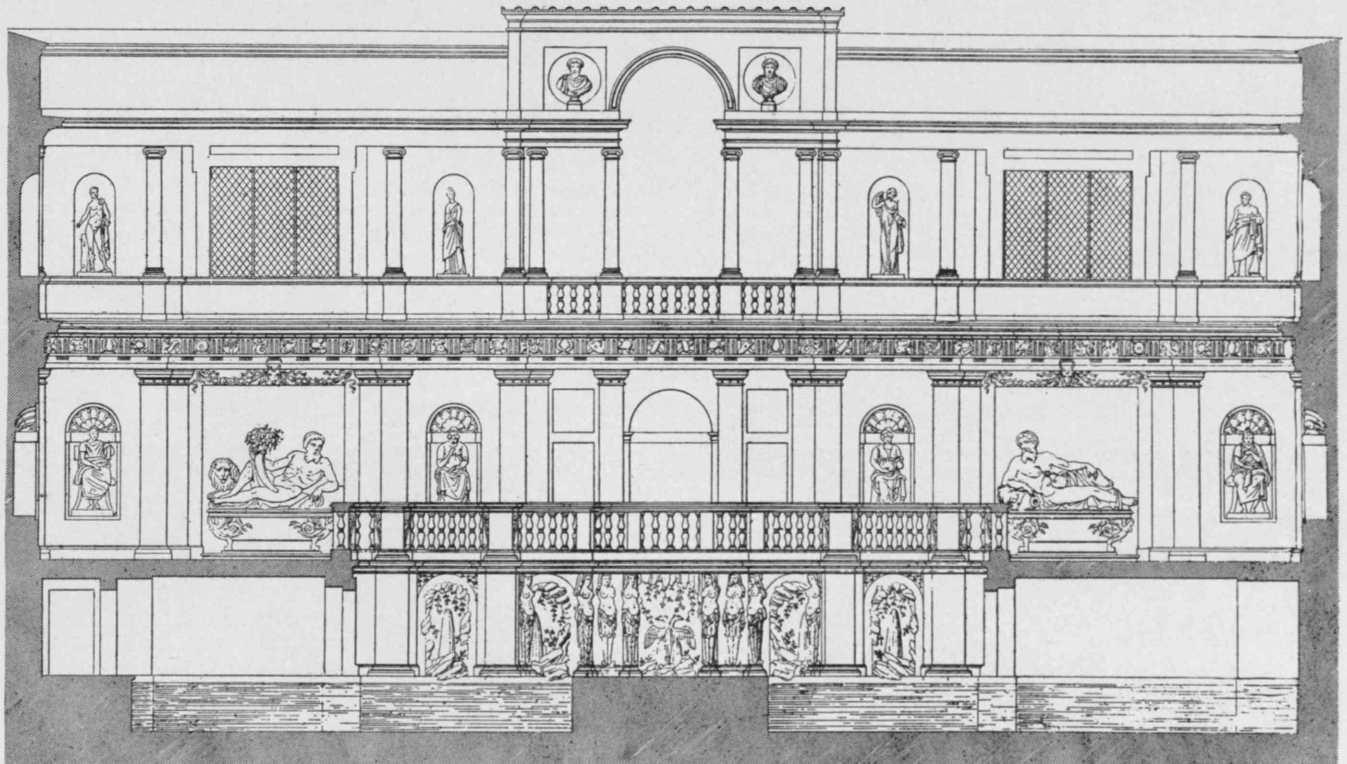


(From "Edifices de Rome Moderne," Letarouilly)

(Plate 213)

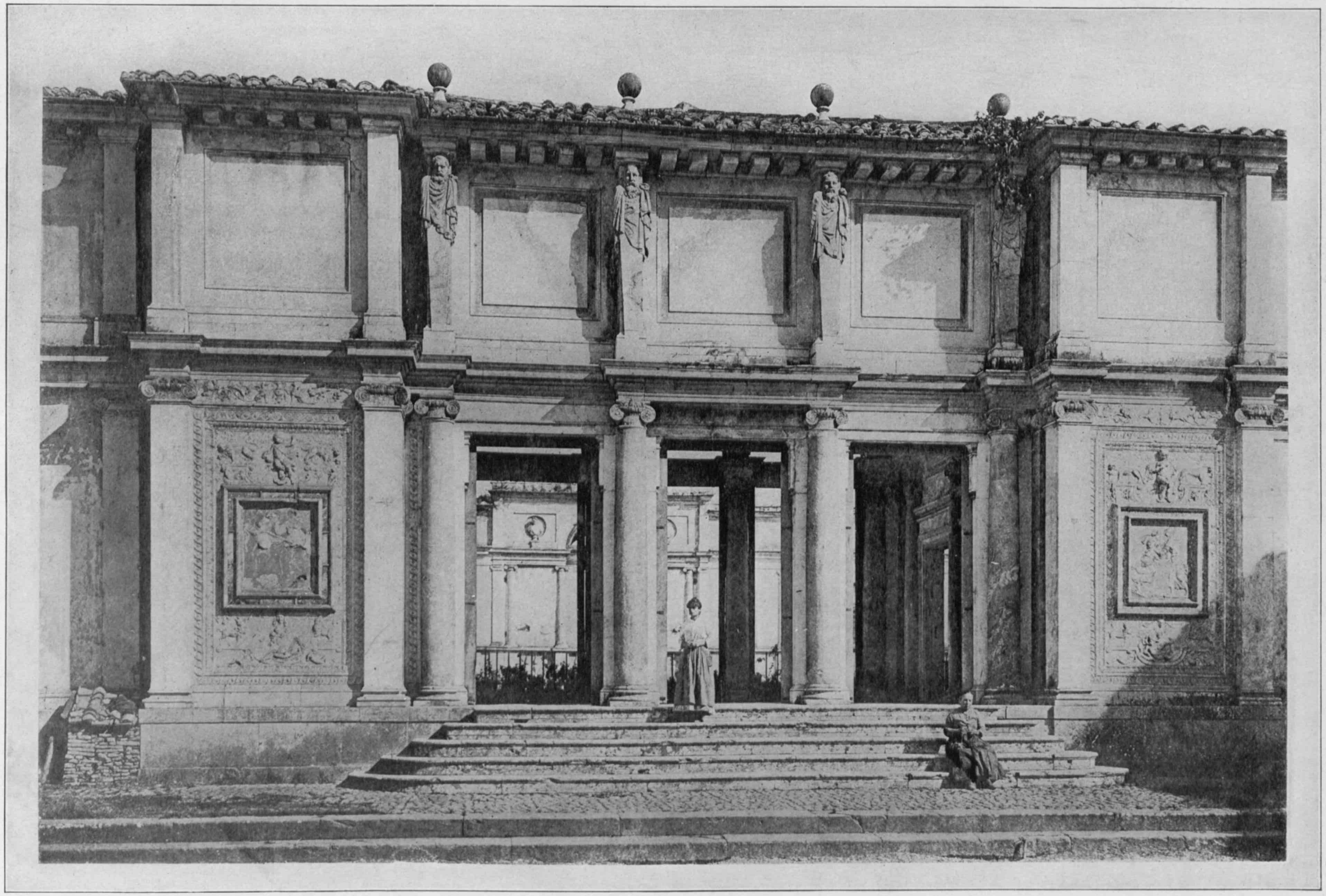
VILLA DI PAPA GIULIO, ROME





(From "Edifices de Rome Moderne," Letarouilly) (Plate 220)

VILLA DI PAPA GIULIO, ROME



VILLA DI PAPA GIULIO, ROME

The Architectural Society

AT their second smoker of the year the Architectural Society listened to a most inspiring talk by Mr. E. I. Williams. Coming direct from travel and study abroad, he looks at the Institute with a fresh mind, and pointed out many valuable features of our course that are not always appreciated by us as students. Architectural design, he said, is not a science; it has no invariable right and wrong. On the other hand, it is not merely inspiration which in some mysterious way comes out of the "thin air" into the designer's mind. It is the result of study and hard work. Taste and logic make up design. All things must have reason, and the ability to construct is one of the first essentials of an architect. He must make skilful use of his "shades and shadows;" with them he explains his conventional drawings and expresses the structural forms of his design; they are essential in the very first studies. The Beaux-Arts plates often give precedent for renderings and presentations, and are useful to have around. Bright colors usually detract from a rendering.

Mr. Williams then told of his three years spent as Fellow of the American Academy, relating many incidents and personal impressions that made his recital entertaining. During the first year at the American Academy a restoration of an antique ruin is required. Mr. Williams chose for his study the House of the Vestals at Rome, and spent the winter in collecting data concerning the dwelling and the life of the Vestals. He was aided in this by an archæologist, Mr. E. B. Van Deman, a Carnegie Research Fellow, who had made an exhaustive study of the subject. Later, he went to Florence, and thence to southern Italy, studying the ruins of ancient Roman houses. In July he returned to Rome, where by steady work he completed the drawings for his restoration by the first of October, when they were due.

In the second year's residence at the American Academy the architect is required to present a design in collaboration with a sculptor and a painter. Mr. Williams and his colleagues agreed upon a Loggia in the Country as their subject, and in the spring of 1911 he traveled in northern Italy in search of material. Among other places he visited Milan, Verona, Vicenza, and Venice, everywhere making measured drawings, sketches, and water-colors.

The last requirement of the architect is either a Greek restoration or a study showing the relation of architecture to landscape. Mr. Williams decided on the latter, and for his subject chose the small island estate, Isola Bella, in Lake Maggiore. He visited the island, where he was received most courteously, and was given every opportunity to prepare himself for his undertaking. He had access to the old plans and models, and he made all necessary measurements of the grounds. With this data he returned to Rome, and during two months of his last winter devoted himself to his great study, the culminating work of his course at the Academy in Rome.

In closing, Mr. Williams told of the very friendly relations existing between the Frenchmen at Rome and the Americans there. The meeting, which was a large one, adjourned to the refreshments after a most absorbingly interesting two hours.

On Friday evening, April 11, the members of the Architectural Society had the pleasure of listening to a most instructive and entertaining informal talk by Mr. Irving K. Pond, of Chicago.

Mr. Pond said that he enjoyed talking to young men in such a heart-to-heart way. He assumed that all wanted to become men as well as architects, saying that one learns to be both in the school of experience. He warned the students against becoming machines at the expense of broad culture and education. He expressed his strong disapproval of the misuse of the orders as extraneous and unrelated ornament; employed in such a way they do not produce real beauty, but detract from it. Many a so-called architect arranges the floors and spaces inside of his "box" in such a way that they are usable, and then puts a row of columns around the "box" and calls it architecture. This is not architecture in its true meaning. The "box" itself should have been made beautiful; then the necessity for hiding its ugliness behind a row of columns would not have been felt.

He spoke of the contributions made to architecture by the Egyptians and the Greeks. Many believe that the Egyptians did not have the true architectural sense. Their buildings were influenced by their ideas of religion, rather than by art. They believed in immortality, and their principal monuments — the tombs — were built for eternity. The very shape of the pyramids, the most stable form known, symbolized immortality.

The Greek was different from the Egyptian. His art was not for the dead, but for the living; he was not interested in Egyptian art and did not copy it. He thought of art as the reconciliation of the constant struggle of life with the ideal of beauty. In the column with its capital he symbolized an ever-rising force upholding the entablature. To the Greeks, stress was a thing not to be concealed, but to be beautified. They were the first architects, in the modern sense.

Mr. Pond spoke of the early Renaissance architects as having begun right, but as later yielding to the influence of Roman work found in excavating their foundations. They not only ceased to create, but misinterpreted the meaning of the forms which they copied. The Gothic architects were also right at the start, but later disguised and concealed the stresses in their structures, as did the Corinthian designers.

Mr. Pond explained some of his own theories of design, illustrating his points by interesting references to architectural examples.

At the business meeting of the Architectural Engineering Society held May 7 the following officers were elected: C. H. Hopkins, '13, president; J. H. MacKinnon, '14, vice-president; G. L. MacKay, '14, secretary; T. J. Barry, '15, treasurer. Executive Committee: S. A. Smith, '14; R. H. Annin, '13; U. C. Schiess, '14.

The annual meeting of the Architectural Society for the election of officers was held April 30. The result was as follows: president, F. Whitten, Jr., '14; vice-president, D. des Granges, '14; secretary, R. F. Barratt, '14; treasurer, H. P. Sabin, '15. Executive Committee: S. H. Taylor, '14; S. H. Harper, '14; and L. C. Rosenberg, '13.

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SPECIAL NOTE

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding. If any abbreviated form is desired, however, the following is suggested:

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TRADE B MARK

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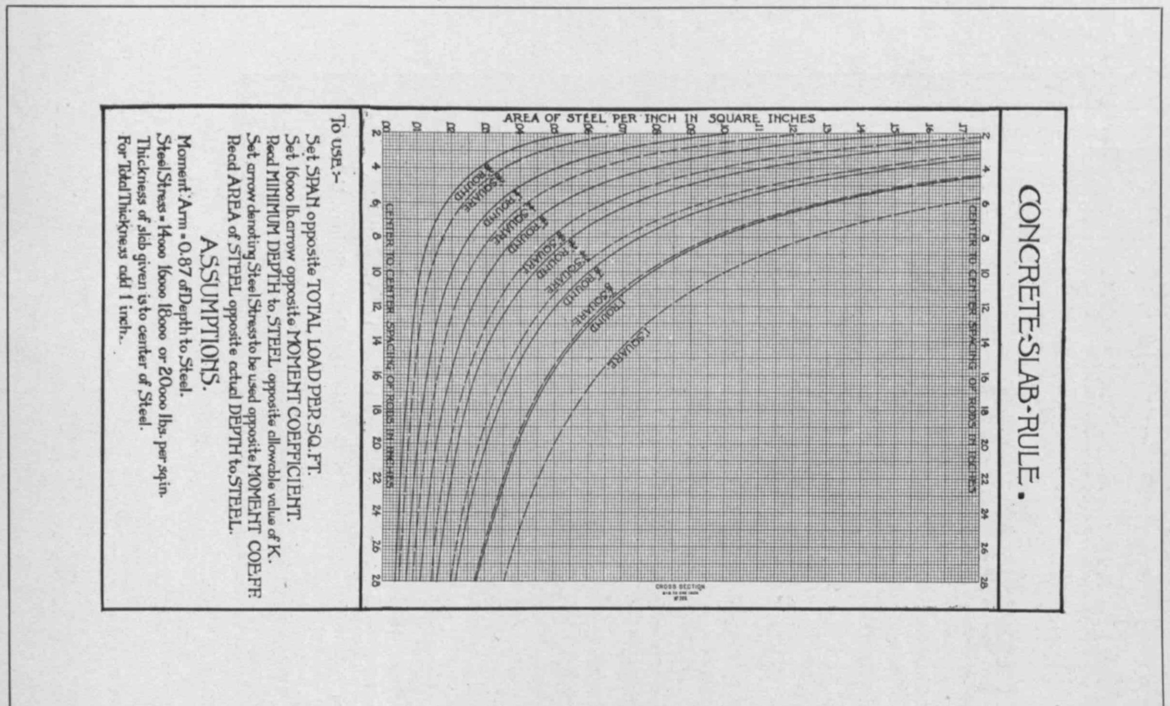

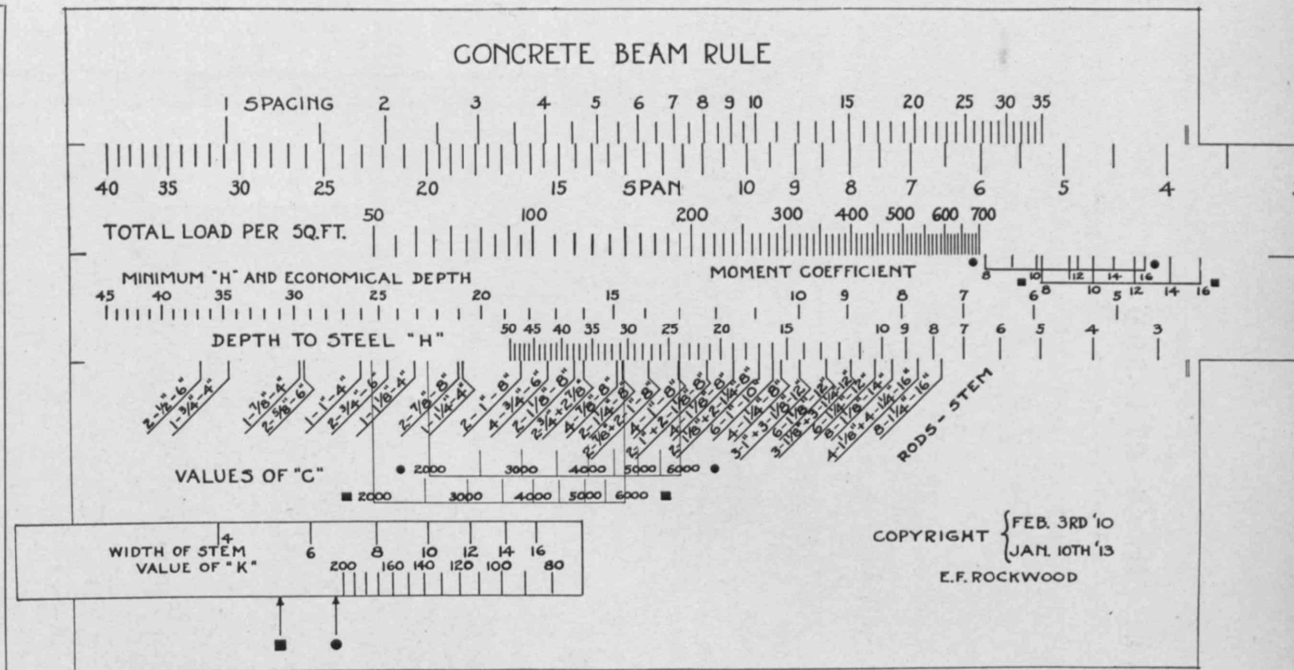

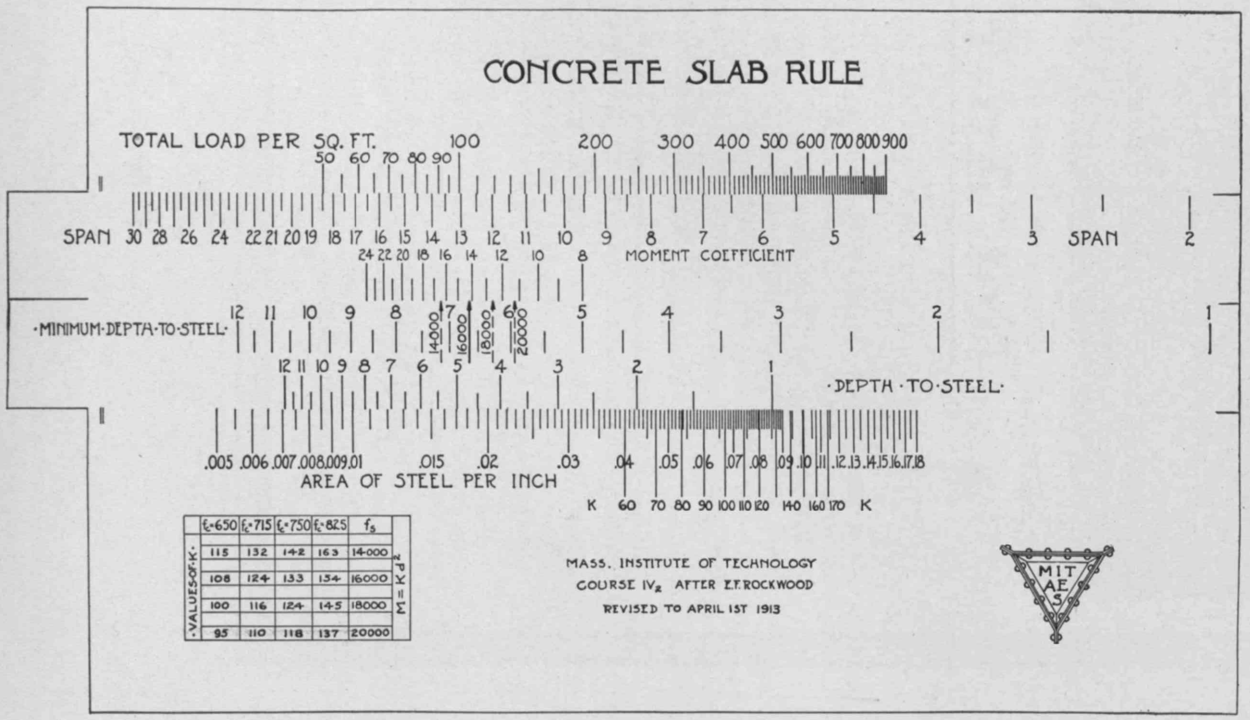

VALUES OF K.

f_c=650	f_c=715	f_c=750	f_c=825	f_s
115	132	142	163	14000
108	124	133	154	16000
100	116	124	145	18000
95	110	118	137	20000

$M = Kbd^2$

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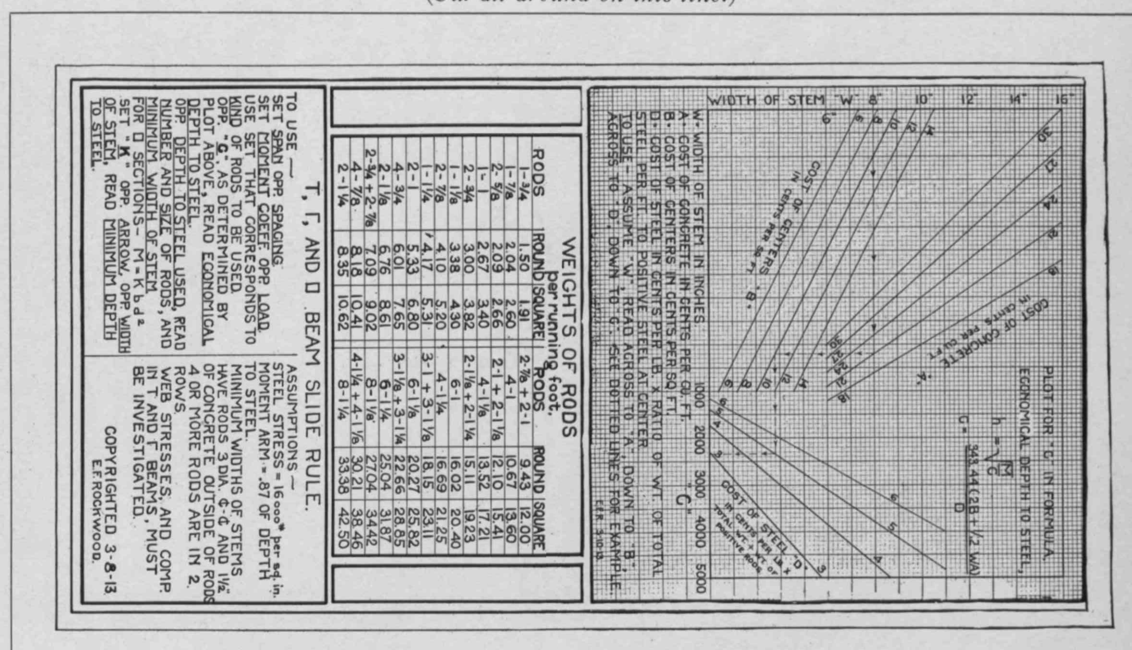


WEIGHTS OF RODS per running foot.

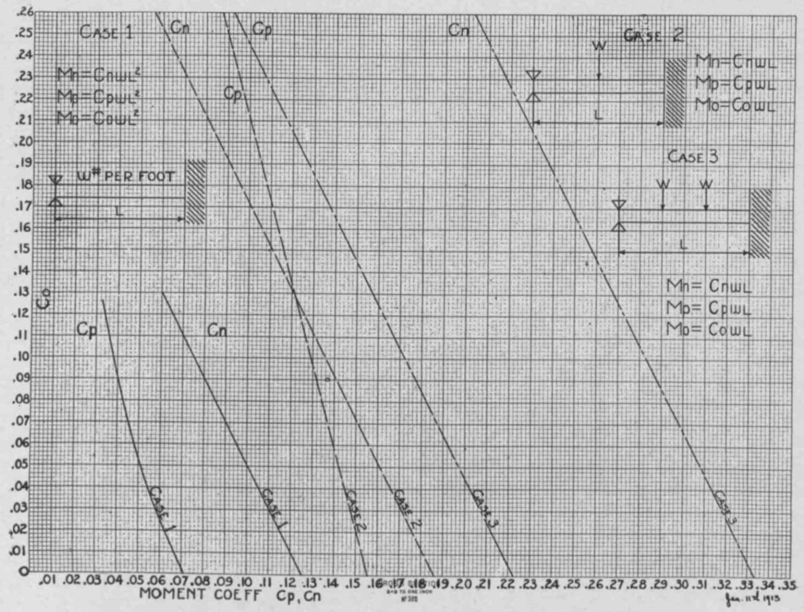
RODS	ROUND	SQUARE	RODS	ROUND	SQUARE
1-3/4	1.50	1.91	2-7/8 + 2-1	9.43	12.00
1-7/8	2.04	2.60	4-1	10.67	13.60
2-5/8	2.09	2.66	2-1 + 2-1 1/8	12.10	15.41
1-1	2.67	3.40	4-1 1/8	13.52	17.21
2-3/4	3.00	3.82	2-1 1/8 + 2-1 1/4	15.11	19.23
1-1 1/8	3.38	4.30	6-1	16.02	20.40
2-7/8	4.10	5.20	4-1 1/4	16.69	21.25
1-1 1/4	4.17	5.31	3-1 + 3-1 1/8	18.15	23.11
2-1	5.33	6.80	6-1 1/8	20.27	25.82
4-3/4	6.01	7.65	3-1 1/8 + 3-1 1/4	22.66	28.85
2-1 1/8	6.76	8.61	6-1 1/4	25.04	31.87
2-3/4 + 2-7/8	7.09	9.02	8-1 1/8	27.04	34.42
4-7/8	8.18	10.41	4-1 1/4 + 4-1 1/8	30.21	38.46
2-1 1/4	8.35	10.62	8-1 1/4	33.38	42.50

(For explanation of slide rules see page 61.)

Round Rods.

Areas, Weights, Strengths @ 16000# per Sq. Inch, and Perimeters.

Diameter	Number of Rods: 1	2.	3.	4	5.	6.	7	8.
$1\frac{1}{4}$"	1.23	2.45	3.68	4.91	6.13	7.36	8.59	9.81
	4.17	8.35	12.52	16.69	20.87	25.04	29.21	33.38
	19,600	39,300	58,900	78,500	98,200	117,800	137,400	157,100
	3.93	7.85	11.73	15.71	19.64	23.57	27.50	31.42
$1\frac{1}{8}$"	0.99	1.99	2.98	3.98	4.97	5.96	6.96	7.95
	3.38	6.76	10.14	13.52	16.90	20.27	23.65	27.03
	15,900	31,800	47,700	63,600	79,500	95,400	111,300	127,200
	3.53	7.07	10.61	14.14	17.67	21.21	24.74	28.36
1"	0.78	1.57	2.36	3.14	3.93	4.71	5.50	6.28
	2.67	5.34	8.01	10.68	13.35	16.02	18.69	21.36
	12,600	25,100	37,700	50,300	62,800	75,400	88,000	100,500
	3.14	6.28	9.42	12.57	15.71	18.86	22.00	25.13
$\frac{7}{8}$"	0.60	1.20	1.80	2.41	3.01	3.61	4.21	4.81
	2.04	4.09	6.13	8.18	10.22	12.26	14.31	16.35
	9,600	19,200	28,800	38,500	48,100	57,800	67,400	78,000
	2.75	5.50	8.25	11.00	13.74	16.49	19.24	21.99
$\frac{3}{4}$"	0.44	0.88	1.33	1.77	2.21	2.65	3.09	3.54
	1.50	3.00	4.51	6.01	7.51	9.01	10.51	12.02
	7,100	14,100	21,200	28,300	35,300	42,400	49,500	56,600
	2.36	4.71	7.06	9.42	11.78	14.13	16.49	18.85
$\frac{5}{8}$"	0.31	0.61	0.92	1.23	1.53	1.84	2.15	2.45
	1.04	2.09	3.13	4.17	5.22	6.26	7.30	8.34
	4,900	9,800	14,700	19,600	24,500	29,400	34,400	39,300
	1.96	3.93	5.89	7.85	9.82	11.78	13.74	15.71
$\frac{1}{2}$"	0.20	0.39	0.59	0.78	0.98	1.18	1.37	1.57
	0.67	1.34	2.01	2.67	3.34	4.01	4.68	5.35
	3,100	6,300	9,400	12,600	15,700	18,800	22,000	25,100
	1.57	3.14	4.72	6.28	7.85	9.42	11.00	12.57
$\frac{3}{8}$"	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88
	0.38	0.75	1.13	1.50	1.88	2.26	2.63	3.01
	1,770	3,530	5,320	7,060	8,830	10,600	12,360	14,130
	1.18	2.36	3.53	4.71	5.89	7.07	8.25	9.42
$\frac{1}{4}$"	0.05	0.10	0.15	0.20	0.25	0.29	0.34	0.39
	0.17	0.33	0.50	0.67	0.83	1.00	1.17	1.34
	790	1,570	2,360	3,140	3,930	4,720	5,500	6,280
	0.79	1.57	2.36	3.14	3.93	4.71	5.50	6.28

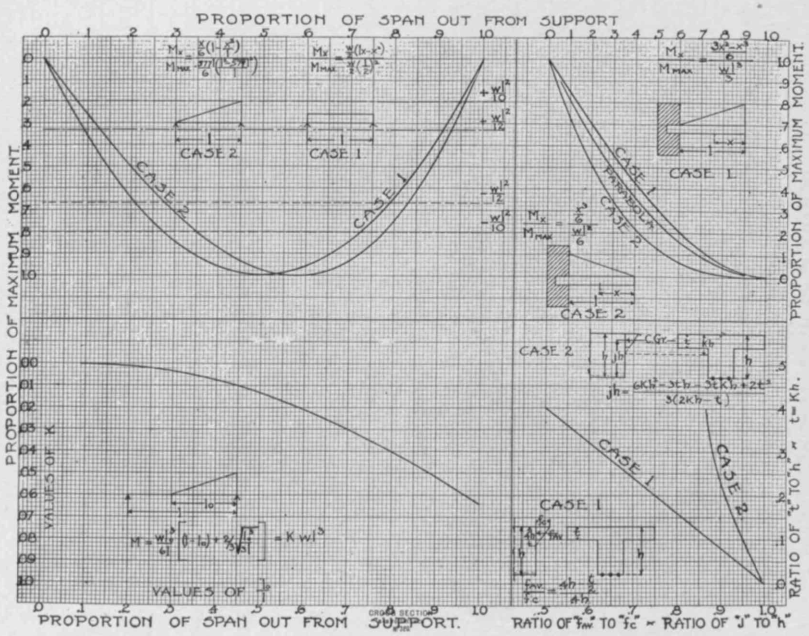


Center and end bending moments of beams fixed at one end and partially fixed at the other.

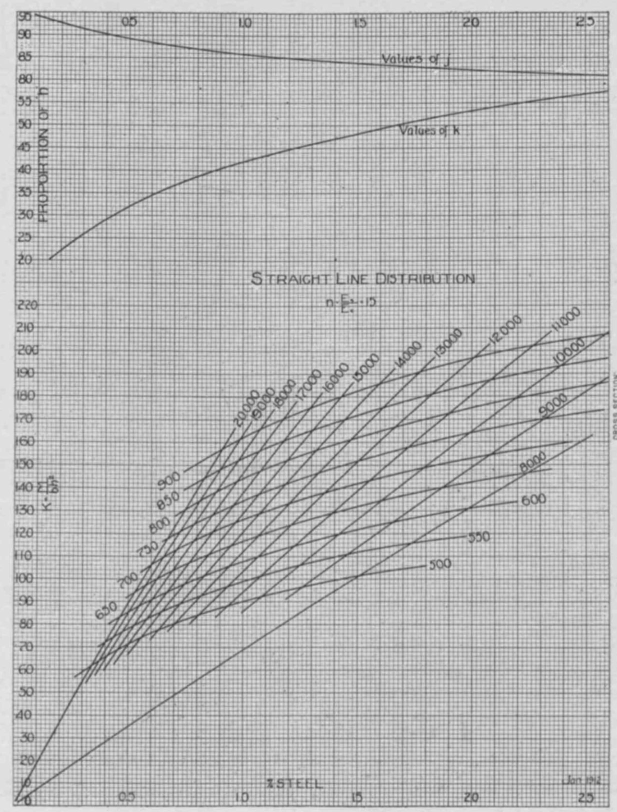
Square, Corrugated, and Twisted Bars.

Areas, Weights, Strengths @ 16000# per Sq. Inch and Perimeters.

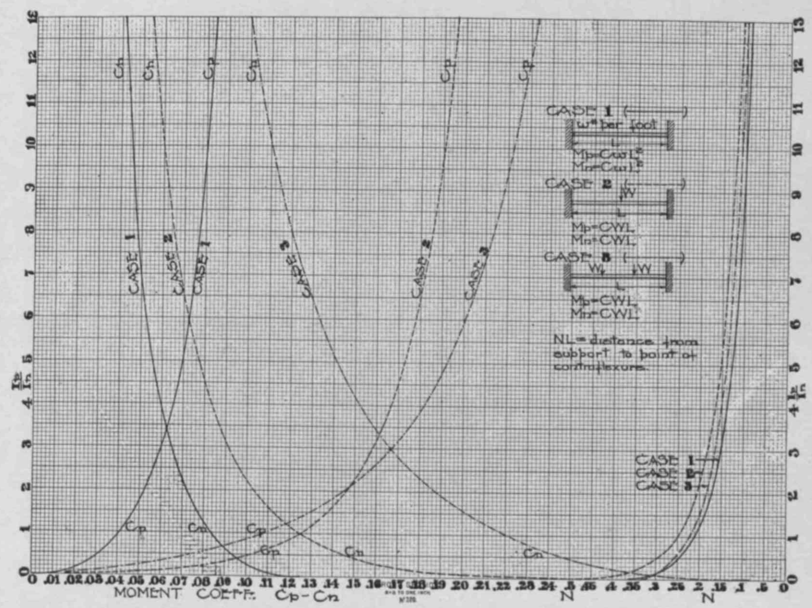
Diameter	Number of Bars: 1.	2.	3	4	5.	6.	7	8
$1\frac{1}{4}$"	1.56	3.12	4.69	6.25	7.81	9.38	10.94	12.50
	5.31	10.62	15.94	21.25	26.56	31.87	37.18	42.50
	25,000	50,000	75,000	100,000	125,000	150,000	175,000	200,000
	5"	10"	15"	20	25"	30"	35"	40"
$1\frac{1}{8}$"	1.27	2.53	3.80	5.06	6.33	7.59	8.86	10.13
	4.30	8.61	12.91	17.21	21.52	25.82	30.12	34.42
	20,300	40,500	60,800	81,000	101,300	121,500	141,800	162,000
	$4\frac{1}{2}$"	9"	$13\frac{1}{2}$"	18"	$22\frac{1}{2}$"	27"	$31\frac{1}{2}$"	36"
1"	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
	3.40	6.80	10.20	13.60	17.00	20.40	23.80	27.20
	16,000	32,000	48,000	64,000	80,000	96,000	112,000	128,000
	4"	8"	12"	16"	20"	24"	28"	32"
$\frac{7}{8}$"	0.77	1.53	2.30	3.06	3.83	4.59	5.36	6.13
	2.60	5.20	7.81	10.41	13.02	15.62	18.22	20.82
	12,200	24,500	36,800	49,000	61,200	73,500	85,500	98,000
	$3\frac{1}{2}$"	7"	$10\frac{1}{2}$"	14"	$17\frac{1}{2}$"	21"	$24\frac{1}{2}$"	28"
$\frac{3}{4}$"	0.56	1.12	1.69	2.25	2.81	3.38	3.94	4.50
	1.91	3.82	5.74	7.65	9.57	11.48	13.39	15.30
	9,000	18,000	27,000	36,000	45,000	54,000	63,000	72,000
	3"	6"	9"	12"	15"	18"	21"	24"
$\frac{5}{8}$"	0.39	0.78	1.17	1.56	1.95	2.34	2.73	3.12
	1.33	2.66	3.98	5.31	6.64	7.97	9.30	10.62
	6,200	12,500	18,800	25,000	31,200	37,500	43,800	50,000
	$2\frac{1}{2}$"	5"	$7\frac{1}{2}$"	10"	$12\frac{1}{2}$"	15"	$17\frac{1}{2}$"	20"
$\frac{1}{2}$"	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
	0.85	1.70	2.55	3.40	4.25	5.10	5.95	6.80
	4,000	8,000	12,000	16,000	20,000	24,000	28,000	32,000
	2"	4"	6"	8"	10"	12"	14"	16"
$\frac{3}{8}$"	0.14	0.28	0.42	0.56	0.70	0.84	0.98	1.12
	0.48	0.96	1.43	1.91	2.39	2.87	3.35	3.82
	2,200	4,500	6,800	9,000	11,200	13,500	15,800	18,000
	$1\frac{1}{2}$"	3"	$4\frac{1}{2}$"	6"	$7\frac{1}{2}$"	9"	$10\frac{1}{2}$"	12"
$\frac{1}{4}$"	0.06	0.12	0.19	0.25	0.31	0.38	0.44	0.50
	0.21	0.42	0.64	0.85	1.06	1.27	1.48	1.70
	1,000	2,000	3,000	4,000	5,000	6,000	7000	8,000
	1"	2"	3"	4"	5"	6"	7"	8"



Bending moment diagrams for various conditions of loading.



Plot of curves $M = kbd^2$



Center and end bending moments of beams fixed at the supports.

(For explanation of tables see page 61.)

Concrete Slide Rules and Tables

By E. F. ROCKWOOD, S.B.,
Instructor in Reinforced Concrete Design, M. I. T.

THE tables and slide rules shown in this issue of the RECORD have been developed in actual practice during the past eight years in offices devoted to concrete engineering and contracting.

The slab slide rule is adapted for the design of any uniformly loaded slab, and will give the required thickness of slab and area of steel for varying unit stresses.

The beam slide rule is intended for preliminary and estimate designing of beams loaded with uniform loads. It shows the depth to the steel and the sectional area of the rods required for any given case, whether the beam be a rectangular, angle, or tee beam. In the case of rectangular beams it also shows the minimum depth for any width and given stresses. For all beams the width of stem is given that would be used to give a rod spacing of three diameters center to center, and one and one-half inches of concrete outside of the rods. In all cases shown, where there are more than two rods the rods are in two rows. The economical depth plot given on the back of the beam rule is based upon the assumption that for given costs and a fixed width the most economical beam is the one in which the cost of the total steel per foot is equal to the sum of the costs of the concrete and the centering on the sides of the beam above the steel and below the slab. This can be proved mathematically if we make the assumption that the cost of the concrete and the centering vary as the depth. This rule does not in any way check web stresses nor compression stresses in tee or angle beams.

Both slab and beam rules are based on the straight-line formulæ recommended by the report of the Joint Committee on Concrete and Reinforced Concrete, with the modification that in determining the area of steel the value of *jd* is assumed constant at 87d.

The two tables giving the weights, areas, strengths, and perimeters of round and square rods are self-explanatory.

Rectangular-beam formulæ, based on the straight-line formulæ, give us the expression $M=kbd^2$. For a given value of $\frac{E_s}{E_c}$, values of k can be plotted for different unit stresses in the steel and in the concrete, and this has been done in one of the plots. On the same plot can be found values of *jd*, the moment arm, and *kd*, the distance from the extreme fiber in compression to the neutral axis, for varying percentages of steel. For given unit stresses we can find k and design accordingly; or, knowing the cross-section of our beam and the bending moment, we can find k and the per cent of steel, and from these two the unit stresses.

Another plot has the bending-moment diagram drawn for various conditions of loading, and, in the case of a beam with two supports, the lines of zero moment corresponding to given end bending moments. On the same sheet are given a simple formula and plot for finding the bending moment in a beam supported at each end and loaded for a portion of its length with a uniformly varying load. A case like this occurs when a basement wall is supported horizontally at the top and bottom by the floors, and is loaded with earth pressure for a portion of its height. On the same sheet is also shown the ratio of the average to the extreme fiber stress in the flange of a tee or angle beam for varying ratios of thickness of slab to depth to steel. This is based upon the assumption that the concrete stress is 650 and the steel stress 16,000. In practice, instead of figuring actual stresses, the bending moment that the section will resist with the above-mentioned stresses is found, and if this is greater than the actual bending moment the design is safe.

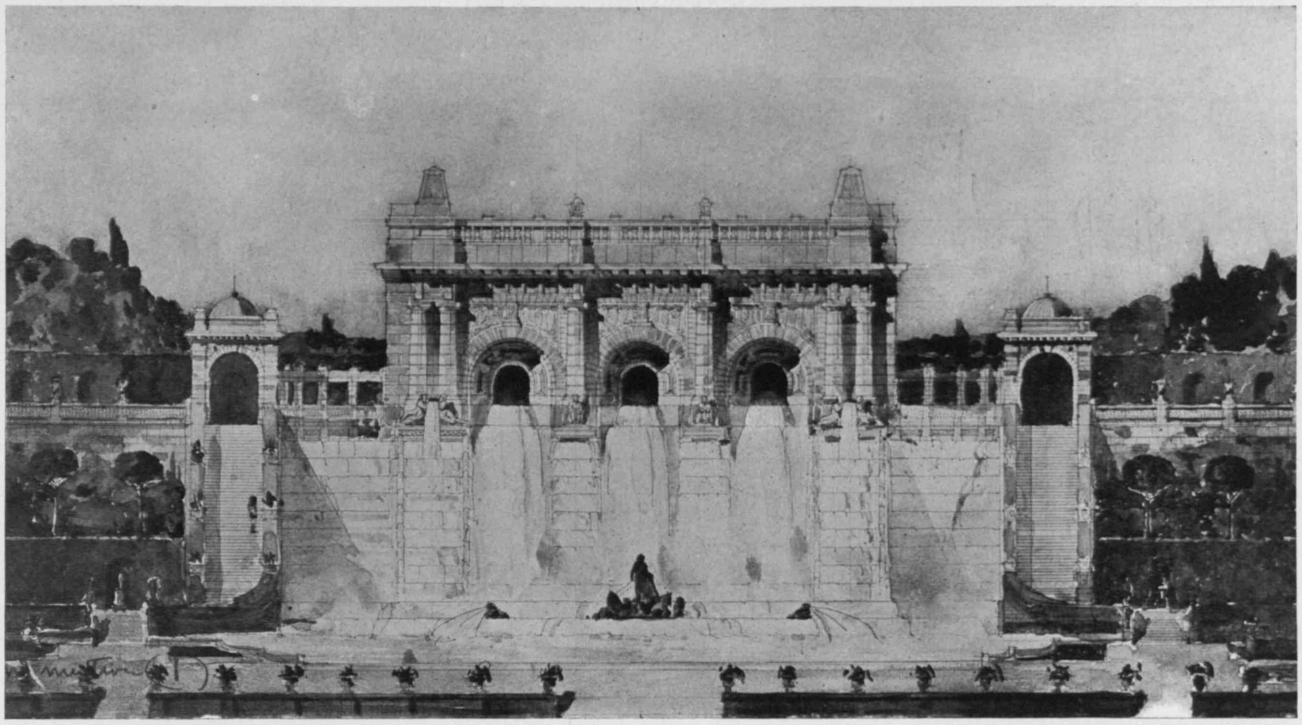
Another plot gives values of center and end bending moments of beams fixed at the ends and under different conditions of loading, having a constant moment of inertia from the fixed end to the point of contraflexure, and another constant moment of inertia between points of contraflexure.

The last plot assumes the beam to be fixed at one end and partially fixed at the other. It shows for different conditions of loading the variation in bending moment at the fixed end and at the center. In this plot the moment of inertia is assumed constant the entire length of the beam.

Reinforced concrete has within the past few years become one of the principal building-materials, not only for structures of mill and warehouse type, but also for buildings of a more monumental character. To keep apace with the increasing use of this material the Department of Architecture, through its Option in Architectural Engineering, has for several years offered a thorough course in the theory and methods of design in reinforced concrete.

The course is begun in the first term of the fourth year, and consists of lectures on the theory of design and of experiments in the laboratory. This portion of the work is under the direction of Professor H. W. Haywood. Tests are made on unknown cement, sand, and stone, which are studied and reported on. The students are trained in the selection of a proper aggregate from the materials at hand. Reinforcing steel is studied and tested. During the latter part of the course lectures are given on cement-handling plants, granolithic floors, walks, waterproofing, paints, etc.

At the beginning of the second semester the students are prepared to commence the study of practical design in reinforced concrete and to learn its application to building-construction. Mr. E. F. Rockwood, Engineer of the New England Concrete Construction Company, has charge of this part of the course. Under his personal supervision the students are instructed in the design of slabs, beams, columns, footings, etc., not as isolated structures, but as members of a construction which, to be efficient, must be completely harmonious and unified. The problems in design are worked out at the drafting-tables, and complete detailed drawings of the construction are made. Parallel with the classroom problems, a lecture course is given, illustrated with lantern-slides, supplemented by excursions to buildings where work in actual progress may be inspected. Mr. Rockwood has prepared a set of notes on reinforced concrete design for use in this class, and, in addition, technical articles are assigned for study.



THIRD YEAR OF DESIGN — A CHÂTEAU D'EAU

R. C. GOETH

Alumni Notes

The Department is in receipt of many applications from architects and others for assistants. We have no information as to whether our alumni are satisfied with their present positions and prospects, consequently many opportunities for Institute men are doubtless lost.

The Secretary of the Institute will send application blanks to any of our former students who wish to register their names with the view of making a change whenever a suitable opportunity occurs.

Of the Class of 1912 the following men are in New York: L. Grandgent, with the National Biscuit Company; A. Harkness, with Mr. Arthur Ware; H. E. Kebbon, with Mr. W. W. Bosworth; V. P. Yacoubyan, with Post & McCord.

Mr. and Mrs. Henry Frothingham Noyes, of Brooklyn, N. Y., announce the marriage of their daughter Dorothy to John T. Arms, '11, on May 17.

R. H. Hannaford, '10, received the third prize ($150) in *The Brickbuilder's* annual architectural terra-cotta competition. His design is shown in the March Supplement of *The Brickbuilder*.

W. E. Haugaard, '10, is in the employ of Warren & Wetmore, New York City.

B. S. Hirschfeld, '10, on March 26, filed his certificate of architecture in San Francisco County.

W. L. Smith, '10, is the winner of the 1913 Rotch Traveling Scholarship. Among the competitors were R. J. Batchelder, '08, and A. McNaughton, '11.

T. H. Atherton, Jr., '09, has an office in the Coal Exchange Building, Wilkes-Barre, Penn., his home city.

J. M. Hatton, '08, and F. A. Burton, '09, who have been in the office of Doyle, Patterson & Beach, Portland, Ore., are traveling in Europe. They paid a short visit to the Department before sailing from Boston.

J. R. Kibbey, '08, has entered into partnership with Mr. R. W. Lescher, in Phoenix, Ariz.

Winsor Soule, '07, last August became associated in business with Mr. Russel Ray, Harvard, '04, at Santa Barbara, Cal. They have at present under way a reinforced concrete hospital building, costing about $90,000, and a Y. M. C. A. building costing about $60,000.

During the first week of April the *envois* of J. McGinniss, '08, were on exhibition in the Department.

E. B. Evans, '06, for the past five years general superintendent for D. G. Loomis & Sons, of Montreal, Canada, has opened an office for himself as general contractor at 74 St. Denis St., Montreal.

W. C. Furer, '06, after a year and a half in Hilo, has returned to Honolulu, where he is connected with the Waiahole Water Co.

J. W. Merrow, '06, has general charge of the architectural and mechanical work in connection with the various F. F. Proctor theaters.

H. A. Whitney, '04, formerly junior member of the firm Whidden & Lewis, of Portland, Ore., is now a member of the firm Sutton & Whitney, with offices in the Lewis Building, Portland, Ore.

O. M. Wiard, '04, is in the office of Davis & Brooks, Hartford, Conn.

C. V. Merrick, '00, has opened offices at 51 State St., Albany, N. Y.

R. S. De Golyer, '98; L. C. Clarke, Jr., '04; F. G. Dempwolf, '07; and F. B. Schmidt, '08, are in the office of Marshall & Fox, Chicago, Ill.

C. J. Hogue, '98, until recently with the Concrete Engineering Company, Boston, Mass., is now in the office of E. T. Foulkes, '98, in Portland, Ore.

C. G. Badgley, '95, is located in the Alaska Building, Seattle, Wash.

Guy Lowell, '94, has been chosen from twenty-two competitors as architect for the New York County Court-house. The jury, consisting of Mr. Frank Miles Day, John Lawrence Mauran, and Robert S. Peabody, said in their report to the board: "This design fulfils to an unusual degree the exacting conditions of the program. It presents an exterior of high dignity and interest. It gives evidence of great architectural ability on the part of its author. It promises a public monument in every way worthy of the city of New York."

Miss Lois L. Howe, '92, and Miss Eleanor Manning, '06, announce that they have formed a partnership for the practice of architecture, with offices at 717 Tremont Building, Boston, Mass.

C. H. Alden, '90, besides maintaining his office in Seattle, Wash., has taken a temporary position with the Panama-Pacific International Exposition as superintendent of specifications.

J. S. Rogers, '81, is a member of the firm Rogers & Bonnah, located in the Penobscot Building, Detroit, Mich.

Current Work of the Alumni Illustrated in the Magazines

American Architect.

August 7, 1912, Newhall, '91, & Blevins, Church, Cambridge, Mass.
" 28, " Bigelow, '88, & Wadsworth, '04, House, Milton, Mass.
October 2, " J. K. Taylor. '79, United States Post-office, Chelsea, Mass.
" 9, " Bigelow, '88, & Wadsworth, '04, House, Mt. Kisco, N. Y.
" 16, " F. A. Bourne, '95, House, Milton, Mass.
November 6, " Newhall, '91, & Blevins, Y. M. C. A. Building, Cambridge.
" 6, " J. W. Beal, '77, Apartment-house, Newton, Mass.
December 4, " Parker, '95, Thomas, '95, & Rice, '91, Commercial Building, Boston, Mass.
" 4, " Little, '75, & Browne, Temple in a Garden, Brookline, Mass.; House, East Gloucester, Mass.
" 18, " J. L. Little, Jr., '01, Church, Chestnut Hill, Mass.
" 25, " G. Lowell, '94, Club-house, Locust Valley, L. I., N. Y.
" 25, " J. Purdon, '98, House, Chestnut Hill, Mass.
January 15, 1913, J. K. Taylor, '79, United States Post-office, Beverly, Mass.
February 12, " Hunt & Hunt, '82, House, New York City.
March 5, " E. F. Lawrence, '01, Library, Portland, Ore.
" 12, " Bliss, '95, & Faville, '96, Bank and Commercial Building, San Francisco, Cal.
" 26, " C. Gilbert, '80, Woolworth Building, New York City.
April 2, " J. L. Little, Jr., '01, House, Chestnut Hill, Mass.
" 2, " H. W. Rowe, '04, House, Greenwich, Conn.
" 2, " J. W. Beal, '77, House, Brookline, Mass.
" 23, " R. Coit, '86, House, Brookline, Mass.
" 30, " G. Lowell, '94, Competition Drawings of New York County Court-house.

Architectural Record.

July, 1912, Graham & Myers, '98, Home Apartment-house, Seattle, Wash.
" " Frost, '79, & Granger, House, Lake Forest, Ill.
" " H. V. Shaw, '94, House, Hubbard Woods, Ill.
" " Tallmadge, '98, & Watson, Bungalow, Maywood, Ill.
September, " Kilham, '89, & Hopkins, '96, House, Brookline, Mass.
October, " Derby, '02, Robinson, '99, & Shepard, '96, Houses, Concord, Mass.
" " W. Eyre, '79, House, Orange, N. J.
" " H. V. Shaw, '94, House, Netka, Ill.

Architectural Review.

January, 1913, Andrews, '77, Jaques, '77, & Rantoul, School Building, West Roxbury.
" " A. W. Chittenden, '92, House, Birmingham, Mich.
" " Parker, '95, Thomas, '95, & Rice, '91, School Building, Dorchester
February, " E. H. Hewitt, '97, Studio, Minneapolis, Minn.
" " H. V. Shaw, '94, Stable, Radnor, Penn.
" " Shepley, '82, Rutan & Coolidge, '83, School Building, Roxbury, Mass.
March, " E. Q. Sylvester, '93, Church, Manchester, N. H.
" " Wheelwright, '78, Haven & Hoyt, Anderson Bridge between Boston and Cambridge, Mass.

Architecture.

October, 1912, Bigelow, '88, & Wadsworth, '04, House, Mt. Kisco, N. Y.
December, " C. Gilbert, '80, Library, University of Texas, Austin, Tex.
" " J. E. R. Carpenter, '88, and D. E. Waid, Associated, Apartment-house, New York City.
January, 1913, C. Gilbert, '80, Woolworth Building, New York City.
" " J. E. R. Carpenter, '88, and W. D. Blair, Associated, House, Greenwich, Conn.
February, " Perkins, '89, Fellows & Hamilton, Park Building, Chicago, Ill.
April, " LaFarge, '83, & Morris, Church, Philadelphia; Country House on Long Island, N. Y.
" " H. K. Walker, '00, & G. H. Chichester, House, Montclair, N. J.

Brickbuilder.

August, 1912, Page & Frothingham, '99, House, Topsfield, Mass.
September, " G. Lowell, '94, Hospital, Pawtucket, R. I.
October, " Page & Frothingham, '99, American Academy of Arts and Sciences, Boston, Mass.
" " J. K. Taylor, '79, United States Post-office, Chelsea, Mass.
" " Shepley, '82, Rutan & Coolidge, '83, House, Brookline, Mass.
November, " H. V. Shaw, '94, Apartment-house, Chicago, Ill.
December, " W. Eyre, '79, House, Forest Hills, L. I., N. Y.
January, 1913, Andrews, '77, Jaques, '77, & Rantoul, Town Hall, Nahant, Mass.
" " Parker, '95, Thomas, '95, & Rice, '91, Private School, Baltimore, Md.
" " Richardson, '98, Barott & Richardson, '03, Commercial Building, Boston, Mass.
February, " LaFarge, '83, & Morris, House on Long Island, N. Y.
" " Marsh & Peter, '92, and E. D. Ryerson, Associated, Church, Washington, D. C.
" " Wood, Donn, '91, & Deming, House, Washington, D. C.
March, " Brainerd, '87, & Leeds, '94, and O. C. Thayer, Associated, Y. M. C. A. Building, Lawrence, Mass.
" " LaFarge, '83, & Morris, Church, Philadelphia, Penn.
" " Page & Frothingham, '99, House, Chestnut Hill, Mass.
" " Schmidt, '87, Garden & Martin, Apartment-house, Chicago, Ill.
April, " Bigelow, '88, & Wadsworth, '04, House, Milton, Mass.
" " J. H. Cady, '06, Commercial Building, Providence, R. I.
" " A. Garfield, '96, House, Cleveland, O.
" " Kilham, '89, & Hopkins, '96, Houses, Forest Hills, Mass.

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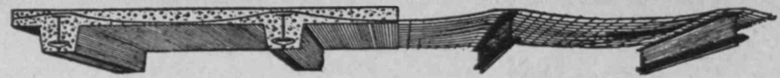

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