

REDDING, BAIRD, & CO.,  
83 Franklin Street,  
BOSTON, MASS.  
ARTISTIC, DOMESTIC, AND ECCLESIASTICAL  
STAINED GLASS.

Established 1848.  
L. HABERSTROH & SON,  
**Painters, Designers, and Decorators,**  
9 Park Street, corner of Beacon, Boston.  
ALBERT HABERSTROH.

ARCHITECTURAL DRAWINGS  
Mounted in the best manner, and at reasonable prices.  
FRAMES SUITABLE FOR ARCHITECTS' USE A SPECIALTY.  
WILLIAMS & EVERETT,  
79 BOYLSTON STREET . . . . . BOSTON.

99 Court Street, Boston.  
GEORGE H. POLLEY & CO.,  
*Publishers and Importers of*  
\* ARCHITECTURAL PUBLICATIONS \*  
OF EVERY DESCRIPTION.  
99 Court Street, Boston.

MEMORIAL WINDOWS. COLONIAL LEADING.  
EDWIN FORD,  
*Pelham Studios, Boylston Street, Boston.*  
GLASS MOSAICS IN PLASTER. DOMESTIC STAINED GLASS.

PATENT STIFFENED  
FIRE-PROOF WIRE LATHING.  
The best surface upon which to plaster. It is more easily and rapidly applied than any other Wire Lathing. Plaster will not crack. Fire cannot spread. *For discounts and particulars, apply to*  
NEW JERSEY WIRE CLOTH COMPANY,  
TRENTON, NEW JERSEY.

GRANVILLE MOSAIC  
WOOD FLOORS  
Excel in all the essentials requisite to an  
ornamental floor.  
ASK ABOUT THEM.  
O. S. DICKINSON . . . . . Granville, Mass.

THE BRUSH ELECTRIC COMPANY,  
MANUFACTURERS OF  
ALL KINDS OF ELECTRIC LIGHTING APPARATUS, ELECTRIC  
MOTORS, ELECTRO-PLATERS, CARBONS, ETC.  
*SEND FOR CATALOGUE.*  
GENERAL OFFICES . . . . . CLEVELAND, OHIO.

N. WILSON & CO.,  
\* BOOK \* BINDERS, \*  
112 Beach Street, Boston, Mass.  
*All kinds of books bound. Architectural books mounted and bound with special care. Portfolios made to order.*

WIRE LATH.  
See advertisement on page iv.

"SHIPOLEUM,"  
"SUPREMIS,"  
"IVORY ENAMELITE."  
See advertisement on pages ii. and iv.

HENRY HUBER & CO.,  
NEW YORK,  
MANUFACTURERS OF  
BOYLE'S PNEUMATIC WATER-CLOSETS,  
AND  
FINE PLUMBING TOOLS.  
See advertisement on page ii.

GRANOLITHIC,  
FOR  
SIDEWALKS, BASEMENT FLOORS, CORRIDORS,  
RAILROAD PLATFORMS, ETC.  
STUART & CO., Edinburgh, Scotland.  
CHARLES HARRIS, Agent for New England,  
OFFICE, 12 PEARL STREET, BOSTON.

School of Drawing and Painting.  
MUSEUM OF FINE ARTS,  
BOSTON.  
The School Year begins Sept. 30, 1889. Classes from the cast and the living model, nude and draped. The Department of Decorative Design is of special value to architectural students.  
For further information or circulars, address the School.

THE MAGEE FURNACE CO.,  
32 to 38 Union Street, Boston,  
86 Lake Street, Chicago,  
*Manufacturers of Magee's Boston Heater*  
AND OTHER FURNACES.  
Also a full line of Cooking Apparatus.  
Estimates furnished. Satisfaction guaranteed. Send for special circulars.

THE NORTHWESTERN TERRA-COTTA CO.  
MANUFACTURERS OF  
ARCHITECTURAL TERRA-COTTA,  
FOR EXTERIOR AND INTERIOR DECORATIONS, from Special Designs,  
in all Colors.  
Main Works and Office: Branch Works:  
Clybourn and Wrightwood Aves. Corner 15th and Laflin Streets.  
Branch Office:  
Room 1118, Rookery Building, CHICAGO.

FINE CARPETINGS AND ORIENTAL RUGS.  
Full lines of the Scotch Axminsters, English Wiltons, and Brussels. Special patterns. All of Morris & Company's designs in Carpets. Also a full line of American Carpetings.  
JOEL GOLDTHWAIT & CO.,  
169 Washington Street,  
BOSTON.

T. ASPINWALL & SON,  
TILES OF EVERY DESCRIPTION, MOSAICS,  
WOOD MANTELS, GRATES, OPEN FIREPLACES,  
IRON AND BRASS WORK, BRIC-A-BRAC,  
ART POTTERY, ETC.  
303 Fifth Avenue, N. E. Corner 31st Street,  
NEW YORK.

ESTABLISHED 1840.  
JACKSON ARCHITECTURAL  
IRON \* WORKS. \*  
FOUNDRIES & SHOPS: EAST 28th & 29th STS.,  
NEW YORK.  
OFFICE: 315 EAST 28th ST.

THE U. S. MAIL CHUTE,  
FOR OFFICE BUILDINGS, APARTMENTS, AND HOTELS.  
NOW IN GENERAL USE IN THE UNITED STATES, CONNECTING  
EVERY STORY WITH MAIL BOX.  
CUTLER MANUFACTURING CO., ROCHESTER, N. Y.,  
PATENTED. Sole Manufacturers.

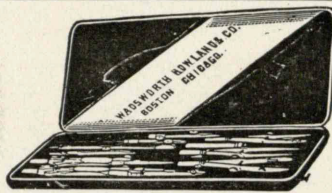
JOHANN FABER'S  
SIBERIAN AND POLYGRADE  
LEAD PENCILS,  
In all grades and degrees. The finest pencils made.  
QUEEN & CO., Philadelphia,  
SOLE AGENTS FOR U. S. A.

PHILADELPHIA & BOSTON FACE BRICK CO.,  
No. 4 Liberty Sq., BOSTON, MASS.  
MANUFACTURERS OF  
\* PRESSED FACE BRICK, \*  
RED, BUFF, WHITE, MOTTLED, ETC.  
PLAIN, OR IN CURVES AND ARCHES TO ANY RADIUS.  
*Our brick are not dry pressed.*  
Works:—425 Medford Street, Charlestown District.

PHILADELPHIA & BOSTON FACE BRICK CO.,  
No. 4 Liberty Sq., BOSTON, MASS.  
SUPERIOR MERITS OF OUR BRICK. { UNIFORM COLORS, PERFECT ANGLES,  
FINEST TEXTURE, GREAT STRENGTH,  
SLIGHT ABSORPTION, EVEN SIZES,  
EASILY CUT, CLIMATE PROOF.  
*Our brick are not dry pressed.*  
Works:—425 Medford St., Charlestown District.

PHILADELPHIA & BOSTON FACE BRICK CO.,  
No. 4 Liberty Sq., BOSTON, MASS.  
MANUFACTURERS OF  
\* ORNAMENTAL BRICK \*  
OF EVERY DESCRIPTION  
STANDARD SHAPES ALWAYS IN STOCK. SPECIAL DESIGNS TO ORDER.  
*Our brick are not dry pressed.*  
Works:—425 Medford Street, Charlestown District.

**WADSWORTH, HOWLAND, & CO.,**  
 MANUFACTURERS OF  
*Bay State Paints, & W. H. & Co. Liquid Paints,*  
 In 45 Shades, for Interior and Exterior House Painting.  
 WOOD FILLERS: VARNISHES, JAPANS, AND STAINS.  
 FINE COLORS OF ALL KINDS.



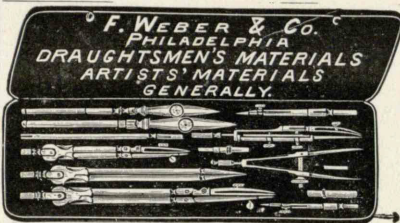
82 & 84 WASHINGTON STREET, BOSTON.  
 263 & 265 WABASH AVENUE, CHICAGO.  
 DRAUGHTING INSTRUMENTS  
 OF ALL KINDS,  
 DRAWING AND BLUE PROCESS PAPERS,  
 CURVES, SCALES, TRIANGLES, T SQUARES,  
 OIL AND WATER COLORS, BRUSHES,  
 ARTISTS' MATERIALS.

**STAINED GLASS.**  
 DONALD MACDONALD, AGENT,  
*GLASS STAINER AND DECORATOR,*  
 Studio and Works, 400 Northampton Street,  
 BOSTON.

**METAL  
 CEILINGS**

OF FINE CORRUGATED, TWILLED, AND EMBOSSED  
 IRON AND TIN DESIGNS FOR ALL CLASSES OF BUILDINGS.  
 SEND FOR ILLUSTRATED CIRCULAR.  
*H. S. NORTHROP, Manuf'r, 18 Rose Street, New York.*

**THE MITCHELL VANCE COMPANY,**  
 Successors to MITCHELL VANCE & CO.,  
 ESTABLISHED 1854,  
 MANUFACTURERS OF  
**GAS FIXTURES, ELECTROLIERS,  
 LAMPS, ETC.**  
 CORRESPONDENCE SOLICITED.  
 ESTIMATES FURNISHED.  
*Manufactory: 24th & 25th Sts. and 10th Ave. Salesrooms: 836 & 838 Broadway and 13th St.*  
 NEW YORK CITY.

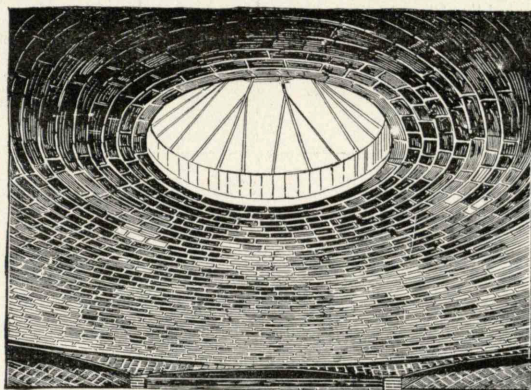


**F. WEBER & CO.,**  
**Engineers' and Draughtsmen's Supplies,**  
 United States Agents for  
 RIEFLER'S PATENT DRAWING INSTRUMENTS, SUN AND  
 ECLIPSE BLUE PRINT PAPERS, JUPITER ROLL PAPER.  
*Artist's Materials of Every Description.*  
 No. 1125 CHESTNUT STREET, PHILADELPHIA.  
 Branch House, No. 918 OLIVE STREET, ST. LOUIS, MO.



**GUSTAVINO FIREPROOF CONSTRUCTION Co.,**

BOSTON, MASS.:  
 63 Pierce Build'g, 12 Huntington Ave.



DENVER, COL.:  
 1643 Lawrence Street.

[DOME 40 FEET IN SPAN AND 2 INCHES THICK.]

View of the Ceiling of the Main Office, N. Y. (In Construction.)

NEW YORK: 35 BROADWAY; 57TH STREET AND NORTH RIVER.

**"IVORY ENAMELITE"**

Is the only Varnish PALE ENOUGH to use over dead white for the old colonial style of finish, and which will remain hard after drying. Another great desideratum in the preparation is that it can be rubbed to a dead or Ivory finish.  
 It is made of a new variety of hard gum which never gets sticky, and our best Decorators, who have used it for more than two years past, declare IT HAS NO PEER. It dries quickly.

**CHICAGO VARNISH CO.,**  
 204 PINE ST., CHICAGO.  
 PEARL & HIGH STS., BOSTON.  
 WORKS: Chicago & Lake View, Ill. See advertisement on page iv.

**To Architectural Draughtsmen and those contemplating study abroad.**  
 Attention of Students in the Architectural Department of the Massachusetts Institute of Technology is specially called

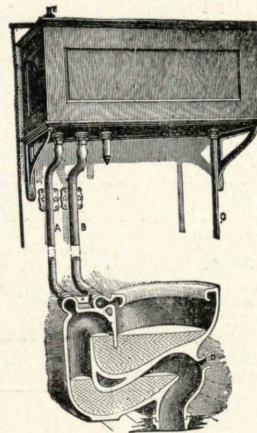
*Evening Classes in drawing from the life and cast have been formed with special reference to the accommodation of architectural students, draughtsmen in architects' offices, and others engaged during the day-time.*  
*The training here given is patterned after that of the best Ateliers of Paris, and covers the ground necessary in preparing for the Ecole des Beaux-Arts. Evening Classes are in charge of Mr. Bunker, pupil of Gérôme, head Professor in Painting at the National School of Fine Arts, Paris.*

**Cowles Art School.**  
 New Studio Building, 145 Dartmouth St., Boston.  
 SEVENTH YEAR OPENS OCTOBER 1.  
 Day and Evening Classes.  
 Full Courses in Drawing and Painting.  
 Special Attention to Life and Cast, Portraiture and Illustrating. Class in Interior Decoration.  
 Begin any time.  
 ERNEST L. MAJOR, ABBOTT GRAVES, MERCY A. BAILEY,  
 DELIA C. RICH, Instructors.  
**FRANK M. COWLES, Manager.**  
 For circulars, address as above.

**TO ARCHITECTS,**  
**Civil, Mechanical, and Mining Engineers,**  
**Builders, Manufacturers, etc.**  
 WE WILL MAIL FREE ON APPLICATION  
**A COMPLETE CATALOGUE OF OUR PUBLICATIONS**  
 (ABOUT EIGHTY PAGES),  
 ARRANGED UNDER SUBJECTS AS FOLLOWS:  
 AGRICULTURE — ARCHITECTURE — ART — ASSAYING —  
 ASTRONOMY — BOTANY — BRIDGES — CHEMISTRY —  
 DRAWING — ELECTRICITY — ENGINEERING — HYDRAULICS —  
 MANUFACTURES — MATERIALS OF ENGINEERING —  
 MATHEMATICS — MECHANICS — METALLURGY —  
 MINERALOGY — MINING — SHIP-BUILDING — STEAM ENGINE —  
 VENTILATION — etc.  
**JOHN WILEY & SONS,**  
 ASTOR PLACE, NEW YORK.

**WILER'S SUDING BANDS**  
 ARE SUPERIOR TO ALL OTHERS AND ARE USED BY THE LEADING ARCHITECTS  
 AWARDED FIRST PRIZE AT CINCINNATI CENTENNIAL EXPOSITION IN 1888.  
**WILLIAM WILER**  
 SOLE MFR.  
 47 & CEDAR ST. MILWAUKEE WIS.  
 Agents wanted everywhere  
 State your business when writing for Catalogue or Agency.

**HENRY HUBER & COMPANY,**  
 MANUFACTURERS OF  
**SANITARY SPECIALTIES.**  
 MAIN OFFICE AND WAREHOUSES,  
 81 BEEKMAN STREET . . . NEW YORK.



We manufacture a general line of plumbing goods suitable for public and private work.

Boyle's Patent Pneumatic Water Closets, which we alone control, are used in all parts of the United States, and their excellence in a sanitary point of view is generally acknowledged. They have been placed in post-office and court-house buildings, and have stood the test of rough usage where other

makes have utterly failed. Many prominent hotels throughout the country are provided with our closets; they are also specially adapted for use in residences, owing to their noiseless operation and absolute safety against noxious gases. We have branch show-rooms at Boston and Chicago, and invite inspection of our wares. Our illustrated catalogue will be cheerfully sent to all architects upon application.

Branches at { 82 Dearborn Street, Chicago.  
 { 235 Washington Street, Boston.

# THE ANDERSON

PRESSED FACE SHAPE, AND ORNAMENTAL

## \* BRICK, \*

IN

RED, DRAB, PINK, GARNET, MOTTLED,  
 BUFF, OLD GOLD, BLACK, BLOOD STONE, DRUSED,  
 BROWN, OBSINIAN, WHITE, ONYX, MARBLED,  
 ROMAN, ASHLAR, ETC.,

are pronounced by Architects, in strength, texture, uniformity of size, color, shades, perfect shape, angles, and lines, the finest in the world, surpassing everything in the art.

**THE ANDERSON COMPANIES ARE THE LARGEST MANUFACTURERS IN FINE GRADES OF PRESSED BRICK IN THIS COUNTRY OR ABROAD.**

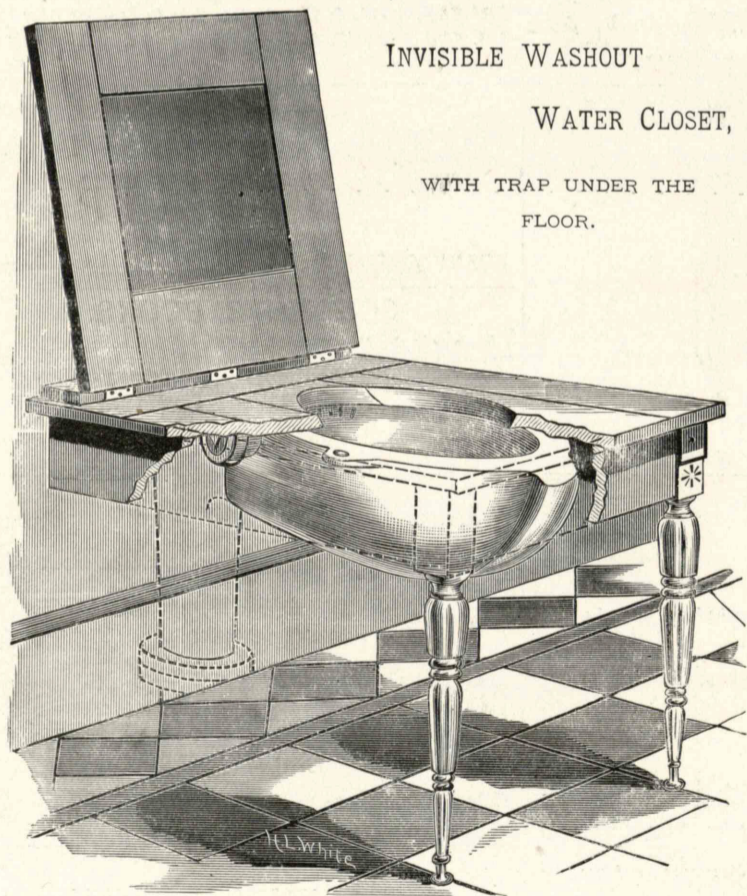
Architects and Builders can obtain illustrated catalogue and any desired information, on application to the nearest Company.

CHICAGO ANDERSON PRESSED BRICK CO., Office, 189-191 La Salle St., Chicago.  
 NEW YORK ANDERSON PRESSED BRICK CO., Office, 132 Mangin St., New York.  
 NEW ENGLAND ANDERSON PRESSED BRICK CO., Office, 50 Bromfield St., Boston.

### WEEDEN'S AEIDA

OR,

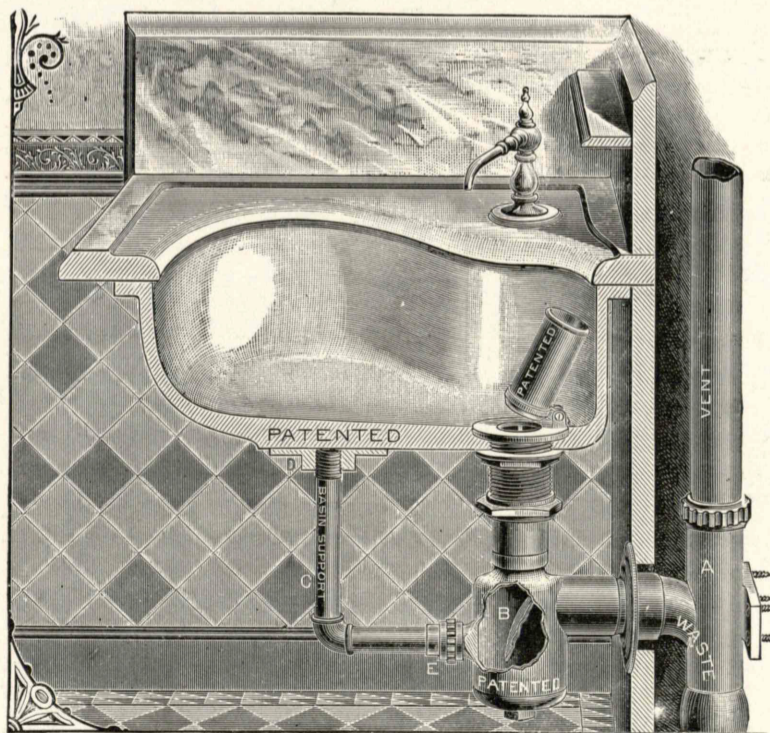
INVISIBLE WASHOUT  
 WATER CLOSET,  
 WITH TRAP UNDER THE  
 FLOOR.



Illustrated Catalogues sent on application to  
 WEEDEN SANITARY MANUFACTURING COMPANY,  
 BOSTON, MASS.

### BARRETT'S COMBINATION WASH BASIN,

OVERFLOW BRASS TRAP AND  
 BASIN SUPPORT.



Send for catalogue.

JAMES BARRETT,  
 BOSTON, MASS.

# WIRE LATH

"CLINTON" DOUBLE TWIST WARP.  
CLINTON STIFFENED.  
STANLEY CORRUGATED.  
STEVENS RIGID.

## CLINTON WIRE CLOTH COMPANY,

PATENTEES AND SOLE MANUFACTURERS OF THE ABOVE-NAMED LATH.

MOST PERFECT AND ECONOMIC SYSTEM OF FIRE-PROOF CONSTRUCTION.  
CEILINGS PLASTERED ON THIS LATH WILL NEVER CRACK.

SEND FOR CIRCULARS.

76 BEEKMAN STREET,  
NEW YORK.

199 WASHINGTON STREET,  
BOSTON.

137 LAKE STREET,  
CHICAGO.

FACTORY,  
CLINTON, MASS.

UNITED STATES SOLE AGENTS  
For ALBERT LEVY'S BLUE PROCESS PAPERS.

**FROST & ADAMS,**  
IMPORTERS & DEALERS  
in **Artists' Materials**  
of Every Description

MATHEMATICAL INSTRUMENTS,  
ETCHING MATERIALS, TAPESTRY  
CANVAS, COLORS, Etc.

37 Cornhill  
Boston



BLUE PRINTS FROM TRACINGS AT SHORT  
NOTICE A SPECIALTY.

### LUTHER S. CUSHING,

60 STATE STREET, BOSTON.

Agent for Investors in Omaha and  
Kansas City Real Estate Mortgages.

Among my Customers are Some of the Most  
Prominent Trustees, Institutions, and Individuals in  
Boston and New England.

N. B. — The loans that I recommend are on highly im-  
proved and income-bearing property in the city proper.

### RUSTLESS IRON PIPE,

— FOR —  
WATER, GAS, AND STEAM.

THE WELLS RUSTLESS IRON CO.,

21 Cliff St., New York.

EDWARD L. COOK, Buffalo, Agent for Buffalo, N.Y.  
BRAMAN, DOW, & CO., Boston, Sole Agents for New Eng.  
I. S. VAN WINKLE & CO., San Francisco, Sole Agents for  
Pacific Coast.

### CAUTION!

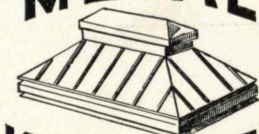
THE BEST MADE AND  
SOLD UNDER OUR GUARANTEE.

ALL GENUINE ALTENEDER INSTRUMENTS  
ARE STAMPED WITH NAME OR TRADE-MARK.

T. ALTENEDER,  
Manufacturer, PHILADELPHIA.

Trade  
T. A.  
Mark.

**METAL  
SKYLIGHTS**



Made of galvanized iron and copper. Absolu-  
tely no leakage from any source; no dripping  
or sweating; fire-proof; ventilating.  
Galvanized iron and copper cornices and gutters.  
Sheet metal work for buildings. Send for illustrated  
circular.

E. VAN NOORDEN & CO.,  
383 Harrison Avenue, BOSTON, MASS.

**FIRE PROOF  
FURRING**



of sheet metal, for iron and  
wood columns and beams, plas-  
ter cornices and panels on  
walls, ceilings, and girders.  
Conforms to all shapes, making  
a great saving of plaster.  
Send for illustrated circular.

PLASTER

### "SUPREMIS" FLOOR FINISH,

First Introduced in 1883,

Has received the unqualified praise of all who have used it, because: It dries rapidly (can safely be walked on in six hours);  
is very easily applied; has no unpleasant odor.

It is thoroughly water-and-mud proof; i. e. never stains. Scratches do not show white upon it.

It has great durability; age hardens it. It imparts the beautiful finish, without the dangerous slipperiness, of waxed  
floors.

### "SHIPOLEUM"

For interior house work has wonderful power of resistance to water, alkali, soot, ammonia, dampness. Its great elasticity  
and consequent durability, and the beautiful finish it imparts, give it preference over all similar varnishes.

We have exposed this continuously for one year upon the roof of our Works; to dripping water for fifteen months; in  
a basement stable for three years; and all without serious impairment of the Varnish.

Both these preparations are made upon a formula entirely new to Varnish Makers (our own discovery), and are, we  
say unhesitatingly, worthy your serious consideration. Though valuable, they are not costly.

OFFICES:

204 Pine St., Chicago.  
Cor. Pearl & High Sts.

CHICAGO VARNISH CO., Sole Makers.

Established 1865.

See advertisement on page ii.

### THE TELESCOPE \* HYDRAULIC \* ELEVATOR.

Most Practical, Economical, and CHEAPEST  
ELEVATOR yet devised.

NOT POSSIBLE TO FALL.

FRANK E. FITTS . . . 76 Pearl Street, Boston.

### SCIENTIFIC BOOKS.

Students in the Massachusetts Institute of Technology are invited to  
visit the Old Corner Bookstore, and examine the large assortment of  
works adapted to their studies in the various departments of the School.  
The prices will be found very reasonable.

THE OLD ESTABLISHED STAND,  
283 Washington, Corner School Street, Boston.

DAMRELL & UPHAM.

### J. & R. LAMB,

ESTABLISHED 1857. 59 CARMINE ST., NEW YORK.

### STAINED GLASS & COLOR DECORATION.

Sketches submitted embodying the architect's suggestions for any work  
of this character.

Designing Dept.,  
CHAS. R. LAMB.

Mural Painting,  
F. S. LAMB.

### NOTMAN. Photographic Portraiture of every description.

MINIATURES ON IVORY,

Only Studio in Boston, opp. 99 Boylston St.  
Public Garden.



MENEELY & COMPANY,  
WEST TROY, N. Y., BELLS,  
For Churches, Schools, etc., also Chimes  
and Pells. For more than half a century  
noted for superiority over all others.



THE ORIGINAL TRANSCONTINENTAL LINE



BETWEEN

THE MISSOURI RIVER

AND

THE PACIFIC COAST.

DAILY TRAINS from Council Bluffs, Omaha, St. Joseph, Leavenworth, and Kansas City,

TO

DENVER, OGDEN, SALT LAKE CITY, BUTTE, HELENA, PORTLAND, SAN FRANCISCO, LOS ANGELES, AND OTHER CALIFORNIA POINTS.

Pullman Palace Sleepers, Free Reclining Chair Cars, and Modern Day Coaches.

For pamphlets covering the territory traversed, or other information, apply to

R. TENBROECK, General Eastern Agent,  
287 Broadway, New York City.

W. S. CONDELL, NEW ENG. F. & P. A., 290 Washington Street, Boston, Mass.

C. S. MELLEN,  
Traffic Manager.

T W. LEE,  
Assistant General Passenger Agent.

E. L. LOMAX,  
General Passenger Agent.

OMAHA, NEBRASKA.

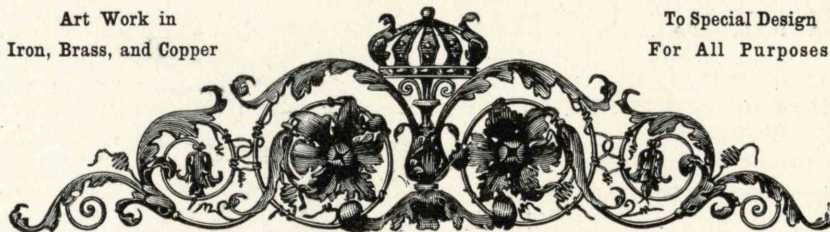
(ESTABLISHED 1875.)

JOHN WILLIAMS

Art Work in  
Iron, Brass, and Copper

544 to 556 West Twenty-Seventh  
Street, New York.

MAKER OF WROUGHT IRON  
AND BRASS GAS FIXTURES,  
GRILLES, RAILINGS, LAMPS,  
ETC.



EXECUTED IN WROUGHT IRON DEC., 1887. 1-12 SIZE.

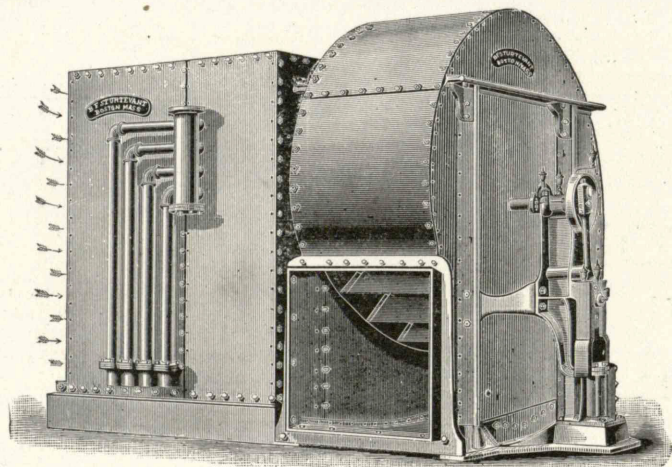
To Special Design  
For All Purposes.

REFERENCES:

- TIFFANY & CO., New York.
- COTTIER & CO., New York.
- L. MARCOTTE & CO., New York.
- McKIM, MEAD, & WHITE, New York.
- BABB, COOK, & WILLARD, New York.
- BRUCE PRICE, New York.
- BAILEY, BANKS, & BIDDLE, Philadelphia.
- FRANK HILL SMITH, Boston.
- A. H. DAVENPORT, Boston.
- THE HENRY DIBBLEE CO., Chicago.

B. F. STURTEVANT'S  
STEAM HOT-BLAST APPARATUS,  
FOR HEATING AND VENTILATING

BUILDINGS OF ALL CLASSES BY A FORCED CIRCULATION OF WARM AIR.



Send for "Illustrated Treatise on Ventilation and Heating." PLEASE MENTION THIS PAPER.

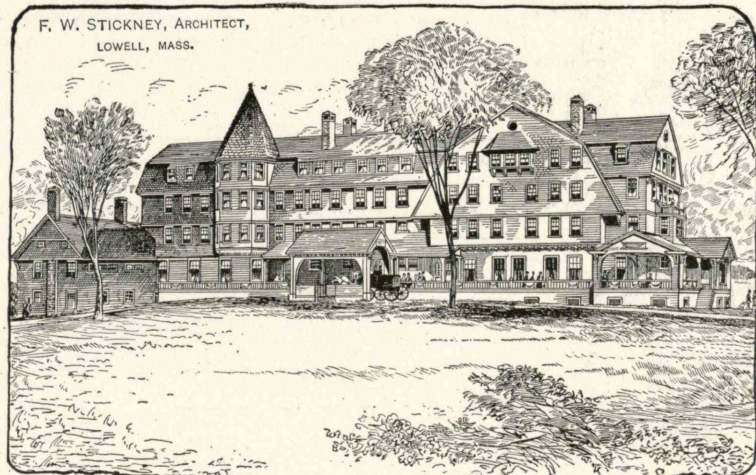
B. F. STURTEVANT,

BRANCHES { 91 Liberty St., New York.  
          { 31 No. Canal St., Chicago.

34 Oliver Street, BOSTON, MASS.

This house is stained with

F. W. STICKNEY, ARCHITECT,  
LOWELL, MASS.



SENER HOUSE, AT CENTRE HARBOR, N. H.

\* CABOT'S \* CREOSOTE \* SHINGLE \* STAINS. \*

They have been used NINE years. They are the only ones that do not wash off, grow chalky, or turn black. They are the only ones that contain NO KEROSENE. Send for illustrated catalogue, showing a collection of actually creosoted houses.

Samples and circulars on application.

SAMUEL CABOT, Sole Manufacturer, 70 Kilby Street, Boston, Mass.

# MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

BOSTON, MASS.

*FRANCIS A. WALKER, President.*

THE INSTITUTE OF TECHNOLOGY offers four years' courses, leading to the degree of Bachelor of Science, in CIVIL, MECHANICAL, MINING, ELECTRICAL, CHEMICAL, AND SANITARY ENGINEERING, ARCHITECTURE, CHEMISTRY, BIOLOGY, AND PHYSICS. A course of General Studies for young men contemplating a business life is also provided.

## THE COURSE IN ARCHITECTURE

aims not only to make the student thoroughly acquainted with the scientific principles underlying sound construction, and to familiarize him with the mathematical and mechanical formulæ and processes necessary to the solution of architectural problems, but also to cultivate his taste in color and form by constant practice in design and by the study of the history of architecture. Too great restriction to purely professional work is avoided by the introduction of the study of modern languages, history, political science, etc., the proportion of time devoted to these general subjects diminishing as the student goes on in his course.

The studies of the first year are common to all the courses of the School, and embrace mathematics, drawing, chemistry, and modern languages. In the higher years, thorough courses in analytic geometry and the calculus, carried on simultaneously with lectures and laboratory work in physics, lead up to the study of theoretical and applied mechanics, the lecture-room work in which is supplemented by actual laboratory tests to determine the strength of the various building materials, the accuracy of the commonly accepted constants, etc. The strictly professional work begins with instruction in materials, common constructions, and architectural history, followed, in the later years, by courses in stereotomy, iron construction, specifications, and contracts, in heating and ventilation, in planning, and in the requirements of schools, theatres, hospitals, and other special classes of buildings. Whenever practicable, the text-book and lecture-room work is emphasized by visits to actual structures; and throughout the whole course the student is continually drilled in original design. To this end two problems each month are required,—one, a sketch, to be finished within one week; and the other, more elaborate, occupying the whole month for the completion of the details and finished drawings relating to it.

Sketching in water-color and pen-and-ink, together with lectures and exercises in color decoration and history of ornament, are in charge of well-known gentlemen; and a class for drawing from the living model is maintained during the greater part of the year.

Unusual advantages exist in the nearness of the Boston Museum of Fine Arts and of the Boston Public Library, the facilities of which are freely offered by the Trustees to students of the Institute. The School itself possesses a valuable departmental library and collection of casts and building materials.

For the benefit of those who are contented with a limited acquaintance with the subject, or who have acquired elsewhere the necessary mathematical and physical knowledge, a partial course in Architecture is arranged, occupying two years.

The professional work of both courses is under the immediate charge of Prof. Francis W. Chandler, who gives the lectures on Construction, Specifications, and Contracts, Materials, and Special Classes of Buildings; Assoc. Prof. Eugene Létang, the Instructor in Design; and Messrs. Eleazer B. Homer and Walter H. Kilham, Assistants. Special instruction is given by Messrs. Ross Turner, in Water-Colors; C. Howard Walker, in Decoration; Ernest L. Major, in Drawing from the Life; and David A. Gregg, in Pen-and-Ink Sketching.

*For detailed information apply to*

H. W. TYLER,  
*Secretary.*

OVER TEN YEARS' UNPRECEDENTED SUCCESS

OF THE

## "GIANT" METAL SASH CHAIN



ECONOMICAL SUBSTITUTE FOR CORD AND CABLE CHAINS FOR HANGING HEAVY WEIGHTS TO WINDOWS.

MANUFACTURED ONLY BY

**THE SMITH & EGGE M'F'G COMPANY,**  
Bridgeport, Conn.,

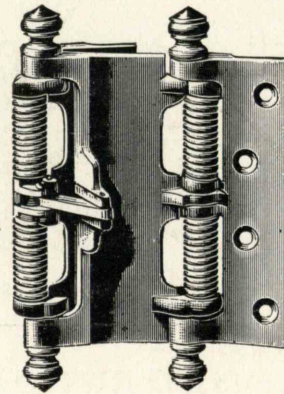
*who absolutely control the only Automatic Machinery* which feeds the metal into the machine, punches out the links, forms them into the chain, draws it out of the machine, and tests its tensile strength without any human hand touching it.

Also Red Metal and Steel Sash Chain made in the same way, for ordinary use, where a cheaper article is desired strong and simple. Also Patented Fixtures for attaching to the sash and weight and easily and rapidly applied. Special attention paid to communications of Architects and Builders, and samples sent free of charge to any address.

TRY IT. IN USE IN ALL THE LARGE CITIES.

## "JEWETT" DOUBLE & SINGLE ACTING SPRING BUTTS.

*Made in Iron, and on Special Order in Real Bronze.*



In introducing this BUTT to the public, the manufacturers feel assured that they are offering an article of rare merit, that cannot fail to give satisfaction in use, and they respectfully call attention to the following points of excellence:—

1st. They are made from the best material we can select, and the Springs are formed of very superior steel spring wire made especially for this purpose, and are thoroughly reliable.

2d. All the Pins and Push Bars are made of steel and hardened, thus making them the most durable Butt in the market, as the greatest amount of wear comes on these parts.

3d. The Springs exert their greatest power when the doors are closed, and their force gradually decreases as the doors are opened.

4th. They are the most easily adjusted to the doors, neat and attractive in construction and finish, and not liable to get out of order, and adapted to severe wear.

MANUFACTURED BY

**THE SMITH & EGGE M'F'G COMPANY, Bridgeport, Conn.,**

Also Manufacturers of very SUPERIOR Single and DOUBLE GROOVED Steel Axle, Iron, and Real Bronze Pulleys, and BALANCING FIXTURES for the DOUBLE GROOVED PULLEYS, an entirely new and practical device for hanging very heavy PLATE GLASS by two strands of chain on each side of sash.

Post-Office Box No. 26.

BRIDGEPORT, CONN., U.S.A.



500,000 H. P.

BABCOCK & WILCOX

## WATER-TUBE STEAM BOILERS

ARE IN SERVICE.

Book on "STEAM" containing information of value to every Architect. Sent free on application.

ADDRESS

107 HOPE STREET,  
GLASGOW.

**THE BABCOCK & WILCOX CO.**

30 CORTLANDT STREET,  
NEW YORK.

### SOME REFERENCES FOR ARCHITECTS.

COLUMBIA COLLEGE, New York. 400 H. P.  
CORNELL UNIVERSITY, Ithaca, N. Y. 561 H. P.  
NEW YORK PRODUCE EXCHANGE. 624 H. P.  
GIRARD ESTATE, Philadelphia. 688 H. P.  
NEW YORK LIFE INSURANCE Co. (various buildings). 1,513 H. P.  
HOTEL PONCE DE LEON, San Augustine, Florida. 416 H. P.  
DAKOTA APARTMENT HOUSE, New York. 864 H. P.  
SENATE WING U. S. CAPITOL, Washington, D. C. 312 H. P.  
ASYLUMS, State of Indiana. 1,480 H. P.  
NEW YORK STEAM COMPANY, New York. 13,482 H. P.  
MASSACHUSETTS INSTITUTE TECHNOLOGY, Boston. 208 H. P.  
NATIONAL LIBERAL CLUBS, London, England. 194 H. P.  
EDISON ELECTRIC LIGHT COMPANIES. 18,000 H. P.  
WESTINGHOUSE COMPANIES. 7,500 H. P.  
LONDON ELECTRIC SUPPLY CORPORATION. 6,993 H. P.  
VIENNA OPERA HOUSE. 1,192 H. P.

# TECHNOLOGY ARCHITECTURAL REVIEW.

DEPARTMENT OF ARCHITECTURE,

Massachusetts Institute of Technology.

VOL. II.

BOSTON, NOVEMBER 16, 1889.

No. 7.

## PUBLISHERS' DEPARTMENT.

HENRY D. BATES.                      THOMAS R. KIMBALL.  
EDITORS.  
BOSTON . . . . . MASS.

Eight numbers constitute a yearly volume.  
Price, mailed flat to any address in the United States or Canada, \$3.00 per volume in advance.  
To any foreign address, \$3.50 per volume in advance.  
Single copies, 50 cents.  
Remittances by Postal Money Order, or Bank Draft on *Boston* or *New York*, should be made payable to TECHNOLOGY ARCHITECTURAL REVIEW.

Copyright, 1889, by BATES & KIMBALL.

## FREEHAND DRAWING.

(Continued from No. 6.)

### BOOKS FOR YOUNG DRAUGHTSMEN.

THE poorest apology any young draughtsman can offer for his lack of progress in drawing, and for the shiftless and uncertain kind of work he has done, is that he has had no teacher.

What have his eyes and his hands been doing all the time we would ask?

If he is to be no more than a teacher can make him, and to do nothing when the master's eye is not on him, the sooner he gives up all idea of becoming a draughtsman the better it will be for his interest and success in life. The stuff out of which the accomplished architect or artist is made, is not in him. Other doors are open for his going out and in, and the door of the Beautiful is not for such as he. If the spirit be in him, the master will come; in fact, he will never be absent from him; he will be his own teacher. Still, he must know how the great teachers have worked; he must be familiar with their methods.

It is a somewhat commonplace observation that the Book of Nature is always open to him: he must be directed how to study this wondrous book, how the great masters have studied and interpreted it, and the methods by which they have represented it.

For this purpose, books on drawing have been published by the hundreds; and the poor young pupil is all at sea as to which is the best for his purpose.

The object of the present paper is to point out what, in the case of the old draughtsman who writes it, have been the books on the subject which have been the most useful to him.

It is not an embarrassment of riches which the modern press offers us in the way of instruction in books which claim to teach drawing: it is rather an embarrassment of poverty, or commonplace. The drawing-books of fifty years and more ago were mostly printed from drawings on stone by the author himself, or etched, or colored by his own hand.

First in importance among them all is the famous old "Rudiments of Landscape in Progressive Studies" by Samuel Prout,

published in 1813. This is the most valuable book on the subject of pencil drawing, sketching in sepia and India ink washes, and in water color, with which the writer is familiar. A mastery of this book will probably do as much towards teaching a young man all that a book can teach on this subject as any book that was ever published.

Beginning with fragments simply treated, it proceeds step by step to the more complicated subjects wherein the principles of light and shade, and the opposition of cold and warm tints,—or "teints" as they are called,—are explained and taught in the simplest and most direct manner. This book, long out of print, can now be found only, at rare intervals, in old book shops and auction sales of old libraries. The writer's copy, now lying open before him, with its old faded green covers hanging by threads, is most precious associated with the labor of many years.

All of Prout's books and separate lithographic sheets and Ruskin's notes with examples, many of which can be easily obtained, are of the greatest value to the student.

Next in importance is Cotman's "Liber Studiorum," a series of sketches and studies in pencil and ink, with which no modern book can for a moment be compared as examples of masterful drawing and graceful composition. The sharp and decisive method of rendering buildings and ruins, the drawing of the sky in bold and fearless lines, the wonderful preservation of all light objects in the foregrounds, and the drawing of foliage and foregrounds, make this a book of priceless value to the student.

Cotman's larger works on the architectural remains of Norfolk, etc., are expensive and pretty much out of the student's reach, as his own possession; but he cannot afford to do without the "Liber," and it can be without difficulty obtained.

Turner's "Liber Studiorum" we put third in our enumeration, because it is addressed to a more advanced class, and presupposes a greater knowledge of the elementary principles of drawing than the previous books we have named. But studied in connection with Ruskin's book on drawing and parts of "Modern Painters," it justifies Turner's title as the first artist of modern times. The reproduction of this book in outline has been recently published by Ticknor & Co.

Among Harding's books, the one entitled "Elementary Art" embraces most that is characteristic of his method of drawing trees and foregrounds, and the "Drawing Book," reprinted in 1863, is probably the most useful to the beginner, of all his books, in the rendering of general and varied subjects.

A most beautiful book is Henri Havard's "La Hollande," illustrated in line and charcoal by Maxime Lalanne. The rendering of the quaint old Dutch buildings and streets, gateways and waterways, is so suggestive of an easy mastery of difficult subjects, that the sensitive draughtsman is involuntarily led into studying and copying them. Try your hand, young draughtsman, on the Belfry of Leyden; the chances are that Leyden would look as if it had been built of jackstraws,—not quite so easily done as it looks; so it is with all great drawing. Try it again and keep trying, and so some day your own work may be the delight, and perhaps the despair of those who follow you.

Calame's lithographs may be studied to great advantage. Less brilliant than Harding's, they show the possibilities of the lead pencil, in expressing great masses of transparent gray shadows; and some of his architectural subjects are worthy of close imitation. Copies of Calame can be had at any of the print shops at small cost.

The reading of Ruskin's works with the aid of the beautiful drawings in the large copies of "The Stones of Venice" and the "Seven Lamps," with a painstaking copying of them, or parts of them, is an indispensable part of a young draughtsman's training, and will give him a taste of the riches that await him with every step in his progress.

And the same may be said of Hamerton's great work on the "Graphic Arts."

But the direct benefit to be derived from Ruskin's book on drawing, or Viollet le Duc's "How to Draw," is perhaps not very appreciable: the assumption of all knowledge of the subject by the former, and the too general treatment of it by the latter, have deprived their books of the usefulness which was to be expected of them.

After being told by honest old Prout "how to do it" in the most practical way possible, the perusal of such books is like the reading of Carlyle's "French Revolution" after Goldsmith's "Deserted Village."

But whether the young draughtsman owns it or not, perhaps the drawing books that influence him most are the illustrated magazines of the day. All conceivable subjects treated in all conceivable ways by the best artists are put daily before him, and must tell strongly on what he is to be and do.

Among the artists employed by the great popular publishing house of Cassell & Co. of London, the drawings by Seymour are especially to be noted; his mastery of effects in architecture and in landscape is wonderful, and his power of representing great stretches of distance is only surpassed by Pennell, in the miles of flat country with cities, rivers, and endless geography he can express in almost a single line.

With examples like these before him, any apology on the part of the pupil for poor progress, is an acknowledgment of his incapacity or of his lack of industry. In either case, neither the pleasures nor the rewards of art shall be his. Incapable, he will go to the wall in any case; but lazy, it must be a poor satisfaction to take the dust of the workers who have gone on, making themselves and the world the happier for their work.

W. R. EMERSON.

[To be continued.]

---

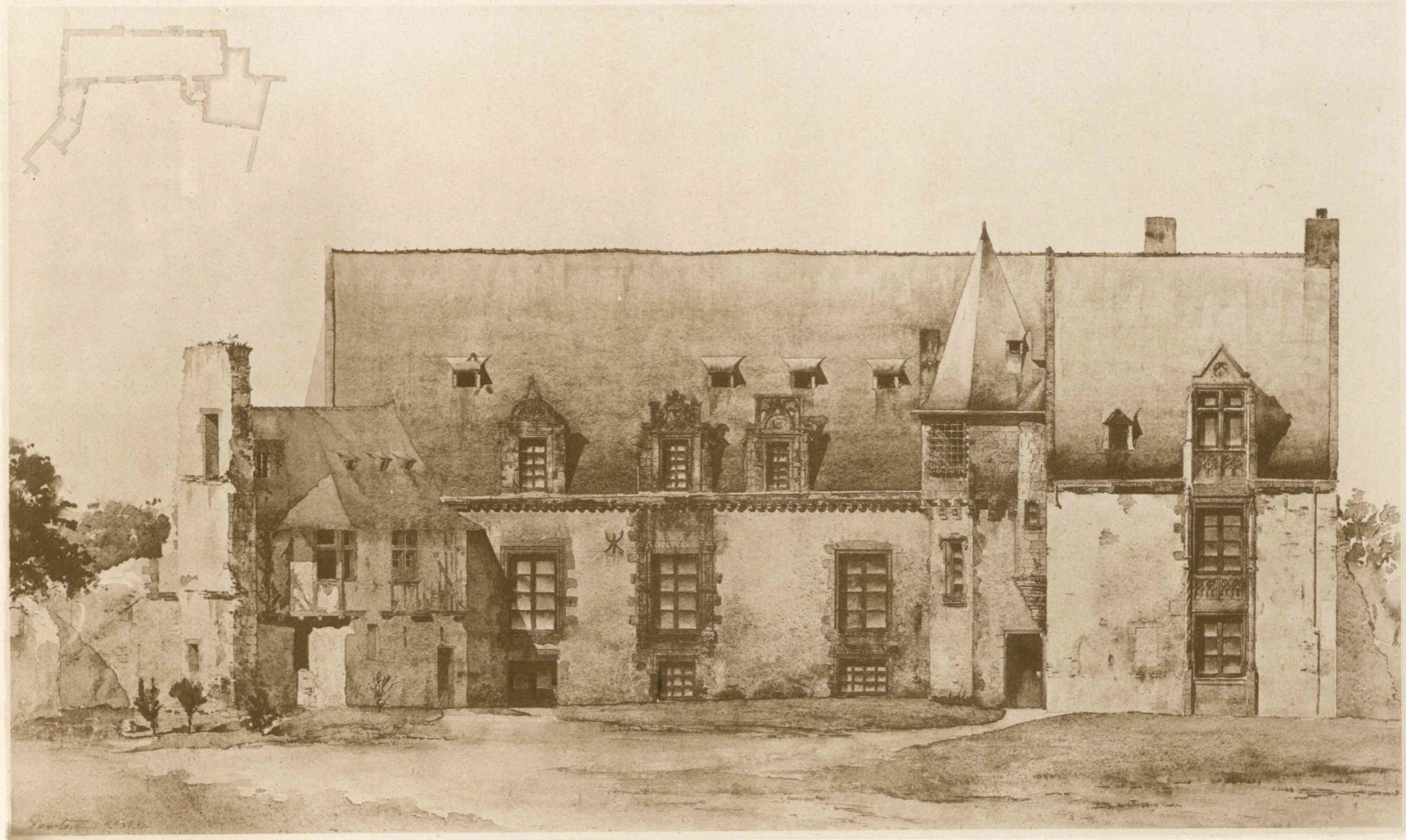
## A PLEA FOR MONUMENTAL BUILDING.

---

THE characteristic difference in appearance between an established and dignified city and an overgrown town, is in the choice of a systematic and regular method of architectural composition on the one hand, and a merely picturesque one on the other. Growth in extent and in evident prosperity is very apt to outrun a corresponding reserve in the use of the materials at hand, and the prettiness and quaint conceits that may be amusing in a village become merely wearisome or grotesque in the long vistas of a city. A certain degree of monotony is conducive to breadth of design and largeness of scale; and while the sameness of long façades and groups of building subordinated to one idea may not be flattering to the self-love of the householder, it certainly gives the impression that the congregation of householders is collectively more impressive and august and well to do as a body than are its members individually. All of which means that in architecture, as in everything else, the best result is obtained by the sacrifice of the

desire of the average individual to the good of the community. The usual householder in building considers that he has not only a legal, but almost a regal, right to have the design of his house conform with his ideas, regardless of the result upon his neighbors, who if they are offended can cast their eyes elsewhere; but he forgets the stranger within his gates. It is this stranger who sets the seal of praise or contempt upon the householder's house and that of his neighbors *en masse*, not by piecemeal. It is this stranger who notes general impressions and not particular bits; who generalizes and sums up Paris as a city of magnificent vistas and London as a city of mediocrities. It is this stranger, be he artist or architect with his sketch-book, or literary fellow with his pen, who in a few touches epitomizes whole streets of householder's fancies as "architectural sample books," or else passes by without a second glance, and by silence declares the emptiness of the subject. It is a matter of choice, somewhat, whether picturesqueness or impressiveness is considered preferable; but it is worth while remembering that all picturesqueness that is devoid of affectation has in it a large element of accident, and that dignity, grandeur, magnificence, are all the direct result of intention, that picturesqueness expresses nothing but variety of causes and opinions, and that monumental character expresses variously power and wealth and intellect. So that when a city has overgrown its charming naïveté of extreme youth, it should don new manners and new garments; and the picturesque, that conformed admirably with crooked streets, narrow ways, and hilly surfaces, is out of place in broad boulevards and large squares. What are the elements of the work that should take its place? The streets are being laid out in a monumental scale; why should not the buildings upon them be treated with the same amplitude? There is no lack of money, there is no lack of desire for effective result. The means alone are mistaken ones. If the prevalent thirst for novelty could only be transformed into an appreciation of uniformity, there would be little more required. It might be instructive to notice the factors of the so-called great architectural styles. The Greek has column and lintel; the Roman, column and arch; the Goth, shaft, arch, and gable,—simple factors made to have value by what? Reiteration,—a reiteration approaching monotony even. The same unit repeated until it has made itself felt, not isolated as a solitary architectural motive, nor repeated in various sizes and conditions for the sake of sensation; but used again and again without variety except in the matter of minor detail. Such precedent should prove instructive. Here is fine material for syllogisms. If the Greek temple, the Roman amphitheatre, the Christian basilica, the monastic cloister, the Gothic cathedral, the Renaissance palace, owe their character principally to the continued repetition of a simple architectural form, and if these types of architectural design are considered to be successful as would seem to be the case, the necessary conclusion is suggestive in its bearing upon modern methods of design. At once the objection is made that the modern problem is more complex, that the relation between exterior and interior is more intimate, that façades should express refinements of plan, and should have a sort of domesticity and live in evident accord with all the petty requirements of modern life. And so, away with the birthright for this mess of pottage, away with colonnades and arcades, away with long lines of modillions and corbels, for the sake of many-sided, many-sized bay windows, for overburdened, off-centred doorways, for an infinite variety of window-openings, for niches and balconies and all the small fry of the architectural vocabulary. If the result expresses aught else but confusion, its language has been misunderstood. Is not there a more important idea than that all the accidents of environment should be perpetuated. In all other arts, a dominant motive worked out and developed is considered the salient factor of greatness of design. We have got to the point when we admit this in a piece of decoration, possibly in a single façade. Has a city less corporeal quality than a building because it is more complex? Why should not the same argument that

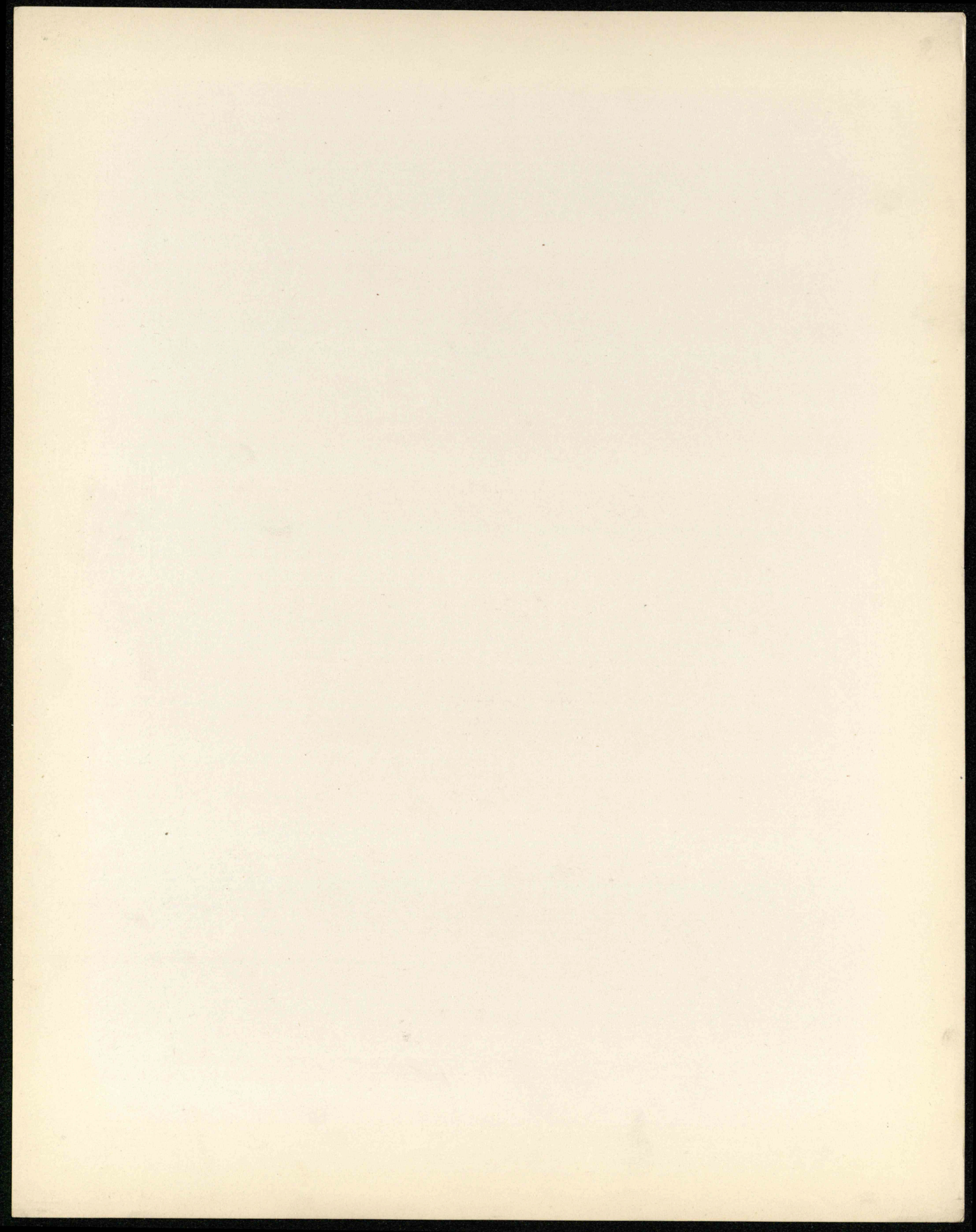


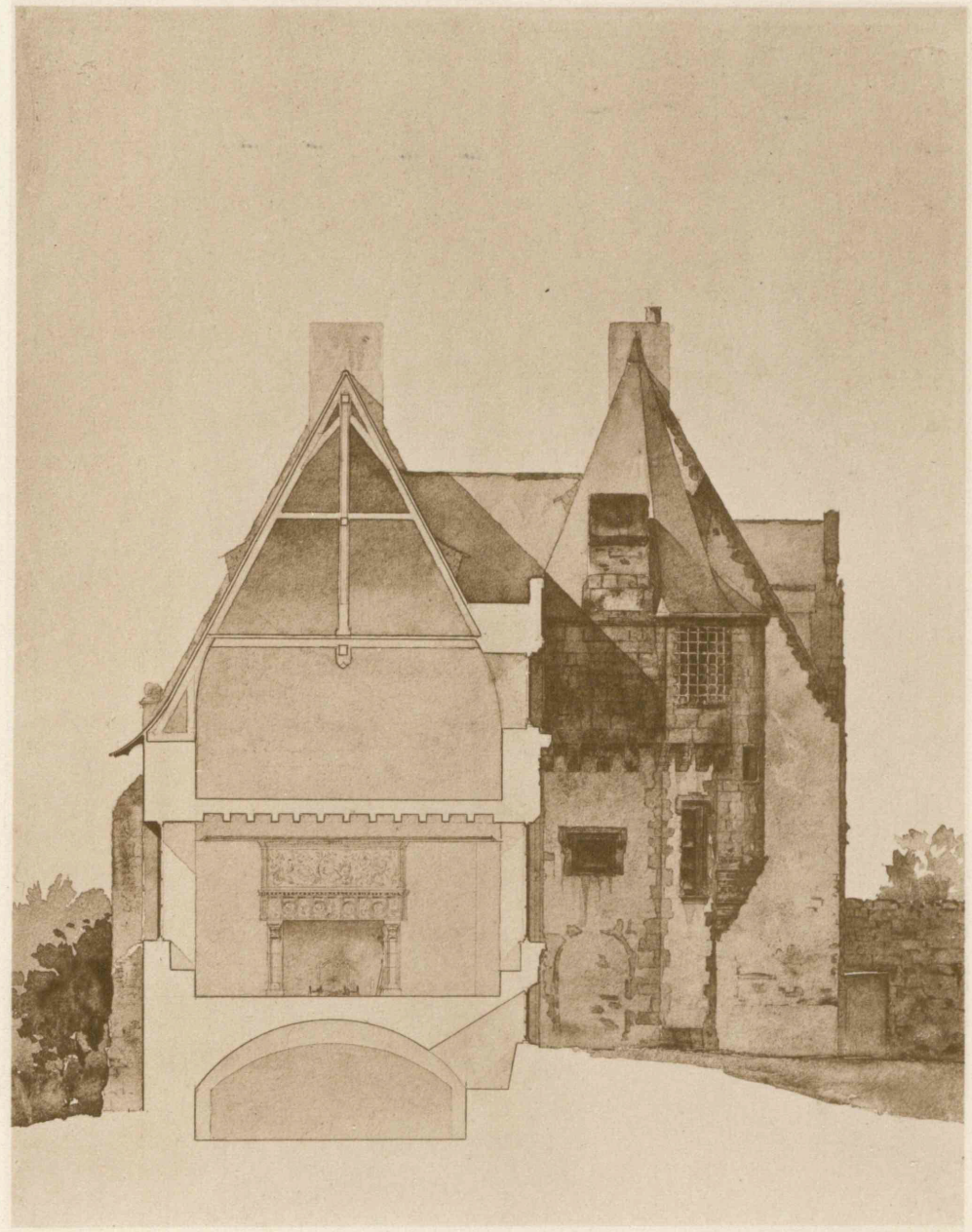
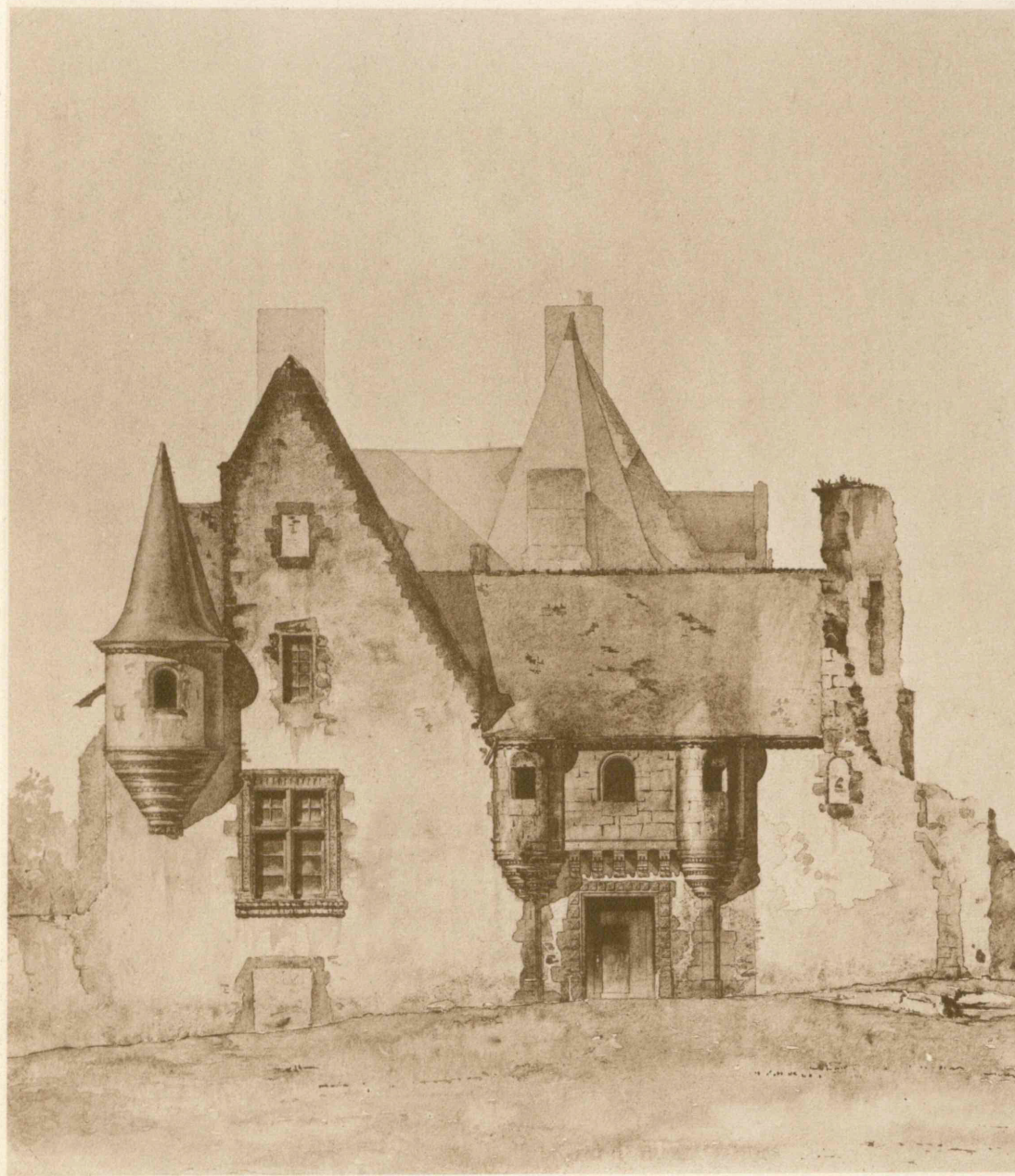


MAISON DE LA VOÛTE, ANGERS.

ROTCH SCHOLARSHIP "ENVOI".

GEO. F. NEWTON.



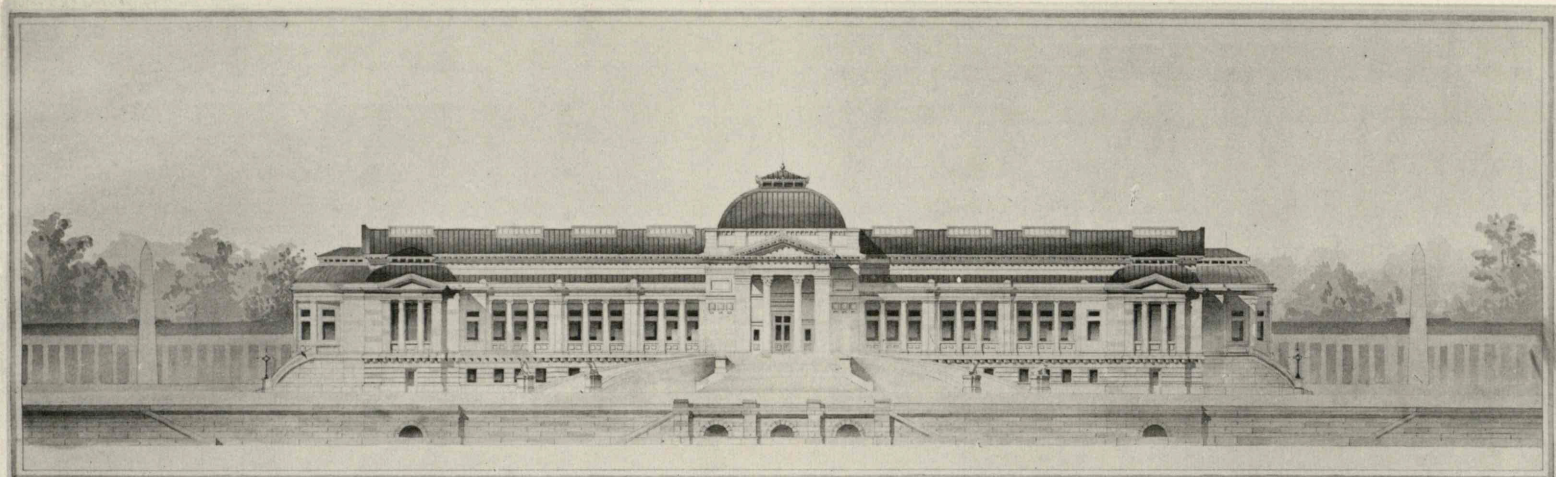


MAISON DE LA VOÛTE, ANGERS.

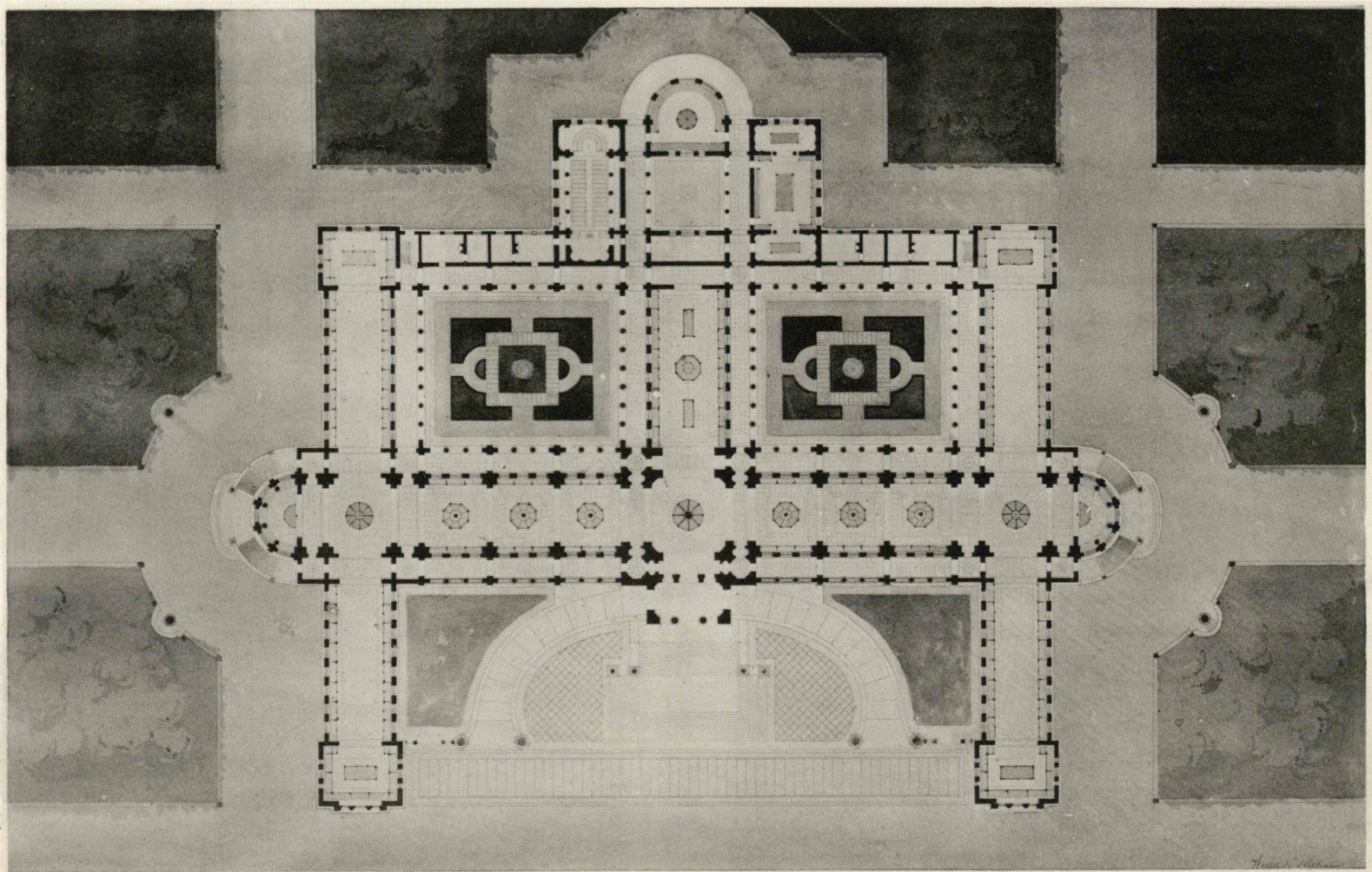
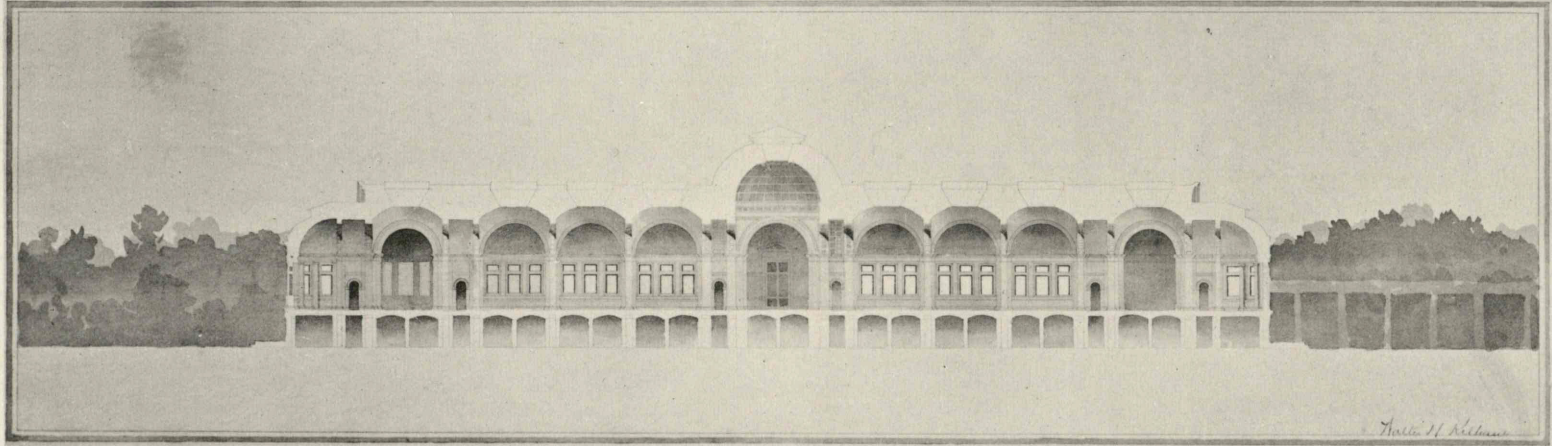
ROTCH SCHOLARSHIP "ENVOI".

GEO. F. NEWTON.

WILSON D.



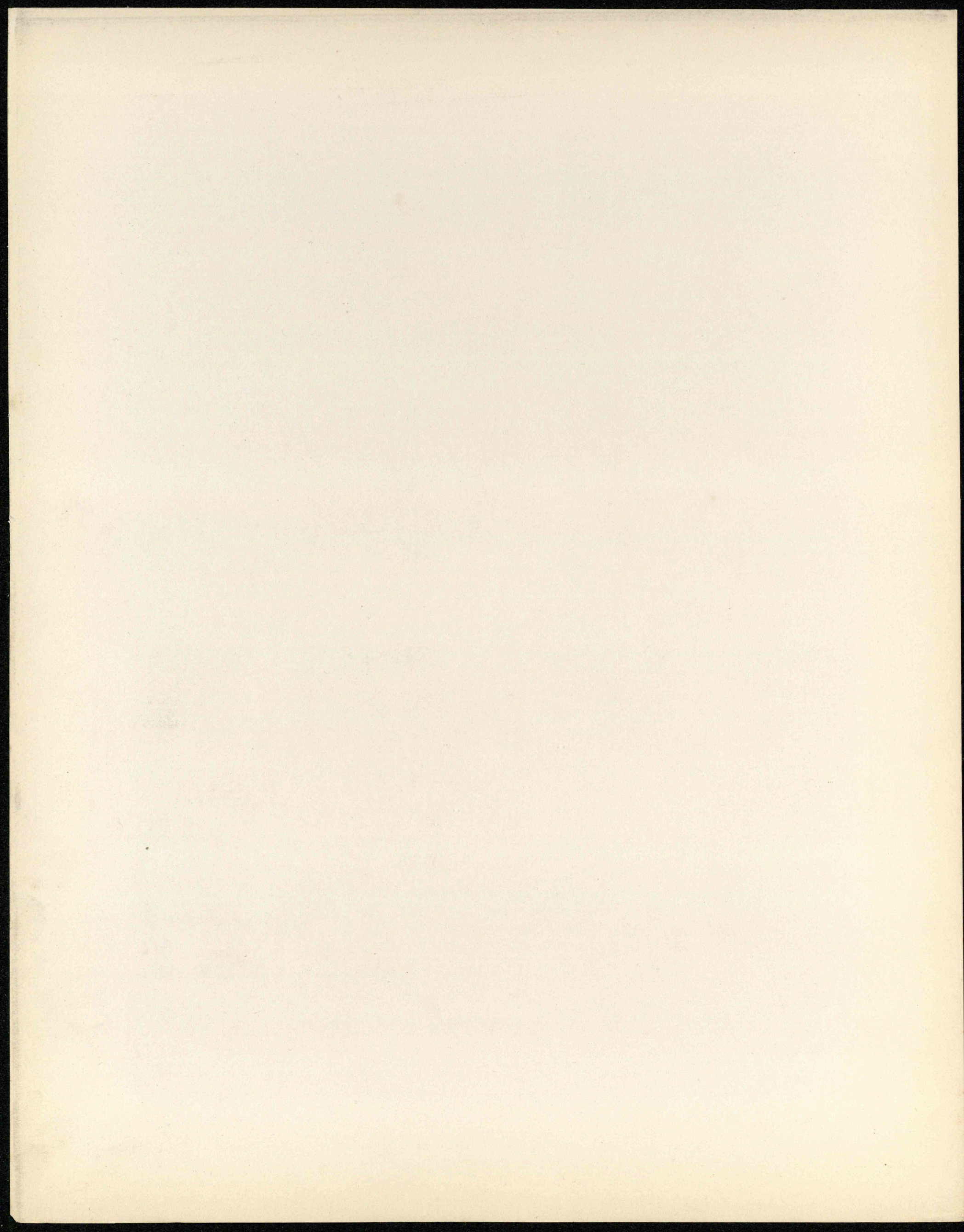
THESIS DRAWING - A MUSEVM OF NATVRAL HISTORY - M.I.T. 1889-116 SCALE.

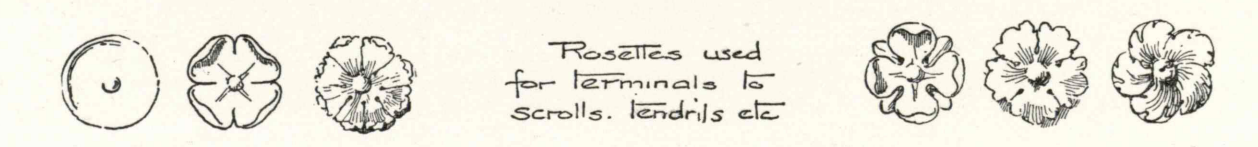
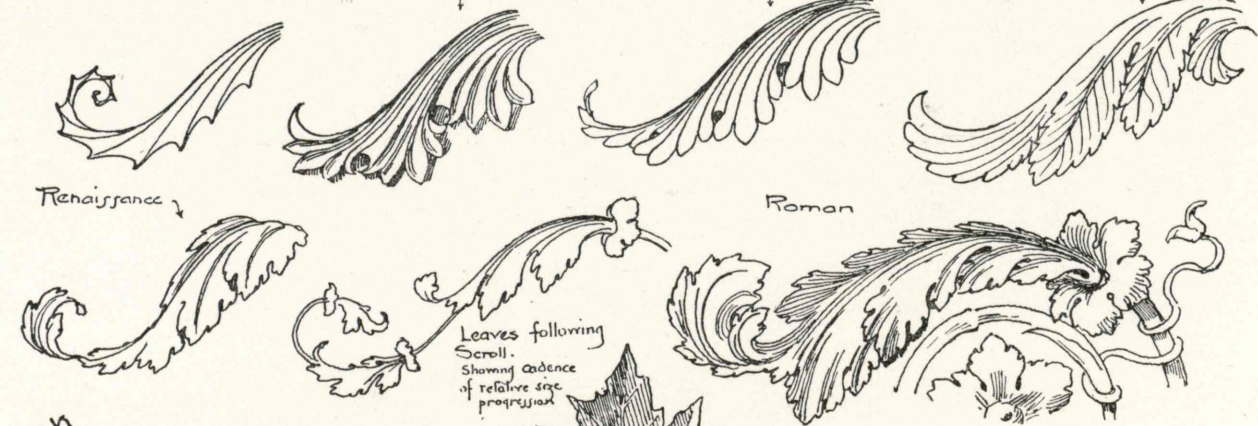
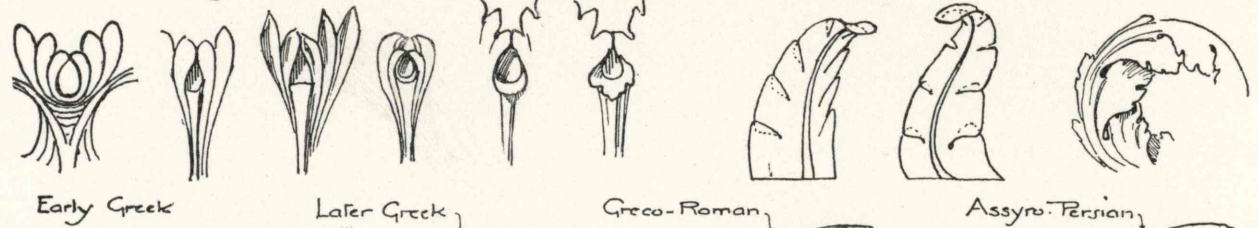
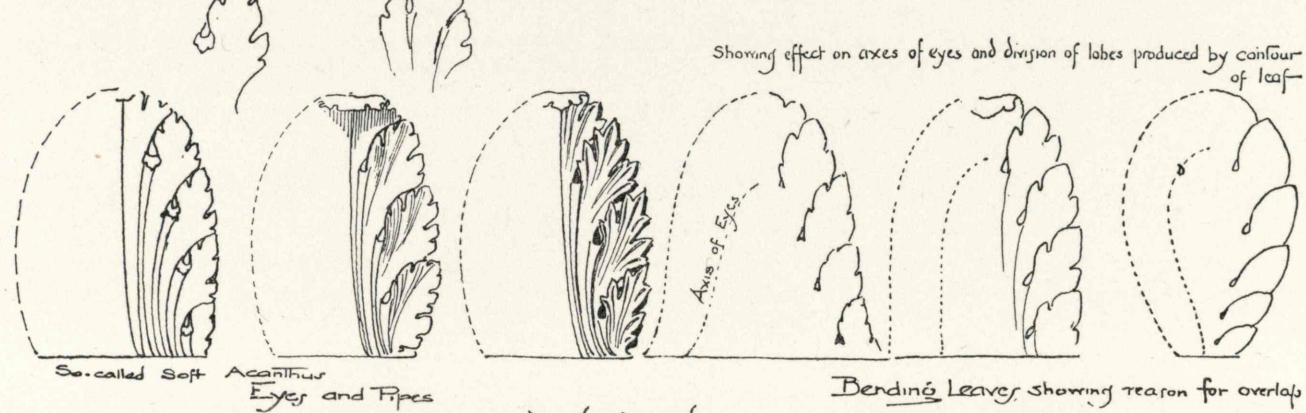
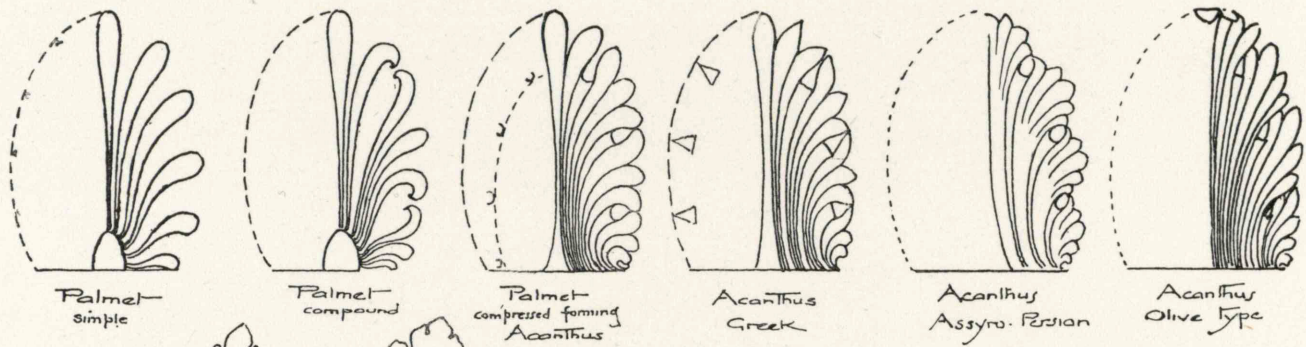


THESIS: 1889.

WALTER H. KILHAM.

A MUSEUM OF NATURAL HISTORY.









applies to the small portion be applied to the whole, except that there may be more flexibility perhaps in the application. It is conceded, of course, that diversity of opinion, of expenditure, and of requirement should produce great variation; but if it were possible to have some homogeneous idea, there would be no doubt of the greatness of the result. A city that was insistent in the employment of a dignified and monumental scheme in massing its buildings as well as in laying out its streets, would not only be more dignified than its neighbors, but—enigmatical as it may seem—would also have more original and individual character as a whole.

---

## ROTCH TRAVELLING SCHOLARSHIP.

### *MAISON DE LA VOÛTE AT ANGERS.*

#### PLATES I. AND II.

#### ENVOI OF MR. NEWTON.

THE *Maison de la Voûte* at Angers is one of the most interesting examples left us of a fortified country house in the region of the Loire. The illustrations show only the remaining fragment of what must have been a very picturesque group.

A large portion has been destroyed; a part quite recently was removed in opening a new street. The part represented is evidently of the fifteenth century with later alterations. No intelligent record of this structure seems to have been preserved in Angers.

The view showing gable and entrance, presents a defensive air with turreted and machicolated entrance.

The long side fronted on a court-yard. The half-timbered portion is probably in its original state. The building recently demolished is said to have been older, to have had battlements, and to have contained the granary. The fragment represented, doubtless was used as a residence, the grand hall occupying the first story. At one end of this hall is a magnificent stone chimney-piece, equal to the best period of the Renaissance.

The building is evidently an example of the early adaptation of the Renaissance to feudal architecture. The ornamentation is excellent, executed by Pierre Biardeau, a sculptor of ability and originality. The details appear to be early, or before the forms had become developed to the refinement shown in the larger châteaux of the Loire.

One of the most pleasing conditions of the ruin is its charming color. Angers is renowned for coloring, and this is one of its gems. The stone-work is a rich golden hue, and the plastered ruffle has acquired by age delightful green-gray tones.

The drawings were made at the building from measures.

GEORGE F. NEWTON.

---

## THESIS WORK.

### ABSTRACT OF THESIS.

ARTHUR V. EDWARDS, 1889.

#### *A DESIGN FOR A QUARANTINE HOSPITAL.*

THIS hospital is supposed to be erected for the reception of all cases of infectious diseases arriving from foreign shores, as well as to receive infected persons from the adjoining city and its suburbs. It is located on an island outside the main harbor of a large commercial seaport, and has connection with the city by

means of a bridge, and also by water. Such a hospital calls for a large group of buildings to meet specific purposes.

In studying the general disposition of the plan, three main features are to be considered: first, the hospital pavilions or wards for patients, with accompanying kitchen, laundry, convalescent wards, and accommodations for nurses; second, the administration, comprising Board of Health building, port physician's or superintendent's building, and space for storage of supplies and provisions; third, the entrance pavilion for declaration office of port physician, lodgings for keeper, storehouses for suspicious and infected goods taken from vessels, and buildings for steam and sulphur fumigation.

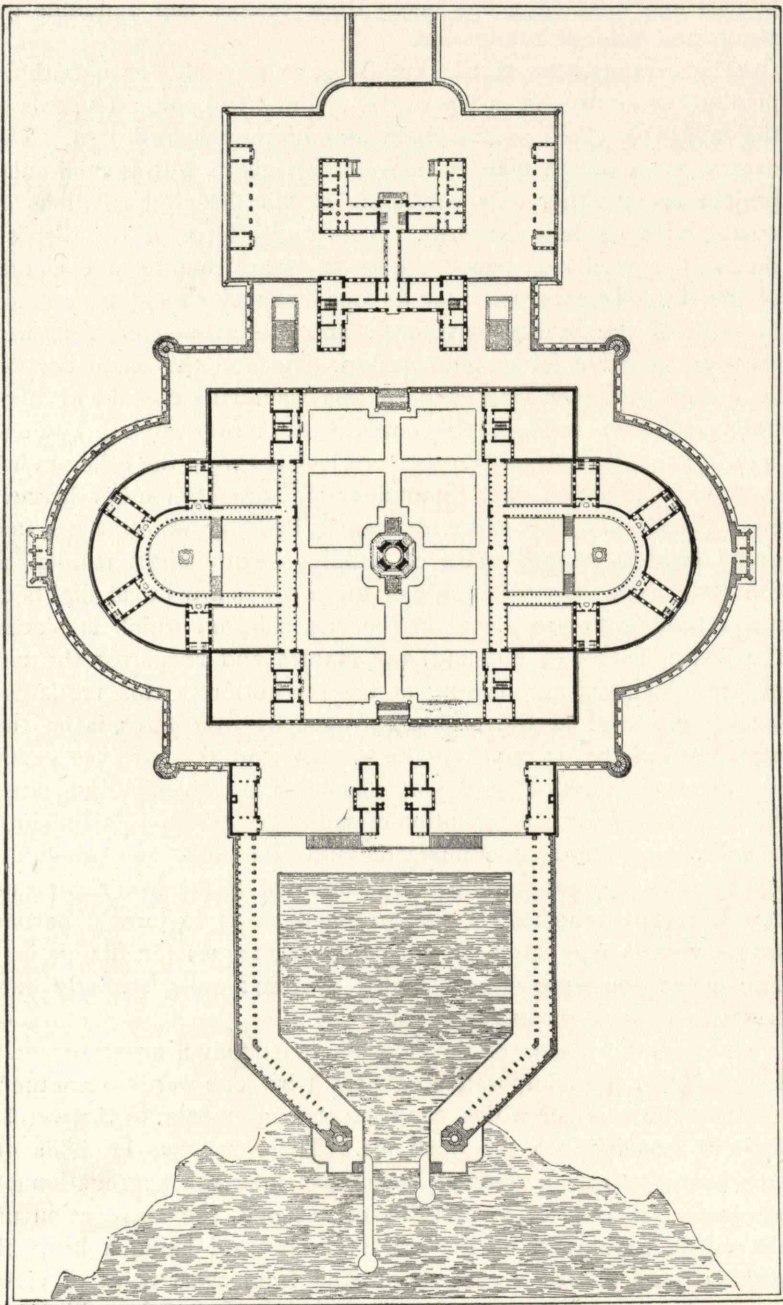
The arrangement of the buildings, as is readily seen both in plan and in elevations, is a perfectly symmetrical one. The axis of the bridge is taken as the main axis of the whole design. The central mass of the plan is very nearly square, with semicircular projections on either side, consisting of four hospital pavilions or wards, with gardens between. This radial form of the disposition of the pavilions seemed the most natural one to take, as one of the requirements was that an open chapel should be erected in sight of the several pavilions; and this arrangement seemed the most effective for general design. Around this same portion is a wide girde or walk, and in this way, with the aid of high walls and iron railings, the wards with accompanying kitchen, laundry, and convalescent wards are isolated from the other buildings, and yet are in easy communication with each other by covered corridors. The superintendent's building is on the same grade level as central mass of buildings, with wings parallel to the main axis. On either side of these wings are broad flights of stairs leading to the lower on the city side, on which is placed the Board of Health building, and stables and sheds for the use of doctors and visitors calling at the institution. This rectangular space, closed at the bridge entrance by iron gates, is on the same level as the bridge. At the seaward end, the entrance pavilion for declaration office of port physician is conveniently located near the wharf for the reception of patients. From this building two flights of stairs communicate with the wharf and adjoining storehouses. These storehouses, terminated at the lower extremities by small light-houses, are arranged so as to form a harbor where vessels may enter to unload their cargoes for fumigation. The whole enclosure is surrounded by thick walls, strongly buttressed, to serve as breakwaters.

Each of the wards or pavilions is practically a separate small hospital, and it is impossible to pass from one ward to another, or from the corridor which connects the basements, to the wards, without passing into the open air. There are two methods of constructing these permanent pavilions: first, the aggregation of wards in buildings of several stories; second, the segregation or the entire separation of the wards, each ward being a hospital pavilion with all the accessories. And from every point of view we can but regard the question as settled in favor of pavilions of one main story. This story is for the patients, having at the end next the corridor two small rooms with a small fountain between them, and at the other end stairs leading to the upper story, which is divided into rooms for the accommodation of nurses. The basement forms a large space devoted entirely to heating and ventilating purposes, containing steam-pipes, etc. Each of these wards has an aspirating chimney, into which empties a foul-air duct, which runs longitudinally beneath the centre of the floor, and which receives the air from lateral ducts opening beneath the foot of each bed. The force in the chimney is created by a steam coil or a fireplace at its base.

The administration building is three stories high. On the first floor are the private offices of assistants, dispensary, kitchen, and offices for superintendent. In the centre is a large vestibule, leading to a covered bridge which connects with the second story of the Board of Health building below. The second story contains

laboratories, offices, tank for salt water, linen closets, etc. The third story is divided into sleeping apartments for resident medical officers, physicians, surgeons, and chaplain. The basement of this building, accessible on the rear side, is used for the storage of chemicals and provisions.

The Board of Health building for city officers comprises vestibule, meeting room, dining-room, kitchen, offices, and sleeping-rooms. A flight of stairs on either side of the vestibule leads to the second story to the bridge mentioned before, which connects with the first story of the superintendent's building.



The mortuary chapel in the centre, in sight of the pavilions, is raised upon a high pedestal or basement. It has four large arches, one on each side, the whole surmounted by a dome. Inside, in the centre, is placed an altar, reached by a flight of stairs, where funeral ceremonies may be observed.

The problem is one of planning, and in the elevation the aim has been to express the functions of the different parts in a simple manner, and to give the buildings an aspect of lightness and airiness, making them as pleasant and inviting as possible to the patients.

#### ABSTRACT OF THESIS.

WALTER H. KILHAM, 1889.

#### *A MUSEUM OF NATURAL HISTORY. Plate III.*

It is proposed to build a Museum of Natural History in the suburbs of a large city. It is to be designed to contain all collec-

tions proper to such an institution, and at the same time to exhibit them to the best advantage in regard to lighting and ease of access. It is to be surrounded by extensive gardens, arranged both for artistic effect and a setting off to the building, and for the convenient study of plant life.

Such a building must be well lighted, conveniently arranged, perfectly fire-proof, and of a sufficiently monumental character to render it an important ornament to the city. To fulfil the required conditions, I have provided the following main rooms: a large hall for what is called an epitome collection, containing typical specimens of the different classes; two large halls for the two most important collections, mineralogy and geology; four smaller halls for the lesser collections of birds, mammals, fishes, and reptiles and insects; smaller rooms for special gift and loan collections; a herbarium; a library and reading-room; a lecture-room, conveniently arranged with professors' and apparatus rooms; and study rooms, laboratories, offices, lodging for the janitor, and plenty of room for storage. Finally, it was required that the building should have but one story above the basement. These requirements constitute the problem which I have taken as a Thesis.

The building faces the north, and is erected on a slight eminence, in order to give it the commanding position in the midst of the garden, of which it is the centre of attraction. In front, the building is approached from the terrace by a flight of steps and a graded ramp, upon which carriages may be driven to the main entrance.

In designing the elevation, the end wings have been brought forward, forming a half-enclosed great open court, beside which the building contains three entirely enclosed courts. In arranging the plan, my aim has been to provide an abundance of light, convenience of visiting any part, effectual separation of the public and private portions of the building, and proper architectural accentuations of the more important rooms. I have placed the epitome collection in the centre of the building, directly opposite the main entrance and in the most convenient place for the visitor who has not time to examine carefully the main collections. The main halls extend to the right and left from the entrance vestibule, which is roofed with a hemispherical dome resting on four great arches. The library, lecture-room, laboratories, etc., are placed at the rear of the building, with their own entrances, secure from the interruptions of the public. A private corridor connects all of these rooms.

The janitor's lodging, with storage room and heating apparatus, is located in the basement. A large door is provided at the rear for the admission of specimens of unusual size. Access to all parts of the Museum without passing through the halls is had by wide porticos. The lighting by day is effected by outside windows, or windows opening on spacious courts, and by skylights, and at night by the incandescent electric light.

As the building covers a great area, and its height is comparatively small, steam heating by direct radiation will be employed, and as it will never be very crowded at one time, ventilation will be effected through the skylights, the lightness of the warmed air being the ascensional power.

An essential qualification of such a building is that it shall be absolutely fire-proof, as the damage by fire, smoke, or water to the rare specimens contained in it would be irreparable. The floors are built on the Spanish tile arch system, recently introduced into New York. They are composed entirely of terra-cotta tiles and concrete, no iron being used. These arches, though but three inches thick, and composed of three successive layers of one-inch tiles, have repeatedly sustained immense loads with perfect safety.

The walls are of stone, backed with brick. The ceilings of the main halls show a series of domes and arches of terra-cotta blocks, and those of the other rooms are of terra-cotta blocks on I beams, with wire lathing. The roof is supported by wrought-iron trusses, and is also made of terra-cotta and tiled. The trusses over the

main halls are of thirty-two feet span, spaced nine feet eight and one-half inches on centres. The principals of the trusses are channels, the struts of I beams, and the tension members of eye-bars of different sections. The whole construction renders it impossible for a fire to gain headway in the building.

The problem is essentially one of architectural design and planning; but besides considering these important points, I have paid due attention to the necessary requirements of strength and stability. Much of the construction has been carefully worked out by graphical and other methods, and in every part an effort has been made to combine convenience, stability, and architectural effect.

## THE STUDY OF DECORATION.

(Continued from No. 6.)

THE preceding attempt at a synopsis of Roman architectural forms has been necessary to show the background upon which Roman decoration was displayed. Apart from the wall paintings, which belong to a separate type of art, and can be best studied at Pompeii, Roman decoration was for the most part employed in enriching the architectural forms. As far as mouldings are concerned it was largely sculptured ornament of the alternate unit type, — that is, ornament that had alternate mass and detail, such as the bead and fillet, egg and dart, leaves, flutings, guilloches, rosettes, etc. The fret is almost forsaken. Round forms predominate. The outline of the moulding sets the key for the motive used upon it; for instance, the guilloches are used on the half-rounds of the bases, the eggs and darts and similar forms on the quarter-rounds of the echinus and the bedmould, the beads and fillets upon small separating mouldings, and the flutings upon flat or concave surfaces. In compound curves, such as ogees, the curve suggested the motive line of the ornament. By this method alone can the integrity of form of a moulding be kept, for if the strong lines of the ornament oppose the general contour of the moulding on which it is placed, both moulding and ornament become confused and of no value. But the favorite units of the Roman are those the Greek used least — the scroll and the acanthus. These the former displays upon every occasion, especially upon the friezes. The acanthus used is not the spiny acanthus of the Greek, but a softer type, with lobes slightly rounded, slightly convex at the top, and not cut very deeply toward the heart of the leaf. This acanthus, whirled into scrolls with a flower or knot of leaves, also of the acanthus kind, in the eye of the scroll as a terminative, is the favorite Roman motive. The leaves, instead of being kept intact as in Greek work, overlap and underlap, and there is a great deal of naturalistic study beginning to be evident. The bond of hieratic form is becoming weaker. Birds, butterflies, flowers, and fruit, make their appearance as accessories and satellites about the chief motive, which still remains conventional. The acanthus clings closely to the flowing line of the scroll, and all the lines are radial and tangential. The abruptness of the departure of the leaves from the scroll and the change of surface is softened by a base leaf like a cup turning backward, out of which the larger leaf springs. The sequence of size of leaves as they follow around the scroll, starting with the largest and continuing to diminish until the terminal flower is reached, is carefully considered, as is also the corresponding sequence of relative distance apart along the scroll of each leaf from its neighbor. The general growth of the scroll is accented by long parallel lines drawn on its surfaces, and the same tendency is continued on the leaves by fine sets of radial lines starting at the base of the leaf and carried out to the tips of the lobes. When these lines become too long or stringy in the scrolls, they are crossed by twining tendrils, and pieces of uncov-

ered ground are filled by waving filaments and by naturalistic growths, all radiating, however, from the parent scroll. The terminal flowers, which form rosettes (usually placed on the axes of the field ornamented) which are the prototypes of the Gothic rosettes, have often a secondary closed flower springing from their centres, which, by a backward fling, counteracts the too evident monotonous flow of the scroll. The acanthus and scroll are also used in the Corinthian cap and in the modules. As secondary motives appear the long array of sphinxes, tritons, griffins, dolphins, tridents, vases, etc., — common also to Greece, but abundant in Rome, — the vine, the laurel, the olive, in great garlands tied with ribbons, festoons of fruit in high relief, and what is, perhaps, a perfectly new motive, — the use of striated shells as centres of ornament. In most Roman work, the ornament covers a large proportion of the ground in which it is placed, is in high relief with deep cutting, and is consequently extremely rich in its effect. It depends upon light and shade almost exclusively; for the exteriors, at least, of Roman buildings had but little color applied to them, the chief effect being obtained by the lavish use of gold and bronze. One extremely rich and beautiful class of work is produced by the use of the arch and dome. The caissoned ceilings of the Greek peristyle appear in another form under the soffits of the arches, and in concentric circles around the zones of the domes, the panels growing smaller towards the centre. These panels have very rich mouldings carried around them, are sunk deeply, and have great bosses of acanthus as central rosettes in each panel. The ribs between them are broad and often decorated, at times with a fret, or else with a guilloche, or long wreaths of laurel leaves bound with ribbons. The panels usually have the same character throughout, but occasionally vary in size, shape, and arrangement, especially in the vaulted ceilings of the tombs in the Via Latina, where the panelling has become a delicate stucco decoration in low relief and the panels are both square and circular with isolated bas-reliefs as centres to each.

### THE CLASSIC ACANTHUS.

The acanthus is pre-eminently the chief of classic motifs of ornament, and is also the chief of radial forms, — in fact, it is the radial principle, which is so permanently associated with the acanthus, that causes all leafage having a radial scheme to resemble the acanthus. An acanthus leaf without radiating systems of lines is practically a contradiction of terms and is impossible.

The acanthus is probably a gradual growth, not an inspiration; but it attains its developed form very quickly. The palmet, especially the anthemion, suggests it, and there is a certain form of Greek acanthus that is but little more than an anthemion with its divisions compressed together in one compound unit or leaf.

There was, probably, coincident suggestion from natural leafage; but the retaining of the radial lines, intact from tips to base of leaf, show that naturalistic veining was ignored in favor of method of growth. It is but a simple development of the anthemion lobe to broaden it and serrate its edges and accent the radial scheme by carrying radiating lines from the base to the tips of the serrations. The origin of the eyes separating one lobe from another is somewhat more difficult to trace, and may come from suggestion of natural form, though this seems improbable; but is more than likely to have arisen from a desire to separate the lobes and make each more individual and complete. A developed acanthus leaf has then the following factors in its composition, common to all varieties: —

A Radial Skeleton to both whole and parts, the radial lines being carried from tips of division and from angles of divisions of lobes to the base of the leaf.

Eyes separating the lobes.

Pipes from the eyes.

A strong central stem.

The varieties of leaf are produced by the relative proportions of lines and background and by the many different types of leaflets or divisions of lobe.

The circumscribing line of an acanthus in full face, if drawn, would be elliptical. Inside of this line and nearly parallel with it, though with less distance between the lines at the base than at the apex, is drawn another for the axes of the eyes. These eyes are either spaced equidistant or with an increasing or a decreasing ratio of interval from top to bottom. The size of the eyes usually increases towards the bottom.

The size of the lobes is determined by the interval of the eyes.

The character of the leaflets should resemble that of the lobe, and the character of the lobe that of the leaf itself; that is, if the type of leaf is spiny, the lobe and its divisions should be spiny.

The pipes have a broader surface than the divisions between the radial lines of the leaves, and thus afford the contrast of broad form and fine multiplied lines.

The leaflets have the same characteristics in relation to the lobes, that the lobes have in relation to the entire leaf, except that the leaf is symmetrical on either side of its central stem, while the lobe has fewer leaflets above its axis than below it.

The lines of the pipes and the lines from top of lobes to the base are radial to the entire leaf.

The lines from the leaflets are radial in relation to the axis of the lobe.

It will be seen from the foregoing that the acanthus has a very organic construction.

The lobes frequently overlap, this being produced by the bending forward or backward of the leaf.

If the leaf bends forward or has a concave curve at the top, each lobe will overlap the next above it; this is the usual form. If it bends backward or has a convex curve, each lobe will overlap the next below it. In drawing a leaf in three quarters view, the halves of the leaf are inclining backward from the central stem, and consequently the further half of the leaf is in sharp perspective and becomes full of almost parallel lines, while the nearer half is in elevation. In carrying the leaves in succession about a scroll, the ratio of progression, both in interval and size should be carefully preserved. Leaves clinging closely to a scroll should have their central stem parallel with scroll at a slight distance from it with the tip of leaf radiating.

Beside the acanthus leaf itself, there are several compound motives, formed of acanthus leaves, which are used as motives of ornament. These are terminal flowers, clusters of base leaves from which the general motive starts, and calyx-cups, used to afford starting-points for the larger leaves and to break the monotonous continuity of scroll.

As for the varieties of leaf edge, they are numberless; but there are few during the Greek and Roman epochs. The first Greek acanthus is seen in profile, has no division into lobes, but its edge is a succession of hollows separated by sharp spines. The sharp-pointed spiny leaflets hollowed with radial channels next appear, and this form becoming rounded, at length developed into the so-called "olive acanthus," universally used by the Romans in the Corinthian caps. This, by a further sub-division of leaflet, so that each leaflet becomes a diminutive lobe with smaller leaflets, is elaborated into the so-called "soft acanthus" used in the Roman friezes. The spiny Greek acanthus is the antecedent of the Byzantine acanthus with long, sharp spurs. The soft acanthus is the prototype of the numerous Renaissance forms. Finally, by cutting the eyes down far into the heart of the leaf and so making each leaf a group of long-stemmed lobes and by rounding the leaflets, is derived the Romanesque and Gothic leaf forms, which, by twisting and turning, form the elaborate early English and similar capitals. The influence of the acanthus goes far afield.

The vine is used occasionally in Roman friezes, the leafage resembling the acanthus in its edges, having evidently been influenced by similar conditions. The leaf is divided into three distinct lobes, each with a strong central rib. The bunches of grapes are usually smaller than the leaves, and are used merely to obtain small masses of detail in contrast to the broad leaf surface, in the same way that the berries are used with the laurels. Tendrils are also used with the vine for this purpose. The acanthus lacks, in the sequence of its masses, exactly the contrast between small detail and broad forms. It is obtained along the edges of the leaves as compared with their centres, but there is always a monotony in the use of the acanthus scroll, unless some other motive supplements the acanthus itself. It was probably in recognition of this fact that the tendrils and occasionally the fruit of the vine are found growing with acanthus leaves and from acanthus stems.

The tendrils especially are frequently used, wound loosely around the acanthus stems to counteract the tendency of the long lines of scroll, or carried out into spaces to fill voids. Often a small flower is put at the end of the tendril, and at times a bunch of leaves appears in the same place.

The Romans had also a trick of boring deep holes, not only at the eyes of the acanthus leaf, but in the cleft of each serration of the lobe, thus gaining contrast, but very soon giving a mechanical and spotty look to the carving. Roman carving is very seldom kept in flat planes; it is very decidedly in the round, and in consequence has deep shadows and refracted lights that constantly change and disturb the design. It is doubtful whether the effect of the design was assisted by colored grounds, although in some cases this did occur; but the carving was frequently gilded, either in masses or with lines picked out, as is evidenced by the continuance of this custom with the Byzantines. The Roman desire for rounded form is so intense, that even mosaics are modelled or overlay bas-reliefs.

Beside this broad, rich, and overdone type of Roman work, there is another class, which seems to be a translation of the delicate Pompeian paintings into stucco. The figures are in very slight relief and the stems of the foliage are in long slender lines with subtle curves terminating in a delicate flower or cluster of leaves. This work is occasionally done in marble, but is more apt to be sketched and modelled in the wet plaster.

There are panels filled with this class of ornament in the Palazzo Farnesina at Rome and upon the ceilings of some of the tombs in the Via Latina. The modelled surfaces often blend into the ground, giving an illusive visionary character to the forms.

The use of garlands, which appears on Greek work at about the time of the use of the Ionic order, and is directly traceable to the adornment of altars, is continued in Roman friezes, but is usually heavy and overdone. The treatment of both garlands and of ribbons is best in the work of the Renaissance. The Roman garlands, which are of two kinds, — a heavy dense chaplet of laurel leaves, bound by broad ribbons crossing each other at intervals, and a mass of fruit and leaves with but little apparent support, — are intact from end to end, and increase from ends towards the pendant centre in regular crescendo, thus forming very heavy, roundly moulded festoons, extremely difficult to handle with other than coarse effect. The ribbons are broad, usually forked at the ends and weighted with the little terminal weights used in the classic drapery. They have very numerous folds or wrinkles across the face of the ribbon, not longitudinal with it, and are not long, but curve into full round loops and curves, and are fastened with the usual acanthus rosette or a plain disk. Both garlands and ribbons were much more frequently used upon interior work than upon exterior.

C. HOWARD WALKER.

[To be continued.]