STEPS IN ARCHITECTURE AND ARCHITECTURAL DRAWING

FOR

STUDENTS, CARPENTERS AND BUILDERS

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EASY STEPS IN ARCHITECTURE

AND

ARCHITECTURAL DRAWING

THIS WORK CONTAINS EVERYTHING THAT IS NECESSARY FOR A COMPLETE, SELF-TEACHING COURSE IN ARCHITECTURE. IT COMMENCES WITH A DESCRIPTION OF DRAWING INSTRUMENTS, ETC. RULES FOR LAYING OUT SIMPLE DRAWINGS AND EXECUTING SAME ARE GIVEN, AND THE STUDENT IS TAUGHT STEP BY STEP TO DRAW TO SCALE, FIRST THE PLANS, NEXT THE ELEVATIONS, AND FINALLY THE DETAILS OF A COTTAGE, INCLUDING FOUNDATIONS, WALLS, DOORS, WINDOWS, STAIRS AND ALL OTHER ITEMS REQUIRED FOR FINISHING A SMALL BUILDING COMPLETE

FULLY ILLUSTRATED

BY FRED T. HODGSON

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PREFACE.

In preparing and adapting the present work, the Editor feels that he has supplied wants the ambitious young workmen have long felt. When a workman reaches a certain stage of perfection he naturally reaches out for more information in connection with his occupation, no matter what it may be. The Carpenter, the Bricklayer, the Mason and the Decorator all desire to know more of the art of architecture than can be acquired on the building or in the workshop; and this book is put together in order to give them an opportunity of getting that information and I am inclined to think that what is offered herewith, while not by any means a complete or comprehensive work on architecture, if thoroughly studied, will convey to the student a sufficient knowledge that will enable him to grasp the main points in architecture and styles, to such an extent, that he will be able at least, to talk intelligently on the subject.

"The Easy Lessons in Architecture," embodied in the work have been used for many years as a sort of catechism of the art, while the part on architectural styles is about the most complete ever published in so small a space. The latter is adapted from the German of Rosengarten.

I think that all readers of this little book will be satisfied with its contents, and that every workman who

peruses it with a view of enlarging his knowledge on architecture, will be satisfied that he knows much more when he lays down the book, than he did before he took it up. If this is the case, and I am sure it will be, I shall feel that my efforts in this direction have not been made in vain.

FRED T. HODGSON.

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PART II.

EASY LESSONS IN ARCHITECTURE.

BEING "STEPPING STONES" TO THE ACQUIREMENT OF A KNOWLEDGE OF THE NOBLE ART OF ARCHITECTURE.

Part I.

The following series of Questions and Answers were first prepared by Mr. Thomas Mitchell, and published in London some years ago, and is still a standard text-book in many schools and science colleges. Some time ago I slightly revised it, and Americanized it as it were; and have since enlarged it and made it more useful by additions of some new matter and pertinent illustrations; making the work of much more value to American readers than it formerly was. I feel assured that the work as now presented will be favorably received by every carpenter and builder who desires to know something of the history and theory of that most useful of the Arts—Architecture. If this work should be the means of creating an interest in the Art, in my readers, I shall be well repaid for my efforts.

QUESTIONS AND ANSWERS.

EARLY HISTORY OF ARCHITECTURE

Q. What is Architecture?

A. Architecture is the art of constructing a building upon correct and scientific principles, embodying strength, utility, and beauty.

Q. What was the origin of this art?

A. The origin of this art must have been the neces-

sity found by our race in all parts of the world for protection from weather and from the attacks of enemies.

Q. What was probably the first kind of habitation devised or adapted by man?

A. No doubt the first habitations devised by man were bowers in the forests, and from his observance of the habits of inferior animals, caves hollowed out of the earth.

Q. Of what materials is it most probable that the earliest buildings were constructed?

A. It is most probable that the earliest materials used were rushes, reeds, and the branches of trees tied together, plastered with mud and thatched with leaves. The ancient Britons constructed most of their dwellings of wicker-work.

Q. What reason have we to suppose that such rude materials were ever used by man in constructing his dwellings?

A. Because such materials were generally ready at hand, and because they are even now used among uncivilized tribes of New Zealand and the Sandwich Isles.

Q. Of what shape is it most likely that the earliest habitations were made, and why?

A. It is most probable that they were made of a conical shape, because such structures would be most easy of construction and removal, would afford most protection from rain, and would be less likely to be upset by the wind.

Q. Are there any countries in which the conical shape is still in use?

A. Yes; it is seen in the tents of the nomadic tribes of Arabia and Thibet, the huts of the Kamtschatkans, and wigwams of many tribes of North American In-

dians, some of which are constructed of bundles of long rushes, the thin ends of which are tied together at the top, and the thick ends spread out, and fastened to each other at the bottom.

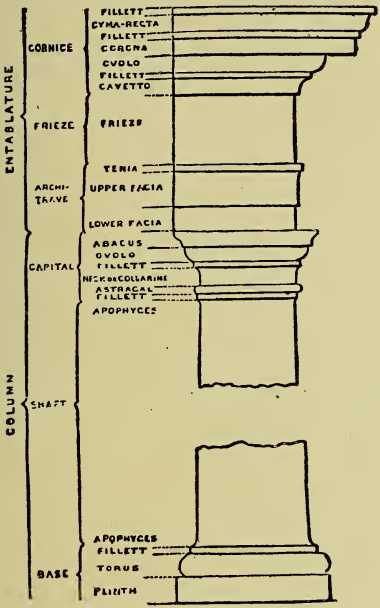


Fig. 1.

Q. What was probably the next form that suggested itself?

A. As owing to the increase of families larger space was required, this was no doubt obtained by means of

large limbs of trees fixed in the ground at the corners of the proposed dwelling, and the intervening spaces filled up with smaller branches, etc.

Q. To what result did the experience thus gained lead?

A. In the first place to the practicability of still further increasing the accommodation by the addition of another room above the room on the ground, while the advantages derived from the conical habitation no doubt suggested the idea of a sloping roof, though in eastern countries, and in others where there is little rain, this form of roof has never been generally adopted.

ON ANCIENT AND MEDIAEVAL ARCHITECTURE.

Q. How many styles of architecture are there?

A. There are many styles of architecture, and it would be impossible in this work to describe or enumerate them all, as every country on the face of the globe with any approach to civilization has its various styles adapted to the exigencies of its climate, the tastes and pursuits of its inhabitants, and the materials for building which they have at their command.

Q. What distinction can you make between Greek and Roman architecture?

A. The architecture of the Greeks was that of the column and entablature. The genuine architecture of the Romans was that of the arch, though when they conquered the Greeks they grafted Greek forms on their own style, and so made the latter exhibit a combination of both. (See Frontispiece.)

Q. What is the principle of the styles known as Gothic?

A. The Gothic styles may be classified in two broad divisions, the first of which, comprising the style generally known as the Early English or Lancets and the Geometrical, or First and Second Pointed Styles, exhibits throughout the principle of subordination or unity of separately existing parts, while the second division comprising the Curvilinear Decorated, or Continuous, and the Rectilinear, or Perpendicular Styles, tended more and more to blend or fuse the separate

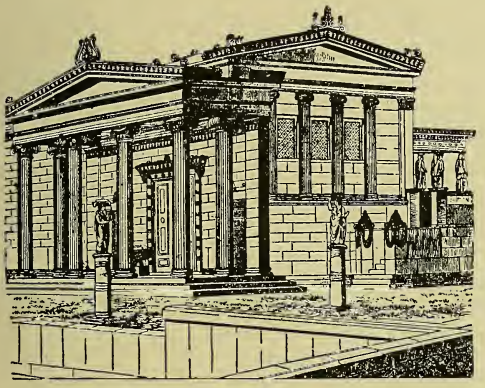


Fig. 2.

parts. The Romanesque styles which preceded the Gothic may be described as more or less a return to the genuine arched constructions of ancient Rome.

Q. Wherein does the great difference consist in the principle of construction of an ancient and mediæval edifice?

A. In the effect produced by the chief lines in the design. These, in Greek architecture, are the horizontal; in the mediæval styles they are the vertical.

Q. May not some religious symbolism be the cause of this difference in principle?

A. To some extent perhaps; but it is obvious that when the pointed superseded the round arch, all the buildings would exhibit more and more the vertical character, which results from the combination of the several parts of a design into the whole.

GENERAL DETAIL OF GRECIAN AND ROMAN ARCHITECTURE.

Q. Give a general idea of what the so-called classic styles include.

A. The classic styles are the various styles founded and practiced by the ancient Greeks and Romans. Other styles were developed from these, the principal of which are the Romanesque or Byzantine, the Italian, including the Florentine, modern, Roman and Venetian, and the Renaissance.

Q. Name some of the distinguishing features of Greek and Roman architecture.

A. The column, entablature and pediment, together with pilasters, colonnades, arcades and porticoes.

Q. What is a column? (See Plate 2.)

A. A column is a perpendicular erection of timber, stone or iron, and is used to support the weight of superincumbent parts of the building. In classic architecture the column, with its appurtenance, forms the principal distinguishing feature of the different orders.

Q. Describe the different parts of a column.

A. The principal parts are the base, the shaft and

THE PROPYLÆA AT ATHENS

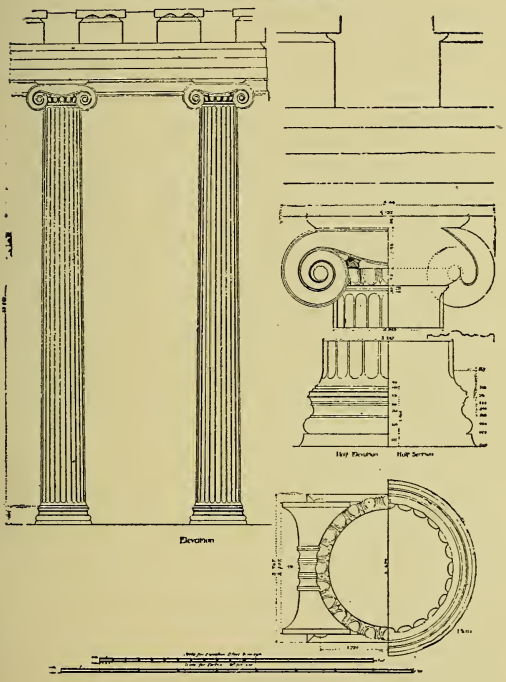


PLATE 2

the capital, the base and the capital being subdivided into different parts, each of which had its name and proportion. Indeed, the column is so important a part of classic architecture that the exact proportions of each part are settled by rule, according to the order used. (Fig. 1.)

Q. What is an abacus?

A. A flat slab or tablet forming the upper member of a capital. In the Tuscan and Doric orders it is square, but in the other orders it is hollowed out at the sides and the corners cut off.

Q. What are pilasters?

A. Pilasters are flat, square columns attached to a wall, behind a column or along the side of a building, and projecting from the wall about a fourth or a sixth part of their breadth. The Greeks had a slightly different design for the capitals of pilasters and made them the same width at top as at bottom, but the Romans gave them the same capitals as the columns and made them of diminished width at the top, similar to the columns.

Q. What is a colonnade?

A. A colonnade is a range of columns, and the name is usually prefixed to it, signifying the number of columns it contains, and founded on the Greek word for that number.

Q. Give examples of these different names.

A. A colonnade with four columns is called tetrastyle; with six columns, hexastyle; with eight columns, octastyle; with ten columns, decastyle, and so on. If the space between the columns is equal to one and a half diameter of the column it is called pyenostyle; if to two diameters, systyle; if to two and a quarter

diameters, ustyle; if to three diameters, diastyle, and if to four diameters, aræostyle.

Q. What is a colonnade called when in front of a building?

A. It is then called a portico (Fig. 2), and when entirely surrounding the building, peristyle; and when the columns are double or treble of depth, polystyle. (Fig. 3.)

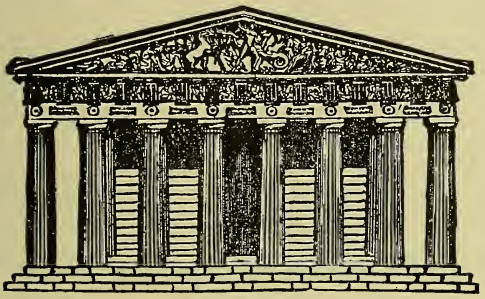


Fig. 3.

Q. What is an arcade?

A. An arcade is a series of arches and pillars, either open or attached to a wall, and is, perhaps, one of the most beautiful and pleasing combinations which architecture affords.

Q. What are the spaces between the arches in an arcade called?

A. Spandrils, which in mediæval architecture are often carved with a diapered pattern or decorated with tracery or paneling.

Q. What is the chief use of an arcade?

A. An arcade, when outside of a building, is generally used to support a balcony or promenade outside the first floor windows. Arcades also afford shelter from rain and heat; the only real objection to their use is that they obstruct the light from the ground floor. They are more frequently used on the continent of Europe than in this country.

Q. Describe the entablature.

A. The entablature comprises the whole of the parts between the tops of the columns and the pediment, and consists of the architrave, the frieze and the cornice. (See Fig. 1.)

Fig. 4.

Fig. 5.

Q. What is the architrave?

A. The architrave (or principal beam, as the name implies) is the lowest division of the entablature, resting immediately on the tops of the columns. (See Fig. 4.)

Q. What is the frieze?

A. The frieze (or ornamental part) is the division between the architrave and the cornice, and in the ancient Grecian examples was beautifully sculptured. In the Tuscan order it is quite plain, as that order is destitute of ornament. In the modern Italian style it is

sometimes plain, but swelled out, or, as is technically termed, cushioned. (See Fig. 1.)

Q. How is the frieze ornamented in the Doric order?

A. By triglyphs and metopes. The triglyphs consist of three vertical angular channels or flutes separated by flat spaces, and were generally placed by the Romans over the tops of the columns. Metopes (Fig. 5) are the spaces between the triglyphs, and originally were left open, and when filled in were quite plain. In Roman buildings they were usually carved with a representation of an ox skull, but sometimes shields and other devices were used. The Romans considered it essential that the metope should be an exact square.

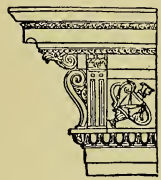


Fig. 6.

Q. What is the cornice?

A. The cornice (Fig. 6) is the horizontal molding on the top of the frieze, and the division between the cornice and the frieze is generally marked by a row of small square locks, called dentals, placed at regular intervals of about two-thirds or three-fourths of their breadth. The cornice is varied for each of the orders.

Q. What is the pediment?

A. The pediment is the triangular crowning part of a portico, and corresponds with a gable in Gothic

architecture, excepting that the angle is much more obtuse than that of a gable. The angle of the pediment corresponds with the slope of the roof. (Fig. 3.)

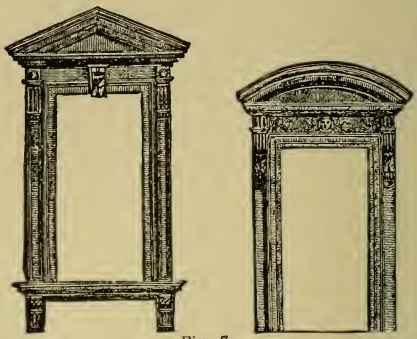


Fig. 7.

Q. To what other uses are pediments applied?

A. In the modern Italian styles the tops of doorways and windows are often arranged as pediments,

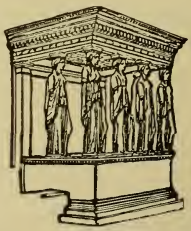


Fig. 8.

which are supported on consoles, trusses or brackets, and in later examples such pediments are often seg-

mental or circular at top, instead of angular. (Fig. 7.)

Q. What are caryatides?

A. Caryatides (Fig. 8) are colossal emblematical figures, made to do duty as columns, to support porticoes, etc. There is no doubt that, as a means of support, columns would answer the purpose much better, but they were often used by the Greeks when an extra amount of decoration was required. Male figures are called Telamones and Atlantes, or Persians.

ON THE ORDERS OF GRECIAN AND ROMAN ARCHITECTURE.

Q. What do you mean by an order?

A. An order, in Grecian and Roman architecture, consists of the column, base, pedestal, capital, frieze, cornice, and moldings belonging to it.

Q. How many orders are there?

A. Five. There are three primary Greek orders, viz.: The Doric, the Ionic, and the Corinthian. Two more were added by the Romans, viz.: The Tuscan, a modification of the Doric, and the Composite, a modification of the Corinthian.

Q. Describe the principal features of the Doric order.

A. The Doric order was the oldest and simplest of the three Greek orders. The shafts of the columns are fluted, and the flutings, which are twenty in number, are not quite a semicircle in depth, are separated only by a sharp edge and not by a fillet. As used by the Greeks, this order was without base or pedestal.

Q. What is the proportionate height of a Doric column?

A. The height of a Doric column is usually from seven to eight times its diameter at the bottom.

Q. How is the Doric column surmounted?

A. The Doric column is surmounted by a capital, consisting of a perfectly plain square abacus, with a single line of molding underneath it, technically termed a quirked ovolo.

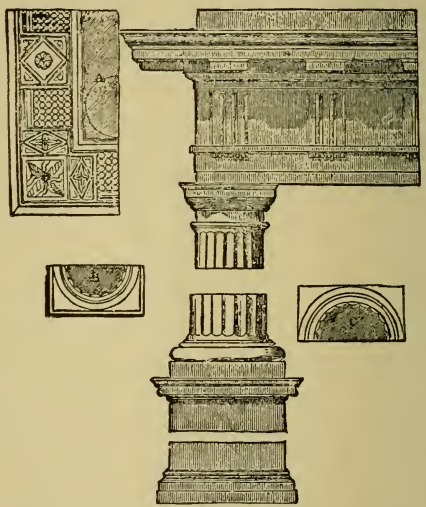


Fig. 9. DORIC ORDER.

A—Plan of the Sofite Corona. B—Plan of the Capital. C—Plan of Base.

Q. Describe the Tuscan order.

A. The Tuscan order, which was founded by the Romans, is a variety of the Doric, and is principally distinguished by its massiveness and strength.

Q. What is the proportionate height of the column, and how is it surmounted?

A. The columns are seldom higher than from five-and-a-half to seven times their diameter at the bottom; they have a simple square abacus and ovolo for a capital, and rest on a massive cubical base, with a torus molding. The shafts are never fluted. (Fig. 10.)

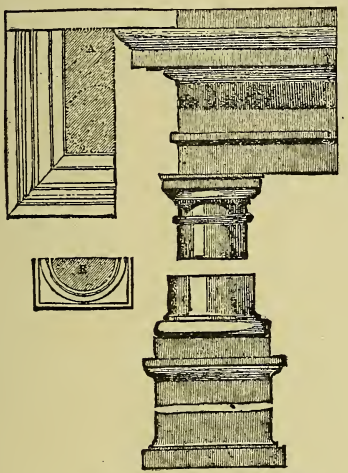


Fig. 10. TUSCAN ORDER.
A—Plan of Sofite of Cornice. B—Plan of Capital.

Q. In what position is this order placed in modern erections of more than one story and where several orders are used?

A. In such a case this order would be used for the basement or lower stories, which would give an air of strength and solidity to the whole.

Q. Describe the Ionic order.

A. This order is the second of the orders adopted by the Greeks and is of lighter character than either the Doric or the Tuscan. The shafts are generally, though not always, fluted, with a fillet between the flutings.

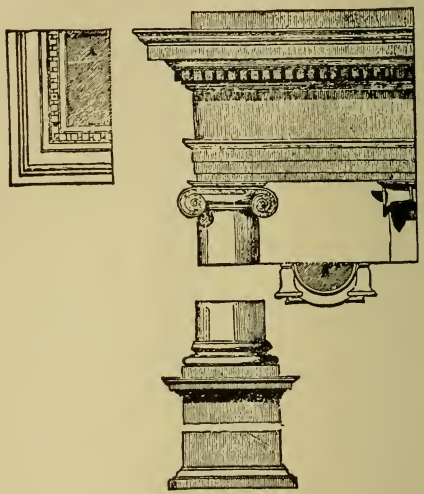


Fig. 11. IONIC ORDER.
A—Plan of Sofite of Cornice. B—Plan of Capital.

Q. What is the proportionate height of the Ionic column?

A. The total height of the column ought not to exceed nine times its diameter at the base, including the pedestal, if there is one. As used by the Grecians, this

order was without a pedestal, but the Romans added one.

Q. How is the Ionic column surmounted?

A. It is surmounted by a capital, having spiral-shaped scrolls at each side, termed volutes. It has also a molded base at the bottom, in height about half the diameter of the shaft. (Fig. 11.)

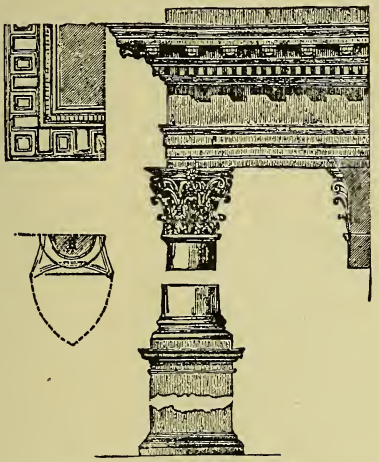


Fig. 12. CORINTHIAN ORDER.
A—Plan of Sofite of Cornice. B—Plan of Capital.

Q. Describe the Corinthian order.

A. This order is the lightest and most elegant of the three orders used by the ancient Greeks. The shaft of the column is fluted and the cornices and mouldings are richer than those of the Ionic or Doric orders.

Q. What is the proportionate height of the Corinthian column?

A. The Corinthian column is generally about nine-and-a-half or ten times its diameter in height, including the molded base. It generally, though not invariably, rests on a pedestal.

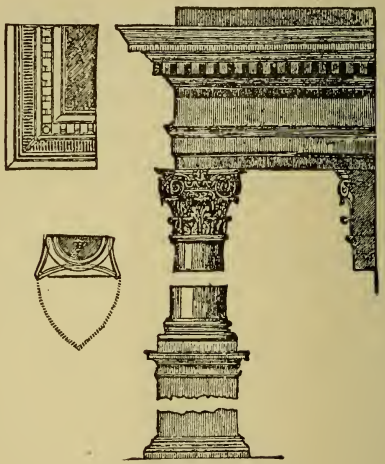


Fig. 13. COMPOSITE ORDER.
A—Plan of Sofite of Cornice. B—Plan of Capital.

Q. How is the Corinthian column surmounted?

A. It is surmounted by a very beautiful capital, which is the distinguishing feature of the order. It is richly carved and surrounded by three rows of acanthus leaves. The abacus at the top is hollowed out at the sides, and has the corners cut off. (Fig. 12.)

Q. Describe the Composite order.

A. The Composite order, used by the Romans is, as its name implies, composed of a combination of other orders. It is extremely light and elegant, partaking of the character of both the Ionic and Corinthian orders, and usually possessing rather more ornament.

Q. What is the proportionate height of the column, and how is it surmounted?

A. It is of the same proportion and height as the Corinthian and has a capital consisting of a combination of the Ionic and Corinthian; it has two rows of acanthus leaves, with a modification of the Ionic scrolls. The abacus is hollowed out at the sides, like the Corinthian. (Fig. 13.)

ON PLANS, FOUNDATIONS, AND THE CONSTRUCTION OF ARCHES.

Q. What are the first steps generally taken by an architect in the erection of a building?

A. The preparation of plans and drawings showing the design of the building intended to be erected.

Q. How many sets of plans are necessary to convey an accurate idea of the appearance and arrangement of the intended building?

A. Four, viz., the ground plans, the elevations, and the perspective, and sectional plans.

Q. Of what do the ground plans consist?

A. The ground plan is a representation of a horizontal section of the intended building, showing the shape of the ground plot whereon it is to be erected, the outlines of the walls and the distribution and extent of the various parts. When necessary this plan is

repeated for each floor. In a ground plan the solid parts, such as walls and piers, etc., are shaded or colored dark to distinguish them from the open parts.

Q. What is meant by an elevation?

A. The elevations are correct drawings of the front and sides of the proposed building, showing its height and proportions.

Q. What is the perspective drawing?

A. A representation of the intended building as viewed from a given point, showing the general effect of its appearance.

Q. What are the sectional drawings?

A. Drawings representing a perpendicular section of the building cut in two from the top to the bottom, showing the internal arrangement of floors, staircases, chimneys, etc.

Q. What are the next steps to be taken in the erection of a building?

A. The preparation of the foundation, which must be of sufficient firmness to insure that there shall be no settlement or sinking of the building at any part.

Q. When the ground is not naturally firm enough to insure the stability of the building, how is this remedied?

A. Artificial foundations are prepared of concrete. A trench is dug about twice the width of the thickness of the wall at the foundation, and of a depth in proportion to the height of the building or as the ground is more or less to be trusted, and is filled with a mixture of broken or small loose stones, sand, and Portland cement. This mixture, which is dropped into the trench from some height, speedily sets, and becomes almost as hard as solid rock.

Q. Are the walls then raised on this foundation?

A. Yes, and they should be twice as thick for the basement as for the rest of the building. In fact the remainder of the wall is sometimes slightly reduced in thickness for each succeeding story.

Q. When openings are required in the basement walls, how are they constructed so as not to diminish their strength?

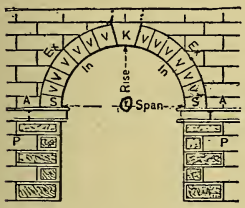


Fig. 14. SEMICIRCULAR ARCH.

A A—Abutments. S S—Springers. V V—Voussoirs. I I—Imposts. IN—Intrados. K—Keystone. P P—Piers. EX—Extrados.

Fig. 15. INVERTED ARCHES

A. In such cases inverted arches are used, and the opening above is covered by means of an ordinary arch or iron girder.

Q. Explain the principle of the inverted arch. (Fig. 15.)

A. Inverted arches are used to prevent the weight of the superstructure pressing the piers into the earth at any point, which might occur owing to their not being sufficiently broad in surface at the bottom. The inverted arches distribute the weight along the whole length of the foundation wall.

Q. What is an arch?

A. An arch is a curved structure, open below and closed above, and when properly constructed is supported by the pressure of its component parts.

Q. In what style of ancient architecture was the arch systematically employed?

A. In that of the ancient Romans, by whom it was used both for engineering and ornamental purposes, but it enters most largely as a constructive principle into the mediæval styles.

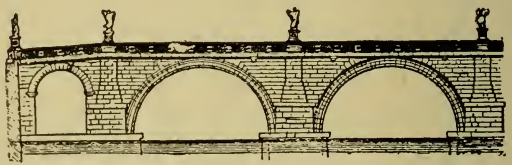


Fig. 16. BRIDGE OF ST. ANGELO OVER THE TIBER AT ROME.

Q. Was not the arch used by the ancient Greeks?

A. No. They seem to have been unacquainted with the principle of the arch, all their doorways, windows and spaces between columns being on the principle of the architrave.

Q. How do you account for the absence of the arch in Greek architecture and its frequent use in Roman?

A. The reason is apparent when the natural features of the different countries are considered. In Greece there are few or no rivers, in fact, they can hardly be called more than rivulets or streams, and the means of crossing them were simple, but in Italy the width of the rivers necessitated the use of arched bridges.

Q. Name some of the uses of the arch.

A. The arch is most frequently used where there is weight to be supported and open spaces are needed below, for instance, in bridges, viaducts, and the walls of churches, between the nave and aisles.

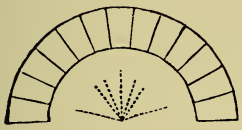


Fig. 17. ROUND ARCH.

Fig. 18. EQUILATERAL ARCH.

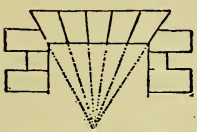


Fig. 19. FLAT ARCH.

Q. Give an example of the use of the arch by the ancient Romans.

A. The ancient Romans employed the arch in their viaducts or artificial roads, in their bridges, and in their aqueducts, and for ornamental purposes, chiefly in their triumphal arches, which were erected to honor the return of their victorious generals and to celebrate their triumph

Q. Describe the construction of an arch.

A. An arch is composed of voussoirs or wedge-shaped pieces of stone or brick, and the lines formed by the interstices between the voussoirs all point to the

center of the arch, or to the center of the segments of arcs which form the arch, as will be clearly seen from the diagrams. The outer line is called the extrados and the inner line the intrados.

Q. What are the abutments of an arch?

A. The abutments are the solid pieces at the sides of the arch, and it is obvious that these must be sufficiently strong to bear the thrust of the arch.

Q. How is the arch measured?

A. The distance between the piers is called the span of the arch; and from the level line of the springing to the point or top of the arch, is its height.

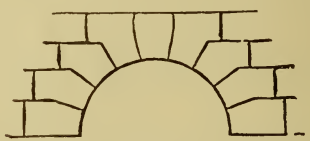


Fig. 20. ROUND ARCH WITH CROSSETTES.

Q. Are there not other modes of shaping the voussoirs?

A. Yes; but they are only variations of the principle already explained, and are perhaps resorted to more for ornament than for additional strength; the principal is the same in each case, as will be seen by the diagrams. In Fig. 20, six of the voussoirs have crossettes or elbows, overlapping the adjoining stone, which gave them a horizontal as well as a central bearing; in Fig. 21, the voussoirs are cut to fit into each other, or in technical phrase joggled.

Q. What is the name of the uppermost or middle voussoir?

A. The keystone; it is generally larger than the other voussoirs and it is so named because it forms, as it were, a key to bind the whole arch firmly together.

Q. Is the arch capable of supporting much weight?

A. Yes, if the arch is properly constructed it is capable of supporting an equal, if not greater weight, than a solid wall.

Fig. 21. FLAT ARCH, JOGGLED.

Q. Is this the case with brick work without any masonry?

A. Decidedly. If the brick are gauged to the proper shape, and the arch rightly constructed, with a double or treble course of bricks to form the arch, it will, after the wall has been carried up a little way, be capable of supporting as much weight as if there were no opening.

GENERAL DETAIL OF MEDIAEVAL ARCHITECTURE.

SECTION I.—ECCLESIASTICAL.

Q. Name some of the chief features peculiar to mediæval or Gothic architecture.

A. Arches, pillars, buttresses, towers, spires, and pinnacles, traceried windows, and high pitched roofs.

Fig. 22. TARRAGONA CATHEDRAL.

Q. How many different kinds of arches are there, and name them?

A. Nine, viz.:

1. Semi-circular, used in the Roman, Saxon and Norman styles, but rarely met with in the Gothic.
2. The lancet or sharp-pointed, belonging to the Early English period.

3. Equilateral. } belonging to the Geometrical and Curvilinear Decorated periods.
4. Ogee }

5. Four centered, belonging to the Perpendicular period.

6. Drop
7. Straight and } used in the various transitional periods.
8. Shouldered

9. Rampant, used in either style for staircases.

There are some variations of these occasionally met with, for instance, the horseshoe in the Moorish and the stilted arch in the Norman, the three and five-centered in the Perpendicular period, and the flat arch; but those enumerated above are the principal. (Fig. 23.)

Q. What is the difference between a Gothic pillar and a classic column?

A. The Gothic pillar is generally clustered, giving an appearance of several small pillars united together, and often consists of a large central shaft with four smaller shafts surrounding it. A common form of pillar consists of a square with rectangular recesses at each of the corners a circular shaft in each of the recesses, and a semi-circular one on two or on each of the faces. In the decorated period a lozenge-shaped pillar is often met with, beautifully carved.

Q. What kind of capitals and bases are used for a Gothic pillar?

A. The bases are generally molded, the capitals also sometimes consist of a series of moldings, but as the style was developed, and as more decoration was used, they are richly carved with foliage and flowers copied

from nature, oak leaves, ivy leaves, and the leaves of the whitethorn, hazel, and marsh-mallow, being often met with.

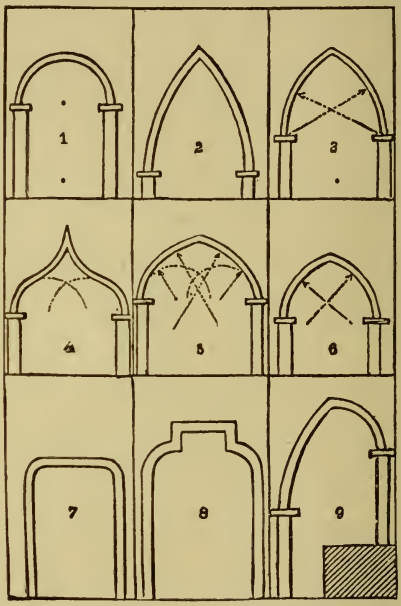


Fig. 23. DIFFERENT SHAPE ARCHES.

Q. What is a buttress?

A. A buttress is a mass of masonry or brickwork, built on the outside of a wall to give it additional strength to resist the strain of the roof, etc.

Q. Are the buttresses alike in all the English styles?

A. They are on the same principle, but vary according to the period. The Early English buttresses stand

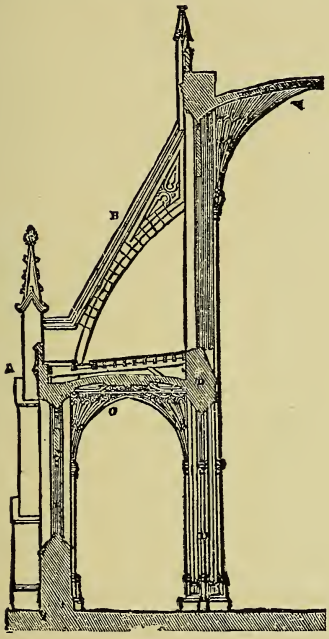


Fig. 24. FLYING BUTTRESS, BATH ABBEY.
A—Buttress with Pinnacle. B—Flying Buttress supporting Clerestory. C—Vaulted Roof of Aisle. D—Pier dividing Nave from Aisle. E—Vaulted Roof of Nave.

out very boldly and are generally broken into two or three stages, and reduced in thickness at each stage. In

the decorated examples they are also divided into stages and ornamented with niches and canopies to contain figures. In the Perpendicular period they are but slightly different, excepting that they are more often ornamented with the paneling peculiar to that style. They are often surmounted by pinnacles.

Q. What are flying buttresses?

A. Flying buttresses are arched buttresses, used when extra strength is required for the upper part of the wall of the nave, etc., to resist the outward thrust of a vaulted ceiling; the lower part of the flying buttress generally rests upon the buttress of the outside wall of the aisles. Such buttresses are most common in the great continental churches; but some beautiful specimens can be seen at Westminster Abbey, Wells Cathedral, Bath Abbey Church, and St. Mary Redcliffe, Bristol. (Fig. 24.)

Q. What is a tower?

A. A tower is a lofty, square structure, of several styles, and strengthened by buttresses. The object of a tower is to give dignity to a building and also to contain a peal of bells, which are placed in an upper chamber of the tower called a belfry. (Fig. 25.)

Q. Mention some of the best examples of towers in England.

A. The towers of Gloucester Cathedral, York Minster, Beverley Minster, Canterbury and Lincoln Cathedrals, and Magdalen College, Oxford, are, perhaps, the finest amongst the many noble towers in Great Britain.

Q. What counties in England are celebrated for the fine towers to their parish churches?

A. Somersetshire, Lincolnshire and Norfolk, which possess a very large number of magnificent towers, any

one of which might well be the pride of a whole county.

Q. What is a spire?

A. A spire is a lofty structure built on the top of a low tower, and tapering gradually to point at the top. (Fig. 25.)

Heckington. SPIRE. All Saints' Derby. TOWER.

Fig. 25.

Q. Of what shape is the tapering part?

A. The tapering part is generally octagonal, and the angles are often crocketed, i. e., ornamented with carved figures like leaves curling over. There are often

little windows or niches, and canopies made at intervals. The name of steeple is often applied to either a tower or a spire, or to the combination of both.

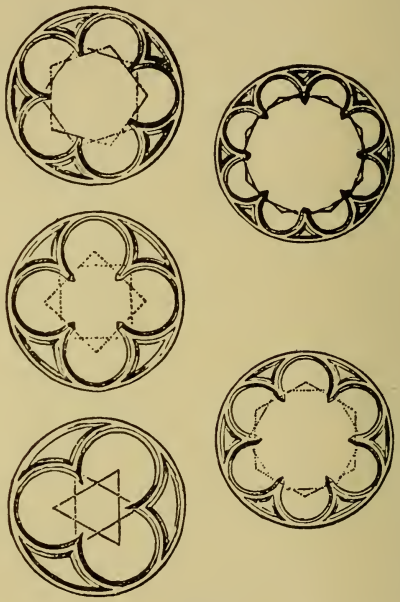


Fig. 26.

GEOMETRICAL FIGURES USED IN TRACERY AND PANELING.

Q. Mention some of the finest spires in England.

A. The spires of Salisbury and Norwich Cathedrals, and St. Michael's Church, Coventry.

Q. What are pinnacles?

A. Pinnacles are small spires used to ornament the tops of buttresses, gables, etc.

Q. What are turrets?

A. Turrets are little towers which are used to ornament different parts of Gothic buildings; frequently the high towers of churches and cathedrals are finished off by turrets or pinnacles at the corners.

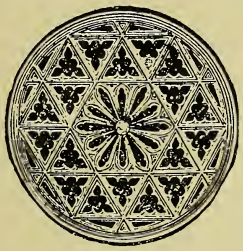


Fig. 27.

Q. Are not towers and spires used in classic building?

A. They were not used in any ancient examples, but modern buildings often have steeples and the idea is evidently taken from the Gothic, though not with very great success. The best specimens are those by Sir Christopher Wren, St. Mary-le-Bow, Cheapside, Christ Church, Newgate Street, and St. Michael-le-Querne, Foster Lane, are, perhaps, the three best examples that can be mentioned, though there are many copied from them.

Q. What is tracery?

A. Tracery is the ornamental stonework in the head of windows forming geometrical and flowing patterns, or caused by the intersection and combination of mullions. (Figs. 26, 27, 28 and 29.)

Q. What are mullions?

A. Mullions are the upright divisions of the stonework, dividing the windows into compartments or lights. (Figs. 26 and 27.)

Q. What was the origin of mullions and tracery?

A. No doubt the first idea of mullions and tracery was obtained by the combination of two or more narrow windows of the Early English period.

S. Ouen. Rouen.

York.

Fig. 28.

Q. How many kinds of tracery are there?

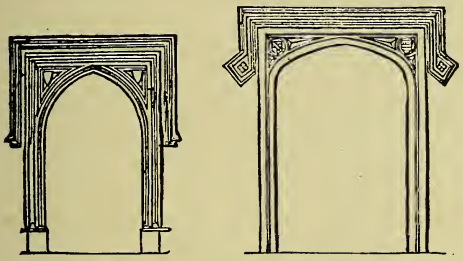
A. Two; plate tracery and bar tracery.

Q. What is plate tracery?

A. Plate tracery is the very earliest form of tracery and belongs to the later periods of the First Pointed or Early English style. It consists simply of apertures cut in the flat surface of the stonework between the tops of the narrow windows.

Q. Is this, properly speaking, tracery?

A. No; the complete idea of Gothic tracery requires not only the lights and figure (or figures) above them shall be combined by label and arch, with mullions instead of portions of wall, but that the spandrils in the window-head shall be pierced.



Tattershall Castle. S. George's Chapel.

PERPENDICULAR WINDOWS AND DOORWAYS.

Aylsham. Norwich.

Fig. 29.

Q. What is bar tracery?

A. Bar tracery is the most elaborate form of this kind of ornament and belongs chiefly to the Geometrical and Curvilinear Decorated periods. Its name is derived from the supposed resemblance to bars of iron twisted and bent to form geometrical and floriated patterns.

Many most beautiful examples are to be found in York Minster.

Q. Is the use of tracery confined to windows?

A. No; it is also used in paneling and in open screen work of wood or stone.

Q. What are transoms?

A. Transoms are the horizontal divisions across the mullions and are used in the windows of the continuous or Perpendicular period and are occasionally of great size; indeed, the tracery of windows of this period very often partakes more of the character of open paneling, filled in with glass than is consistent with a true Gothic effect, and this is one of the later features of the period marking the decline of the style.

GENERAL DETAIL OF MEDIAEVAL ARCHITECTURE.

SECTION I.—ECCLESIASTICAL.

Q. What other feature exists in the windows, paneling and screens of Gothic architecture?

A. The little arches formed by the mullions are often cusped, that is, there are projections from the curve of the arch, as though another arch were going to spring out. These cusps in the Perpendicular style are often decorated by a flower at the point. Two cusps in the arch form a trefoil, three a quatrefoil, and so on.

Q. What other shapes do windows assume in Gothic architecture?

A. The wheel or rose, and the squarehead.

Q. Describe these.

A. The wheel or rose window is circular and is filled with tracery like shafts, radiating from the center, re-

sembling the spokes of a wheel, as in Westminster Abbey, or in waving lines, as in the Flamboyant buildings of France (Fig. 28). The square-topped window used only in the Perpendicular style is divided by mullions and transoms. (Fig. 29.)

Q. What is meant by the hood molding?

A. The hood molding, also called the dripstone, is a projecting molding over the tops of traceried windows and doorways. It seldom extends lower than the spring of the arch, and is used for the double purpose of ornament and to protect the tracery from the rain. Perpendicular windows and doorways are almost invariably hooded.

Fig. 30. Fig. 31.

Q. Describe the construction of a roof.

A. The principal parts are the rafters, trusses, posts, purlins and braces. Their forms and uses are shown in the diagrams. It will be observed that the object of the tie-beam is to prevent the sloping rafters from spreading out. The king-post stands on the tie-beam and reaches up to the ridge-piece, which it supports, and the braces or struts reach from the foot of the king-post to the middle of the sloping rafters, preventing them from bending in or bulging out, and the purlins are horizontal rafters, running along the sloping rafters at the top of the braces. Sometimes there are two posts on the tie-beam, in which case it is called a queen-post roof. (See Figs. 30 and 31.)

Q. What is meant by a high-pitched roof?

A. Gothic roofs of the Early English and Decorated periods are often of a high pitch, i. e., the sides and base of the roof form an equilateral triangle, the insides being open so that the woodwork is visible. In the Perpendicular period the roofs were more depressed, that is, the angle at the top was more obtuse, which marks another sign in the decline of the true Gothic principle. (Fig. 32.)

Q. What material was used for covering the roof?

A. Shingles or thin slabs of oak, which, however, gave way to tiles, and ultimately to lead, as being more durable.

Q. What were the means used for conducting the water from the roof?

A. The water was collected by a gutter and discharged from the roof by spouts called gargoyles, which were frequently carved into a representation of a grotesque figure, which threw the water from its mouth.

Q. What are corbels?

A. Corbels are projecting pieces of timber or stone set in a wall for an arch to spring from, or to support the beam.

Q. What is a gable?

A. A gable is the upper part of the end wall of a building above the eaves and conforming to the angle of the roof.

Q. What is a vaulted roof?

A. A vaulted roof, or more properly a vaulted ceiling, as there is always an additional outside roof to cover it, is built on the principle of the arch and is often richly groined and ornamented with bosses and pendants. In some mediæval buildings, probably owing

to the walls not being of sufficient strength to bear the weight of stone, blocks of wood have been used instead and made to look like stone. (Fig. 32.)

Q. What is a groined ceiling?

A. Most vaulted ceilings are groined, the groins being the angles formed by the intersection of the arches. In many cases they are rendered more prominent by being ribbed or molded, a boss or ornament being generally placed where all the ribs meet at the top.

Fig. 32. VAULTED CEILING.

Fig. 33. PENDANT.

Q. What other ways are there of ornamenting the ceiling?

A. In the Perpendicular style there is a kind of tracery leading from the pillars and spreading all over the vaulted ceiling. This is called fan tracery. There are also in this style some beautiful examples of flat ceilings divided into panels, the divisions of which are richly molded and ornamented with bosses.

Q. What is a pendant?

A. A pendant is a hanging ornament, sometimes of large size and often covered with molding or sculpture. It is placed at the conjunction of the fan tracery, or of the ribs at the top of the vaulted roof. The way in

which it is supported is shown in the diagram. Pendants are principally used in the Perpendicular style, and there are some beautiful specimens in Henry VII's chapels. (Fig. 33.)

Q. How is a Gothic church divided?

A. Into nave and aisles, choir and chancel. The nave and aisles are for the congregation, the choir for the singers and the chancel for the celebration of Holy Communion. This arrangement is that which is generally adopted in cathedrals and minsters, but it is not universal, as many small parish churches have no aisle or choir, but simply consist of nave and chancel.

Q. What is a lady chapel?

A. A small chapel attached to collegiate and other large churches, dedicated to the Blessed Virgin and often forming a projection from the main building, generally to the eastward of the chancel.

Q. Are these divisions all under the same roof?

A. No. The nave is divided from the aisles by arches and pillars and has a roof to itself; the roofs of the aisles are not nearly so high as the nave, and the roof of the choir and chancel is generally either higher or lower than the nave. (Fig. 34.)

Q. What are clerestory windows?

A. The clerestory, or clear-story, is the name of a series of windows which are often seen over the arches which divide the nave from the aisles, and are so called because they form a clear story above the other parts of the building and to distinguish it from the triforium, which was called the blind story. They are useful to increase the light in the nave. (Fig. 34.)

Q. What is the triforium?

A. The triforium, sometimes called the blind story, is a gallery with small open arches in front built over the

aisles, sometimes in the thickness of the wall, and often between the vaulted ceiling of the aisles and the outside roofs. (Fig. 34.)

Q. What is a porch?

A. A porch is a roofed structure outside the principal doorways, and most usually in height only just covers the doorway, though in some examples there is a room over them. In the debased or Elizabethan style, porches are sometimes carried up as high as the rest of the building and with uniform stories.

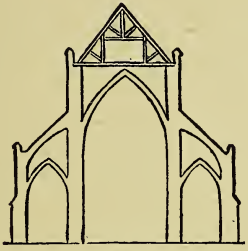


Fig. 34.

Q. What is a canopy?

A. A canopy is projecting ornamented covering over doors, windows and niches for receiving statues, etc. They are used in all the Gothic styles, though chiefly in the Perpendicular.

Q. What is meant by tessellated pavement, and by whom was it originally used?

A. Tessellated pavement is composed of pieces of different colored marble or tiles arranged to form geometrical patterns. The Romans often used baked tiles,

also, which were colored and shaped to form patterns. Many remains of those have been exhumed recently, among which may be mentioned a very fine specimen recently found at Canterbury, and now deposited in Canterbury Museum. Tessellated pavements were largely used by mediæval architects.

Q. Did the ancient and mediæval architects employ the aid of color in their buildings?

A. Yes: color was largely employed by both in the way of coloring the walls by means of frescoes, etc., and in drapery as well as in painted windows. Much of the bareness and coldness noticed in some mediæval remains is no doubt caused by the absence of drapery and tapestry hangings, intended to be used by the architect, but which have not been replaced.

Q. What great lesson may be learnt from a survey of the remains of both ancient and mediæval buildings besides their style and form of architecture?

A. That ancient architects worked throughout on principle, employing in their construction only such forms as were necessary. We seldom find in the remains of their buildings anything made of plaster while purporting to be of stone, or any inscriptions painted while purporting to be incised. Nearly everything is what it seems to be. If Greeks and Romans had erected their buildings as many large modern buildings are erected, we should have but few models from which to take pattern. Evidently their buildings were meant to last, and each stone was laid with the intention that their children in a remote age might find it as perfect as they left it. Their motto was not "this is the cheapest and easiest way to do it, and at any rate it will last our time." The remains of our mediæval buildings, many

of which were brought to their present state by sieges and fires, and battering of war engines and yet, the masonry, in many instances remains practically uninjured. From this we can form some conception of what the whole must have been when just completed by those master builders.

ON MILITARY AND DOMESTIC ARCHITECTURE.

[Although many of the features just described are used both in ecclesiastical and military or domestic architecture, the following are used only in the latter and it is therefore deemed best to describe them in a separate section.]

Q. What was the character of the domestic architecture of the ancient Greeks?

A. Very poor; their entire attention was paid to their temples.

Q. Was this the case with the ancient Romans?

A. No. The ancient Romans paid greater attention to civil and domestic architecture, as the remains of their triumphal arches, amphitheatres, baths and houses testify.

Q. What was the Basilica of the ancient Romans?

A. Basilica was the name given to the public Hall of Justice; it generally contained an altar for the administration of oaths, and a raised platform for the judges. Many of these basilicas were afterward converted into Christian churches.

Q. What buildings next to the ecclesiastical structures received the greatest amount of attention from the mediæval architects?

A. The castles of the barons and nobility.

Q. What is a castle?

A. An edifice of great strength and solidity, being a fortress and palace combined. They were used as dwell-

ing places by the nobility, and were strongly fortified so as to be able to withstand the attack of an invading force.

Q. What are the general characteristics of a Gothic castle?

A. Convenience was evidently sacrificed for security, the apartments were often gloomy, bed-chambers few and small, passages narrow and intricate, and the stairs steep and dark.

Q. What was the general plan of defence?

A. They were surrounded in most instances by a moat or deep ditch, which was generally kept filled with water so as to render it difficult for the attacking party to get near enough to make a breach in the walls.

Q. What were the means of exit and entrance to the inhabitants of the castle?

A. A drawbridge or platform which could be lowered or raised when necessary.

Q. Supposing the drawbridge was inadvertently left down, what was the defence of the doorway?

A. A portcullis, which was a kind of crossbarred gate of great strength, sliding in grooves, which was kept lowered in front of the principal entrance.

Q. Describe the principal entrance to a castle.

A. The principal entrance was often very imposing, consisting of a long passage with a vaulted ceiling and portcullis at either end, and capable of resisting a prolonged attack.

Q. What was the next defence to the castle?

A. The barbican, which was a kind of tower often separated from the castle and strongly fortified to guard the drawbridge and principal entrance.

Q. What was the principal tower called?

A. The keep.

Q. What is a parapet?

A. A low wall to afford protection to soldiers fighting on the ramparts of castles and the roofs of other buildings.

Q. What is an alur?

A. A hidden passage behind a parapet for the purpose of watching unseen the operations of besiegers.

Q. What are battlements?

A. Notched or indented parapets. The solid parts are called merlons, and the openings embrasures, or crenelles, through which archers could shoot. Battlements are sometimes employed for ornaments in ecclesiastical structures.

Q. What is a bartizan?

A. A small overhanging turret projecting from the corners of a tower or from the parapet. They are more commonly used on the Continent than in England.

Q. What was the chief apartment in a mediæval castle?

A. The hall, where all meals were had, and which was often strewed with rushes for the servants to sleep on at night.

Q. What is a bay or oriel window?

A. Bay windows were chiefly used in the Perpendicular style, and formed a bay or recess at the upper end of the hall. These recesses were either rectangular or polygonal, and when used for an upper story were supported on the outside by corbels, or a projecting series of mouldings. Bay windows or bow windows of semicircular shape are often used in the modern Italian styles.

Q. What was the next important apartment in the castle?

A. The kitchen, which on account of the number of

retainers and frequent visitors at the castle of a baron, formed a most important feature. It was sometimes a separate building, but was most usually in direct communication with the hall.

Q. What was the postern gate?

A. A private or concealed gate in a castle or monastery by which means of exit was obtained or message sent for aid during a siege.

Q. What are cloisters?

A. A covered arcade on three sides of a quadrangular space in front of a church or monastery; they were used as places of study by the monks, and the space enclosed within them was used for recreation.

Q. What were the lavatories?

A. Places for washing in monastic buildings, sometimes consisting of a fountain or reservoir of water and a stone trough in the cloisters.

Q. What is a lantern tower?

A. A small turret usually erected on the roof of a hall, or at the junction of a transept; they were open to view from the ground nearly the whole of their height. The name was also applied to an open erection at the tops of towers, as at Boston Church, Lincolnshire, England.

Q. What are dormer windows?

A. They are small windows built out of a high-pitched roof; they are very picturesque in appearance, and are so called because they were originally used for dormitories, or sleeping-chambers.

Q. What is the meaning of the term "batter"?

A. Walls leaning inward are said to batter, that is, the top part of the building would be of less circumference than the base. Walls of wharves, embankments and fortifications generally batter.

ON THE DEVELOPMENT OF MEDIÆVAL ARCHITECTURE.

Q. What is meant by the term Gothic?

A. The name of Gothic was given to the various Mediæval styles at a period in the sixteenth century

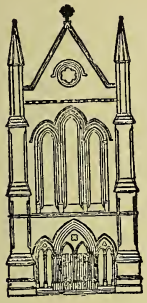


Fig. 35. Early English Facade.

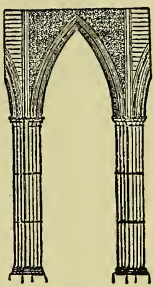


Fig. 36.

when a great classic revival was going on, and everything not classic was considered barbarian or Gothic. The term was thus originally intended as one of stigma, and although it conveys a false idea of the character of the Mediæval styles, it has been long used to distinguish them from the Grecian and Roman.

Q. What change was produced by the general adoption of the pointed arch?

A. The true principle of Gothic architecture was firmly established.

Q. What is the true principle of Gothic architecture?

A. The vertical, division, relation, and subordination of the different parts, distinct and yet a unity with each other, and while this principle was adhered to,

Fig. 37. YORK,
Equilateral or Decorated Arch and Pillars.

Fig. 38. ST. GEORGE'S CHAPEL.
Tudor or Perpendicular Arch and Pillars.

Gothic architecture may be said to have retained its vitality.

Q. Describe the distinguishing features of the earlier stage of Gothic architecture.

Fig. 39.

Fig. 40.

A. The chief features of the earliest periods are high-pitched roofs, sharp-pointed arches, and narrow windows, and a more severe treatment generally than is apparent in succeeding styles. Lincoln and Salisbury

Cathedrals and Westminster Abbey are among the most beautiful examples of this period which has been designated as the Early English, First Pointed, or Lancet, on account of the sharp-pointed arches. (Figs. 35, 36, 37, 38.)

Fig. 41.

Fig. 42.

Fig. 43.

Q. What further progress was made in Gothic architecture at this period, and to what did it give rise?

A. The grouping together of two or more windows and inclosing them with an arch. The spaces between

Fig. 44.

Fig. 45.

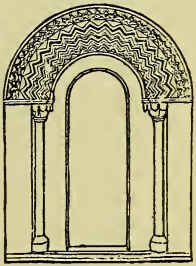


Fig. 46.

the tops of the windows were then pierced, which gave rise to the adoption of plate tracery, which at first consisted only of the openings made in the walls between

the tops of the windows. The upright pieces of wall between the windows became narrower and ultimately gave way to mullions, and the two or more windows grouped together became one window, consisting of two or more lights.

Q. What were the next changes introduced into Gothic architecture?

A. The principal changes next made were such as further developed the principle of subordination, viz., the widening of the arches and the general adoption of the equilateral form; the use of bar tracery instead

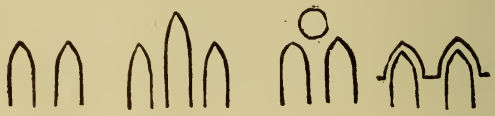


Fig. 47. Fig. 48. Fig. 49. Fig. 50.

of plate tracery, the patterns being worked in geometrical forms; the clustering of shafts and the exquisite moldings around the arches, doors and windows. (Fig. 26.)

Q. What name has been given to the style now adopted?

A. This style has been called the Geometrical Decorated, or Second Pointed, and during this period Gothic architecture may be considered to be in its prime, for whatever may be the beauty of succeeding styles—and the question of beauty is quite distinct from that of principle—the departure from the true Gothic principle becomes more and more apparent.

Q. Did these changes take place suddenly or rapidly?

A. No. The change was very gradual, and many examples exist which partake of the character of both

Fig. 51.

Fig. 52.

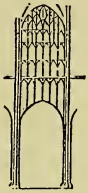


Fig. 53.

Fig. 54.

the Lancet and Geometrical Decorated styles. Many buildings were erected exhibiting some of the new features of the former period after they had passed out of general use. These are called transitional.

Fig. 55.

Fig. 56.

Q. Is not this mixture of styles a great hindrance to the assignment of exact dates to mediæval buildings?

A. Yes; but the development of the art rendered

necessary a period of transition between each stage, and we are indebted to such periods for some of the most beautiful designs.

Q. Give some examples of the Geometrical Decorated style.

A. Parts of Ely, Exeter, Norwich, York and Litchfield Cathedrals contain exquisite specimens of the workmanship of this period.

Q. What was the next change in principle?

A. The next change was one which ultimately resulted in the downfall of Gothic architecture; and this

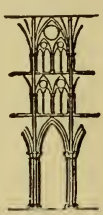


Fig. 57.

Fig. 58.

was the introduction into the tracery of windows of curved forms, blending one into the other, instead of the pure geometrical forms which preserved a separate character, while existing in perfect unity (Fig. 60). This style, which commences the second division of Gothic architecture, is called the Curvilinear or Flowing Decorated, and corresponds with the Flamboyant style of France.

Q. Describe the Flamboyant style of architecture.

A. The Flamboyant style was contemporary in France with the Curvilinear and Continuous styles of

Great Britain. This name was given to it because of the resemblance of its tracery to the waving of flames. The Church of St. Ouen, Rouen, and the Cathedral of Harfleur in Normandy, contain beautiful specimens of this style.

Q. How did this change lead to the downfall of Gothic architecture?

A. Because it involved a departure from the true Gothic principle, the unity of separately existing parts, and allowed to the flowing of one form into another, thereby acting upon a new principle—viz., the absorption or blending together of different parts.

Fig. 59.

Fig. 60.

Q. Describe the next stage of Gothic architecture.

A. In this stage the principle of continuity is carried out to its greatest extent, the capitals of columns become smaller, and ultimately are disused altogether; string courses and bands are more seldom seen, and the perpendicular lines are carried up to the top of the building, until they are finally lost in the fan-tracery of the vaulting. This style has been designated the Tudor, Rectilinear Continuous, or Perpendicular style.

Q. What is the shape of the arches in this style?

A. Pointed but much depressed (Figs. 71-73). This style is remarkable for the introduction and use of the four-centered arch, which is used for both pier arches, doors, and windows, but which gets more and more depressed, until both doors and windows are made with square tops, like those of Aylsham and Norwich.

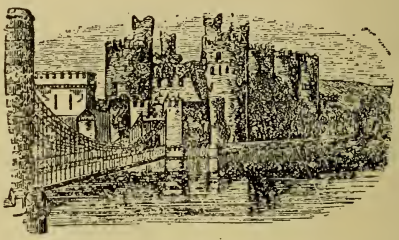


Fig. 61.

Q. Describe the window tracery of this period.

A. The perpendicular principle of this style is further carried out by the extension of the mullions up to the tops of the windows in place of the flowing tracery of the preceding style. The immense size of some of the windows necessitated the use of transoms to support the mullions.

Q. What were the other characteristics of this period?

A. The abundant use of paneling both for doors and walls, which partakes largely of the character of the window tracery. The moldings are not quite so rich as those of the preceding styles, but the excess of orna-

ment generally is so great as to obtain for this style the designation of "Florid."

Q. Name some examples which may be considered as specimens of this style.

Fig. 62.

Fig. 64.

Fig. 63.

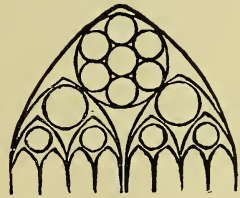


Fig. 65.

A. Many very beautiful specimens are in existence, e. g., Henry VII.'s Chapel at Westminster, parts of

Fig. 66. Flamboyant Window.

Fig. 67. Flowing Tracery.

Gloucester Cathedral, Winchester College and Cathedral, St. Michael's, Coventry, and Trinity Church, Stratford-upon-Avon.

Q. What was the style of architecture in use in this country in the sixteenth century?

A. It was termed Debased, or Elizabethan, and answers to the Renaissance of the French, being a curious mixture of the Perpendicular style with the Grecian and Roman architecture which was then being revived. It is remarkable how few churches were erected during this period, but many very beautiful country mansions belonging to this time are still in existence.

Q. What is the meaning of the term Renaissance?

A. The Renaissance is the name given by the French to the style which was developed in their country in

Fig. 68. Continuous Window Head.

Fig. 69. Arcade, Romsey Church, Hampshire.

the sixteenth century from a revival of classic detail, which was mixed up with French Gothic.

SOME GENERAL REMARKS.

The term Gothic was fundamentally incorrect, because the architecture to which it was applied was nothing more than the natural sequel and outgrowth of the Romanesque style, which in turn was derived from the Roman architecture. The changes of style which came about in the early centuries were due largely to alterations in principle of construction, the use of the round arch by the Romans taking the place of the lintel construction of the Greeks. Official recognition by the Emperor Constantine in the year 328 A. D., and his zeal in building places of worship, brought about the

construction of basilicas. Many of these basilicas were formerly Roman halls of justice and were afterward used as churches. The arch was used extensively in their construction, and their plan had formed the basis for almost all places of worship up to the present day. The gradual evolution of Christian architecture from Italy and elsewhere brought about the style which was appropriately called Romanesque. Speaking of England prior to the Norman conquest, there was little or no architecture worthy of mention. The few extant

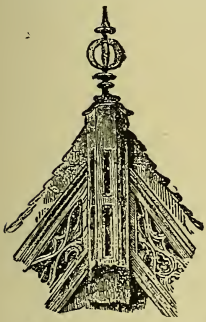


Fig. 70. HIP-KNOB, COVENTRY.

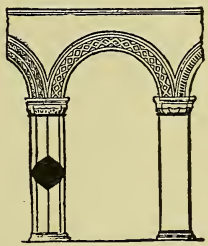


Fig. 71.

remains of Saxon buildings consisted mostly of towers and bore a remarkable resemblance to some built in Italy about the same period. Their chief peculiarity was an arrangement of alternating long and short stones at the corners and in vertical strips on the exterior, which was known as long and short work. With the Norman conquest there came extraordinary activity in the building of churches and abbeys. These new churches were of the Romanesque type, though differing somewhat from the Norman-Romanesque churches

of the same period. Gothic architecture was derived from the Norman-Romanesque, the great change taking place in the use of the pointed arch instead of the semi-circular one. The pointed arch was the outcome of the difficulty of making two arches or vaults over two adjoining spaces of different width, so that they should be of the same height. At the end of the twelfth century architects were working out this problem, and with the power of the church becoming greater and greater, ecclesiastical architecture made rapid strides, and there was a remarkable variety in unity to be found in the resultant efforts. This variety was due to subdivision

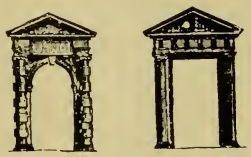


Fig. 72.

Fig. 73.

of labor in the design. The builder seemed to have planned only the main scheme of the building, leaving the precise form of each detail to be determined according to the skill or fancy of the artisan to whom the work was entrusted; and yet, with all this variety, the general scheme was much the same.

The period of Gothic architecture lasted about four centuries, in which there were three distinct varieties, known as early English, decorated and perpendicular, as shown by the changes in the form of window tracery, doorways, vaulting and the different forms of moldings characteristic of each period. The period of the building or portion of the building could most easily be de-

termined by the window tracery, the elaboration of which was due to the increased use of stained glass. The windows not only became more ornate, but much larger, until in the late perpendicular period the walls seemed to be almost a continuous surface of stained glass. At the same time that this occurred the vaulting became more and more elaborate, and with the decadence of Gothic architecture at the end of the fifteenth century the vaulting had almost the likeness of lace work.

ON THE DEVELOPMENT AND DISTINGUISHING FEATURES OF SUCCEEDING STYLES FROM THE ANCIENT GRECIAN TO THE ROMANESQUE.

Q. What different races would be likely to have used the primitive forms of habitation you have mentioned, viz., the cave, the tent and the hut?

A. The cave hollowed out of the earth would be most likely to be used by those races who adopted hunting and fishing for their pursuits, and would not have much time for mechanical occupation. The tent was used by those engaged in pastoral duties, on account of the frequent removals necessitated by changing pasture for their flocks; and the hut was no doubt used by those who were engaged in agricultural occupation, and required a permanent dwelling near the scene of their labors.

Q. What styles of architecture are most likely developed from these original sources?

A. The architecture of India, Assyria and Egypt was no doubt derived from caves and excavations, that of China, etc., from the tent, while that of Greece and Rome was derived from the wooden hut.

Q. Explain very briefly the grounds for assuming

that the excavated cave was the model for Egyptian and Indian architecture.

A. The remains which exist at the present day of the Indian rock-cut temples and the similarity between these and their edifices above ground go far to prove the theory as regards India, while the massiveness and the converging walls of Egyptian architecture give rise to a similar belief.

Q. Explain, in a similar manner, the reason for believing the tent to have been the model of Chinese architecture.

A. The principal proof is the form of the roofs, which nothing but a tent could have suggested, and the extreme lightness of appearance which characterizes the style. (See Figs. 73 and 74.)

Q. Why may it be believed that the principle of Grecian architecture was derived from the wooden hut?

A. The chief features of Grecian architecture already enumerated all give evidence of their having been copied in stone from what were originally timber structures; and perhaps it will be well to enumerate each portion separately.

Q. What was the origin of the column?

A. Trunks of trees driven into the ground to support a covering for shelter were the origin of the columns used to support the porticoes of temples, etc., which became one of the chief features of the style. As the trees were wider in diameter at the bottom than at the top, so the columns were made to diminish in thickness as they rose.

Q. What was the origin of the capitals and bases?

A. The first step in the formation of an architectural capital was no doubt a flat slab of stone, tile or

wood placed on the top of the column to give it a larger surface to receive the architrave. The Doric capital consists simply of this square slab or abacus, with an echinus and annule or ring below it, and it has been suggested that the bases were added to raise the columns from the earth to prevent rot from dampness. It must,

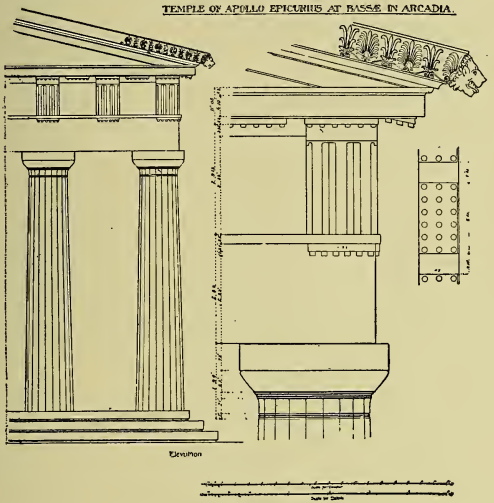


Plate 3.

however, be remembered that the Doric, the earliest of the Grecian orders, had no base. (Plate 3.)

Q. What was the origin of the fillets at top and bottom of the shafts?

A. The column, being originally of wood, no doubt had ties or rings of iron at top and bottom to prevent the wood from splitting, and these were afterward imitated in the stone column.

Q. What was the origin of the architrave?

A. The architrave, as its name implies, was the chief beam of wood laid horizontally on the tops of the columns, and was intended to support the covering of the entire building.

Q. What was the origin of the frieze?

A. The joists of the ceiling rested on the architrave, and the space occupied by their height was the origin of the frieze, the ends of the joists being ornamented with triglyphs, and the open spaces between the joist formed the metopes, which were afterward filled in solid.

Q. What was the origin of the pediment?

A. The inclined rafters of the roof projected beyond the face of the building and the angle formed by the pitch of the roof gave the form of the pediment.

Q. Explain the different parts of the cuts. (Figs. 30 and 31.)

A. aa. The architraves.

bb. The ridge piece or columen.

c. The king post or columna of a roof.

dd. The tiebeam or transom.

e. The strut or capreolus.

ff. The rafters or contherii.

gg. The purlins or templa.

hh. The common rafters or asseres.

Q. Which of the three Grecian orders gives most encouragement to the theory of the wooden model?

A. The Doric, which was the most ancient, from its severe simplicity gives great weight to the theory of its having been founded upon a translation into stone of previous wooden structures.

Q. What was the next step in the advancement of Grecian architecture?

A. The Ionic order, which appears to have sacrificed a certain amount of solidity to the attainment of

elegance and finish, and to have lost a great many of the characteristics of the wooden model.

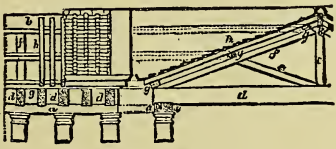
Q. About what period was this?

A. About the time of Alexander the Great, at a period when there was a general outburst of talent, both for sculpture and architecture, throughout Greece.

Q. What was the next advance made in the art?

A. The Corinthian order, which exhibits still further the progress of the art. The beautiful capital of acanthus leaves, the elegant frieze and the costly marbles used in its construction combined to make this the most elegant and delicate of the three Grecian orders.

Fig. 74.



75.

Q. Are the remains of Grecian workmanship numerous?

A. No; unfortunately, they are very scarce; and it is conjectured that owing to the value of the materials employed many of the most splendid buildings were taken down by the Romans after their conquest of the country and re-erected in Rome to increase the glories of their own capital.

Q. What put a stop to the further development of Grecian architecture?

A. The entire subjugation of that country by the Romans.

Q. To whom must we now look for the further development of the art?

A. To the Romans, who, although they had a style of their own, founded on the principle of the arch, acknowledged the intellectual superiority of the Greeks and submitted to their teaching in the matters of art; and much that was thoroughly good in their own style was disguised or concealed by Greek decoration.

Q. Did the Romans go the proper way to work to develop their own style of architecture?

A. No; they sacrificed their own superior constructive genius, which, if strictly adhered to and properly developed, might in their hands have produced the most stupendous results, for the sake of a foreign ornamentation which, however beautiful, was entirely unsuited to their peculiar principle of construction, the Greek capital and entablature being thoroughly antagonistic to the principal feature of pure Roman work.

Q. What was the constructive principle of pure Roman work?

A. The real principle of ancient Roman architecture was that of the arch, and the remains of their buildings where Grecian decoration was abstained from prove that they were constructed with a massiveness and strength which has rarely been equaled since.

Q. What was probably the origin of the arch?

A. It is not improbable that the first idea of the arch was suggested by the inclined struts which were often used in timber structures to lessen the strain on a beam, and which were placed from the sides of the columns to the under side of the beam. But in truth the theories which profess to account for the origin of this form of construction are almost endless.

Q. What was the character of Roman workmanship?

A. The detail of Roman workmanship was more meretricious in effect and possessed greater richness than the Grecian, but was destitute of the chaste simplicity, sublimity and grandeur of the Grecian model.

Q. What was the first symptom of decay in Roman architecture?

A. The abandonment of columns from their natural and legitimate use as a means of support and their employment merely for ornament, in many instances being half imbedded in the walls.

Q. What was the immediate cause of the decline of Grecian and Roman architecture?

A. The overthrow of the Roman power by the northern races of Europe, who stripped the temples, etc., of all the gorgeous decorations with which they were adorned, and so revealed the genuine principle of construction, which became in their hands the germ of a style which, when fully developed, contained in it all that was beautiful and grand.

ON THE ROMANESQUE STYLES.

Q. What was the next step toward the development of a new style and the disuse of the ancient?

A. The transition period from the Roman style to the succeeding one was marked by the abandonment of the use of the Grecian entablature above the columns, and the use of arches of a semicircular form for window and other openings which sprung immediately from the imposts of the columns.

Q. What was the name given to the architecture which succeeded that of Rome?

A. The Romanesque.

Q. What particular styles of architecture are included in the Romanesque?

A. The term Romanesque embraces all those styles of architecture which prevailed between the destruction of the Roman Empire and the use of the vertical Mediæval style, and in it may be included the Saxon, Norman and Lombard styles.

Q. What are the chief characteristics?

A. They partake much of the character of the debased Roman style, which accounts for the name of Romanesque. The style is also called Byzantine from its introduction at Byzantium. This style may be considered as the progenitor of the Mediæval styles, as in it may be found the germ of many features which were afterward developed and brought to perfection in them.

Q. What peculiar kind of roof is often introduced in Romanesque or Byzantine buildings?

A. The cupola, which is a kind of dome, and constructed on the principle of the arch.

Q. What model did the Romanesque builders employ in their erection of the early Christian churches?

A. The earliest Christian churches appear to have been built upon a model of the Roman Basilica or Hall of Justice, which was divided down the middle by rows of columns forming aisles, and in many cases had a semicircular recess at the end, no doubt suggesting the idea of the apsidal termination to the chancel, noticeable in the remains of many Saxon and Norman churches.

Q. Describe the Saxon style.

A. The Saxon style was that species of Romanesque which was in use in England before the Norman was introduced. It was of simple character, and no doubt the greater portion of the churches, etc., were of wood, the existing remains exhibiting evidence of their having

been copied in stone from previous wooden models. The round arch was used and occasionally the pillars were octagonal. The remains of Saxon workmanship in the old parish churches are very numerous, but they are of a very fragmentary character.

Q. What was the Norman style?

A. The Norman style was that species of Romanesque which was practiced by the Normans, and which was introduced and fully developed in England after they had established themselves in it.

Q. Describe the chief features of the Norman style.

A. Plainness and massiveness are the chief characteristics of the earlier examples. The arches, windows

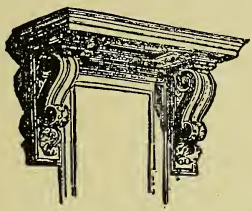


Fig. 76. CORNICE SUPPORTED BY CONSOLES

and doorways were semicircular. The pillars are very massive, and are often built of small stones laid like brickwork. (Fig. 45.)

Q. Are the later examples as plain as the earlier?

A. No; as the style progressed the ornamentation was more elaborate, and in later examples the arches, doorways and windows are most richly molded (Fig. 42), and often sculptured with grotesque figures. Many beautiful examples of Norman art remain, e. g., parts of Petersborough, Ely, Norwich, Hereford, and Gloucester Cathedrals, and the Chapel of St. Cross, Winchester.

Q. What other features do the later specimens of Norman work present?

A. The elevation of the interior, and the division into the triple range of pier arch, triforium, and clerestory. This is a great advance toward the pure Gothic principle, but it is as yet only partial, as the horizontal lines between each remained unbroken.

Q. What further advance was required to develop fully the Gothic principle?

A. The transitional progress of the Norman style from a Romanesque to a Gothic character was further marked by the introduction of small vertical shafts

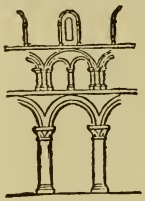


Fig. 77.

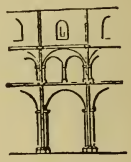


Fig. 78.

running up the piers of the roof, dividing the triforium and clerestory into parts. The effect of the horizontal division into layers of the Romanesque style is now gone, and the vertical principle of Gothic architecture begins to establish itself. In many later examples of Norman work, the departure from the Romanesque principle is so great as to remove them entirely from the Romanesque class to the Gothic.

Q. What other change was now necessary to establish fully the principle of Gothic architecture?

A. The universal adoption of the pointed arch, in place of the semicircular, was alone needed to establish fully the principle of verticality, which is one of

the principal characteristics of pure Gothic architecture.

Q. Were the Normans good builders?

A. It can hardly be said that they were good builders, for notwithstanding the massiveness of their works they appear to have been careless with their foundations, often commencing new work upon the foundations of old buildings. Very many of their towers

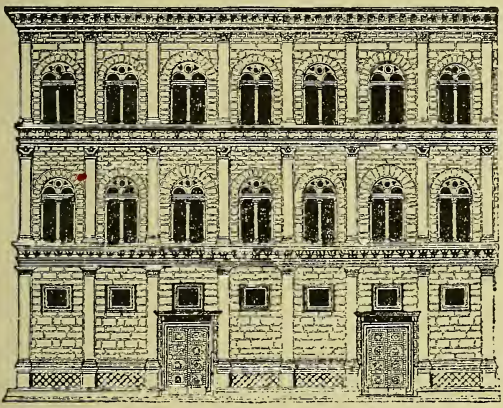


Fig. 79.

have fallen from this cause, and the fact of our having so many remains of their work may be attributed to the immense masses of stone employed in their masonry, rather than to the skill with which they were laid.

Q. What is the Lombard style?

A. The Lombard style was that species of Romanesque which was in use on some parts of the Continent

of Europe during the periods when the Saxon and Norman styles were in use in this country, and corresponded with them in its development into the Continental Gothic.

ON THE MODERN STYLES OF ARCHITECTURE.

Q. What course was adopted by architects on the decline of Gothic architecture?

A. They tried to adopt the ancient Grecian and Roman styles to modern requirements, an attempt which resulted in the production of what is now termed the Italian style.

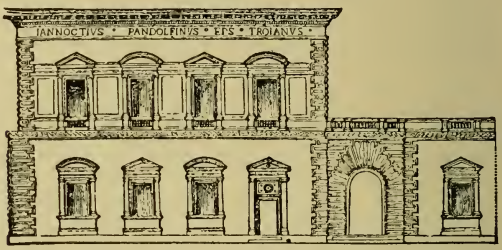


Fig. 80.

Q. Describe the Italian style.

A. The Italian, which embraces the Florentine, modern Roman and Venetian schools, may be considered as an adaptation of the Greek and Roman orders. (Figs. 76, 77, 78 and 79.)

Q. What are the chief features of the Florentine style?

A. The Florentine, a variety of the Italian style, is characterized by the absence of columns on the outside and by massive cornices with which the buildings are crowned. This style has rather a heavy appearance.

The Pandolfini Palace, Fig. 80, at Florence is a very good example.

Q. Describe the chief features of the modern Roman style.

A. The buildings of this style present a most imposing appearance, which is not marred by the too great severity of the Florentine school, and the use of columns in the facades renders them more light and pleasing. The Farnese Palace at Rome, Fig. 81, is a beautiful example of this style. The churches at Rome

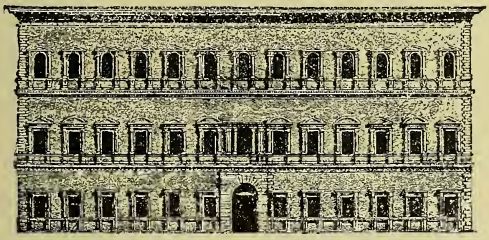


Fig. 81.

built in this style are characterized by an excessive amount of ornament. (See also Fig. 82.)

Q. What special feature is introduced in the style known as the Venetian?

A. The use of rustic work for the basement and ground floors, which consist in the front edges of the stones being beveled or molded, so that there is a space of one and a half inches or two inches round each stone on the face. The Pompeii Palace, Fig. 82, at Verona, and the Church of St. Mark at Venice are beautiful specimens of this style.

Q. What is a Mezzanine?

A. A low intermediate story which is sometimes made in the Italian styles, to run between two stories of greater height.

Q. Give the names of two celebrated architects who introduced the Italian style into England with great success, with examples of their works.

A. Inigo Jones, who designed the banqueting house at Whitehall, and Sir Christopher Wren, who designed St. Paul's Cathedral, St. Stephen's Walbrook,

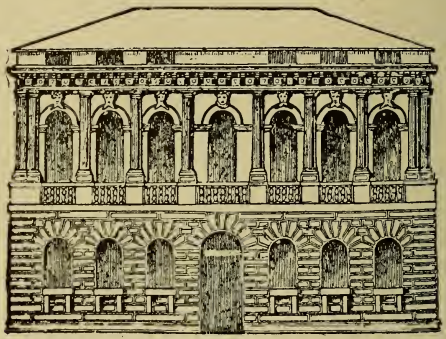


Fig. 82.

and nearly all the other churches in the city of London, which were rebuilt after the great fire.

Q. What is the present style of architecture?

A. There is no style of architecture that can, strictly speaking, be called that of the present period. The architecture of the present day is chiefly copied or modified from the ancient and mediæval styles; and architects seem to hope that by strictly adhering to the genuine principles of both, a new style may gradually be developed.

THE ARCHITECTURAL STYLES OF ANTIQUITY.

PART II.

INDIAN ARCHITECTURE.

ROCK-TEMPLES.

1. **Our** knowledge of Indian architecture is essentially of modern growth, inasmuch as no reference to the subject is to be found in ancient European writings. Although, however, modern research and information are in general only partial, still they are sufficient for the acquisition of a knowledge of the peculiarities of Indian art. Our investigations on this subject are favored by the fact that the ancient Hindoo race has subsisted to our own day, and has erected its monuments in the same distinctive type, although many minor alterations may have supervened with the lapse of time.

2. When we take into consideration the great influence which the religion of the Hindoos exercised on the form of their buildings, it may be advisable, before proceeding further, to mention some particulars of the principal features of their worship.

In the religion of the Hindoos a distinction must be observed between the creeds of Brahma and of Buddha. They conceive Brahma, as the Supreme Being, to be formless. All emanations from him are worshipped and placed in their temples as idols: Siva, the great god,

the productive and at the same time destructive power of Nature, whose symbol is fire, and Vishnu, the preserving power, whose symbol is water.

These three chief gods, Brahma, Siva, and Vishnu, are also worshipped conjointly as a three-headed figure. Besides them, there is a large number of gods of inferior rank.

3. Various sects exist among the Hindoos, the principal, however, are the Brahmins and the Buddhists, which are essentially antagonistic. The religion of Buddha claims to be a purer form of Brahminism, and Gautama, king of Magadha, surnamed Buddha, *i. e.*, The Sage, is considered as its founder. The epoch when he lived is uncertain; it was, however, not later than 543 B. C., with which date, as that of the introduction of Buddhism into Ceylon, the chronology of the island begins. The religion of Buddha still prevails in Ceylon, as also in the Malay peninsula and in many of the East Indian islands, in the greater part of the Chinese empire, in Thibet, and amongst the Mongolian tribes.

4. Two classes of monuments are to be distinguished in Indian architecture, besides later Mahometan buildings, which are not to be considered amongst the constructions of the Hindoos: viz., real structural buildings and cave-temples, hewn out of the solid rock.

5. The latter kind of structure is frequent in the mountainous district of the Deccan and in the islands of Elphanta and Salsette, in the neighborhood of Bombay, especially at Kanneri; in the interior of the country and caves at Karli and Mhar, and those near Nassuk and Ajunta, and above all, the marvellous and magnificent temple of Ellora, are especially worthy of mention.

6. We possess but little reliable information regarding the age of Indian architectural remains. The dawn of Indian civilization began, speaking in round numbers, between 2000 and 3000 B. C., while the date of the earliest sacred writings of the people, viz., the Veda, may be assigned to about 1400 B. C.; and that of the great epic poems, the principal of which are the Ramayana and the Mahabharata, to about 1000 B. C. It was in these poems and through these poems as in the case of the Greeks, that the diversified religious system of the Hindoos, namely, Brahminism, was developed. In the middle of the sixth century B. C. the above-mentioned establishment of Buddhism took place, and in the sixth century A. D. the extirpation of that religion from India, by which time, however, it had extended itself over the countries which have been previously enumerated.

7. The cave-temples are earlier than the structural ones; and amongst these a distinction is to be drawn between the Brahmin, which are the older, and the Buddhist.

Their general characteristics are rendered obscure by the multiformity of Indian architecture, and by a want of any settled method: since in excavating the rock neither organic laws nor constructive principles guided the work, as must needs be the case with structural buildings, but a purely arbitrary scheme based on an uncultivated taste, as well as an uncontrolled fancy, determined the shape of the design. The following points may, however, be selected as being, to a certain extent, normal:—

8. The Brahmin cave-temples (Fig. 1) are, as a rule, open in front, and are sometimes connected with an

independent structure hewn out of the solid rock. They consist, generally, of a main quadrangular space, on which the sanctuary containing the image of the god stands; in some instances side spaces also occur. This space is low, with a flat roof, supported by columns or piers, the front row of which forms the facade of the temple. Courts with colonnades and side spaces in front of them are also met with. In some cases several temple-spaces are found in continuous procession.

Fig. 1. CAVE-TEMPLE OF DUMAS-SEYNA AT ELLORA.
A—Entrance. B—Rock-Temple. C—Small Shrine.

A clear space, open above, is hewn out of the rock, and surrounds the detached and independent portions of the temple, which consequently has the appearance of being formed of a block left in the center, the external configuration of which is shown by Figure 2, which represents the so-called Kylas at Ellora, which was formed about 1000 A. D. In the interior a grotto has been excavated, with several smaller caves in the background. The walls of rock which surround the open space are pierced with galleries containing little shrines.

9. The Buddhist cave-temples differ principally from the Brahmin in not having an open exterior. The internal design of these temples is invariably an oblong space terminating in a semi-circle at the further extremity, surrounded by a narrow passage, which is

Fig. 2. KYLAS AT ELLORA.

separated from the main space by rows of pillars. The vault-like roof is excavated in the shape of an elongated semi-circle, and at times assumes a horse-shoe form. The roof of the passage is flat. In the background of the central space is the shrine, with the constantly recurring symbol of Buddhism, the so-called Dagoba, a hemispherical block resting on a cylindrical pedestal, and figurative of a water-bubble, to which the creed of

Buddha likens the human frame, and which is especially intended to portray the transient nature of all that is earthly.

10. The following peculiarities of detail should be especially noticed in the Indian rock-temples. The vegetable kingdom is but little represented in the dec-

Fig. 3. VIEW OF THE INTERIOR OF BUDDHIST CAVE-TEMPLE AT WISNA KARMA AT ELLORA.

orations, which consist on the contrary of combinations of straight and curved lines, and of globular and flat shapes. Animals are also employed in the ornamentation, with a preference for the more powerful beasts, such as lions and elephants; these are introduced as guardians in front of the entrances, while in the interior they answer the purpose of supports, or are em-

ployed as ornaments in the capitals and friezes. These animals have probably a symbolic meaning, for both are considered sacred, and according to the Hindoo conception of transmigration, the souls of the mighty are destined to inhabit the bodies of the most powerful beasts. The bulk and weight of these animal forms is in entire accordance with the architectural style of

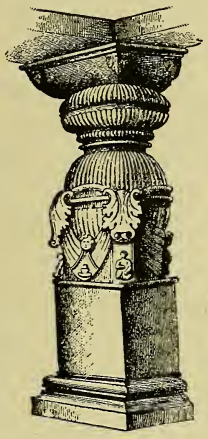


Fig. 4. INDIAN PILLAR FROM THE ROCK-TEMPLE OF PARASONA RAMA AT ELLORA.

the whole structure; as is also the case with the colossal human figures, which are ranged along the walls, cut out in prominent relief. These figures must have created an impression of awe in the dim twilight which reigned in the temple.

11. The supports, which in every other style, whether as piers or columns, constitute the distinctive element, assume a vast variety of forms. In some instances, especially in the Buddhist caves, they are quite plain, quadrangular or octagonal in shape, and ornamented at the top with a shallow carved moulding, and surmounted by an abacus. They are generally, however, richer, and composed of four principal parts: (1) of a quadrangular base, which is higher than it is broad, and which terminates above in a sharp arris or in a kind of volute.

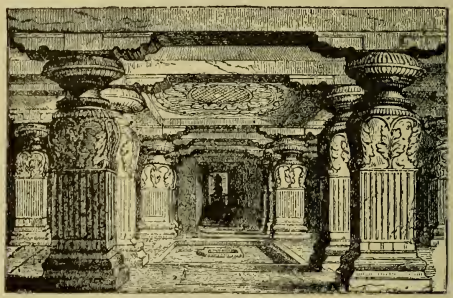


Fig. 5. INTERIOR OF ROCK-TEMPLE OF INDRA AT ELLORA.

On this rests (2) a short round shaft, which springs like a stem from its socket, and which is ornamented either with vertical bands or with flutes. Three circular bands of the same type constitute (3) the neck, on which rests (4) the capital, which generally assumes the shape of a flattened sphere, and which, as is shown in Fig. 5, in most instances supports a quadrangular su-

perstructure, with corbels and an architrave above, on which rests the roof. Since, consequently, none of the individual parts, which have astragals carried round them, stand out prominently, the unity of the pier must

Fig. 6. INDIAN PILLAR.

naturally suffer, and the columns appear squat and heavy, owing to their want of height in comparison with the breadth. This form of pier is also the basis of the columnar construction in structural edifices.

12. Other capitals have the form of a cube instead of a sphere, and have volutes of a ram's-horn shape below. In this case the structure over the quadrangular pedestal is not round, but octagonal and ornamented at the sides.

The capitals are, moreover, sometimes covered with figures of animals, as has been mentioned above. At a much later period supports are met with in structural buildings, though not in rock-temples, formed of carvings of symbolical figures in high relief, as is shown by the pillar in Figure 6.

13. The pillars in the Buddhist cave constructions are, for the most part, when compared with the Brahmin rock-temples, more slender and more beautiful, their rows closer, their ornamentation less excessive; the walls are not covered with semi-detached figures, and the whole is altogether simpler and freer.

In the same way as the most massive forms were in accordance with the precepts of the religion of Siva, so the more enlightened creed of Buddha called forth a simpler form of structure, and the architectural development maintained its connection with the religious.

These heavy massive shapes, these gloomy recesses, encumbered with gigantic carvings, are very deficient as works of art; but, by their very shortcomings, they accord with the dark fantastic spirit of the heathen creeds of Hindostan.

14. With a view to the preservation of the relics of Buddha, or of priests and kings who were considered as sacred, dagobas of various sizes were constructed, called in the vernacular Topes, from the Sanscrit stupa (tumulus) *i. e.* body-hiding (Fig. 7). They consist of a cylinder-shaped substructure with pilasters, on which rests a second substructure without pilasters, supporting

a superstructure like a cupola. The upper part of this spheroidal dome is in every instance destroyed, and it is consequently impossible to discover what further adornment crowned the whole edifice. The cupola construction is, however, only external, for the interior consists entirely of massive masonry, with the exception of some small spaces, in which, for the most part, were found valuables, such as jewels and coins of the period of from 100 B. C. to 600 A. D. This cupola form is con-

Fig. 7. TOPE OR STUPA.

sidered to typify the water-bubble (which was held by the Buddhists to be the symbol of earthly transitoriness), inasmuch as the art of vaulting was still unknown, and the massive masonry only assumes that shape in the exterior.

15. Many such monuments are to be found in the islands of the Indian Archipelago, especially in the island of Java; as particularly noteworthy may be mentioned those of Brambanan and Boro-Budor, which, however, are supposed to have been erected not earlier than 1100-1300 A. D. A great number of them are to be

found on the Indus at Monikyala and Beloor, and also in Cabul, on both sides of the highway which leads from India to Persia and Bactria.

As mentioned above, similar dagobas of small dimensions, proportionate to the size of the construction, are erected in the sanctuaria of the temples.

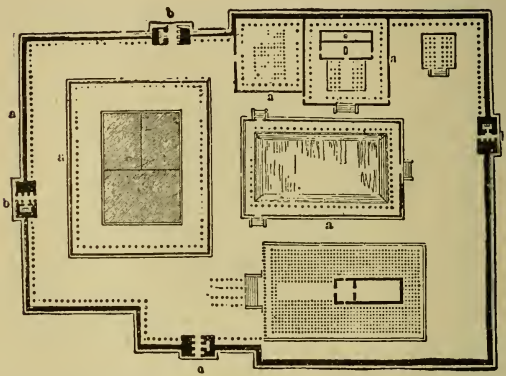


Fig. 8. GROUND-PLAN OF THE PAGODA AT CHILLIMBARAM.

PAGODAS.

16. According to the description of a town given in the epic poem of Ramayana, an art, which was at the same time flourishing and magnificent, had given rise to structural buildings as early as 1000 years before the Christian era. Nothing reliable can be adduced concerning the age of the existing structural temples of India, which are called pagodas, from the word bhagar-

ati, *i. e.* sacred house. They belong both to antiquity and modern times.

Some of these pagodas are wonderfully large and magnificent. They consist (Fig. 8) of one or more quadrangular courts with towers at the corners, surrounded by a wall (*a*). Large pyramids (*b*) rising in stages cover the entrance (Fig. 9), behind which extend colon-

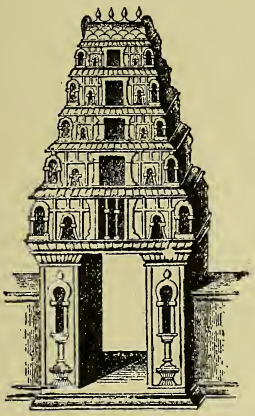


Fig. 9. ENTRANCE TO A PAGODA.

nades. Inside the courts are lustral pools, colonnades, large halls, called Tschultris, which are used to lodge pilgrims in. Small side-temples appear with cupolas surmounting the accessory buildings. Behind the court is often a second and a third, in which, finally, the chief temple stands. Although the architecture of all these

constructive designs has no pretensions to artistic or stylic importance, still the drawings, Figures 10 and 11, illustrate, in forming an opinion of these buildings, how a wonderfully fantastic effect is produced by a tasteless excess in peculiar ornamentation and architectural features.

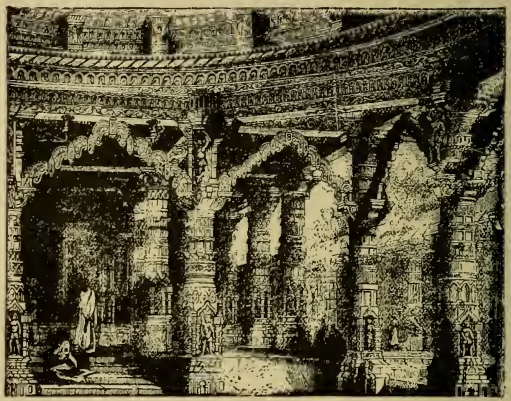


Fig. 10. TEMPLE OF VIMALA SALE (JAINA ARCHITECTURE 12th CENTURY).

17. The most important of these pagodas are those of Madura, Tanjore, and Chillimbaram. The island of Ramisseram furnishes also a large number of these sacred buildings, which are, in their way, magnificent. The most celebrated is the Pagoda of Juggernaut, which was only completed towards the end of the twelfth century after Christ. This was built after the model of the older temples which are now in ruins, and to be

found in numbers in the neighborhood of the existing building. Monstrous swarthy idols, with eyes of sparkling diamonds, are ranged in the interior. The chief

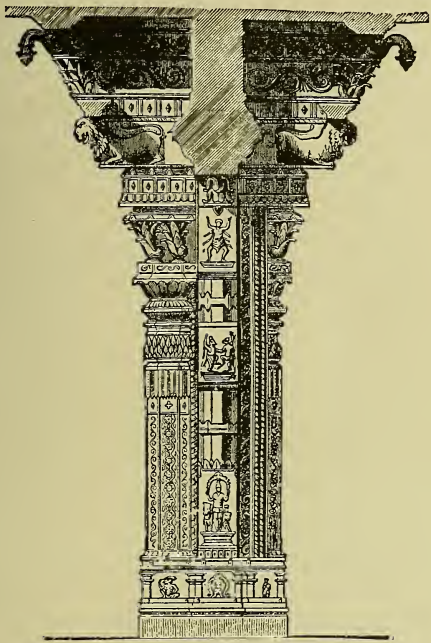


Fig. 11. PILLAR IN FEIMAL NAIK'S TSCHULTRI.

temple stands in the middle of a large square court, which is surrounded by a wall, and at the vast entrance are placed two enormous griffins, or winged lions in a

sitting posture, facing eastwards. The main building consists of an octagonal tower, 180 feet high, resting

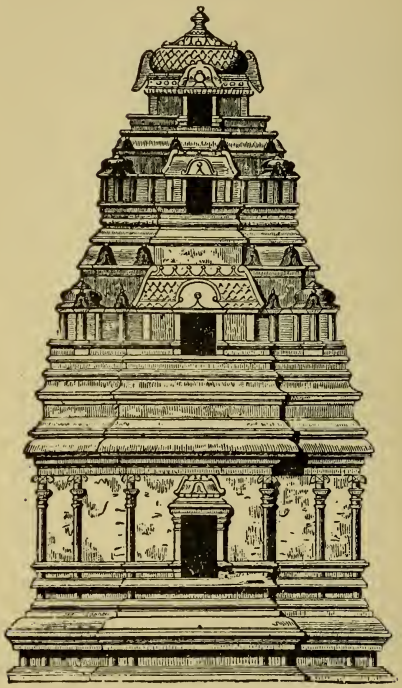


Fig. 12. PAGODA.

Fig. 13.

on a square base. The angles of the eight sides of the tower are cut off diamond-wise, by which sixteen sides

are formed, which are ornamented with flutes, and, approaching one another above in arched curves, form a sort of dome, on the top of which a knob or crown unites all the sixteen sides together. From the vestibule in front of the entrance an uninterrupted view is obtained of the idol which stands in the midst of the temple. Behind the principal temple are colonnades, towers, and shrines of inferior gods. The whole is encircled with mouldings, human and animal figures, embellishments and inscriptions.

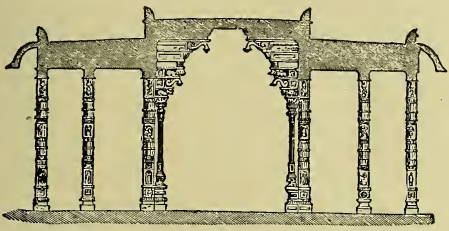


Fig. 14. ELEVATION OF THE ENTRANCE-GATE OF THE TEMPLE AT CHILLIMBARAM.

18. All these buildings are of a pyramidal shape, with vertical stages, which are separated by curved roofs and terminate above in the form of a cupola (Fig. 12). Rows of small cupolas stand out from the roofs of the stages. The walls of these stages are covered in a bewildering way with pilasters and niches, with intricately cut cornices, with varied intersecting mouldings, and with manifold and fantastic embellishments and carvings. The pillars, which are round or octagonal, resem-

ble the columnar structure of the rock temples, and are richly ornamented in every part. The inner spaces are low and dark, but the cupolas are high and narrow. (The cucurbitaceous, *i. e.*, gourd-shape cupolas of the more recent pagodas, with fluted pointed arches, are borrowed from Mahometan architecture.)

Fig. 15.

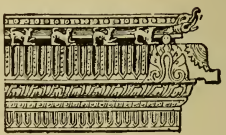


Fig. 16.

To sum up, it should particularly be observed that in these structures full massive forms, instead of simple and suitable ones, predominate; that a pyramidal superstructure takes the place of the rectilineal and rectangular; and that, finally, neither the main outlines nor the minuter details are determined by fixed laws, but rather by arbitrary discretion.

Figure 13 represents a pilaster at the entrance-gate of the temple at Chillimbaram (Fig. 14), Figure 15 a column, Figure 16 a moulding, and Figure 17 a front of a temple of late Indian style.

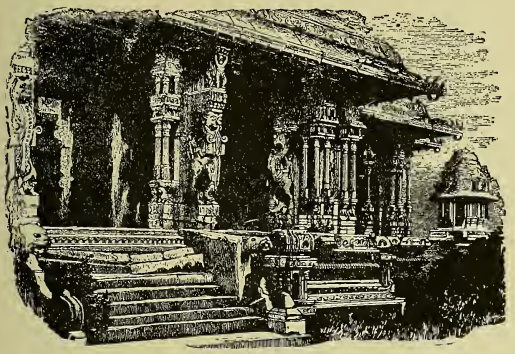


Fig. 17. ENTRANCE-GATE OF A TEMPLE AT BEJANUGGUR. 16th Century.

EGYPTIAN ARCHITECTURE.

19. We possess varied information regarding the existence of an early civilization in Egypt, both from the Bible and from Greek and Roman authors. Religion, as well as peculiar manners and customs, exercised a great influence on the form of architecture. Besides other gods, Osiris and Isis were especially venerated; perhaps because a peculiar relationship was established between the inundation of the Nile and the synchronous

change in the sun's orbit. This yearly inundation of the Nile was of the very highest importance, as it was only from this source that the land derived its fertility. Many of the gods were represented with heads of beasts: and various animals were themselves accounted sacred, as cats, serpents, dogs, ibis, hawks. Two bulls met with especial veneration; Apis at Memphis, and Mneris at Heliopolis.

20. It is supposed that Egyptian religion and culture took their rise in the district of Meroe in the interior of Africa, and that following the course of the Nile they thence spread over Egypt, where, at first, Thebes and Memphis, and in later times under the Greek kings, Alexandria especially, were powerful and important places; particularly the first-mentioned of these towns, as its mighty ruins testify, which are situated in the neighborhood of the present town of Shenay, and not far from the villages of Assur, Naha and Messura.

21. The development of Egyptian culture is to be sought in the primeval history of this people, and its origin may be assigned to as early a date as about 1700 B. C., when the country was freed from the nomad race of the Hyksos, which had burst over it several centuries previously.

The essentially brilliant period of Egyptian art was in the middle of the twelfth century, B. C., in the reign of Sesostris or Ramases at Thebes, as is to be seen by the stupendous monumental buildings and figurative representations of that king, which have reference to his glorious campaigns, and on which his name shines resplendent. This flourishing condition of Egypt lasted for centuries; till about the middle of the seventh century, B. C., Psammeticus by the admittance of foreigners

partially put an end to the exclusiveness which the country had hitherto enjoyed. From the beginning of the sixth century, B. C., however, the country was subjected to the Persians under Cambyses, then, from the time of Alexander the Great, to Grecian rulers, till it finally passed under the sway of Rome. Still, however, during these various periods, Egyptian nationality maintained its existence till the epoch of the extension of Christianity. Through this agency, and especially in consequence of the conquest of the country by the Arabs at the beginning of the Middle Ages, the old order of things was changed, and a new condition was effectuated.

22. From the expulsion of the Hyksos till about the third century, B. C., a culture, which lasted for 2,000 years, is to be traced in the monuments of Egypt. In all probability, however, the epoch of the origin of many of these monuments must be accepted as a much earlier one: for when the yearly average rise of the soil through the inundation of the Nile is taken into consideration, the present elevation of the surface above the old level on which the monuments of Thebes were erected, leads us to the conclusion that they must have been constructed about 4,760 years before the commencement of the present century, that is to say, 3,000 years before the birth of Christ. In these monuments at Thebes fragments have been found which were wrought in a similar style on the reverse side, and which must therefore have formed part of former buildings, and this fact points to the conclusion of the existence of an already long-established culture at the time of the construction of the present monuments.

23. The monuments of the golden age of Egyptian art, namely, the time of Sesostris, are those of Homer's

hundred-gated Thebes, the capital of ancient Egypt, the diameter of which city was two geographical miles each way. Its ruins are called after the villages which now stand on its site, as the temples and palaces of Luxor and Karnak, with an avenue of colossal sphinxes 6,000 feet long; a palace and the sepulchers of Medinet Abu and Kurnah. Here, too, in the neighborhood are to be seen the Rock-Tombs, the so-called "graves of the kings," and still further, below Thebes, the Temple of Tentyris (Denderah).

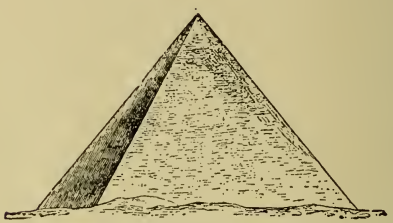


Fig. 18. PYRAMID OF GHIZEH.

24. The most important of the monuments of Nubia, and which have only become known in our own times, are the Rock-Temples of Ipsamboul, the monuments of Derri, Kalabsche, &c.

In Upper Egypt, the well-preserved temples in the islands of Philæ and Elephantina; those of Syene, Ombos, Esneh, &c.

In Central and Lower Egypt no important remains exist: of the capital, Memphis, we find only tombs, and the pyramids, the sepulchers of the kings.

The Egyptian monuments, of which we possess any

knowledge, consist for the most part of pyramids, the tombs of the kings, and their palaces and temples.

25. The pyramids (Fig. 18) form a distinct class by themselves in Egyptian architecture, and present no points of resemblance with other structures. Their form is substantially invariable—a simple mass resting on a square, or sometimes approximately square, base, with the side facing with slight deviations towards the four principal winds, and tapering off gradually towards the top to a point or to a flat surface, as a substitute for this apex.

The proportion of the base to the height is not always the same, nor is the angle of inclination uniform.

The pyramids were constructed in platforms, and then revêted or coated with blocks or slabs of granite, as may still be observed in incomplete pyramids. Recently the supposition has been maintained that in the case of the largest pyramids, a smaller one was first erected as a nucleus, and subsequently enveloped by another layer.

The interior of these massive structures contains narrow passages and some totally dark halls or chambers, and probably served as the burial-places of the kings who had caused them to be constructed. The entrance to these buildings is raised considerably above the level of the base, and was blocked-up by a portcullis of granite, so as to be on ordinary occasions inaccessible. In the pyramid of Cheops the entrance is raised about 47 ft. 6 in. above the base. From thence a passage about 320 ft. long conducts at an angle of 26° 41′ downwards to a chamber whose roof is about 90 ft. beneath the base of the pyramid. From this chamber leads a corridor which has not yet been explored. As the section in Fig. 19 shows, another passage, starting in an upward direction

from the above-mentioned downward-sloping corridor leads to another chamber, and a still further passage

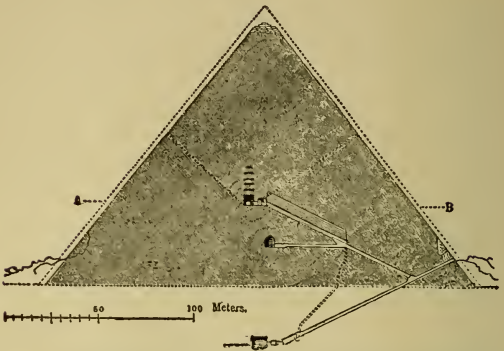


Fig. 19. SECTION OF THE PYRAMID OF CHEOPS AT GHIZEH.

branching off again, and growing smaller as it ascends (Fig. 20) conducts to the so-called Crowning Hall or

Fig. 20. SECTION OF A CORRIDOR IN THE PYRAMID OF CHEOPS.

King's Chamber, which is 34 ft. 3 in. long, and 17 ft. 1 in. broad.

The roof of this apartment is formed of massive blocks

of granite, over which, with a view to supporting the weight, other blocks are laid, with clear intervals between (Fig. 21). The size of the pyramids is various,

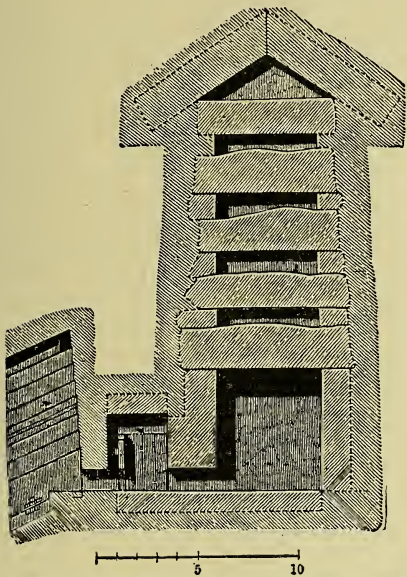


Fig. 21. SECTION OF GRANITE BLOCK ROOFED CHAMBER IN THE PYRAMID OF CHEOPS.

but for the most part very considerable. The largest is one of those at Ghizeh, and has a perpendicular height of 448 ft. and a breadth of 728 ft. on each side of the base.

In an æsthetic point of view, these buildings occupy an inferior rank. The impression which they make is to be ascribed to their size and striking simplicity as well

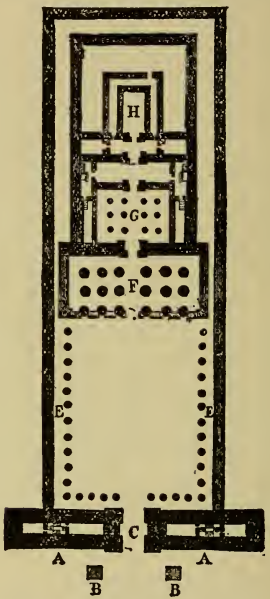


Fig. 22. TEMPLE OF EDFU.
A—Pylon. B—Obelisks. C—Entrance. D—Temple-Court. E—Porticus. F—Pronaos (Court with colonnades). G—Noas. H—Sanctuarium.

as to the associations which fancy may link with them.

26. The principal elements in the designs of the Temples (Fig. 22) consist, firstly, of the temple building

itself, with its vestibules and side-buildings which served as dwelling-places for the priests; secondly, of a closed court which surrounded the actual temple; and, thirdly, of a stupendous entrance-gate of peculiar shape, called the Pylon.

In some instances a second forecourt occurred, before which was likewise a pylon, and occasionally even a third pylon was found.

Fig 23. SPHINX AT THEBES.

The avenues to these pylons, which are in many instances 6,000 ft. long, lead through rows (dromos) of colossal sphinxes or rams (Fig. 23), and through various other smaller entrance-gates, resembling the pylon in form.

27. The pylon (Figs. 24 and 25), the main entrance-gate, which conducts into the front-court, overlooks all the other gates and the whole structure of the temple. The pylon consists of three parts—namely, of two flanking towers, and the gateway thus formed between them.

This gateway again is flanked by perpendicular jambs

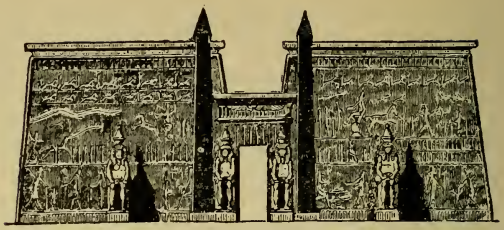


Fig. 24. PYLON AT THE PALACE AT LUXOR.

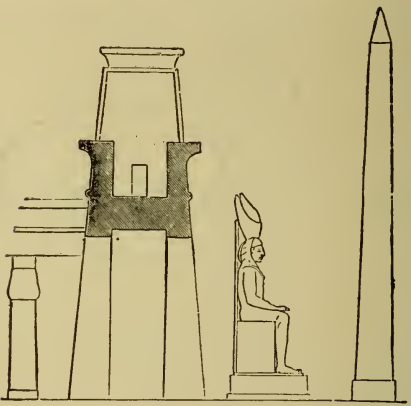


Fig. 25. PROFILE OF PYLON. Fig. 22, WITH COLOSSAL STATUE AND OBELISK.

adorned with sculptures, and covered by an entablature consisting of a fillet and a large cavetto. A symbolical carving (Fig. 26) is introduced into this entablature and repeated over every doorway in the interior of the temple, namely an egg or globe with a wing at each side.

The two flanking towers of the pylons have each an oblong base, the longer side being turned towards the front, and the shorter towards the inside of the gateway (compare Fig. 22). They are, to a certain extent, pyramidal in shape, inasmuch as the external surfaces slope slightly inwards (see profile of the Pylon, Fig. 25), and consist only of a flat, wall-like surface, adorned throughout with colored sculpture and girt with astragals, and of an entablature formed of a fillet and deeply-projecting cavetto. The roof of these constructions is flat.

Fig. 26. ENTABLATURE OVER DOOR-WAY AT THE GREAT TEMPLE AT PHILAE.

They contain several dark rooms, whose object is uncertain. The chief aim of the pylons seems to have been to give an imposing appearance to the entrance. To this end colossal statues and obelisks were introduced in front of the pylons (see Fig. 25). Obelisks are square diminishing monumental columns capped with a pyramidal point. On festive occasions flagstaffs were hoisted from the pylons. That these pylons were intended merely for gates, and not for buildings with an independent purpose, may be assumed from the small proportion which their depth bears to their length. They were generally constructed of colossal dimensions. For instance, the first pylon at the Palace of Karnak is 370 ft. long by 48 ft. deep.

On the pylon abuts the fore-court with corridors (see Fig. 22 D) with rows of columns (E) either at the two side walls, or on all the four sides; or sometimes only on three. On these columns rest cross-pieces of stone, which form an architrave and support the roof-slabs of the area. They thus form a kind of entablature, which, as in the case of the pylons, is surrounded by an astragal and shaped like a cornice (Fig. 27).

The space between the columns is generally about one and a half time, rarely double, the diameter of the lower part of the shafts.

Fig. 27. CORNICE ENTABLATURE AT THE GREAT TEMPLE AT PHILAE.

28. Passing through the colonnade the temple (Fig. 28) is reached; in no instance at once the inner sanctuary, but other initiatory spaces, which invariably occur: and, firstly, an entrance-hall, "the polystyle hall" (Fig. 22 F) is entered, the roof of which is supported by many columns, and then follow two or more other entrance-chambers, which all, however, appear more as belonging to the structure than the outer area does; for temples of tolerable size are met with in which the outer areas are wanting, but not a single one in which the columnar entrance-halls do not occur. The columns form three or four rows, the rows which face the court being closed

in by walls of about half the height of the columns, and with the upper part crowned in the manner shown by

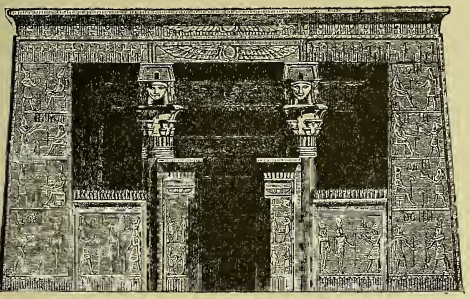


Fig. 28. GREAT TEMPLE AT THE ISLAND OF PHILAE.

Fig. 29. The columns of the middle rows are higher than the rest, so that light may enter through the side-

Fig. 29. MOULDING OF THE WALLS BETWEEN THE COLUMNS AT THE GREAT TEMPLE AT PHILAE.

PROFILE OF THE SAME.

openings between the higher roof of the central nave and the lower rows.

To the many-pillared entrance-chamber succeeds another, which is always much narrower, but sometimes equally rich in columns (G). Then one or two vestibules without columns are reached, and then finally the innermost sanctuary, which is only accessible by one entrance-door (H). This sanctuary is always small and totally dark, and very rarely contains the statue of a god. Adjoining are several chambers, probably intended for the preservation of sacred vessels and as residences for the officiating priests. The whole of the hinder portion is surrounded by a continuous wall. This arrangement of

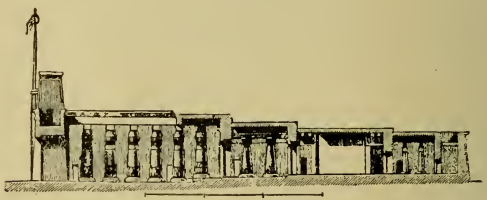


Fig. 30. SECTION OF THE TEMPLE OF CHENSU AT KARNAK.

the larger temples may be considered as the prevalent type, and amongst others the Temple of Edfu (Fig. 22) offers a model of this plan.

Fig. 31 affords another example. The section, Fig. 30, which belongs to the same, serves to illustrate the proportionate height of the various parts of the interior of a temple of this description.

It is there pointed out how, both through elevation of the floor and depression of the roof, the chambers decrease regularly in height as they proceed from the front to the back.

29. The serious, solemn, and awe-inspiring effect which the general arrangement of the temple produces is maintained by the smaller details, while the slanting form of the outer walls gives the temple an appearance

Fig. 31. GROUND-PLAN OF THE TEMPLE OF CHENSU AT KARNAK.

of solidity and isolation. On this account, and especially owing to its simple unbroken lines, the exterior, although monotonous and heavy, is still imposing. The chief peculiarity in the construction of these buildings is that they

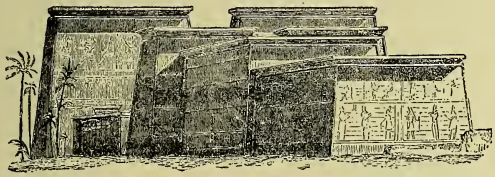


Fig. 32. BACK VIEW OF THE TEMPLE OF PHILAE.

produce the effect of being composed of an agglomeration of separate parts, which resemble one another, but become smaller and smaller towards the rear of the structure (Fig. 32).

The walls of such a temple are covered with rows of sculptures painted in bright colors, and which are sep-

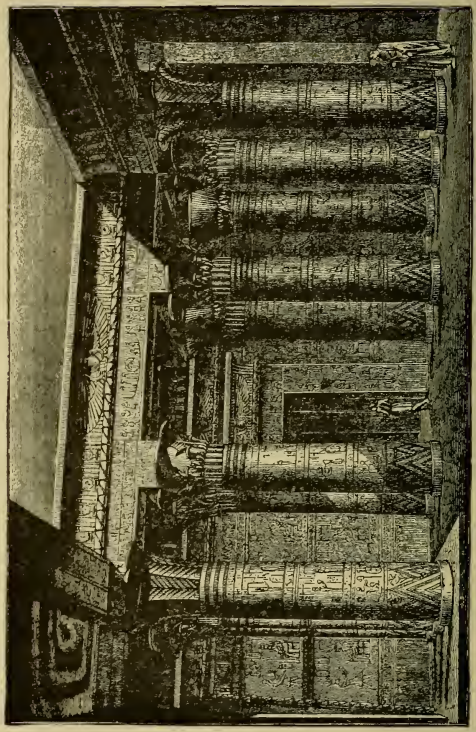


Fig. 33. INTERIOR OF THE TEMPLE AT PHILAE.

arated by bands, the lower rows on high walls being of greater breadth than the upper. The interior (Fig. 33) has a richer appearance, chiefly owing to the use of columns of a round cylindrical shape. These are, moreover, of the most varied form, and without exception represent objects drawn from the vegetable world.

Fig. 34. PILLAR OF THE TEMPLE OF EDFU.

Fig. 35. PILLAR OF THE PALACE LUXOR.

30. The shaft is sometimes thick and sometimes slender, but never diminishing. Its height varies from 3 to 4½ times the diameter of the base, or, in some instances, even 5 to 5½ times. This shaft is occasionally smooth, and only ornamented above and below, but it is generally marked off by horizontal lines into divisions, which are covered with sculptures and hieroglyphics (Fig. 34). It often consists of convex bands placed vertically, which resemble a bundle of thick reeds, and

which in their turn are surrounded by several horizontal belts (Fig. 35).

The shaft almost invariably rests on a circular plinth as a base, which projects more or less in different instances.

31. The capitals of the columns display an immense variety. The most beautiful have a crater-like form, and appear like the projecting bell of a flower, with leaves standing out from the surface (Fig. 37). At the lower

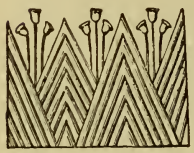


Fig. 36. ORNAMENT ON THE LOWER PART OF THE CAPITALS IN THE TEMPLE AT EDFU.

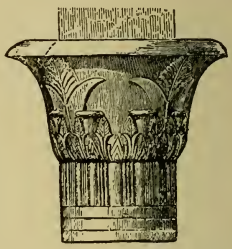


Fig. 37. CAPITAL IN THE TEMPLE AT EDFU.

part of the capital there frequently occurs an ornament of diminishing triangles, resembling the sheath from which the stalk of a plant springs (Fig. 36). The same ornament often occurs at the base of the shaft, and seems to a certain extent borrowed from the shape of the lower portion of the papyrus plant (Fig. 34). Other capitals imitate an unopened bud or seed-pod, as in Fig. 35. In both cases the lotus, which is the sacred plant, is typified. In other instances (though these may perhaps belong to a later period) the pillars are imitations of a palm tree, and have a smooth slender shaft,

a neck-moulding of several rings, and then, without any intermediate architectural division, a capital formed of the graceful leaves of the palm (Fig. 38). In some temples the pillars have, in lieu of capital, the face of a goddess, probably of Isis, with a drooping sacerdotal hood, and supporting a temple on the head (Fig. 39). This face is repeated on four sides of the circular shaft.

32. In Egyptian architecture the structures are of stone. The coverings of the apertures as well as of the courts were effected by immense blocks of stone laid horizontally to which form of construction the wealth

Fig. 38. CAPITAL IN THE TEMPLE AT EDFU.

Fig. 39. CAPITAL IN THE TEMPLE AT DENDERAH.

of the country in durable kinds of stone conduced. An admirable skill was called forth and developed through this employment of stone, which was for the most part of a kind laborious to work. This style of construction, operating as it did on the form of the structures, must have exercised an influence on Egyptian architecture generally, inasmuch as short, bulky, closely-ranged columns were requisite for the support of the ponderous blocks of stone which formed the architraves and roof-beams.

The blocks of stone which form the architraves do not rest immediately on the capital, but on a quadrangular block of the breadth of the diameter of the upper part of the column. The columns and capitals are in general

Fig. 40. PROFILE OF A COLOSSAL STATUE ON A PIER AT THE PALACE AT LUXOR.

Fig. 41. FRONT VIEW OF COLOSSAL STATUE.

not uniform, but recur in symmetrical succession. Their unity is preserved by the harmony of the lines for the horizontal divisions in the decorations of the shaft, as well as the upper and lower lines of the neck and the capital have always a uniform height.

33. Instead of columns square piers are not unfrequently introduced in the tombs. In structural buildings they only occur in connection with colossal statues; in which case the pier supports the roof, and the statue, while connected with the pier at the back, has its head free, without supporting anything (Figs. 40 and 41).

34. These human figures on the square piers are three or four times the size of life, but are perfectly uniform height, features, and attitude; they are invariably in a standing posture, the head is decked with the lofty priestly tiara, while the only covering of the

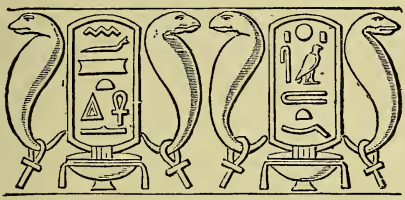


Fig. 42. MURAL FRIEZE-LIKE DECORATION FROM THE TEMPLE OF ESNEH.

body is the Egyptian apron round the loins. In the right hand is the mystic token of the Nile-key, in the form of a cross, with a handle at the upper part; both arms are crossed over the breast or hang close by the side; the feet are either parallel and close to one another, or with one slightly projecting; and the arched breast is rendered prominent by the upright position.

35. To the multiplicity of form is added the variation of bright coloring. The stone is never suffered to retain its natural tint either inside or outside the build-

Fig. 43. MURAL DECORATION WITH HIEROGLYPHICS FROM THE GREAT TEMPLE AT PHILAE.

ing. Everywhere it is covered with sculptures and ornaments, plastered with stucco, and painted in bright colors, which have lasted unchanged to the present day. These sculptures consist mostly of rows of sitting or standing profile figures in similar or nearly similar positions, either following each other as in a procession, or fronting each other in the attitude of worship or consecration. Groups of this sort are repeated symmetrically

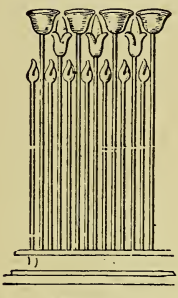


Fig. 44. ORNAMENT AT THE FOOT OF THE WALL FROM THE GREAT TEMPLE AT PHILAE.

on the walls on both sides, and have a direction towards, or at any rate a reference to, the center. They are generally of smaller dimensions in the interior, so that the walls or columns of the same chamber contain several rows of such representations. Between and over them are often found ornamented bands like friezes (Figs. 42 and 43), and at the bottom of the walls, as in the case of the columns, are introduced more decorations, representing lotus-plants (Fig. 44).

Architectural unity was not essentially disturbed by the confusion of the sculptures, although the Egyptians laid on their colors in bald and heavy tints, without a knowledge of blending, toning, or shading.

36. Another element in Egyptian monuments which is worthy of study is the hieroglyphics (Fig. 43), which mean, literally, sacred sculptures, and that not only because the condition and direction of architecture are thence to be learnt, but because also of the historical disclosures which they bring about. Modern research has succeeded in deciphering many of them, and also in gaining a satisfactory insight into the whole graphic system of the Egyptians. These hieroglyphic writings are of two kinds. The first is when single signs express entire ideas. In the other kind, which was much more frequently used, the signs express only single letters, or rather sounds, namely, always the initial letter with which the designated object began. This sort of hieroglyphic is called the phonetic.

Both kinds are intermingled in the inscriptions, but, in order that no ambiguity of interpretation may be possible, the signs which served as conceptions were not used as phonetic hieroglyphics.

Not only natural objects were chosen as hieroglyphic signs, but geometrical figures, such as squares, circles, ovals and lines of various kinds, both simple and double, also often occur. Articles, pronouns and prepositions, as well as gender and number, were principally expressed by these geometrical signs. No settled law was followed in the distribution of hieroglyphic writing. Whether it is to be read from right to left or *vice versa*, must be gathered from the direction in which the heads of the animals therein represented are turned. The

vowels were omitted for the sake of brevity. Besides hieroglyphics, the Egyptians possessed a form of writing which was employed by the priests, as also a current popular form; neither of these, however, need be taken into consideration here, since hieroglyphics were applied to architecture. As regards the meaning of the inscriptions, the expectation of important disclosures and discoveries was disappointed, for they are generally only records of a religious ritual; in the case of the mummies they are always funeral prayers, and in the

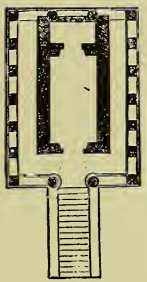


Fig. 45. SMALL TEMPLE IN THE ISLAND OF ELEPHANTINE.

case of the monuments, eulogies and forms of consecration of the prince by whose order they were constructed.

37. Besides the temples the designs of which have already been described, another form of temple exists which are called Typhons.

They consist of a simple house in the shape of an oblong square, which has the entrance on the shorter side, and two or three consecutive chambers in the interior; whilst a colonnade surrounds all the four sides of the exterior (Fig. 45). At the corners, however, of this

colonnade, columns did not occur, but only simple piers of masonry without a capital or entablature, so that the columns, which are thus shut in by the wall-work, do not form an uninterrupted colonnade. The space between the columns on the narrow side is considerably smaller than that on the longer. There are in consequence only two columns between the masonry piers on the narrow side, whilst in the longer sides generally six, but sometimes as many as nine, columns are introduced.

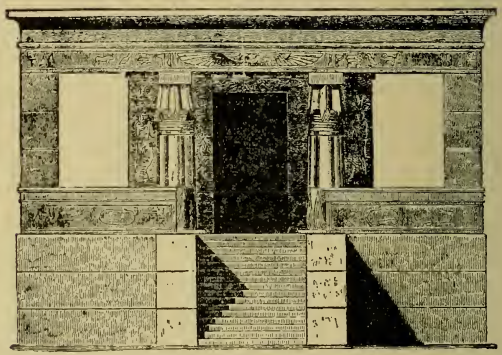


Fig. 46. FACADE OF THE LITTLE TEMPLE AT ELEPHANTINE.

The whole temple stands on a perpendicular substructure, the outline of which is only broken in the middle of the smaller frontside by a flight of steps which leads up to the entrance into the building (Fig. 46). The columns are besides throughout connected with a wall about half the height of the shaft (as in the case of the polystyle entrance-halls), and a break in the con-

tinuity of the same only occurs in the interval between the middle columns of the front of the edifice where a door, corresponding to the flight of steps, takes the place of this wall.

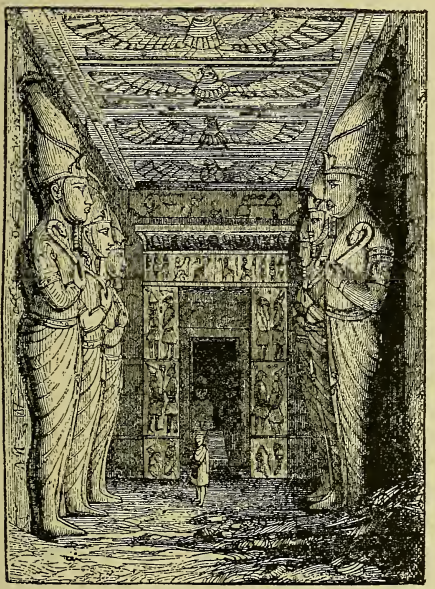


Fig. 47. ENTRANCE-HALL OF THE ROCK-TEMPLE AT IPSAMBOUL.

These temples possess in every respect a purely Egyptian form. The external walls are not, however, slanting, but entirely perpendicular, as was necessitated

by the mural connection of the pillars. It is nevertheless probable that this kind of temple is of later date, and they are only found as subsidiary-buildings in connection with the larger temples.

38. The arrangement of the excavated structures corresponds with that of the temples.

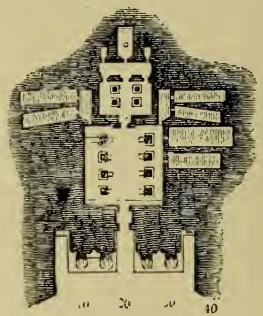


Fig. 48. GROUND-PLAN OF THE ROCK-TEMPLE AT IPSAMBOUL.

In most rock-temples a court, which is sometimes open and sometimes hewn out of the rock, or a covered vestibule forms the entrance, which opens into an entrance-hall, with smaller chambers beyond, in which pillars or columns are introduced according to the exigencies of the case. The ground-floor (Fig. 48) and the section (Fig. 49) of the rock-temple at Ipsamboul illustrate this construction. In the latter figure is seen one of the four sitting colossal statues which are hewn out of the rock in front of the entrance, and which attain a height of 68½ feet. Fig. 47 gives a perspective

view of the entrance-hall, in which are seen eight standing colossal statues 33 feet high, supported by square piers. Fig. 50 gives a view of the entrance with the colossal statues. The larger rock-tombs have a similar arrangement: the vestibule is generally open to the air, then more or less halls and chambers, and finally narrow passages issuing from them, in which are placed the mummy-cases in well-like recesses.

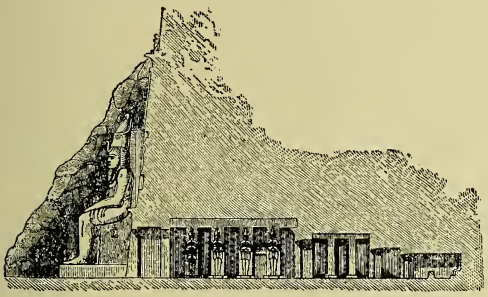


Fig. 49. SECTION OF THE ROCK-TEMPLE AT IPSAMBOUL.

39. In essential particulars the palaces are adorned and arranged in the same way as the temples, with the exception that in their case the successive steps to the inner sanctuarium are not so clearly marked, and that the whole space with its entrance-courts and many-pillared halls is surrounded by a continuous wall. Fig. 51 may perhaps serve to give an idea of the design of these palaces, which were executed with the utmost magnificence.

An avenue of crio-sphinxés, 810 feet long, and in continuation of the same a road, which passed through four pylons erected at various intervals, leads in an oblique direction of the side entrance of the palace (Fig. 51X). On the contrary the main entrance leads through a colossal pylon to a court (A) surrounded by colonnades, and which is 332 feet long by 269 feet broad, and in-

Fig. 50. ENTRANCE TO THE ROCK-TEMPLE AT IPSAMBOUL WITH COLOSSAL STATUES IN FRONT.

tersected at one side by a temple let in obliquely by Rameses III.; while through a second pylon the magnificent pillared hall (B) is reached. This hall is 170 feet long by 332 feet broad, and its roof is supported in the middle by 12 columns 75 feet high, and by 122 lesser columns, which are divided into seven rows.

Fig. 52 shows how the middle passage is made more imposing by this arrangement of elevating the columns in the middle, and how at the same time a means is contrived of lighting the whole hall by the raised side-lights. A pillarless court (C) leads from this hall to a fourth pylon. Between the two stand two enormous

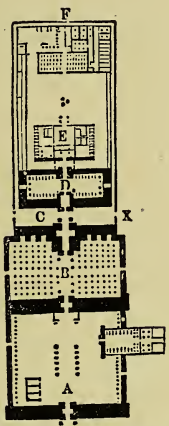


Fig. 51. GROUND-PLAN OF THE PALACE AT KARNAK.

obelisks. The following chamber (D) is equally an open chamber surrounded with statues in connection with piers, and in it also two obelisks were erected. A smaller open court leads thence through other pylons to chambers (E) and the sanctuary, surrounded by galleries and small columns; while at the extreme end of the whole construction at the end of the open space beyond the sanctuary is a small columnar temple (F).

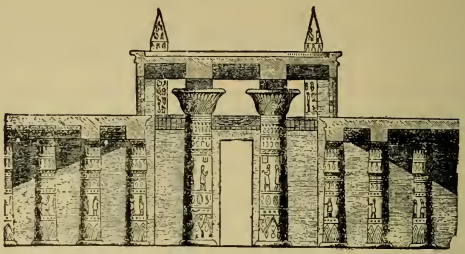


Fig. 52. SECTION OF THE HALL OF THE PALACE OF KARNAK.

WEST-ASIATIC ARCHITECTURE.

40. We possess but scanty information regarding the art of the ancient races of Western Asia, and the remains of their monuments which have been preserved to our own times are few and insignificant. Through the excavations and researches of quite recent times, however, an entirely new field has been opened out, which, although poor in architectural remains, properly so called, gives an interesting insight into the colossal constructions of Babylon and Nineveh, owing to the numerous sculptured representations which have been discovered, and the deciphering of inscriptions written in the cuneiform character.

BABYLONIAN (CHALDEAN) AND ASSYRIAN ARCHITECTURE.

41. Babylonian buildings belong to an epoch previous to the year 1400 B. C., after which period their subsequent development was checked by the growth of the more powerful kingdom of Assyria. The most con-

siderable architectural activity did not occur till the epoch of the monuments of Nebuchadnezzar, viz. about 600 B. C. Both these Babylonian and Assyrian buildings were constructed of baked or unbaked bricks, which were not calculated to be durable; and this is the reason that we now possess no well-preserved monuments, but only rubbish-mounds of old building materials, which still, however, by their vast extent bear witness to the compass and greatness of the towns of Nineveh, in the neighborhood of Mosul, and of Babylon, near the modern Bagdad; at which places, according to the description of ancient Greek writers and quite recent investigation, structures must have been erected on a gigantic scale.

The latest excavations of the Assyrian ruins of Nimroud, Khorsabad, and Koyundschick, near Mosul, and which are for the most part ascribed to the old town of Nineveh, have led to the conclusion that the royal palaces, which united formed a kind of citadel, as well as the temples, were erected on artificially raised mounds or terraces. These terraces were not, however, constructed of embankments of earth, but of clay-bricks regularly dried in the sun, while natural elevations of the soil were taken advantage of to form these superstructural ramparts. In this way platforms of from 30 to 40 feet high were reared, on which the real building was subsequently erected. In the buildings themselves unburnt bricks were in a great measure employed; the walls consequently have a thickness of from 5 to 15 feet. They were revêted both on the inside and the out with alabaster or limestone slabs, on which were engraved basreliefs and inscriptions in the cuneiform character (Fig. 53). In the exterior, freestone was also employed for the lower parts of the coping. In the interior the walls

consisted, above the line of the revêting slabs, which reached a height of from 9 to 12 feet, of richly-painted burnt or unburnt bricks, coated with stucco painted with various kinds of ornamentation. In some instances the entire walls are covered with painted stucco, without any facing of slabs.

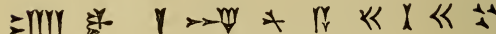


Fig. 53. CUNEIFORM WRITING.

Another kind of mural casing, especially in external walls, was effected by driving conical terra-cotta studs about 3½ inches long into the surface of the wall on

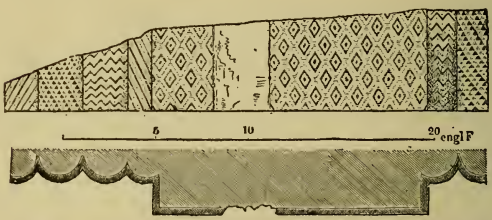


Fig. 54. WALL-MOSAIC FROM THE TERRACE RUINS AT WORKHA.

which convex mouldings had been formed. The pointed ends of these studs, which were of various colors, white, red, black, &c., were imbedded in clay which had been worked up with chaff, and the broader bases of the cones were made to form simple ornamental patterns of alternating colors on the exterior, as is shown in Fig. 54.

42. The excavations at Nineveh, although of great importance for the attainment of a knowledge of the de-

sign of Assyrian buildings and the condition of art, have afforded no definite information regarding the architectural appearance of their structures as a mass. We are able to determine anything definite about one branch only, and that is the decorative. This we are enabled to do by the many specimens which have been

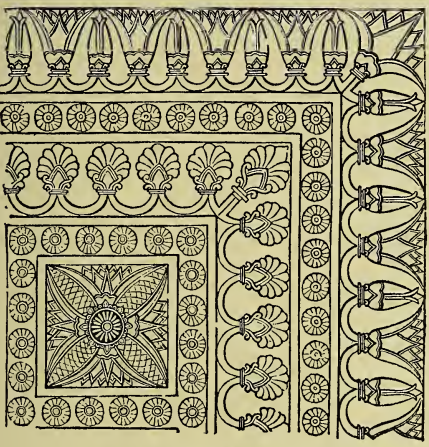


Fig. 55. PART OF A PAVEMENT-SLAB IN THE NORTH PALACE AT KOYUNDSCHICK.

discovered. The most interesting point under this head is a certain accordance with the Grecian style of decoration, as is shown by Figs. 55 and 56. The latter of these represents an ornament which occurs very frequently on vessels and drapery, but which is also used in mural decorations, and by comparing it will be ob-

served what a marked affinity exists between the Grecian and Assyrian patterns. Since, however, it is not the object of this volume to enter into any critical investigations, but only to characterize and point out peculiarities of style, and only to admit artistic assertions when they are definitely allowed and established, it must be left an open question whether in these productions of Assyria and West-Asia generally, a germ is not visible of many forms which the Greeks, with their keen eye for the beautiful, subsequently borrowed, and expanded in accordance with their own more advanced rules of art;

Fig. 56. GUILLOCHE ORNAMENT PAINTED ON BURNT CLAY, FROM THE RUINS OF NINEVEH.

or whether on the other hand it is not more probable that these forms had their original home in Greece, and from thence made their entrance into Assyria. The former of these views is supported by a comparison of Fig. 57 with a Grecian griffin and by the fact that these forms were features of Assyrian buildings before the Persian conquest, *i. e.* before the sixth century B. C.

The accompanying drawings are only intended, in the total absence of all authentic records of the main architectural principles, to give at least an insight into the style of ornamentation, as far as it is possible to convey

any idea from the few specimens which have as yet been discovered.

43. One peculiarity is visible in all Assyrian buildings, namely, that all the chambers are very narrow in proportion to their length. Nothing definite is known of the manner of constructing the roof, and views on this subject are much at variance. It may, however, be accepted as established that the chambers were in general

Fig. 57. SCULPTURED GRIFFIN FROM THE SCULPTURES IN THE RUINS OF NINEVEH.

lighted by windows, which were inserted in the walls either high up or immediately under the roof, and that only large halls received their light from above through openings in the roof. The dwelling-houses which are represented in the sculptures, show at least traces of these windows let into the upper part of the walls.

44. Colossal winged-bulls or lions with human heads form the main entrance into the halls, where battles, victories, triumphal entries, hunting scenes, and religious ceremonies and processions were engraved on the

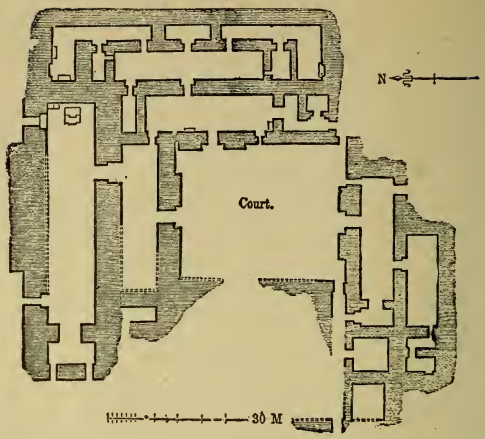


Fig. 58. GROUND-PLAN OF THE NORTH-WEST PALACE OF NIMROUD.

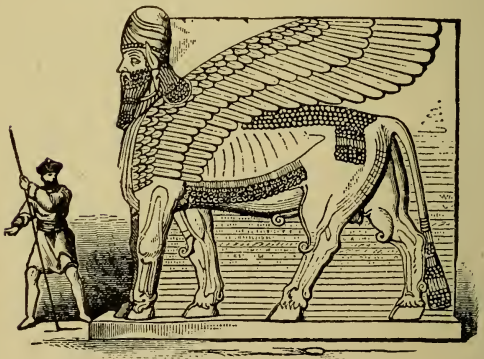


Fig. 59. WINGED-BULL FROM NIMROUD.

slabs of the casing, and painted in the most brilliant colors. Over these sculptures were painted other royal acts of the king surrounded by his eunuchs and warriors, and these representations were in their turn surrounded by an ornamental border, in which winged-bulls and monstrous beasts, as well as the sacred tree, principally figured (Fig. 60).

At the top of the walls the roof was probably constructed of wooden beams, divided into coffers by wainscoting, which were painted with flowers or animals, or inlaid with ivory. Graceful borders and corner-pieces surrounded each division. The brilliancy of the chambers was increased by employing rare woods and coatings of metals, especially gilding.

Fig. 60. SCULPTURED ORNAMENTAL BORDER FROM THE RUINS OF NINEVEH.

All the buildings that have hitherto been discovered in Assyria have precisely the same character, so that in all probability the palaces and temples were united in one building: for the deeds of the king and nation are therein associated with the symbols of religion and the statues of the gods. It may be accepted as a general principle that it was not the temple, or the building destined for worship, which formed in Babylonian, Assyrian, and the Persian architecture which is to be de-

scribed hereafter, the most important and distinctive element of the style, as it did in the case of other cultivated races; but rather that it was the palace of their despots which enjoyed a paramount importance in the minds of those races. The building destined for worship was only to be distinguished by a pyramidal terrace-like substructure, whilst the structure of the temple itself was by no means in accordance with the commanding position which raised it above the whole surrounding district: raised palaces were also erected on terrace-shaped substructures. One especially distinctive mark, however, of temple-terraces was this, that they were covered with glazed tiles in such a way that each platform had a distinct color.

45. No trace of the column is to be found in Assyrian ruins. That columns were not, however, unknown to the Assyrians is proved by two which are represented in the older sculptures of Nineveh. as supporting a kind of pavilion.

The total absence of shafts and capitals in Assyrian ruins, as well as the insignificant breadth of the chambers in proportion to the length leads to the conclusion that independent columns were not used as main supports. On the supposition of a wooden roof to the chambers this might, it is true, have been supported by wooden posts, but such a presumption is difficult to reconcile with the otherwise massive character of the structure.

46. One of the Babylonian buildings, the Temple of Baal or Belus, which is known in the Bible under the name of the Tower of Babel, was a pyramidal structure consisting of eight stories, and was 600 feet broad at each side of the base, and also 600 feet high. In the

top story was a large temple. A staircase winding round the eight stories led to the temple and also to the interior of the building.

The appearance of one of these terraced pyramidal structures is shown by a Relief from Koyundschick (Fig. 61), which unfortunately has not been preserved complete. It there is represented as rising on a mound-shaped substructure, on which two paths are marked out, and in which an entrance-gate is introduced, which reminds one in miniature of the gigantic Egyptian temple-gates or pylons. On this substructure rests a

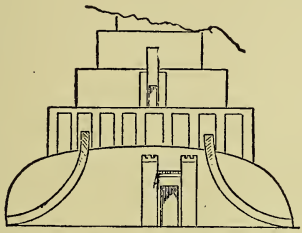


Fig. 61. TERRACE-PYRAMID. RELIEF FROM KOYUNDSCHICK.

terrace supported by buttresses, and on that again a second with an entrance-gate, and then a third with a quite narrow entrance, and lastly a fourth terrace, whose termination the delineation leaves doubtful.

47. The other monuments, known to us, date from the later times of the Chaldeo-Babylonian kingdom, the most flourishing period of which was during the reign of Nebuchadnezzar, about 600 B. C. The celebrated hanging gardens of Semiramis belong to this epoch. Prob-

ably these were terraces disposed in stages one above the other, so that each formed a garden-plateau.

No clue is left amidst the numerous masses of ruins, by which the style of these structures can be determined.

Fig. 62. PILLAR OF A TABLE IN AN ASSYRIAN RELIEF.

Fig. 63.

Still, however, the bas-reliefs which have brought to light present much that is worthy of note. Figs. 62, 63, and 64, amongst others, bring out prominently the similarity of many details with Grecian art. Fig. 62, rep-

Fig. 64.

Fig. 65. CAPITALS AND BASE OF A COLUMN IN A BAS-RELIEF FROM KOYUNDSCHICK.

resenting the pillar of a table, bears a strong resemblance to an Ionic capital as displayed in Asia Minor. Other reliefs portray small facades of temples with capitals like Figs. 63 and 64, and of these Fig. 63 shows an af-

finity, although it be a remote one, with the Corinthian capital. A base is shown in Fig. 65. In the fragment of a relief from Koyundschick columns occur which rest on a cushion-shaped base on a lion's back, just as is the case in the doorways of Gothic churches (Fig. 66).

It may finally be mentioned as a remarkable peculiarity that, totally contrary to the usual belief that the semicircular arch was applied by the Etruscans and subsequently by the Romans, arches of this description have

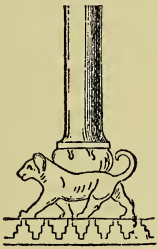


Fig. 66. PILLAR ON A LION'S BACK.

been found represented in the reliefs of the ruins of Nimroud, and that it thence also appears that the pointed arch was thus early employed both for niches and doors. This may be gathered not only from reliefs in which such constructions occur, but also from still existing arches of both descriptions applied to gateways and vaulted drains, which have been discovered, although the dimensions of the same are but small. Although the conclusion cannot positively be deduced that broader spaces were also vaulted over, still it thence appears far from improbable that chambers may have had arched roofs.

PHOENICIAN AND ISRAELITISH ARCHITECTURE.

48. Whilst at best heaps of ruins alone bear witness to the existence of Babylonian buildings, the fabrics of the Phœnicians and of the Jews have disappeared without leaving any traces. With a view, however, of rendering the present work as complete as possible, mention must be made of those of their considerable buildings of which we possess a knowledge; so that, as far as may be, a conception may be formed of the architecture of those remarkable nations, which have exercised so important an influence on European civilization. Of the Phœnicians we only know in general terms that their cities were splendid and magnificent, as also were their colonies of Carthage and Gades, of which equally no remains exist; and that wood and metals, especially gold, were employed in covering the internal walls, and that brass was used for columns.

49. Something at least of architecture amongst the Jews may be gathered from the Old Testament: and it may have had much affinity with that of the Phœnicians. As early, however, as the Exodus from the land of Egypt, 1500 B. C., a peculiar architectural development may be traced, which is exemplified by the description of the Tabernacle, which was a movable temple-structure shaped like a tent. Since the people were continually wandering in the wilderness, this Tabernacle can have had no permanently structural character, but was composed of wooden walls, covered with gold plates. Hangings formed the roof, and divided off the Holy Place, and the richly adorned Ark of the Covenant, The Court of the Tabernacle was surrounded with hangings and brazen pillars.

50. Solomon's Temple was built at Jerusalem, 1000 B. C., after the pattern of the Tabernacle. This temple was destroyed 420 years later, at the time of the conquest of Jerusalem by Nebuchadnezzar, and subsequently, on the return from captivity under Cyrus and Darius, was rebuilt by the Jews from about 536 to 515 B. C., in probably the same style as the former temple.

Herod the Great had this temple pulled down, and in B. C. 20 caused a new and magnificent temple to be erected, which in A. D. 73, at the time of the destruction of Jerusalem by Titus, experienced the same fate as the former one. Herod's building was, it is true, in accordance with the main plan of the former temple, but was executed in the then prevailing Grecian style.

51. Regarding Solomon's Temple we know that it was of small size, that the material was a combination of stone and wood, and that the fabric rested on strong foundation walls of blocks of stone. The building had two outer courts, the exterior one for the people, and the interior, which lay somewhat higher, for the priests. In the court were dwelling-places for the Levites and door-keepers. The actual temple consisted of the outer hall, or Holy Place, and of the Holy of Holies. On both sides of the building, and also at the back, was a side building, which was a third lower than the main building, and contained chambers disposed in three stories one over the other. The walls were of stone, but the interior was entirely covered with lining of cedar-wood. Beams of cedar formed the roof, and beams of cypress the floor. All this woodwork was adorned with carving at the doors and windows; the devices represented palms, cherubim, and coloquints, and were over-

laid with gold. In the Holy Place stood the altar of burnt incense, the table for shewbread, and five golden seven-branched candlesticks. At the upper part were let in lattice-shaped windows, which probably answered the purpose of carrying off the smoke of the incense. A wall of cedar and hangings divided this place from the Holy of Holies, in which stood the wooden Ark of the Covenant, overlaid with gold both inside and outside. At the side of it were two immense cherubim, carved from wild olive wood, and also overlaid with gold. No reliable details can be given of the exterior. The actual temple probably rose higher than the courts and side buildings. No columns surrounded the temple. At the entrance of the courts, however, stood the two celebrated pillars, Jachin, *i. e.*, firm, and Boaz, strong; made of cast brass, and which probably possessed a symbolical meaning.

52. Owing to the utter want of all representations nothing definite can be adduced regarding the style of this temple or of Jewish architecture generally. The sole relic of the temple which has endured till our days, consists of part of a foundation constructed of large blocks of stone in the Roman fashion, and it may consequently be attributed to the last temple, which was executed in the time of the supremacy of Rome, although, judging by comparison with similar stone foundations in Assyrian ruins, the date might be set down as a much earlier one.

That no employment of Egyptian models occurred, as many have believed, may be determined by the heterogeneous nature of the materials employed; and indeed the whole design of the temple gives no evidence of any direct connection with Egyptian architecture.

Egyptian architecture has essentially stone as its basis; and the heavy beams of stone required many supports of stone, *i. e.*, columns. On the other hand, the extensive beams of wood rendered columns unnecessary amongst the Jews. Then again, the universal employment of glittering metal and costly wood leads to the conclusion that amongst the Jews there was no prevalent æsthetic taste for noble forms, as was the case amongst the Egyptians, but that a luxurious love of ostentatious display obtained amongst them, which was more in accordance with Phœnician than Egyptian art.

The Jewish tombs, which still exist around Jerusalem, are either sepulchers hewn in the rock with a chamber in front, or independent structures hewn out of the rock, as has been seen to have been already customary amongst the primitive Indian nations. The bodies were disposed in these sepulchers in the same way as one sees in the catacombs at Rome, either resting immediately on shelves of the rock in the surrounding walls, or stowed away in trough-like recesses, or in holes excavated in the depth of the rock of the size of the human contour. The sepulchers have a kind of facade, or merely a framework and setting for the stone which blocked up the entrance. Both in these caves and in the independent structures details borrowed from or akin to Grecian and Roman architecture are perceptible: for instance, Ionic columns and Doric triglyphs; it may therefore be taken for granted that they belong to the later period of the Jewish kingdom. The sarcophagi also, which have been discovered in the sepulchers, show a Roman or Grecian influence, as well as that of the established Phœnician style.

MEDIAN AND PERSIAN ARCHITECTURE.

53. At the overthrow of the Babylonian kingdom, at the end of the eighth century B. C., its culture and art passed into the hands of the Medes, and from them in turn to the Persians, when that people freed them from Median supremacy in the sixth century, B. C.: it is therefore easily to be accounted for, if considerable conformity exists between Persian and Babylonian monuments, both as regards terrace-built structures and various other details.

Religion was not favorable to constructive art amongst the Persians. They worshipped Ormuzd as god of light and good, under the symbol of fire, as opposed to Ahriman, the god of darkness, and promoter of evil. They had consequently no images, and they had also no temples, because sacrifices were conducted in the open air: the essential element was therefore wanting for the rise and development of constructive art.

54. In later times, however, when Egypt and the Greek colonies of Asia Minor were subjected to the Persians, we know that the Persian kings employed Egyptian and Grecian artists in building their palaces. The monuments which have been preserved to us show, however, a peculiar character in spite of every imitation of foreign architecture. Many of these structures belong, it is true, to the fourth century, the period of the Sassanides, but considerable remains have been discovered dating from the times of the successors of Cyrus.

In the neighborhood of Murghab are those of Pasargadæ, a town founded by Cyrus, where was the burying-place of the Persian kings. At this place is the tomb of Cyrus. Seven stages form a pyramidal building 40 feet

high, 44 feet long, and 40 feet broad at the base, and constructed of enormous blocks of white marble. On the topmost surface is a little house with a gable-shaped roof of marble, in which formerly stood the golden coffin, surrounded by all kinds of costly vessels.

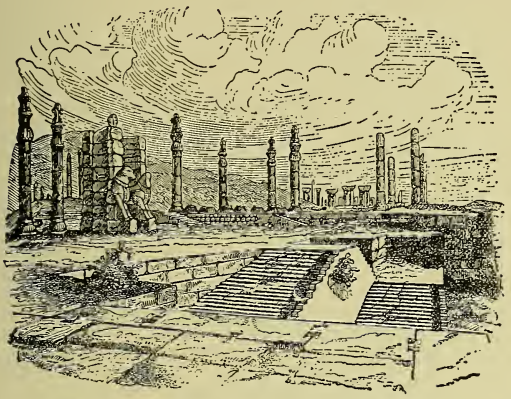


Fig. 67. VIEW OF THE RUINS OF PERSEPOLIS.

55. The most important monuments of Persian art, besides the tombs of the later Persian kings, are the magnificent ruins of Chehil Minar (the forty pillars). They are remains of the great palaces of Persepolis, which were overthrown by Alexander the Great, and rise in terraces at the foot of Mount Rachmed; they are constructed of the blackish-grey marble of the mountain itself, and are 1,400 feet long by 900 feet broad. According to the modern deciphering of the inscriptions,

these palaces were built partly by Xerxes, and partly by Darius. A magnificent double staircase runs along the walls of the terrace (Fig. 67), and leads to a portal, on the entrance piers of which are hewn gigantic, fanciful animal forms, resembling the Assyrian; beyond

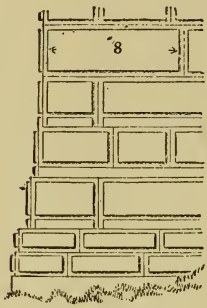


Fig. 68. ELEVATION OF PLATFORM AT PASARGADAE.

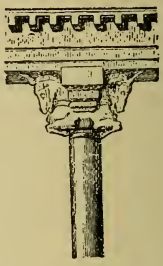


Fig. 69. CAPITAL AND ENTABLATURE FROM THE ROCK-TOMB OF DARIUS.

which, colonnades and another similar staircase conduct to the second terrace, on which are found the remains of large polystyle halls. Ruins of other considerable buildings are to be seen close by, but lying rather higher; these were richly adorned with bas-reliefs. On the third terrace are situated other buildings of various descriptions, as also colonnades, the walls of which are

adorned with sculpture, and contain smaller chambers, which possibly constituted the habitable rooms of the palace. The original intention of other large ruins close at hand cannot be conjectured. The whole is surrounded by a wall which abuts on the rocks which lie behind.

56. The workmanship of the white marble columns, and of the large squared stones which are joined without cement, shows a cultivated skill (Fig. 68). The walls are covered with sculptures and inscriptions in the Persian cuneiform character; those which have already been deciphered betoken the forms of consecration and titles of Darius and Xerxes. The columns in the ruins of Persepolis are circular and slender, and have capitals and bases. The capital generally consists of two half-horses or bulls, whose fore feet overlap the border of the shaft, and which are placed back to back (Fig. 69). Probably a beam was inserted between their necks, which served as a support for the real transverse roof-beams laid upon it. Other capitals are more compact (Figs. 70 and 71), where from the lower part, which is in the shape of a globular vessel, rises a slender cup, supporting a lofty member with double volutes or scrolls on the four sides, which correspond with those of the Grecian Ionic capitals (Fig. 72), but which are introduced not horizontally but perpendicularly. The base consists of fillets and a leaf-covered torus resting on a circular plinth.

The columns have fine flutings and stand tolerably far apart from each other, from six to seven times the diameter, and consequently have a very light appearance. The entablature, of which nothing has been preserved, was probably of wood. To judge by the existing entablature in the tombs, a certain resemblance must

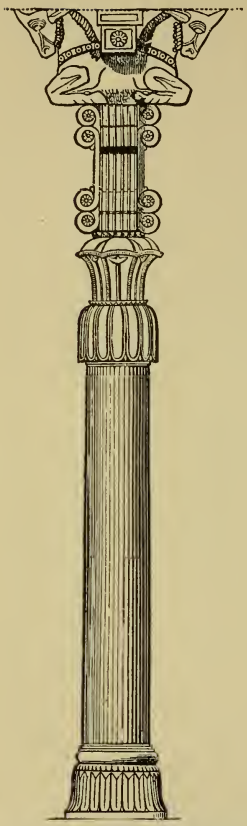


Fig. 70. CAPITAL (RESTORED), FROM THE RUINS OF PERSEPOLIS.

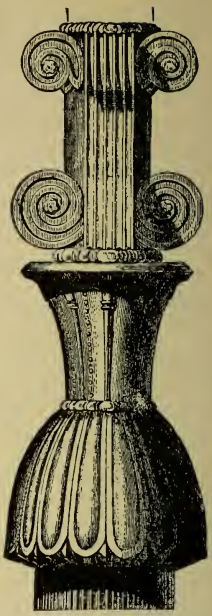


Fig. 71. CAPITAL FROM THE RUINS OF PERSEPOLIS.

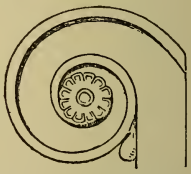


Fig. 72. VOLUTE OF THE PERSIAN COLUMN.

have existed in this feature to the Grecian Ionic style. On an architrave consisting of three projecting stages, an upper beam rested on small blocks similar to the Ionic dentils, on which was a broad frieze with sculpture, such as a row of bulls or dogs. But in the more ornate and slender structure of the palaces at Persepolis, the entablatures were doubtless more elegant than those which were constructed for the tombs.

The doors have a square border and a cornice similar to the Egyptian entablature, consisting of a cyma with a facia over an astragal. With this exception, nothing at all is found that refers to or coincides with Egyptian taste, although we know that after the subjugation of Egypt Cambyses caused architects to be summoned to erect the royal palaces. It must, however, be understood that by this term only artisans are meant, to whom was entrusted the task of carrying out the works in the usual native style.

The development of a peculiar architectural style amongst the Persians is to be accepted as probable, but a style based upon foreign models introduced by them. Remains of other Persian monuments present traces of terrace-like designs with immense flights of steps, which are also, as we have seen, characteristic of Babylonian architecture. Though the Persians had adopted, beside these terraces, many other characteristics of Assyrian architecture, still the Persian style is essentially to be distinguished by its light porticoes instead of the heavy massive walls, and by the simpler and more regular ground-plan of its buildings; but, above all, by the peculiar formation of its columns.

CHINESE ARCHITECTURE.

57. At the conclusion of that portion of this work which treats of the architectural styles of the ancient races of Asia, a short reference must be made to Chinese architecture.

Indian art made its entrance into China with the worship of Buddha. But still diversities, corresponding to the different nationalities, were gradually introduced. Instead of the Indian dagoba there appears a tower-like construction of many stories, growing smaller towards the top and with the stages distinctly marked, and covered with gay-colored curved roofs to which bells were attached (Fig. 73).

These tower-like edifices, which were, for the most part, octagonal, were constructed, like the temples, for the purpose of religious worship.

The details of Chinese architecture show much affinity with late Indian. For example, in the upper part of the column, curved brackets were employed instead of a capital for the support of the architrave.

Chinese structures have nothing durable about them, for perishable wood forms an essential element in their construction, and they were more remarkable for their elegance and slender proportions than for their vast dimensions. The roofs are especially characteristic, the most striking peculiarity being that they are always curved, and have figures on them in high relief, as well as at the corners, from which hang bells, and that they are decorated with all kinds of embellishments, such as gilt dragons, and other fantastic carvings (Figs. 74, 75, and 76).

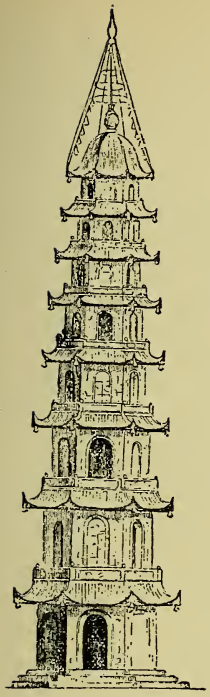


Fig. 73. PORCELAIN TOWER AT NANKIN.

Fig. 74. CHINESE PAVILION.

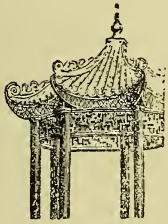


Fig. 75. PART OF CHINESE PAVILION.

The introduction of bright colors and of glittering porcelain and glazed tiles, forms a peculiar feature in Chinese architecture.

The architecture of the Chinese temples does not dif-

fer from that of the other buildings. They are, for the most part, small, and consist of one chamber surrounded by porticoes (Fig. 77). The palaces are constructed in the same way as the temples, and are more remarkable for their size than their beauty.

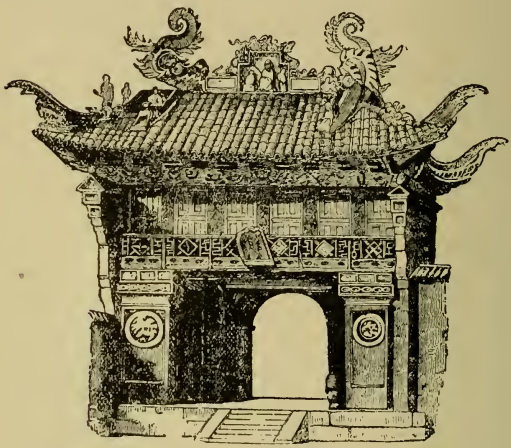


Fig. 76. ENTRANCE-GATE TO THE TEMPLE OF CONFUCIUS AT SHANGHAI.

The Chinese do not possess the art of arching large spaces, consequently numerous columns are introduced for the support of the ceilings and roofs; these are of wood, and sometimes carved and some times plain, but invariably painted.

It is essential to the complete character of a Chinese villa that its neighborhood be adorned with a supplement of artificial rocks and woodland scenery, with water-courses with bridges, and with fountains, grottos, and fantastic rockeries.

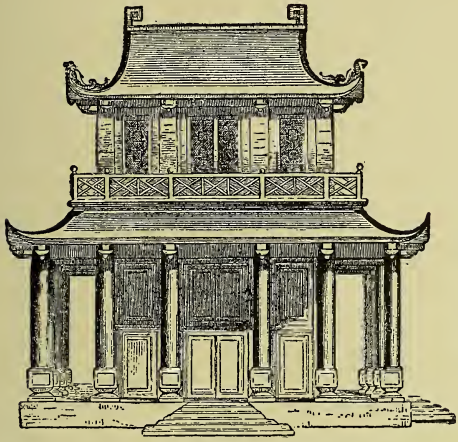


Fig. 77. PAVILION OF THE GREAT TEMPLE AT CANTON.

Chinese architecture is as invariable as everything else in the Celestial Empire, and Chinese art, generally, is the same as it was many hundreds of years ago.

EARLY CHRISTIAN ARCHITECTURE.

ROMAN CHRISTIAN BASILICAS AND CIRCULAR ARCHITECTURE.

78. Christianity, as well as the influx of the Germanic races, could not fail to exercise an essential influence in the transformation of the Roman state, and this influence was naturally extended to Roman art. The same effect was wrought in the East by the Arabs, and by the dissemination of the creed of Mahomet. That branch of art which belongs to totally different periods and races after the propagation of the two religions has been denominated the Romanesque, in order to express in one word the contrast to the calm repose and noble simplicity of classical art. This denomination does not, however, express the new artistic development in all its phases, as has been shown in Section 161, inasmuch as the new growth was synchronous with the decadence of art and the ingression of barbarism; and it was only some centuries later that a more untrammelled movement and a more poetic flight were destined to spring into life, whilst it was not before the Middle Ages that the new art reached its full development. Consequently this title—"Romanesque Art"—must here be applied only to a synoptical review of a whole group of different styles, and in contradiction to pre-Christian and Modern.

79. The new elements mentioned in the preceding paragraph have been entitled "Early Christian Art," inasmuch as they were called into existence by the new religious requirements of the nations of antiquity that had embraced Christianity. As, however, these new re-

ligious requirements demanded other architectural conditions than those which already existed, a new style of building was naturally necessitated. The deterioration of art was, however, so complete, that the new requirements could not be supplied in an independent and organic manner, but recourse was had to novel and peculiar combinations of old artistic forms; consequently an *ensemble* arose, constituting the Roman Early Christian Style, which differed essentially from the styles already in existence. The northern races, which streamed into Italy, namely, the Ostrogoths and Lombards, were able to render no assistance in the work of development: on the contrary, being rude and uncultivated in comparison with Roman civilization, they swallowed it up and rendered the Roman Christian Style the common property, not only of Italians, but also of Franks and Anglo-Saxons.

80. Through the division of the empire into the East and West, A. D. 395, and through the foundation of the new capital, Constantinople, on the site of the old Byzantium, a "Byzantine" art grew up side by side with the Roman Christian: this will be subsequently treated in a separate chapter.

It was during the sixth century, especially, that Early Christian art assumed a distinctively Byzantine form in the Eastern portion of the empire: and this form was the more independent because the nationality of the people was not effaced as it was in Italy by the influence of northern nations.

Since the Christians, forming no distinct people, and constituting no entire nationality, possessed no well-defined art of their own, and were obliged to employ the architects, builders, and sculptors whom they found

amongst the Greeks and Romans for the erection and adornment of their buildings, it may easily be supposed that the first Christian buildings did not differ materially from the heathen buildings which were already in existence. Consequently the title "Early Christian Style" must be understood to apply only to churches as converted basilicas, seeing that in the construction of dwelling-houses the ancient methods were retained for a considerable period. Any alteration in that respect could only take place after protracted and gradual transformation of the manners and customs of the Romans, and as the new religion acquired a greater influence over architecture. Whilst Roman art in the West passed over into the hands of the barbarians, it settled into a new independent system at Bazantium.

Roman Early Christian Architecture found its chief application in Roman Christian basilicas and in circular churches.

The continuance of this description of architectural style lasted till the end of the ninth century—that is, till the time when the ancient elements were forced to give way before independent new ones, which sprang up as described in a subsequent chapter. Classical forms, however, maintained their ground in Italy, and especially at Rome.

81. When the Christians were first allowed to build churches for themselves, they thought that the best model for the buildings, in which the Christian congregations were to meet together for worship, was to be found in the basilicas, the very name of which was retained as suitable, seeing that it means kingly hall. It is probable that the first Christian basilicas were very like their model; with the exception, however, that the

central part of the Roman basilica, which was generally open, was in the Early Christian basilicas covered with a roof. But ere long, about the end of the fourth century, a gradual transformation in the original design was perceptible. A form of basilica was developed from the genius of Christianity, which was retained unaltered for succeeding centuries. Although the main outline remained the same, different proportions were assumed: and it was particularly the architecture of the interior that gave its peculiar appearance to the Christian basilica. Owing to the fact of the nave being roofed over, an essential modification took place compared with the Roman basilicas, which were not vaulted, but formed a kind of open court surrounded by colonnades; whereas the new buildings assumed the form of an enclosed nave, of which the colonnades became aisles, and terminated by a recess called the tribuna, which was less isolated than in the ancient basilicas. The typical form of the Christian basilica is as follows:—

82. The interior was divided by two rows of columns into three aisles, of which the central one (*a* Fig. 78) was broader and higher than the side-aisles (see Fig. 79) *b* for men and *c* for women, and was terminated at the opposite end to the entrance by the apse. The columns were sometimes surmounted by the old architrave, the weight being supported by flat relieving arches; but they were generally connected by semicircular arches, which supported a wall pierced with small narrow windows; these, like those in the walls of the side-aisles, had a semicircular head. Sometimes a transept was introduced in front of the apse, the elongation of which in later times gave rise to the cross-like form of churches. This transept was separated from

the main aisle by semicircular arches, and the ground form of the whole building assumed the form of the letter T.

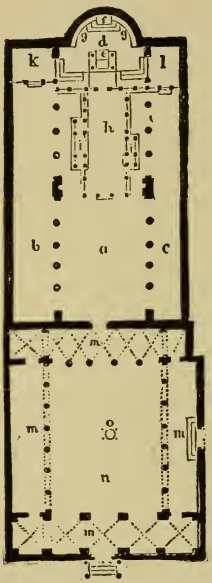


Fig. 78. GROUND-PLAN OF THE CHRISTIAN BASILICA OF SAN CLEMENTE AT ROME.

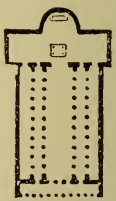


Fig. 79. CHRISTIAN BASILICA OF SAN PAOLO FUORE DELLE MURA AT ROME.

Large basilicas sometimes have as many as five aisles (see Fig. 78)—namely, a main-aisle in the middle and two lower aisles on each side (Fig. 79).

The roofing of the basilicas consisted of beams with a flat panelling, which was richly gilt in earlier times, or the rafters of the timberworks were left without a casing, and were ornamented with colored embellishments (Fig. 80).

83. At the east end in the transept in front of the apse stood the altar (Fig. 81, *e*); this was frequently covered by a baldachino supported on four pillars. Be-

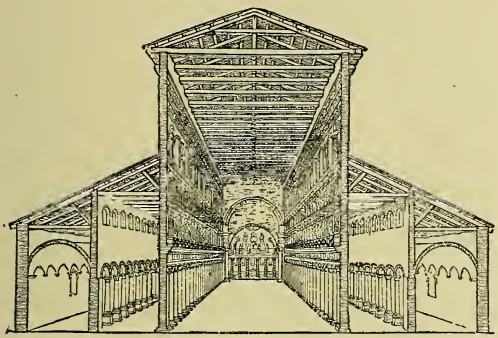


Fig. 80. SECTION AND INTERIOR VIEW OF THE FIVE-AISLED BASILICA OF S. PIETRO AT ROME, BEFORE ITS RESTORATION.

hind, in the tribuna itself, was the seat of the bishop in the middle raised on steps, the cathedra (*f*), and in a semicircle on both sides, the seats of the higher ecclesiastics (*g*). In front of the altar, at the end of the middle-aisle, was a long space surrounded by barriers of marble (*h*) for the lower clergy, who formed the choir, whence the place itself received the name of the choir.

A marble pulpit (Ambo) (*i*), richly adorned for the most part with mosaic, was placed on each side of the choir; from one of these the Gospel was read, and from the other the Epistle. In some instances only one such ambo was erected, and it then had two divisions, from the higher of which the Gospel was read, while the

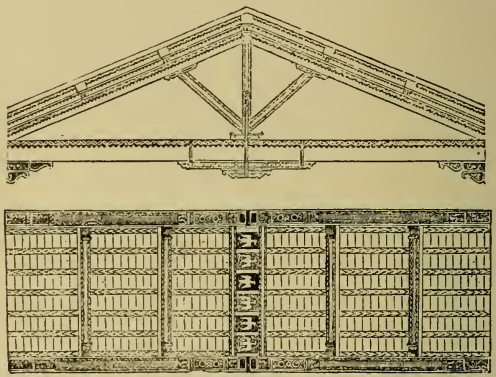


Fig. 81. PROFILE AND VIEW FROM BENEATH OF THE RAFTERS IN THE CHRISTIAN BASILICA OF SAN MINIATO AT FLORENCE.

Epistle was read from the lower. The arrangement of the choir, with the two pulpits, is shown by the perspective view of the interior of the described basilica of San Clemente (Fig. 83).

The whole of the space which is shut off round the altar is designated the Sanctuary, and is raised by one or two steps above the level of the church. At both

sides of it, at the end of the side-aisles, an especial place was occasionally shut off—namely, the Senatorium (*k*), for men of rank; and the other, the Matroneum (*l*), for women of rank.

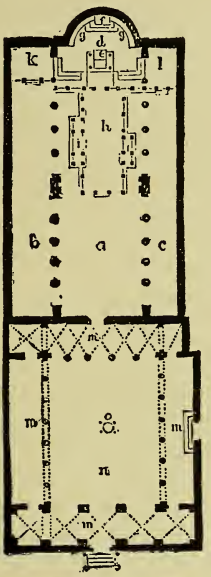


Fig. 82. GROUND-PLAN OF THE CHRISTIAN BASILICA OF SAN CLEMENTE AT ROME.

84. Adjoining the entrance there was frequently a narrow space, shut off by a barrier drawn breadthways across the building, designed as a locality for such penitents as had regained the right of access to the Sanct-

uary. This space was called the Narthex, or scourge. A portico (*m*) in front of the church, and other porti-

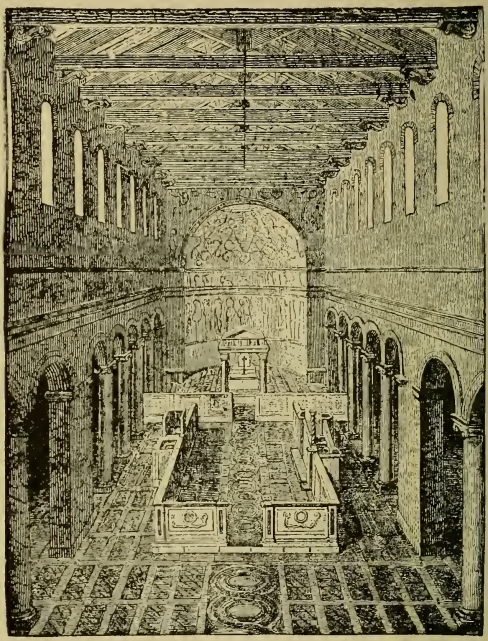


Fig. 83. INTERIOR VIEW OF THE EARLY CHRISTIAN BASILICA OF SAN CLEMENTE AT ROME.

coes which surrounded an outer court (*n*) (Atrium, Paradise, Vestibule, Pronaos) were designated by the

same name, and were intended for such penitents as were entirely out of the pale of the Catholic community. In the middle of this Pronaos was the Cantharus, or bowl for washing the hands, and intended as a symbolic type of the inner purification, which subsequently ensued from the sprinkling of the holy water.

85. One remarkable peculiarity of basilicas is that a subterranean chapel, or crypt, for the reception of the bones of the saint to whom the church was dedicated was constructed under the principal altar, which stood before the tribune. The word "principal" altar has been used advisedly, because in process of time side-altars were introduced in various positions. Sometimes this crypt is a mere vault, but more generally it is an architecturally arranged structure with pillars to support the vaulting; a sort of subterranean hall, which was probably suggested by the chapels of the catacombs at Rome. When these multifarious subterranean passages, which had originally been excavated for the purpose of obtaining stone, were used by the persecuted Christians as places for refuge and burial, they made alterations which converted them into crypts, resembling chapels, to serve as a meeting-place for the congregation. Subsequently, when the Christian religion was recognized at Rome, larger churches were built over these graves of the martyrs, or over the entrances to the catacombs; and probably these sepulchral chapels suggested the idea of the construction of a crypt in other situations also, destined to fulfil the same offices as the structure from which it was copied.

86. The form of the Christian basilica, as it has just been described, owed its origin more to customs and

requirements which were necessitated by religious worship, than to artistic deliberation. Still, though on the one hand, an already vitiated, and on the other a still embryo art were instrumental in their construction, these basilicas produced on the whole a sublime and peaceful effect, which is principally to be ascribed to the beautiful simplicity of Christian architecture that pervades their principal features. The simple ground-plan of later Christian churches is more clearly and intelligibly traceable in the Basilica than it is in more elaborate structures.

The most characteristic feature in the basilica are the three, or sometimes five, parallel aisles, the length of each of which is easily recognizable, owing to the nave being higher than the side aisles.

87. The ornamentation of the basilica corresponded with its architectural form. It did not consist of plastic sculpture, but of paintings and mosaics, which were introduced on the side walls of the nave, as well as on the so-called triumphal arch: but they were principally employed in the apse, which formed the termination of the church and the end of the whole perspective for the eye of a person entering the building (see Fig. 80). These apse mosaics generally represent large, detached figures, turned towards the spectator, wrought on a ground-work of blue or gold, with bold and simple drapery, and produce an imposing effect.

88. Whilst the general impression is therefore significant, the appreciation of detail is entirely wanting in these early Christian edifices. The columns, which are generally of the Corinthian order, were for the most part taken from older buildings of the heathen period, and differed in material and workmanship;

sometimes even those of dissimilar dimensions were placed next each other. The intercolumination, and even the breadth of the side aisle are often unequal, the side walls without ornament, while the entablature consists merely of the projecting ends of the beams; and generally speaking altogether a fine architectural feeling is wanting; but the low standard of an unæsthetic age is still more forcibly expressed by the meanness of the exterior of the basilicas with their bald walls and windows and doors devoid of moulding. The latter were generally covered with a horizontal stone with a plain arch-head to relieve the weight. Sometimes there was in front a portal resting on two columns and covered with a cross-arched vaulting, or a portico was introduced along the whole length of the facade. In spite of the unassuming simplicity of the external construction it is commendable that it seems to have been caused, at least in the main arrangement of its proportions, by a wish to render the characteristic expression of the interior, for the lower aisles are connected with the more lofty central portion by a slanting entablature corresponding to the roof. The material was for the most part brick, which was sometimes left quite plain, whereby the construction was emphasized, and at others received a marble coating, as for instance at the church of San Miniato at Florence.

The form of the Christian basilica which has been described was retained for several centuries in Italy, and especially at Rome. So true did the architects remain to the oldest models, that the buildings of the twelfth century are hardly to be distinguished from those which have been erected since the fourth.

89. The most complete specimen of the arrange-

ment of an ancient basilica is presented by that of San Clemente at Rome (Fig. 83). One of the most notable instances of a five-aisled basilica is that of S. Paolo, outside the walls of Rome, which was burnt down and subsequently rebuilt in accordance with the old plan.

Fig. 84. Tower of Early Christian Basilica of S. Maria in Cosmedin at Rome.

During the later period of the construction of basilicas, an isolated tower, of a simple rectangular shape, and with no taper, was often erected near the front facade of the building. Amidst the conflicting views which have been arrived at concerning the origin and object of this new construction, which first occurred in connection with basilicas, the supposition that it was originally intended to collect the congregation for service, may probably be correct; and the designation bell-tower, as answering to the Italian expression Campanile, may be suitably employed to describe it.

90. In the period under consideration, chapels, convents, and other buildings, such as triclinia, or large halls for the reception of pilgrims were constructed in a style resembling that of the basilica.

There was, however, another usual form of church which was synchronous with the basilica and which must now be described. In this class of structure the principal and often the only constituent part of the building consisted in a space, which was generally round or octangular, covered with a dome; while sometimes a circular passage or other parts of the building abutted

on it (Figs. 85 and 86). But when the entire building does not consist of the one dome-covered space, it always constitutes the central portion, and the other parts abut on it.

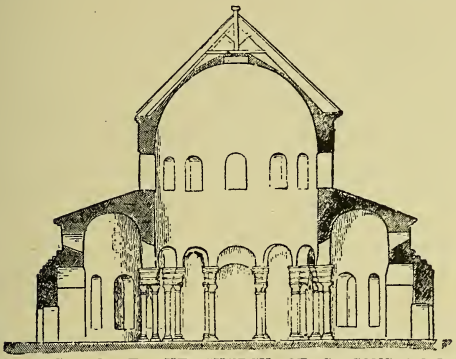


Fig. 85. SECTION OF THE CHURCH OF S. CONSTANTIA AT ROME.

91. The simplest descriptions of this kind of building are the baptisteries (Figs. 86 *a, b, c, d*), for which

Fig. 86. GROUND-PLAN OF THE CHURCH OF S. CONSTANTIA AT ROME.

the ancient Thermæ furnished models. They generally have a circular or octangular ground-plan, a main space covered with a round or polygonal dome, and a

circular passage separated therefrom by pillars in the same way that the side aisles are separated from the main aisle in basilicas (see Figs. 85 and 86). Sometimes they were without this passage, and only had galleries running round the interior like boxes in a theatre. These buildings were generally erected in the vicinity of cathedrals.

Other churches were constructed in the West in a similar simple way, but only in isolated instances; or some times in such a manner that several side domes, resting on pillars were grouped round the main dome: in which case the one which contained the altar always stood out prominently from the rest.

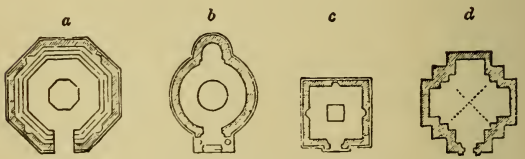


Fig. 87. GROUND-PLANS OF BAPTISTERIES.

92. This circular architecture only occurs in isolated cases in early Roman Christian architecture; on the other hand in the Eastern empire it became the prevalent form of church from the sixth, if not from the fifth century, and must be considered as the principal type of that architectural style, which will be considered under the name of the Byzantine in the succeeding subdivision.

93. In the ornamentation of basilicas, as in all works of early Christian art, and particularly in the case of

tombs, symbolic representations form a characteristic feature. It will not be inappropriate, with a view to a due understanding of the same, to consider some of the most usual and most important of these symbols or emblems.

Christ is naturally the principal subject of these symbols; then come the Christian virtues and attributes.

The earliest and most universal is the sign of the Cross, to which the monogram of Christ was subsequently added. The fish was, moreover, an emblem of Christ, because the letters for the Greek word for a fish, taken as initials, give the words, "Jesus Christ, the Son of God, Saviour."

A very favorite symbol is the lamb, whether as typical of Christ, with the addition of a Cross, or of the Apostles, or of all Christians, as the flock of the Good Shepherd. The Dove is the symbol of the Holy Ghost and of mildness and gentleness. The hart is an emblem of Christian longing, in consequence of the well-known verse in the Psalms: "Like as the hart desireth the water-brook, so longeth my soul for Thee, O God;" the peacock, which was already an emblem of immortality for the heathens, retained that symbolic meaning among Christians; the phœnix was a very natural emblem of the Resurrection; and the cock of Christian watchfulness.

In the earliest times, when the Christians celebrated their worship in the depths of the catacombs, the angel, the lion, the bull, and the eagle, were already emblematic of the four Evangelists. A leaf is a very common symbol: the olive-leaf as sign of peace, sometimes with, and sometimes without, a dove; the palm-leaf, as reward of victory for martyrs and the departed,

because they had triumphed over death: the crown and the garland had the same signification; the vine-leaf was in early times the most favorite emblem; the anchor and lyre were symbols of Christian confidence and joy; the horse, a ship under sail, and footsteps were probably typical of the journey of life and the accomplishment of the Christian struggle; the Rock was emblematic of our Blessed Saviour and of the character of firmness; and the pitcher was a symbol of the agape or of Holy Baptism.

94. Besides these shorter symbols, other more elaborate ones are drawn partly from the Old and New Testaments, and partly from imagination.

Their artistic value is insignificant, and on a par with heathen productions of the later Roman period. Of Old Testament symbols the following are the most common: As a memorial of man's sinfulness, the Fall, with Adam and Eve at both sides of a tree round which is coiled the serpent: as typical of obedience, the sacrifices of Cain, Abel, and Abraham: as incentive to the hope of help in danger, Noah in the Ark on the approach of the dove, frequent representations of the prophet Daniel in the den of lions, and of the Three Children in the fiery furnace, and of the passage of the Red Sea: as proof of heavenly nourishment and strengthening, Moses striking water from the rock or receiving the Tables of the Law from the hands of the Lord: as symbolic of the Resurrection, the ascension of Elijah. An especial favorite was the story of Jonah, which combined several of these references, and representations of his sleeping in the gourd-booth, of his being swallowed by the whale and cast up again, were very frequent.

95. The most important events in the life of Christ afford materials for emblems drawn from the New Testament: these only occur in works of a later period—such are representations of the Passion—of the crucifixion, the crowning with thorns, and the derision. Some of the miracles of the Gospel narrative were greatly in favor, as: the raising of Lazarus, the miraculous feeding of the people, the healing of the woman with the issue of blood, of the paralytic man, of the blind man: then more historic subjects, as the conversation with the woman of Samaria, the entry of Christ into Jerusalem, the washing of feet, Christ before Pilate, Peter's denial and leading away into prison, the delivery of the keys to Peter, etc.

96. The favorite and most usual representation of Christ is as the Good Shepherd, generally in a shepherd's dress, bearing the lost sheep on His neck or caressing it: sometimes merely sitting amongst the sheep with a shepherd's staff or a flute. Besides these forms Christ is often represented without relation to a particular incident, generally teaching, surrounded by His disciples or the twelve Apostles, either sitting or standing on a mountain, from which issue four springs as symbols of the rivers of Paradise and of the Evangelists.

Christ is also represented as Orpheus, in a short garment, covered with the Phrygian cap, with the lyre in His hands and playing on it, sitting under the trees, whilst lions and camels and birds in the branches listen to Him.

God the Father is generally represented simply by a hand stretched forth from the clouds.

Whilst these representations are, it is true, well cal-

culated to stir religious thoughts in the beholder, still their artistic worth must be described as insignificant, with the exception of a few pictures of Christ in the apses, which portray considerable grandeur and dignity.

BYZANTINE ARCHITECTURE.

97. After the separation of the Roman Empire into the Eastern and Western divisions (395 A. D.), a new order of things arose in the Eastern portion, and especially in its new capital of Constantinople. On the site of the ancient Byzantium, and with an infusion of oriental elements, the Byzantine style was consequently developed. The sixth century, which witnessed the reign of Justinian, was the most important for the formation of this new style. Soon afterwards the inroads of the Arabs and the conquest of whole provinces by that race began to exercise an influence on the form of Byzantine architecture. On the other hand Byzantine architecture had a reflex action on Arabian, as will be shown in the succeeding subdivision. The Crusades in the eleventh and twelfth centuries, and the supremacy of the Franks in the Greek empire which arose from those religious movements, tended to extend the scope of Byzantine architecture over other countries also. But when the old line of emperors returned they were unable to withstand the victorious inroads of the Turkish Sultan, and the Western Empire became the prey of the resistless Turks in the year 1453.

It has been usual hitherto to call Art in the west during the early period of its development in the Mid-

dle Ages Byzantine, but, although the influence of Byzantine forms is to be traced, it was far from stamping its impress on the western styles. The architecture of the Byzantine empire, properly so-called, has exclusively to be dealt with here, and the extraneous influence which it exercised will be considered in the fourth division of the second book under the head of Later Romanesque architecture. Moreover, owing to various causes, buildings were erected in other countries in the Byzantine style but these, although they do not belong to the national architecture of the countries in question, must be classified with the buildings built in the prevalent style.

98. Two epochs must be distinguished in Byzantine architecture. The first, which begins with Constantine and ends with Justinian in the middle of the sixth century, is that of the formation of the new style, till the completion of a settled system: domical construction is its essential feature.

The second and longer period exhibits a rigid imitation of the settled system, with an addition of oriental forms, and is finally, at least in some localities, subjected to the influence of Western Art.

99. The essential element in the formation of the Byzantine style is the vault, which did not assume a free and independent character till it reached the Eastern Roman Empire; for hitherto in the west it had always been subordinate and unsuitable to the Græco-Roman columnar construction. Massive piers and wide arches with a dome rising over them in the main space, and vaulted side-spaces in connection with it: these are the prominent characteristic elements of the architectural design. Columns, if they were employed at all,

were made to be subordinate to the main form of the vault construction, and were introduced between the large piers and the arches.

The construction of the vault influenced the whole structure of the building. The principle of vaulting that had already been introduced by the Romans, in which the walls no longer served as supports, but as enclosures, was carried to its utmost limits in the new Byzantine style: for the pressure and thrust of the vault, which is held together by the counterpoise on the opposite side of the dome and strengthened by buttresses, is distributed only on individual points.

The Roman decorative principle was, however, abandoned, inasmuch as a change took place in the individual details and in the manner of their application. Thus, for instance, projecting cornices, if not entirely given up, were only employed to crown the building, and its component parts, particularly intermediate cornices, became tame and flat in their outline. As only a subordinate position was allotted to the columnar architecture, the usual proportions of the columns and their capitals were abandoned and altered after an arbitrary fashion.

During the early period various ground-plans were followed in the construction of churches. Sometimes they were octagonal, after the manner of the West-Roman central style, at others they formed oblongs, approaching a square, with a dome over the center.

100. The Byzantine style of this first period reached its highest example and splendor in the church of Sta. Sophia at Constantinople. After this church, which was originally built by Constantine, had been burnt to the ground, it was rebuilt, with the utmost care, and

at great expense, by Justinian. It remained a peerless model for all later buildings of this description, and was celebrated far and wide, not only for its size, but for the span of its vaults and the splendor of its decorations. A short description of this building will

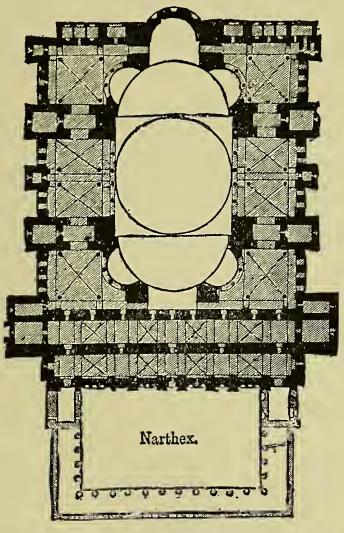


Fig. 88. GROUND-PLAN OF THE CHURCH OF STA. SOPHIA, AT CONSTANTINOPLE.

therefore explain the main characteristics which were subsequently universally followed, for though the proportions in other buildings of a similar nature were diminished, yet they were always constructed in ac-

cordance with the same plan, which will be rendered intelligible by Figs. 88, 91 and 92.

The external ground-plan of the building (Fig. 88) approaches a square, being 252 by 230 feet, in the center of which four massive piers, connected by semi-circular arches, form another square, and by means of triangular vaultings (pendentives) which span these arches, support a flat dome.

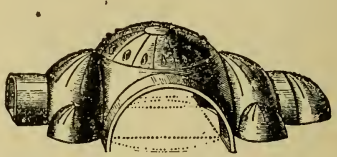


Fig. 89. DOME-SYSTEM OF THE CHURCH OF STA. SOPHIA AT CONSTANTINOPLE.

Right and left on both sides of this central square, as viewed from the entrance, stand four pillars, which are connected by arches, and support the women's gallery. On each of the open sides of the dome-covered square there abuts a semi-circle with semi-domes of somewhat inferior height to the main dome. (Fig. 91.) These semi-domes are penetrated on each side by three smaller vaults (Fig. 89); the middle one of the three is a barrel or cylindrical vault (Fig. 90) and on the entrance-side forms the main-entrance, and opposite, on the further side, it forms the apse: whilst the two remaining vaults on each side assume the form of immense niches with semi-domes, resting on two rows of columns one above the other.

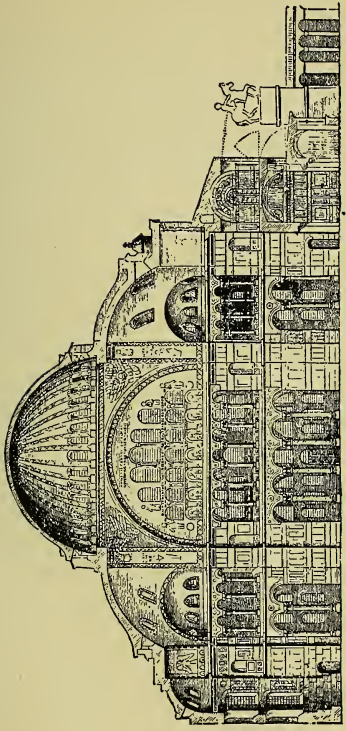


Fig. 90. SECTION OF THE CHURCH OF STA. SOPHIA AT CONSTANTINOPLE. THE CAPITALS OF THE COLUMNS ARE MORE FULLY REPRESENTED IN Fig. 225.

In this way the whole inner space forms an oval nave, which is terminated towards the west by a vault with a square end, and towards the east by the apse: whilst in its height it appears as an entire whole, owing to the vaults of various descriptions and altitudes that radiate from the central dome.

Round this lofty central space, except on the side of the altar, are ranged side-aisles of two stories, which do not however assume the form of a continuous aisle,

Fig. 91. BARREL VAULT.

but are divided into three divisions on each of the long sides, in the second story of which are the women's galleries, so that the whole does not appear an open space, but rather an oval hall with side-halls and arches. These two-storied aisles are shown in Fig. 88 by hatchings, and the nave in the middle, having been left plain, is brought out more prominently.

The embellishment was rich to the highest degree: the walls and piers, and even the floor, were inlaid with colored stones, and the vaults were enriched with mosaics on a ground of gold, and the columns were constructed of various marbles of the most precious kind. The nave was lighted from above by windows pierced in the main and in the semi-domes.

Besides the Narthex, there was a second vestibule: both extended the whole breadth of the building. In

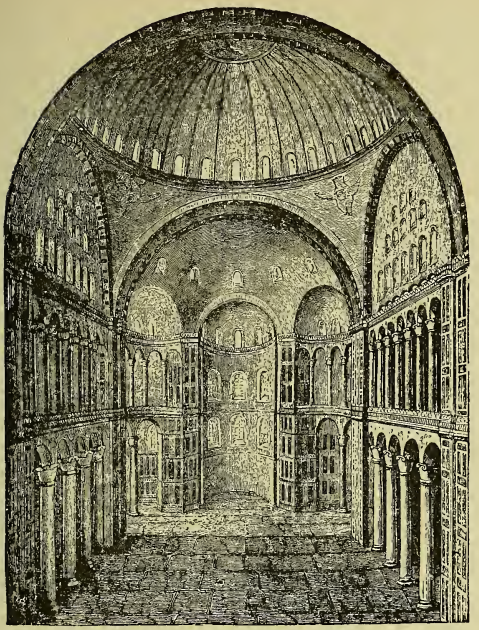


Fig. 92. INTERIOR OF THE CHURCH OF STA. SOPHIA AT CONSTANTINOPLE.

front of it was an entrance court surrounded by a colonnade, which was entered through an arch resting on four pillars.

101. The most striking point of difference in the impression conveyed by the interior of this Byzantine church and the interiors of Roman-Christian basilicas

is that while the latter carry the eye longitudinally to their apsidal termination, the former arrests it by the prominence of the central portion of the building; that is to say, by a stupendous dome constructed on a quadrangular substructure, in which all other details culminate. But notwithstanding this system of centralization, and the majestic appearance of the dome, the perspective effect of length is not entirely abandoned, as it was in the case of octangular and circular buildings; which constructions were, however, rarely employed for large churches.

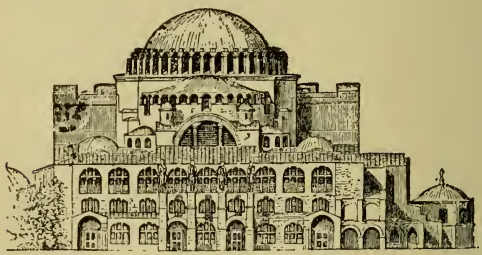


Fig. 93. EXTERIOR OF THE CHURCH OF STA. SOPHIA AT CONSTANTINOPLE.

Although the impression conveyed by this church is not so pure and simple as that which the basilicas produce, still its outlines are magnificent and imposing. The exterior displayed a novel divergency from the normal standard. Whilst hitherto the antique form of the roof had been preserved, it was now replaced by a totally different one: inasmuch as the vaulting, at least of the domes, was visible from the outside without any screen, or the only covering it had was one of polished metal. (Fig. 93.)

According to this model it became the normal rule in buildings in the Byzantine style for the domes to spring from a square, and to introduce around it, except on the altar side, galleries for the women and to allow the vaulting to be visible externally.

Fig. 94. GROUND-PLAN OF THE CHURCH OF ST. MARK AT VENICE.

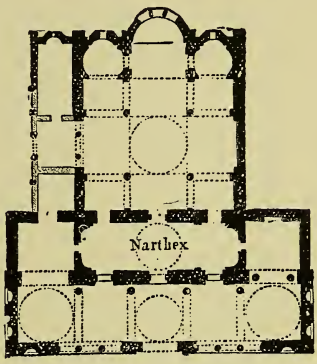


Fig. 95. GROUND-PLAN OF THE CHURCH OF THE THEOTOKOS, AT CONSTANTINOPLE.

102. Contemporaneously with the church of Sta. Sophia, another form arose, which being subsequently frequently repeated, constitutes a second period of the Byzantine style, and forms the most eminent characteristic of Byzantine churches, namely, the ground-plan of the Greek cross with a vault-system consisting of five domes. The cross is formed by the intersection of the nave and transept and a dome is raised on piers

at the point of intersection, whilst over the extremity of each arm of the cross is a similar dome, only without windows. (Fig. 94.) The arms of the cross are often covered by a barrel-vault instead of a dome. (Figs. 95 and 96.) On the front side of the church there is generally a narthex, or a front-hall of considerable dimensions covered by vaultings.

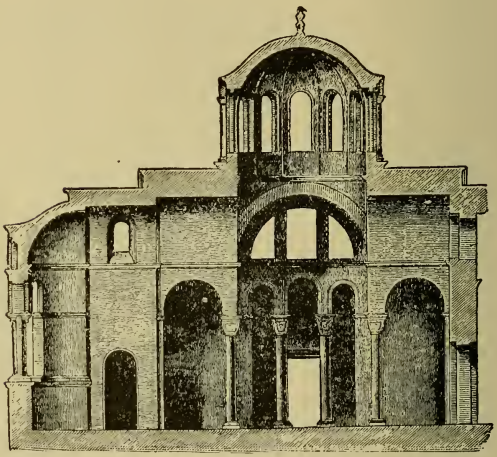


Fig. 96. SECTION OF THE CHURCH AT THE THEOTOKOS AT CONSTANTINOPLE.

But the ground-plan of a square with the central dome resting on piers or columns, and with four smaller domes at the corners, is more common and more characteristic of the Byzantine style. The women's galleries

were then introduced between the principal piers, opening on to the central space.

As a rule, two small side apses were constructed on each side of the main apse: They were not, however, visible from the outside.

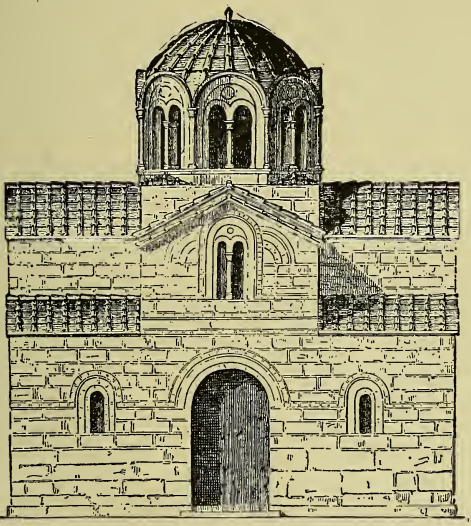


Fig. 97. FACADE OF THE CHURCH OF ST. TAXIARCHOS AT CYTHNUS.

103. The principal difference between these buildings and those of the first period consists in the treatment of the dome, which no longer, as in the church of Sta. Sophia, assumes the shape of a flat vault, but that of a hemisphere, whereas externally it often appears

as a flat vault resting on a perpendicular substructure. Whilst internally the windows pierce the vaulting, externally they are let into the vertical wall. (Fig. 97.) In this arrangement may be recognized the origin of the drum which subsequently became common in the west. In buildings of this period there are found, as has already been remarked, several domes in one building; sometimes three, but more often five; the four smaller ones either forming a cross with the central dome, or being introduced at the four corners.

Fig. 98. CHURCH OF ST. NICODEMUS AT ATHENS.

104. The vaultings are always without covering externally. Only in instances, where regard for climate or western influence have been brought to bear on their construction, are they covered with tiles or slabs of stone: and even then the shape of the various vaultings, whether domes, or barrel-vaults, or cross-vaults, remains almost always undisguised. The roofing of the church, beside the vaultings, consists either of plain slopes, or the outside walls are raised so high that they are only overtopped by the principal dome, whilst they screen the smaller ones, and so terminate the facade by a horizontal line. (Fig. 98.) The barrel-vaults of the arms

of the cross were afterwards converted into circular pediments, and finally all the upper portions of the building were terminated by rounded lines only.

The exterior always remained extremely simple, and the oriental love of magnificence was in preference developed internally. Sometimes the uniformity of the facade was broken by alternate rows of tiles and stones, or of stones of various colors. The windows were introduced in the women's galleries, and were narrow, and covered by round arches, or a double window was formed by the interposition of a pillar.

Fig. 99. FROM THE CHURCH OF SAN VITALE AT RAVENNA.

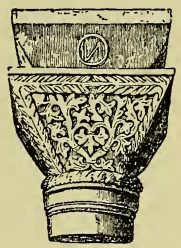


Fig. 100. FROM THE CHURCH OF SAN VITALE AT RAVENNA.

105. The walls of the interior were cased with costly marble, and in later times were ornamented with mosaics, representing either figures or arabesques, composed of very small precious stones or glass dice, and subsequently with frescoes: both the latter kinds of ornamentation were affected on a dark-blue, but afterwards always on gold ground. Owing to this extensive

employment of mosaics, a traditional style, both for design and coloring, was formed for these figurative representations, which may be called the mosaic style: it was, as has been shown, employed in the Roman basilicas, and had great influence over the plastic art of later times. In these mosaics the arabesques are of slender, intertwining patterns, whilst the representations of figures are stiff and conventional.

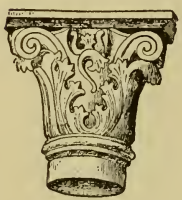


Fig. 101. FROM THE CHURCH OF THE THEOTOKOS AT CONSTANTINOPLE.

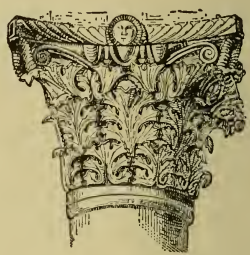


Fig. 102. FROM MARCIAN'S COLUMN AT CONSTANTINOPLE.

106. The essential characteristic of the Byzantine style is therefore, in short, that the vaulting, and especially the dome, constitutes the main feature, to which all else is subordinate. With the Romans vaulting was associated with the Grecian column, and formed an isolated feature in their constructions, but in the Byzantine style it became an independent system; although its artistic productions may never have surpassed mediocrity as regards detail. It was a consequence of this

system that the architrave of the Grecian orders, which is so essentially antagonistic to the vault construction, was entirely abandoned. The predominance of the dome and the vault was only a natural consequence of the development which this system was left free to assume by the abandonment of the outer roof and the association with the dome of the semicircle in place of the gable, at the termination of the outer walls.

107. Besides the main design, many of the details of the Byzantine style present novelties and peculiari-

Fig. 103. FROM THE CHURCH OF ST. MARK AT VENICE.

ties, in which the wish for diversity and picturesque effect point indubitably to an oriental influence. The servile imitation of the Grecian column is abandoned; new forms of capitals arise, which suit the vaulted arches better, and evince more supporting power than the Greco-Roman would have done. This result is produced by the introduction of a kind of support placed under the arch at the top of the capital. (Figs. 99 and

100.) This may be accounted as the most remarkable and most peculiar of the details of form in the Byzantine style. The capitals are of various kinds; generally with pointed acanthus leaves, and resembling the Grecian Corinthian column (see Figs. 101 and 102): others are like the capitals of the Composite order, as, for instance, Figs. 103 and 104. Capitals like that de-

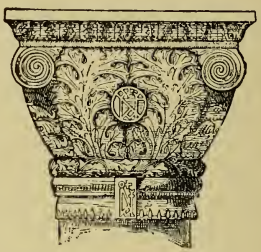


Fig. 104. FROM THE CHURCH OF STA. SOPHIA AT CONSTANTINOPLE.

picted in Fig. 100, short and cubical in shape, with trapeziform sides and incised foliage or other ornamentation, are peculiar to the Byzantine style.

In other respects the purely architectural details are very deficient, and are generally replaced by mosaic ornaments. A love of splendor and varied richness of color predominates over the taste for the artistic working of architectonic details.

Byzantine ornaments are in general to be distinguished from those of the Grecian and Roman styles, to the former of which, as well as to Asiatic sources, they owe their origin, by a rougher and more unpleasing

treatment, and by the leaves in the sculptures being deeply indented, sharp-pointed, and hollowed out in the middle. The running foliage is generally poor and uninterrupted.

108. The forms which have been described are in use at the present day in the construction of churches in Greek Catholic countries; namely, a square or oblong ground-plan with a dome visible from the exterior rising on four piers over the central space, and having cylindrical vaults over the sides and small domes over the corners, and as a rule three apses. The narthex, also, is not wanting, and it sometimes has a portico in front of it.

Such are the regularly recurring elements of most Greek churches, though here and there some modifications occur, as, for instance, the separation of the sanctuary from the main-space by traverse-walls.

109. No remains exist of Byzantine palaces, and we only know by the description of Byzantine writers that they were richly adorned with costly materials, such as precious stones and mosaics. On the other hand, Byzantine buildings of another kind have escaped the ravages of time, namely, the cisterns, which were constructed principally in Constantinople and Alexandria as early as the time of Constantine. They are large reservoirs, covered with little domes or cross-vaultings, resting on columns. Sometimes several shafts were placed one over another. In connection with these cisterns were large aqueducts, after the manner of the Roman.

110. Byzantine Art gained a footing also in the West. Italy especially, even after the division of the empires, and after the separation of the churches, still

maintained relations and intercourse with the East. Many Byzantine elements were communicated to the rest of the West by trade, and in later times by the Crusades directly, whilst indirectly they passed thither through Italy; and here and there buildings in the Byzantine style are to be found, either pure or modified.

In this respect Ravenna, on the east coast of Italy, is most remarkable, which for a long time was under Greek rule, and was therefore subjected at the same time to the influence of both Rome and Constantinople. The church of San Vitale deserves especial mention, which was built at very nearly the same time as the church of Sta. Sophia at Constantinople. It forms an octagon with a dome resting on eight piers; the spaces between these piers form niches, covered by semi-domes, with two rows of arcades one above another, cutting into the main domes; as in the church of Sta. Sophia. (Compare Fig 91.)

In the north-eastern parts of Europe and in Asiatic countries the Byzantine style spread simultaneously with the Greek church, and exercised a great influence over the formation of native Art, as, for instance, in Armenia, and Georgia, and in the Russian empire, in which countries the working of Byzantine style merits a special consideration; the influence that Byzantine Art exercised over Arabian architecture will be considered in that portion of the work to which it properly belongs.

Byzantine Architecture in Armenia and Georgia.

111. Church architecture in these countries must be viewed as an offshoot of the Byzantine style. The Byzantine typical plan is sometimes found combined with the basilica; while the dome in the center of the building, the barrel-vaults of the side portion, the construction of the apses and sometimes the narthex are all accepted.

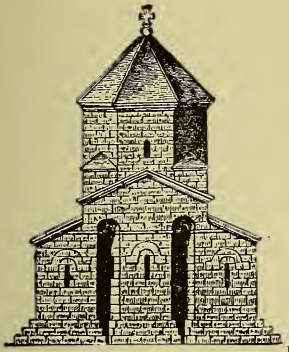


Fig. 105. EAST FACADE OF THE CHURCH.

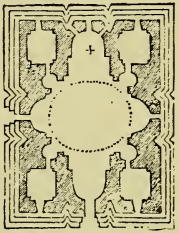


Fig. 106. GROUND-PLAN OF A CHURCH AT VAGHARSCHABAD.

The churches of Armenia and Georgia, which were built in the tenth and eleventh centuries, show a deviation from this form. Their plan is a parallelogram, from which the apse, if it is not concealed in the thickness of the wall, and the gateways project polygonally. Sometimes, instead of these projections, there are triangular recesses in the walls as shown in Figs. 105 and

106. The roofs of the aisles slope from the wall of the nave as in Western buildings.

The doors generally have circular or horseshoe arches over them, although in later times they were pointed or pyriform. The windows, which are as narrow as loop-holes, have sometimes straight and sometimes circular heads, and are often surrounded by ornaments, which do not lay claim to any importance, and which, in the more important churches are freely introduced on the archivolts, cornices, and doors. Intertwined lines as shown in Fig. 107, enriched with foliage, are of very frequent occurrence.

Fig. 107. PART OF AN ORNAMENTED WINDOW CASING.

Fig. 108. CAPITAL OF A COLUMN.

112. The exterior walls are, generally, as in many Byzantine churches, relieved by half columns, connected by arches, which have the appearance of marking off the wall into several subdivisions. Fig. 108 shows the capital of one of these columns, which seldom occur in any other part of the building. The cornices consist of full and massive mouldings.

As regards the exterior, it must be remarked, that where the basilica construction has been retained, a sort of transept extends right and left from the dome, the gables of which resemble those of the western and eastern facades.

113. The central dome rests either on four independent piers; or, when the central form predominates, on the walls which slope inwards, so that totally disconnected spaces are formed at the corners, which, so far as concerns the impression conveyed by the interior, might as well not exist; in fact, internally no endeavor is made to produce any perspective effect. A polygonal form also occurs, with a number of niche-like projecting buildings corresponding to the number of the sides.

The main dome is not spherical but conical in shape, and vaulted with layers of stone projecting one over the other.

RUSSO-BYZANTINE ARCHITECTURE.

114. Russian architecture may properly be called a deterioration of the Byzantine style, though it was modified by many influences, and deviated considerably from it. It has maintained its peculiarities and errors of taste for centuries from the time of its formation from the Byzantine style down to the present day.

The Slavonic races that dwelt in the broad expanses between the Adriatic and Black Seas and the Baltic, which were intersected by forests, morasses, and steppes, had received the first germs of their civilization by their intercourse with the Byzantine provinces; and Byzantine architecture found acceptance, owing to the

building of numerous churches by order of Vladimir the Great (981-1015), in whose reign a general profession of Christianity took place in Russia, whilst that sovereign had continual intercourse with Constantinople.

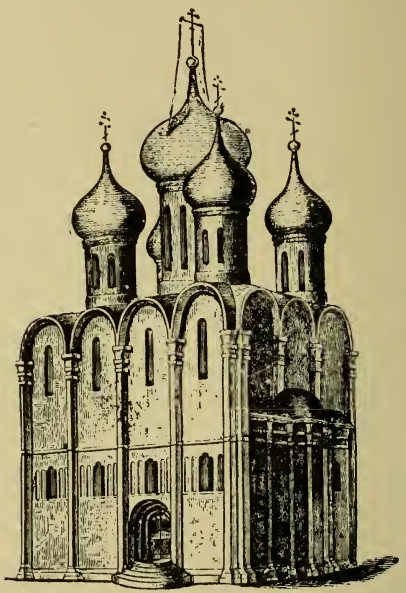


Fig. 109. CATHEDRAL OF THE ASSUMPTION AT MOSCOW.

The nature, however, of the country and of the people was not conducive to a national development of the elements which had been implanted. A further obstacle

was presented by the inroads of Mongols from Asia, and their establishment in the country under the rule of Ghengis in 1237. After their ascendency had been overthrown by Ivan III. (1462-1505), and the relations between Russia and Constantinople had ceased with the capture of the latter city by the Turks, that emperor procured artists of all kinds from the West, and particularly from Italy, for the erection of the numerous buildings which he caused to be constructed; amongst others was the celebrated architect, Fioravanti, of Bologna, in the year 1475, who was summoned to build the still existing church of the Assumption at Moscow, exactly after the model of the Cathedral of Vladimir, which was the oldest metropolitan church of Russia, and therefore it is only in some few details and in the improvement of the proportions that the better taste of the Italian architect is perceptible.

115. It is only at the end of the fifteenth century that Russian architecture begins to exhibit a divergency from the Byzantine; for then forms crop up that denote a Tartar origin, as the bulb-shaped dome, &c.

In the sixteenth and seventeenth centuries Russian architecture assumed a highly peculiar form, to which the church of Vassili Blanskenoy, at Moscow, with its fantastic shapes, greatly contributed (Fig. 110). In this building the merit both of art and style had fallen even lower than before.

116. The first churches were built at Tchernigow, Kief, and Novogorod, during the first half of the eleventh century, after the model of the church of St. Sophia, by Byzantine architects and workmen. A deviation, that had already been introduced into the Byzantine style in the Eastern empire became the in-

Fig. 110. CATHEDRAL CHURCH OF VASSILI BLANSKENOY, AT MOSCOW.

dispensable type for all large churches of this description up till the present day, namely, the construction of five domes in such a way that the four lesser domes are introduced over the four corner spaces of the square that forms the base.

117. Russian architecture displays its most peculiar feature in the shape and number of the domes; the diameter of which often exceeds that of the drum that forms the substructure. These domes no longer have a regular spherical shape, but run up into a point at the top, while the sides have swelling curves in the shape of a pear or bulb, and some are even broader and flatter than those objects. The turriform substructure becomes still higher and slenderer with these bulb-like domes.

The number of the domes is increased in buildings which have pretensions to magnificence, in such a way that either all the domes form part of a central system, the lesser domes being grouped round the central one, and diminishing in height as they recede from the center, and arranged on parallel or diagonal lines which form squares, or several square centralized systems of domes are introduced contiguous to one another. At the top of the dome is a gilt cross, which often springs from a half-moon, and from it gilt chains hang down and are fastened to the dome.

The impression of this mass of domes is heightened and rendered more grotesque by the application of colors. The roofs which are covered with sheet-metal are painted yellow, red, or white, whilst the domes themselves are green or blue, studded with gold stars, or entirely gilt or silvered: the central ones being more richly decorated than the outside ones.

118. The exterior surface of the walls is broken by slightly projecting pilasters, but in other respects it is tasteless. The windows are small and covered by a circular arch or by two connected together; the ends of which have no supports. They are often introduced

in two rows one above another, which seems a meaningless imitation of the Byzantine double row of windows which was necessitated by the women's galleries.

One characteristic peculiarity in the construction of Russian churches consists in the hip-roof, in which the main dome at the top and the side domes at the corners, being raised on drums, terminate in a very unartistic manner (Fig. 111).

Fig. 111. HIP-ROOF WITH SUPERINCUMBENT DOMES.

Fig. 112. BELL-TOWER.

119. The domes are supported in the interior by lofty piers, either circular or angular. The plastic portion of architecture is entirely wanting inasmuch as no sculpture exists in Russian buildings. The principal divisions are only embellished by painting and gilding. The chief ornament of the interior consists of the

iconostasis, which is a high screen reaching as far as the vaulting, and shutting off the altar from the congregation. On this iconostasis are painted pictures of saints in three or four horizontal compartments, according to an arrangement which is fixed and sanctioned by ritualistic use. The figures are painted on a gold ground, with gold and silver drapery, and always in accordance with one normal type, and the whole screen is scantily lighted by lamps. In other respects the interior is generally dark and gloomy.

120. Bell-towers (Fig. 112) are generally detached from the church, and it is only in quite modern times that they have been connected with them. They generally consist of several diminishing stories, either circular or octagonal in shape, which usually, but not always, have a square base. They are frequently crowned by an obelisk, terminating in a bulb-shaped dome, like a gigantic steeple-knob.

121. Even in the later Russian style, which retains few reminiscences of the Byzantine, the circular arch is prevalent; and is introduced for the roofing of the inner spaces, in the form of a barrel-vault, without the cross-vaulting being used. It is only in external details that the keel-arch is met with, which is of such frequent occurrence in the Mahometan buildings in Persia and India, and which consists of two vaultings uniting in one point. (See Mahometan Architecture, Fig. 118.)

122. In the reign of Peter the Great, at the beginning of the eighteenth century, the vitiated taste of the West found its way to Russia, and by encroaching on the native fantastic architecture, if not entirely supplanting it, it followed the same course as it did in other countries; and it is only quite lately that an imperial

edict has been promulgated to retain the old Byzantine style as much as possible in Russian churches. Russian architecture can only produce an advantageous effect for the æsthetically cultivated eye when cities are viewed as an entirety, for then the great variety of the numerous variegated towers and domes, although quaint and wanting in repose, has a rich and imposing effect.

MAHOMETAN ARCHITECTURE.

Arabian Architecture in General.

123. During the course of the seventh century, A. D., the religion of Islam, which had been founded by Mahomet, united in a short space of time the nomad tribes of the Arabs, who had hitherto lived in wild freedom, into one mighty people, which spread this new religion from the Atlantic to the Ganges.

The want of buildings for the new worship necessarily called into existence the architectural and artistic elements amongst these united races. But since the roving life which they had led was little calculated to foster art, or effect an independent civilization, they were obliged to appropriate and use for their own purposes the existing forms of art in the various countries over which they disseminated the creed of Mahomet. These forms, however, were transmogrified in the hands of the conquerors according to their own genius and taste, so that the Arabian style was gradually developed out of the forms which were found ready to hand, and which belonged for the most part to Early Christian art

of the later Roman period, together with an admixture of Asiatic elements. This style, however, received a different impress in the various countries in which it was developed: thus, for instance, in Egypt it was blended with the rigid conformity of the Egyptian. and in India with the voluptuousness of the Indian.

Arabian architecture was developed on the basis of the Early Christian, that is to say, on that of the basilicas of the Byzantine style.

Its formation and peculiarity, apart from the influence of the fantastic genius and lively imagination of the Arabs, was necessarily in part determined by the fact that every kind of figurative representation, whether of man or animal, is forbidden by the Mahometan creed.

124. In the earliest times Christian churches were made use of for the practice of the new religion. It was only when the whole of the East had become united through Islam that independent Arabian art was developed. After the empire of the Caliph had spread from the confines of India to Spain, Arabian architecture diffused itself from Bagdad as a center by the erection of many splendid palaces and mosques. These last-mentioned buildings, however, did not have such an effect on the formation of the style as was the case with the sacred buildings of nations professing other religions, whose worship required certain settled forms.

Mosques, however, have also their essential parts, that must never be wanting; but their design is not normal, and consequently the main form of the mosque is not a settled one. The requisite parts of a mosque are as follows: the Mihrab, or Hall of Prayer, which mark the direction of Mecca (Kibleh), and which must conse-

quently have had a different position in different countries; then a place for the ablutions, which precede prayer; and finally a large space for the entry and departure of the faithful, for the reading of the Koran and prayers. In this space are the Maksura, or seat of the Caliph, when one was required; as also a place for the preservation of the Koran, and finally the Mimbar, or kind of pulpit. A further requirement is the Minaret, a kind of tower, from which the Iman calls the hour of prayer, and of which the larger mosques generally possess four or six.

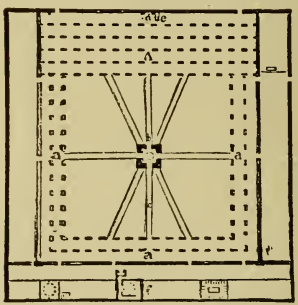


Fig. 113. GROUND PLAN OF THE MOSQUE OF IBN TOULOUN AT CAIRO.

125. Two main forms are noticeable in the design of mosques. The one, which belongs to the western countries of Islam, and is the older of the two, is a lengthened square shut in by walls and surrounded with arcades on the inside, without a roof, and often planted with trees (Fig. a, 113). A well (b) covered by a

cupola always constitutes one of the chief ornaments of this court-like space. On one side is a covered building (A), in which are introduced the hall of prayer (d) and the sanctuary and pulpit (e), and which often consists of several rows of arcades running one behind another with a flat roof.

Besides the portals and battlements, the only ornamentation that the exterior receives is the slender tower or minaret (f, Fig. 114). There seems to be no fixed rule for its position. This design seems more important, when the Mausoleum of the founder is connected

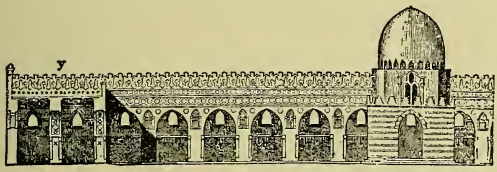


Fig. 114. PART OF THE SECTION OF THE MOSQUE OF IBN TOULOUN AT CAIRO.

with it, rising in a high vaulted dome over the main body of the building. The buildings and arcades are covered with domes of various shapes.

126. In the other kind of mosques, which are constructed on the model of the Byzantine style, the body of the building forms an independent and separate feature, in which the main space, as well as the side spaces, are covered by vaultings in the Byzantine fashion, the roof of the former being a dome. The outer court, surrounded by arcades, also occurs, and these arcades have likewise small dome-vaultings. The exterior is

more gracefully constructed, and the introduction of several minarets, from two to six, at the corners, has an elevating effect. Although a Byzantine model is recognizable in the main design, still an Asiatic, and chiefly Indian influence is unmistakable in the external forms, and especially in the domes.

127. Taken as a whole, Arabian architecture, in accordance with the oriental manner of life, may be described as internal rather than external; especially in palaces and dwelling-houses. Whilst the tasteless exterior of buildings only displays to the eye high walls

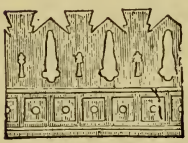


FIG. 115. DETAIL OF THE EXTERNAL BATTLEMENT MARKED *y* IN Fig. 114.

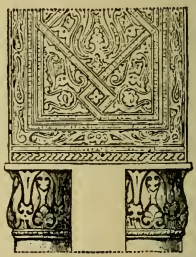


Fig. 116. DETAIL MARKED *x* IN FIG. 114.

which are irregularly pierced by small windows, and those few in number, everything in the interior is richly decorated. The richest ornamentation is lavished on the most essential part of these buildings, namely, on the porticoes which surround the open court. There are no fixed orders or proportions for the pillars, as there are in Grecian and Roman architecture: some-

times they are squat and heavy; at others slender and graceful, especially in the later period.

128. In the different countries which were subjected to the sway of the Arabs, three different forms of arches, besides the circular arch, which is of rare occurrence, are met with in the arcades, and in connection with the doors and windows. In Egypt and Sicily occurs the pointed arch (Fig. 117), which consists of curves, and resembles the arch, which was subsequently employed in the West in the Pointed or Gothic style, only that it is more elliptical. It occurs in monuments which are perhaps rightly attributed to the earliest period of Mahometan architecture: but there is no doubt that it is met with in buildings which belong to the beginning of the ninth century.

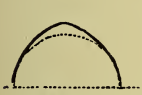


Fig. 117.

Fig. 119.

Fig. 118.

ARABIAN ARCHES.

In Persia and India the keel-arch occurs (Fig. 118), which differs slightly from the pointed-arch, the ends of the curves being bent slightly upwards, in the shape of the keel of a vessel. In Spain the horse-shoe arch (Fig. 119) is the most frequent form, which consists of a larger segment of a circle than that formed by a semicircle.

These different forms of arches were not architecturally determined and systematically carried out in the various buildings in which they occur, but employed rather in an arbitrary manner.

129. The walls over these arches are covered, as all flat surfaces generally were, with embellishments in the shape of arabesques, which either consist of flat relief in stucco, or are painted in lively colors. They are

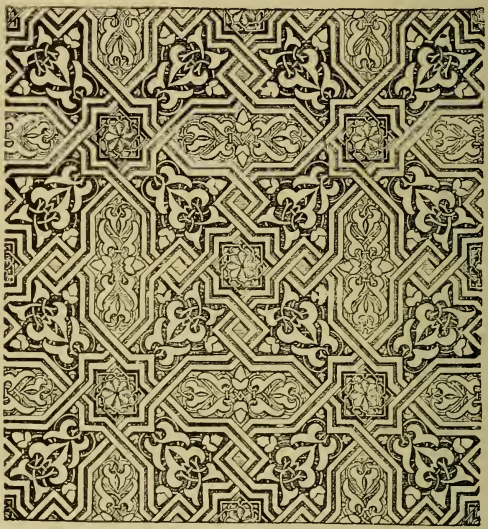


Fig. 120. MOORISH WALL DECORATION IN THE ALHAMBRA AT GRANADA.

formed of the most multifarious entwinings of straight or curved lines or belts, sometimes bearing a resemblance to vegetable forms, as Figs. 120, 121, 122, and 123 demonstrate. Each of these patterns is extended over considerable surfaces. A brilliant but not a staring

general effect is produced, in spite of the lively colors, which must be attributed to the fact that each color is spread over a very small surface, and consequently does not become too prominent.

Fig. 121.

In conformity with religious regulations, the ornamentations never express a symbolic meaning. On the other hand, numerous inscriptions form an essentially characteristic part of the embellishment of Saracenic buildings: they are principally passages from the Koran, or proverbs, and are introduced in the principal parts of the ornamentation. The inscriptions of the older style, in the Kufic character, so called from Kufa

a town on the Euphrates (Fig. 124), is ornamental in form, and blends harmoniously with the other embellishments. At a later period the Italic character (Fig. 125), which is less stiff, came into use for the same purpose.

Fig. 122.

Fig. 123. WALL DECORATION FROM THE ALHAMBRA AT GRANADA.

130. For the roofing of buildings straight beams and vaultings were both in use. For the latter Arabian architecture has created a quite peculiar and highly characteristic form. The vaulting consists of small cavities, or miniature domes, which rise one above another till the topmost forms a kind of point at the top (Figs. 126 and 127). The effect of these vaultings, which resemble stalactite grottoes, and which are richly

ornamented with coloring, is complicated rather than worthy of imitation. Properly speaking, they do not deserve the name of vaultings, inasmuch as they have nothing in common with that kind of construction, and

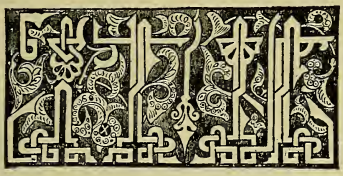


Fig. 124. KUFIC CHARACTER EMPLOYED AS DECORATION.

should be considered rather as fantastic eccentricities. They almost always consist of plaster or wood and are strengthened by beams and roofing.

Fig. 125. ITALIC CHARACTER EMPLOYED AS DECORATION.

The domes are for the most part flat and plain externally, or ornamented with stripes like a gourd; in buildings of importance they are larger, and either semicircular or tapering.

It now remains, after the above remarks on Arabian architecture in general, to describe the peculiarities of

Fig. 126. SECTION OF PART OF THE ROOF OF THE CAPELLA PALATINA AT PALERMO.

PROFILE OF FIG. 126.

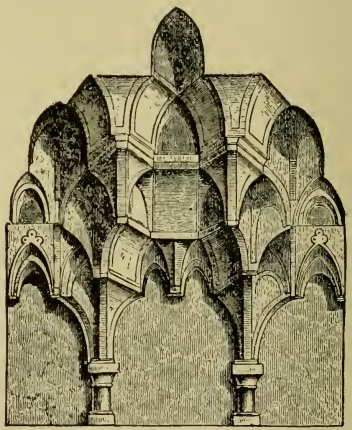


Fig. 127. PERSPECTIVE VIEW OF PART OF A VAULT FORMED BY SMALL SUPERINCUMBENT ARCHES.

style which arose in the various countries in which Saracenic buildings were erected.

2. Arabian Architecture in Spain.

131. Spain was conquered by the Arabs in the year 711 A.D., and in 755 Abd el Rahman founded an independent Arabian empire in that country, and after he had reigned for thirty-five years began to adorn his capital, Cordova, with buildings; especially by the construction of a large mosque; and Arabian architecture in Spain may be said to commence with that structure. The Roman style that was prevalent in the country was to a certain extent retained, and the fragments of Roman buildings were employed in the new structures.

The most flourishing period of Arabian art in Spain was during the reign of Abd el Rahman III., from 912 to 961, under which monarch Cordova reached the highest pitch of its splendor. He caused buildings to be erected in many of the cities of the country, especially in the newly-founded town of Zahra, in which the simple forms of the earlier centuries appear already giving way to rich and fantastic shapes. In the same way as the Roman style had at first formed the model, so now the Byzantine style was preferred, on account of its yielding richer forms. But independent features were employed in connection with these Byzantine elements, and forms, which were quite peculiar to the Arabs, such as the horse-shoe arch, were mingled with them. The relations with Byzantine art were finally entirely broken off, when after long internal struggles with the Christian knights, Arabian Spain passed under the yoke of the African Moors, and Morocco became the seat of government.

132. Buildings were erected at Seville, as well as at Cordova: and amongst these the Minaret, which is called the Giralda, is especially remarkable. It was erected in 1195, and is still in existence; in it the forms of the Early Arabian and Byzantine styles have already disappeared. The Alcazar is also worthy of notice, and though it has undergone many changes through subsequent restorations, still it exhibits essentially the same forms as the Giralda. For instance, the capitals, which are still Corinthian, are of a graceful, slender shape, instead of being heavy, as heretofore, and the arches assume a pointed character instead of the broad circular. They never, however, take the shape of the simple pointed arch, but are indented at the top and on the inner sides with various little arches. Similar towers to the Giralda are found at Morocco, Tunis, and Tetuan, whilst the minarets at Cairo and in the East are different.

133. Whilst the Arabian buildings at Cordova (Fig. 128), as well as similar isolated remains in other towns of Spain, belong to the first period of Arabian architecture in that country, as is evidenced by their clumsy application and imitation of Roman and Byzantine forms, the buildings at Seville belong to the second period, which was that of the freer development of the strictly Moorish style; although it still retained some reminiscences of earlier times. In the third period the forms were entirely independent, and were also richer and more peculiar, and the buildings were characterized by variegated and magnificent ornamentation. This style is illustrated by the buildings of Granada, and, above all, by the Alhambra.

It was only during the latter period of Saracenic rule in Spain, after Cordova and Seville were again in the

possession of Christian kings, and Andalusia had become the last place of refuge for the Mahometan population, that Granada, which had been founded in the tenth century, became powerful and important as the point of concentration for Moorish power and civilization in Spain, and as the seat of a brilliant court and

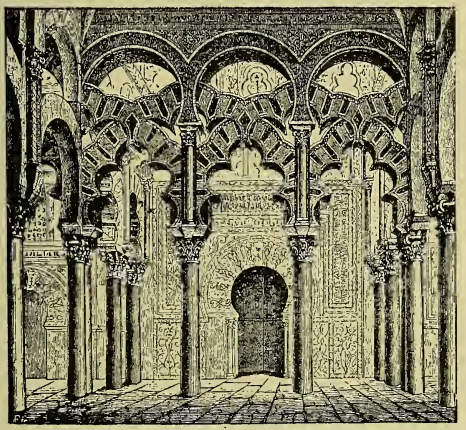


Fig. 128. VIEW OF THE INTERIOR OF THE MOSQUE AT CORDOVA.

a school of arts and sciences. The city attained the zenith of its splendor in the fourteenth century. But small remains exist of its numerous palaces. Besides the Generalife, which is a graceful garden-pavilion in the style of the Alhambra, only the Alhambra itself remains as the most important and best-preserved specimen of its romantic splendor.

134. The Alhambra forms a portion of the town which was entirely surrounded by fortifications; in fact, the citadel on which were built, besides the royal palace, public buildings and the houses of the court officials, and displays externally only the walls and towers of a fortress. The castle was founded in the thirteenth century, during the reign of Abou Abdallah

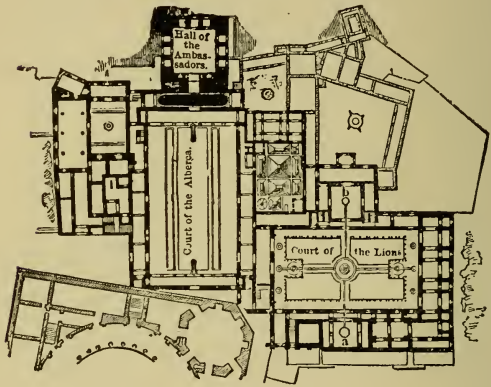


Fig. 129. GROUND-PLAN OF THE ALHAMBRA AT GRANADA.

ben Nassar, who died in 1270. But the richest and most beautiful parts of the building which are still remaining, were carried out by Abou-el-Walid (1309-1325), and by Abou Abdallah (1325-1391). One of the last kings, Muley Hassan (1445-1453), only added some smaller portions.

Though part of the castle was turned into a modern palace under Charles V., yet the most beautiful parts of the interior are still preserved. They consist of splendid halls and dwelling-rooms grouped round two courts, the one, the Court of the Alberca, with its double row of myrtles, and the other the celebrated Court of the Lions. (Fig. 130.) (For plan, see Fig. 129.)

This Court of the Lions, so-called from the fountain, which is placed in the center, and supported by twelve of these animals, is a hall surrounded by graceful columns and arches, while in the middle of the narrow side of the court the projecting columns form pavilions, in which are other fountains. On the south side is the Hall of the Abencerages (*a*), so-called because the knights of the race of the Abencerages were murdered here, while on the north side is the Hall of the Two Sisters (*b*).

The most celebrated amongst the magnificent and graceful dwelling-chambers and banquet-halls are the following: The Audience Hall, or Hall of the Ambassadors, with a banquet hall in front; the Hall of the Abencerages; the Hall of the Two Sisters, in which were the women's apartments, and which consisted of a large hall with two side-halls and a cabinet; and finally a long, narrow hall called the Hall of Judgment, which took in the east side of the Court of the Lions. The combination of all these graceful halls and courts, with fountains and arcades, and with delightful little gardens attached to them, and gleaming with rich and magnificent coloring, lends a romantic charm to the whole.

The whole of the interior is of a highly ornamental character, and displays in the design of the decorations

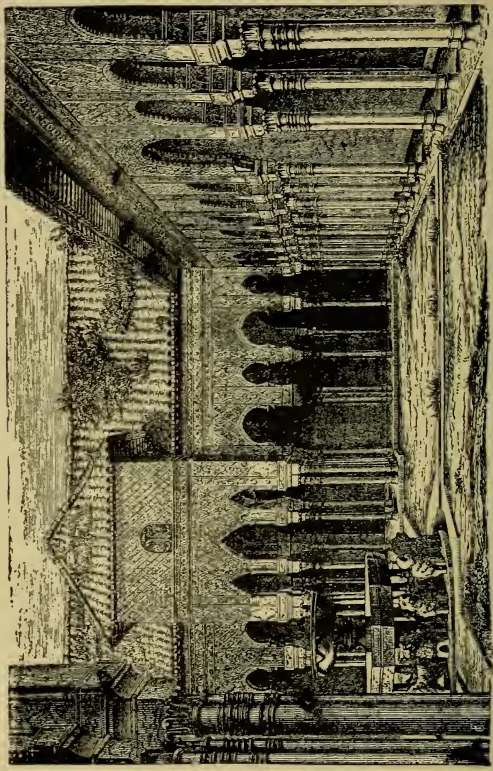


Fig. 130. VIEW OF THE COURT OF THE LIONS IN THE ALHAMBRA AT GRANADA.

a carpet-like treatment, rather than a monumental one, or one based on constructive elements. Light slender columns carry a wall which is covered with various decorative patterns upon stilted arches, which are lightly relieved with filigree work. In spite, however, of the free choice which was allowed in the various forms of the details, the whole seems imbued with a spirit of harmony.

There is a very successful imitation of the Court of the Lions with the adjoining halls, two-thirds of the natural size, at the Crystal Palace, which is well calculated to convey the magic impression which this building must have raised in the days of its splendor, and which it even now creates, although devouring time has robbed it of much of its pristine magnificence.

Since the Alhambra is especially suitable to illustrate the character of the Later Arabian style in Spain, and because the Moorish system of ornamentation found in that building its most splendid and most complete expression, a general description of the details of the Alhambra will not be inappropriate.

135. The architectural style is essentially the same in the different parts of the Alhambra. The columns are very slender and elegant, the height being twelve times the diameter (Fig. 131), and adorned in the interior of the building with various colors and devices. The capital (Fig. 132) is almost always in the shape of a cube with the lower corners rounded off and adorned with interlacing representations of plants, whilst it is separated from the shaft by a long neck with several fillets. The base also is separated from the shaft by a torus, and consists of one simple cavetto only. A rectangular cube rests on the capital and supports a cir-

Fig. 132. CAPITAL OF A COLUMN IN THE ALHAMBRA AT GRANADA

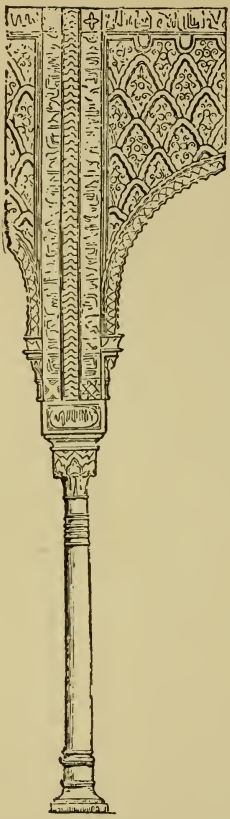


Fig. 131. COLUMN WITH SUPER STRUCTURE IN THE ALHAMBRA AT GRANADA.

Fig. 133.

cular arch with a vertical prolongation of the circumference (stilted arch). The beams which it supports are always adorned with Arabic inscriptions, either along their entire breadth, or interspersed with other ornaments. The arch never terminates directly in the capital or cubical architrave, but finishes on the side of the superstructure. The inside of the arch is not smooth, but ornamented with artistic decorations in stucco, which depend in points and resemble embroidery, richly interlaced and filigreed (Figs. 133 and 134), whilst often they assume the less pleasing shape of stalactites (Fig. 135).

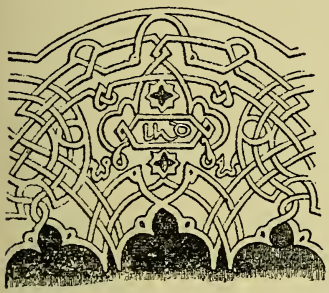


Fig. 134. EMBELLISHMENTS OF THE LOWER SIDE OF ARCHES.

Fig. 135. BORDER OF THE LOWER SIDE OF AN ARCH, RESEMBLING STALACTITES.

136. The walls of the various chambers are uniformly ornamented after the same system, but with greater variety of pattern. The lower part for about three to four feet in height is inlaid with mosaic of a rich design, formed of glazed tiles, and ornamented with a narrow band, over which is a frieze with inscriptions,

which also serve as embellishments, the letters being in tertwined with the ornamentations (compare Fig. 124). Over this frieze there is a square surrounded by a border, which serves as the chief embellishment, and resembles a large carpet with patterns artistically interwoven; and immediately below the ceiling is a broad frieze, which frequently has half-columns as supports for the domes that form the roof. These domes have the stalactite form which has previously been alluded to (Sect. 130), consisting of small groups of niches with dependent points.

The richness of the various details is worked up to the highest magnificence by the tasteful variations of coloring, both in the domes and on the walls. The colors are so arranged, that the most softened are predominant in the lower parts, the deepest on the main surface of the walls, whilst the most brilliant are employed on the remote and elaborate portions of the ceiling. On ornamented surfaces the darker and more powerful colors were generally introduced in the receding portions, and in this way were toned down by the shading of the more prominent parts, which being gilt or painted in light colors were thereby brought into still more prominent relief.

The various colors were either separated from one another by white bands, or this was effected by the shading produced by the relief. The harmony of the entire surface, when painted in various colors and covered with ornamentation in relief, was brought about in the most natural and effective way by means of gilding.

137. By this arrangement of gradual transition from the simple to the artistic and magnificent, and by the proportion of the ornamented surfaces to each other, in

spite of a lavish richness of ornamentation, a desirable harmony is attained, which causes the various parts to blend concordantly, and produces a general impression of repose. The designs of the enrichments contribute to this effect, for being on a small scale, and not concentrated or strongly marked, so as to claim the eye's exclusive attention, they do not detract from the general effect. The patterns in the various panellings have no connection with each other, and present the appearance of detached carpet-patterns, without exercising any influence on the architecture as a whole; and even if the eye be arrested and employed by one particular detail, it has no power to disturb the general survey.

The patterns of these embellishments are, it is true, often very similar, but they are never quite alike, invariably differing in some of their numerous combinations. The inscriptions are introduced sometimes in bold Kufic character, at others with the letters interlacing both in a horizontal and a vertical direction, that is from the bottom to the top of the wall, so that they can only be read conveniently by a person in a recumbent position.

138. It is only in the ornamentation of these surfaces that any artistic taste is displayed in Arabian architecture in Spain; constructive forms are either non-existent or thrown into the background. The more new peculiarities of formation gain ground, the more do the architectonic and constructive elements vanish, and the latter remain in Arabian architecture generally, with its incomplete knowledge of technics, subordinate to the decorative principle. Attention was consequently more directed to the fantastic and elegant, than to the massive and magnificent.

3. Arabian Architecture in Egypt and Sicily.

139. Egypt was subjected to the sway of the Arabs, and to Islam by the Caliph Omar. It formed at first a province of the Great Caliphate, and though it subsequently passed under the rule of independent rulers, it never again attained its former prosperity. The genius of the land remained as before serious and gloomy, and continued to exercise an influence on its artistic productions.

The most important buildings of the Arabs in Egypt which are known to us, and from which our opinion has to be formed of the style of architecture which they introduced into that country, which was modified by its genius, are to be found at Cairo or Musa, which was founded in the tenth century, and became one of the largest and most important cities of the East.

The earlier buildings, of which the oldest is the Mosque of Amrou at Old Cairo founded in 643, are very simple; the latter ones are richer. The richest and most important mosque is that of Sultan Hassan (Melik-el-Hassan), which was constructed in the year 1356 A. D., *i. e.*, 758 of the Hegira. The design varies from the usual form, and the exterior is imposing.

140. In the buildings of Arabian architecture in Egypt, a more solid construction and more powerful forms are perceptible than in the more graceful structures in Spain and Persia, but still a thorough execution and an organic perfection are wanting. Its simplicity has at times something magnificent, which borders, however, on vacuity, a fact which is principally owing to the deficiency in all definite constructive parts.

The style of Arabian buildings in Egypt and Sicily is principally to be distinguished from those which occur in Spain, India, and Persia by the frequent occurrence of the pointed arch, which first came into common use among the Egyptian Arabs. Sometimes it occurred in its simple shape, as in the West, in the so-called Gothic style, but it was generally depressed (see Fig. 117), frequently with a straight prolongation of the haunch. The keel-arch of Persia, and the horseshoe arch are not entirely excluded, but they are of rare occurrence. Still, however, in no building does one distinct form of arch occur to the total exclusion of others.

The arches rest either on pillars, or on plain or moulded piers adorned at the corners with half-columns. Although the arch construction is on the whole predominant, it was not used for the vaulting of large spaces, which were, on the other hand, provided with flat roofs: this was probably partly owing to deficiency in technical knowledge. When vaultings occur, they are generally secured by braces, beams and cement; whilst they are often entirely of wood.

141. The mosques, at least the older ones, consist (see Section 125) of an open court, in which the side of the sanctuary is only distinguished from the rest by various rows of columns. In the middle of the court stands the quadrangular, or octagonal building, covered with a dome, which is intended for ablutions.

In the minarets (Fig. 136) the slender circular shape occurs, as it does in Persia and India, but also the square shape, with round or octagonal substructures.

The dwelling-houses are tasteless externally, according to Oriental custom, with small windows pierced high up in the walls, and with overhanging balconies in the upper stories (Fig. 137), the windows of which, as

Fig. 136.
MINARET AT CAIRO.

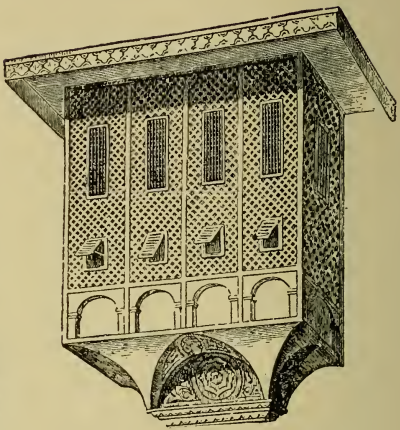


Fig. 137. BALCONY AT CAIRO.

well as those of the lower stories, are secured by wooden lattice-work, which, with its variously intertwining patterns, forms the only, or, at any rate, principal charm of the exterior of the houses.

The interiors, on the other hand, display riches and luxury: a spacious court, paved with various kinds of marble or stone, in varied patterns, and provided with a foundation, is surrounded by open vestibules, beyond which are the doors that conduct to the various apartments, which also have latticed windows.

Ornamentation, as in the Arabian architecture in Spain, plays here too an important part, especially in the embellishment of surfaces. The same fantastic combinations and the same brilliant coloring produce the same effect and exhibit the same shortcomings.

142. In the course of the ninth century Sicily was also subjected to the sway of the Arabs. After the island had attained great prosperity in the tenth century under its new masters, it was again conquered by the Normans under Count Roger, 1090 A. D.

But the Arab element had now become engrafted in the population, and consequently the Norman chiefs favored and advanced the Arabian arts and sciences which they found already existent, and caused buildings to be erected by Arab architects, which accounts for the fact that those structures which were reared during the Christian rule of the Normans still bear an Arabian impress, although Christian elements are mingled with them.

Nearly all the numerous castles and towns which were built in Sicily by the Saracens are destroyed. Two buildings, however, have been preserved at Palermo, in which the style of the Arabs is indubitably recognizable;

the palaces of La Ziza and La Cuba (Fig. 138), which were erected before the period of Norman rule, probably in the tenth century. These buildings, which are less allied to Moorish constructions in Spain than to those at Cairo, have much in common with the latter, as the solid workmanship of the material, the long divisions of the

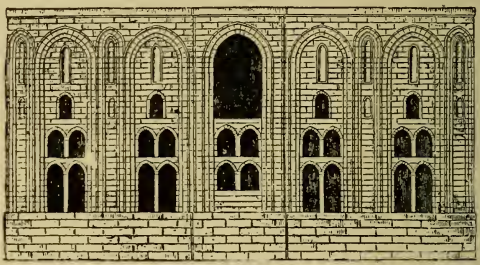


Fig. 138. LA CUBA AT PALERMO.

plain and lofty walls, and especially the pointed arch and the way it is introduced; and finally the favorite embellishment of the façade by the alternation of stone or glazed tiles of different colors, which were introduced in horizontal bands.

4. Perso-Arabian Architecture.

143. In consequence of the battle of Kadesia, 636 A. D., the Persian rulers of the dynasty of the Sassanides were compelled to yield to the Arabs, who burst upon them with the impetuous fury which marked the follow-

ers of that creed which rapidly spread over the whole of Persia. But being a nomad race, and possessing few acquirements, and particularly no architecture of their own, the victors adopted the civilization of the conquered people, in the furtherance of which Greek Christians were also employed. Under the Abassides, in the course of the eighth and ninth centuries, the Arabian and the Old-Oriental elements were amalgamated into one whole. Bagdad was the splendid capital of this dynasty, where under Haroun-al-Raschid, who died in 809, arts and sciences were especially cultivated: still more was this the case under the rule of Mahmoud Jemin-el-Dowlah, who died in 1029 at Ghazni, on the confines of India and Persia.

In the ninth century the artistic reputation of the Arabs was so considerable that the Byzantine Emperor Theophilus caused a summer-palace to be constructed after the design of the palace of the Caliph at Bagdad. Perso-Arabian architecture owes an especial impetus to the construction of fresh capitals, which was necessitated by the frequent change of dynasties. Owing to the Buides, whose seat was at Shiraz (932-1056), and still more owing to the dynasty at Ghazni, on the Indian border (977-1184), Old-Oriental, that is Old Persian and Indian elements exercised an ever-increasing influence, and during the rule of the Mongols (1220-1405), as well as under the Turkish races of the Sofides (from 1505), the same tendency was continued.

144. The strict difference of style between these epochs, which are thus designated by their dynastic names, cannot be indicated, owing to our imperfect knowledge of the buildings in question. But still it may be gathered from the judgment of travellers, who could

scarcely distinguish old from new, that no material alteration had supervened in the constructions of the Mahometan period.

Our information, however, regarding the buildings of a later period is more accurate; as, amongst others, of those of Ispahan, which was founded by Shah Abbas the Great (A. D. 1585-1629), of the dynasty of the Sofides, or Sufis. He caused magnificent buildings, which were mostly of public utility, such as bazaars, caravansaries for travellers, consisting of quadrangular or octagonal courts surrounded by halls and buildings of various kinds, to be erected in his capital.

145. The principal characteristic of the Perso-Arabian style is the arch. Although they are sometimes round or pointed, still they are generally broad with a swelling line and terminal point, not unlike the shape of the keel of a vessel, and therefore called the keel-arch (see Fig. 118). They are, however, devoid of constructive importance, as they do not serve to support anything, but on the other hand, require support themselves; they convey the impression of lightness and freedom, and generally rest on broad piers without columns. Pillars appear only to occur of wood, as supports for horizontal roofs in the halls of the palaces. A further essential component part, at least in all the larger buildings, is the dome. Whilst sometimes of simple hemispherical shape, it frequently is slightly contracted at the base, and runs up into a point above (Fig. 139), it has the bulging form as in Russian architecture, but its shape is nobler and more lofty. The domes are adorned with variegated colors in different patterns.

Internally the vaultings have the stalactite shape, and

are sometimes formed of small flat niches. (Compare Figs. 126 and 127).

The mosques and palaces generally have portals, which consist of a large hall or recess, with a gleaming stalactite vaulting of azure and gold. The minarets

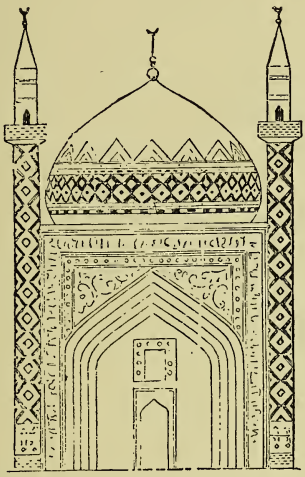


Fig. 139. PERSO-ARABIAN PORTAL WITH DOME AND MINARETS.

are slender and decorated with glazed tiles (Fig. 139). Private buildings are lightly constructed of tiles, and the exteriors are painted in bright but not unpleasing colors, and adorned internally with mirrors and paintings from which the human form is not excluded for the Persians do not observe the prohibition of the Koran in

this respect. These paintings however, have no artistic value, inasmuch as they are deficient in expression, shading and perspective.

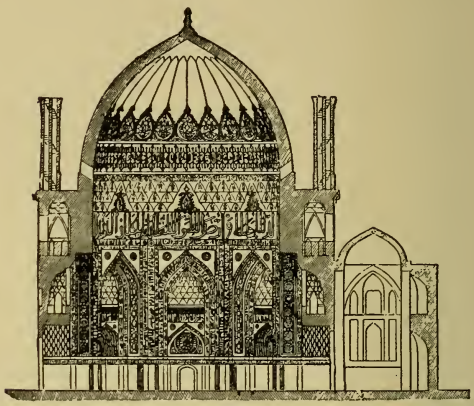


Fig. 140. SECTION OF THE TOMB OF SULTAN KHODABENDAH (A. D. 1303—1316) AT SULTANIEH.

The Perso-Arabian system of ornamentation is not so pure as the Moorish; an effort at immediate representation of nature, such as plants and flowers, is especially noticeable.

Fig. 140 gives the section of a tomb in the shape of a large octangular dome.

5. Arabian Architecture in India.

146. At the end of the twelfth century hordes, which were principally Turco-Tartar in their origin, poured irresistibly into Hindustan, and there founded a permanent Mahometan empire, of which the capital was Delhi. So quickly did this city increase in importance and population, that, at the end of the thirteenth century, it constituted the most brilliant court of the then world, and becoming the largest town in the East, and like a second Rome, was filled with public buildings, mosques, palaces, and mausoleums. This prosperity reached its highest pitch under the rule of the Toglucks (A. D. 1321-1398, particularly under that of Feroze), but it collapsed with their downfall. For the Mongols, who under Timour drove out the Tartars, destroyed Delhi in such a way that only insignificant remains of its former magnificence are remaining. A new conqueror, the Emperor Baber, founded in 1526 the dynasty of the great Moguls, whose residence was Agra, not far from Delhi. Agra soon threw the capital of the former dynasty into the shade, and was adorned with buildings of great splendor. Numerous specimens of their buildings are still in existence, both at Agra and at other places in India, as, for instance, in the neighborhood of the river Jumna, which testify to the love of magnificence and the excellent technical skill of these Tartar races.

147. As characteristic of the monuments erected during the Pathan dynasties, which flourished from the conclusion of the twelfth century till about the end of the fourteenth, it must in general be remarked that the ruins of Old Delhi exhibit an application and pureness

of ornamentation in common with all other Mahometan styles, but at the same time they display to larger proportions and dimensions, and the forms are grand throughout. The domes which occur here, as in all Mahometan styles, are often simply spherical, surrounded at the lower margin with a circuit of battlements resembling foliage; the walls are generally divided by straight belts in a perpendicular and horizontal direction. The openings are sometimes spanned by simple pointed arches of the form prevalent in the West, and at others with keel arches; and in the case of small pavilions with straight entablatures resting on pillars or piers. Still more development and execution is evinced by the monuments of Pathan architecture which were erected at Beejapore in the Deccan. In the middle of the fifteenth century this place was the capital of an independent Mahometan kingdom, but was subjected to the Great Mogul during the latter half of the fifteenth century, and is now only a city of ruins, where, however, many splendid buildings are still standing.

148. In these structures there usually rises over the center of the building the dome, surrounded by battlements resting on a platform, and with a quadrangular substructure. This dome is generally bulbous in shape, bulging out beyond the line of its base, and terminating in a point above; whilst sometimes, but rarely, it is hemispherical. The main plan of the building is generally square, and less frequently octagonal. The walls are always divided by broad perpendicular pilasters which are connected by keel arches, whilst above them massive rectangular entablatures project obliquely, which support galleries, over which battlements of the shape peculiar to this style of architecture, namely, oval shaped,

pointed leaves, form the finish. Octagonal or round towers with small domes distinguish the corners of the building. The arches are always supported by strong square piers without capitals.

The mosques have, as generally in India, the shape of a square, the simple, massive walls of which are ornamented with towers at the corners (Fig. 141). The entrance consists of a large, projecting, tower-like structure, with a lofty gate with a keel arch. In the interior

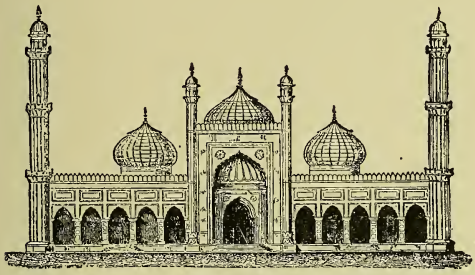


Fig. 141. THE JUMNA MOSQUE AT DELHI.

the court is surrounded on three sides by a simple arcade, whilst the fourth, on which is the sanctuary, is raised somewhat higher, and the doors not being shut, a view into the inner halls is obtained. The mosques are only moderately ornamented internally, whilst the palaces, on the other hand, which have several stories, display every possible richness in embellishment.

149. The gorgeous mausoleums are especially important, of which that of Mahomed Shah is massive and

heavy, but still of striking simplicity, and possesses a dome the span of which exceeds that of St. Paul's, London; while that of his father, Ibrahim Adil Shah, who died in 1626, is lighter and more graceful.

The tombs occupy the middle of a tank, which is surrounded by broad garden-walks, accessible to the public, and connected with mosques, from which the monumental portion stands out prominently. This building generally consists of a square or octagon, bounded by towers or minarets, with four large entrances spanned by arches, which lead to the central space, where the coffins stand under the dome on a raised platform, shut off by a balustrade, richly adorned with mosaics. This form, although the usual one, is not of universal application, for there occur, also, pyramidal designs something similar to the Dagoba, consisting of open halls with stories. The richest and most charming of all these tombs is that of the Taje Mehal.

In general all these buildings exhibit a stately yet simple character, which is decidedly an improvement on the ordinary Mahometan styles. This is joined with a certain richness of details and with the full and luxuriant forms of the East, whilst here and there the influence of early Indian architecture gave rise to curious details, which did not correspond with the otherwise noble forms of these structures, as, for instance, the barbarous ornament of chains of stone worked out of a single block. The style of the buildings at Beejapoor is similar to that of those at Agra, and the splendor of the whole of the designs corresponds: the walls of the interior are richly inlaid with mosaics formed of precious stones.

150. The magnificent buildings with which Shah

Jehan-Abad richly adorned New Delhi in the seventeenth century are essentially the same in style as those at Beejapoor, but their character is more elegant and less stately. The forms still are, however, praiseworthy, the main lines are well defined and uninterrupted, and the divisions symmetrical. The walls are higher and simpler, the entablatures are less projecting, and the bastion-like corner towers do not always occur. A very customary composition consists of a large gateway in the center of the wall, with a broad keel arch, on both sides of which the walls, which are relieved by windows or arches, are divided by perpendicular belts and horizontal lines (Fig. 141).

6. Turkish Architecture.

151. The last stage of Arabian architecture is that of the modern Turkish Empire.

After the conquest of the Grecian Empire by the Turks, that people made use of the buildings which they found ready at hand, as they had done in other instances previously, and they fell into the Byzantine style, with the admixture of oriental forms in the details

When, after the fall of Constantinople in 1453, Mahomet II. began to adorn his new capital, he made use of Christian art and Christian architects. The Christian churches were dedicated to Islam, and under the guise of a mosque, the Church of Sta. Sophia soon came to be considered as very sacred. We consequently find that Arabian architecture, in its Turkish phase, did not undergo the same development as it did in the other countries where Mahometanism was the prevailing creed.

Owing to this imitation, of existing Byzantine forms, of which the Church of Sta. Sophia was the highest model, and to the employment of the materials such as pillars, &c., which were available from the older Byzantine buildings, a very great similarity exists between the mosque and the Christian church. The principal difference consists in the lively decoration of the interior, and

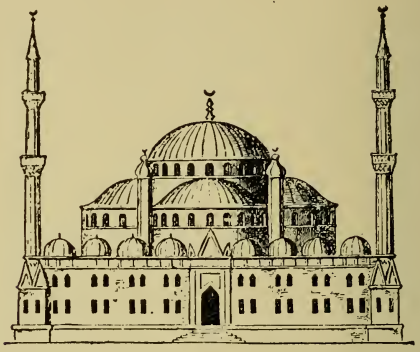


Fig. 142. FACADE OF THE SULTAN AHMED MOSQUE AT CONSTANTINOPLE.

the introduction of inscriptions instead of sculpture, which is common to all Mahometan buildings, and finally in the addition of slender minarets and the indispensable fore court.

The most splendid of all the mosques of Constantinople is that of the Sultan Ahmed (A. D. 1600) (Figs. 142 and 143); which, after Byzantine fashion, forms a large square, and supports in the center a vast dome on

massive fluted piers; from the central dome depend four semi-domes, whilst four still smaller domes are introduced at the corners. In the newest of the domes of importance, which was completed by the Sultan Osman at the end of the seventeenth century, one dome covers the entire building.

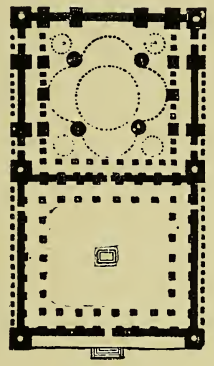


Fig. 143. GROUND-PLAN Fig. 142.

In the architecture of palaces the modern western construction has lately been adopted at Constantinople and Alexandria.

152. The essential particulars of the individual Arabian styles amongst the various Mahometan nations having now been considered, it remains to take a general survey of them when treated as a whole.

It must firstly be remarked that owing to the immense diffusion and difference of origin of the nations which

embraced the creed of Mahomet, and owing to the heterogeneousness of the older native styles which prevailed at the time of its expansion, it was impossible that one uniform style should be developed in one and the same way, although it started from one and the same point. This accounts for the little similarity that exists between buildings in the Arabian style as they occur in India or in Spain, or amongst the Turks in the Byzantine empire. But in spite of the heterogeneousness of the nations of Islam, a common stamp is visible in all; and consequently their buildings, although they vary considerably from one another, display a common peculiarity, which distinguishes them clearly from those of other nations, and which is highly characteristic of the tendencies of Mahometanism.

153. Speaking generally, a definite totality of design is wanting in Mahometan buildings; for it is obvious at the first glance that the faulty forms of the exterior by no means correspond with those of the rich and elaborate interior, and that the essential constructive parts appear incomplete and meaningless. Unity of form yields to arbitrariness, as is shown by the manner in which piers and pillars, vaults and arches, of the most different kinds are jumbled together; so that by the want of constructive skill in the treatment of these forms, both pillars and arches lose their intended effect, and appear unreal and feeble. Domes are readily introduced everywhere, but they are never in organic connection with their rectilineal substructures, but always seem to rest on them in a capricious manner.

It must further be remarked of Arabian architecture collectively, that the system of ornamentation is based principally on the decoration of flat surfaces. The plastic

element could not be developed or even admitted, chiefly in consequence of the prohibition of sculptural representations by the Koran, and partly because all taste for this branch of art was wanting.

The application of the pointed arch is also characteristic of Arabian architecture, but it was not carried out constructively and harmoniously as in the Gothic styles of the West, but employed rather as a decorative detail.

154. From all these peculiarities viewed collectively, it appears that the main characteristics of Mahometan architecture are caprice and a striving after contrast. The latter tendency, however, is manifested in such a way, that, in spite of all its shortcomings, it asserts a certain pre-eminence, so that its deficiencies are not always apparent.

In details, however much they vary in the different Mahometan countries, the skill and quaintness of a versatile and bold imagination are always manifest.

155. Still more characteristic and universally met with is the stalactite vaulting which has been described in section 130, as also the decoration of the walls with the arabesques, which are peculiar to Arabian art, and have given their name to that species of ornament.

These arabesques display so much ingenuity and taste, and such variety and grace in their designs, that they attain perfection in their own branch, in spite of the exclusion of everything imitative. Although regularity is persistently avoided, yet certain rules are recognizable. Thus, for instance, the straight line, which is employed in most of these ornamentations, never forms a right angle, at least not one that appears so, for when the design seems likely to produce one, the line is slightly prolonged, so as to bring about a complication of the pat-

tern, or the right angle, if already begun, is broken off, and the line produced in another direction, so as to give rise to fresh intricacies. These lines have, moreover, generally an oblique bordering, so that they never form diagonals of the panelling. By the different disposition of the lines, besides many irregular designs, various

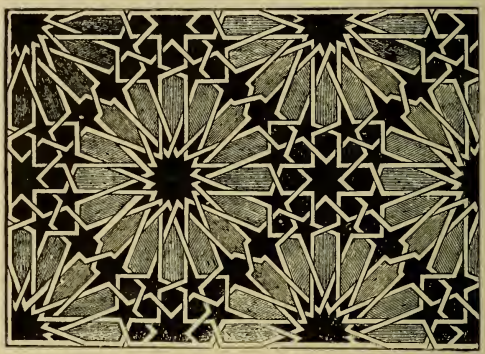


Fig. 144. MURAL DECORATION AT THE ALHAMBRA AT GRANADA.

polygonal forms, such as stars, &c., are produced, the lines of which are extended beyond the point of an intersection, as shown in Fig. 144. In arabesques in which circular lines are predominant, the treatment is free, but they seldom form a circle or any other mathematical figure, but rather flowing curves, which have a rich and graceful effect.

A very simple and characteristic way of forming a marked contrast is by repeating the design in two colors in an inverse direction. (Fig. 145.)

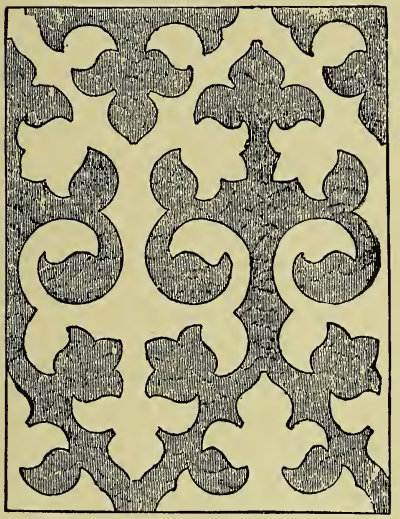


Fig. 145. ARABESQUE, WITH REPETITION OF THE DESIGN IN AN INVERSE DIRECTION.

156. Colors are universally employed in these arabesques, as they are in Arabian art in general, with great taste, and with a due appreciation of moderation; not only the usual decorative colors, as red, blue, white, and gold, but also green, violet, brown, yellow, and even black. In the lower decorated portions green, white,

black, violet, blue, and dark yellow predominate; on the walls the ground is red, the borders sky-blue, and the letters gold, while the stalactite domes and the little niches are generally gilt, or brightly painted with red and blue enrichments on a white ground.

THE ARCHITECTURE OF THE RENAISSANCE.

157. The series of original styles of architecture closes, strictly speaking, with the various styles that have been described in the foregoing divisions of this work, for all the new phases which have presented themselves in the domain of architecture since the abandonment of the Gothic style are more or less imitations of what previously existed, or, at the most, new combinations of elements which had already been employed. The manner of their reapplication exhibits, on the other hand, a decided change, and many forms which were unknown in earlier times were developed in consequence of this reapplication, especially in the later period of the Renaissance style.

As early as the beginning of the fifteenth century, art commenced to take a new course of development, which, accompanying the employment of the pointed arch during the latter part of the prevalence of the Gothic style, was speedily extended in all directions.

The discovery of the productions of the ancients in statuary and painting, and the study of these works of art which was thereby stimulated, as well as the renewed interest in classical literature which was contemporaneously aroused by the long-hidden stores of Greek and Latin MSS. being brought to light, as, for instance,

the work of Vitruvius on the architecture of the ancients, could not fail to bring Roman buildings into prominent notice, and to predispose the public mind in favor of the classic style. Science, moreover in accordance with the spirit of the age, began, like art, to be classical rather than romantic.

A new system was consequently developed, during the first stages of which, namely, the Transition period, the elements of Roman architecture came again into use, although the forms which belong to the Later Romanesque period, as, for instance, the division of the window-arches by mullions, were not entirely abandoned.

158. This new style of architecture, which is known by the distinctive name of the Renaissance, that is to say, the new birth of Roman architecture, first sprang into existence in Italy as early as the beginning of the fifteenth century. It reached its zenith in that country in the course of the same century, and at the beginning of the following became a model for all other countries, in which, however, the Gothic style prevailed for some time longer, and maintained its ground against the encroachments of its rival. In Italy, on the other hand, the Pointed style was abandoned, except in isolated instances, and notably in Lombardy. The style which was thus introduced into the countries north of the Alps was consequently accepted there as one which was already developed, and the buildings constructed in it were mere imitations of the Italian; moreover, after it was introduced, it underwent no further change or development, and on that account was designated, especially in Germany, as the Italian style. It will therefore be sufficient to describe its phases and characteristics as they appear in Italian buildings.

The same reasons which militated against the development of the Gothic style in Italy were instrumental in occasioning the ready and definite acceptance in that country of the forms of ancient architecture. The large number of monuments of classical antiquity existing in Italy must have been favorable to the change, particularly as their influence had remained effective during the whole period of the Middle Ages.

159. At the early epoch of its existence the new style of architecture displays not so much an alteration in the arrangement of the spaces and of the main features of the buildings, as in the system of ornamentation and in the aspect of the profiles. The object and construction of the buildings of the period in question were very different from the colossal monuments of ancient Rome, which were now to serve as an example, and consequently the model was mainly copied in the decorative details, principally in the columnar orders with their various entablatures. It is owing to this cause that the façades appear to a certain degree to be merely appendages to the main building. Architects, moreover, could not at once abandon the customary freedom of conception which had been permissible in the Romanesque style, nor subject their imagination to the strict rules of Roman architecture by surrendering all endeavors to attain picturesque effects. Roman architecture was consequently not at first a model which secured that slavish obedience which became its prerogative in later times. At the outset, moreover, the essential character of Roman architecture was not fully understood, as far as material and construction are concerned. It was consequently only in the case of buildings which did not require a total abandonment of the prevalent style that Roman architecture was at first employed.

In accordance with the tendency of the age, ecclesiastical architecture, which had assumed such prominence during the prevalence of the Byzantine, Roman-

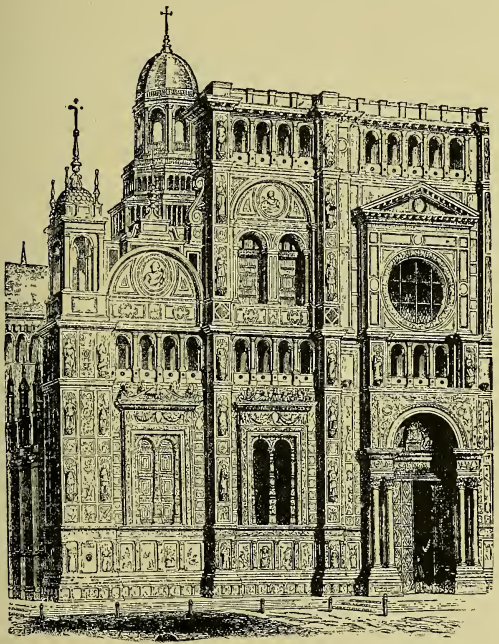


Fig. 146. VIEW OF A PORTION OF THE CERTOSA AT PAVIA.

esque, and Gothic styles, was now thrown into the background, whilst the style of the Renaissance was brought to the front in the construction of castles and palaces.

The varieties that occur in the style of the Renaissance are therefore not to be considered, as in the case of the previous styles, as the result of time and national peculiarity, but rather as the effects of individual and assumptive personal conceptions.

The first period of this modern style of architecture is also its brightest one. The façade of the Certosa at Pavia (Fig. 146) may be cited as the most notable instance. This was begun by Ambrogio Borgognone in 1473, and is very rich in sculpture; but the rest of the building, with the exception of the dome, which is also Renaissance, belongs still to the Gothic period.

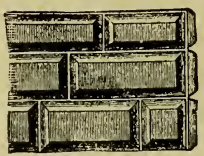


Fig. 147. BOSSAGE OR RUSTIC-WORK.

During the early period the endeavor was maintained to adapt classical forms with more or less freedom to modern buildings, whilst later, that is in the sixteenth century, a scheme based on ancient architecture was universally prescriptive. Two distinct styles belong to this first period, each possessing its especial peculiarities. These are: The Early Florentine and Early Venetian Renaissance styles.

In the Roman Renaissance the system of the second period, which confines itself more closely to classical elements, is more prevalent. This Roman Renaissance

was subsequently most widely extended, and was introduced into Venice, and to a less degree into Florence.

The invention of printing exercised a considerable influence on the development of this second system. The works of Vitruvius were translated into Italian and printed in 1521, and were soon extensively circulated. Owing to the tendency and predilection for classical antiquity which were then beginning to be displayed, as well as to the scanty knowledge of Roman architecture which the world then possessed, it is not to be wondered at that these works soon came to be viewed as an authority. But although the writings of Vitruvius, and laws of architecture based on the classical monuments themselves, were considered as authoritative, still the traditional forms were employed in a new spirit and in a new manner. A striving for the picturesque is perceptible amidst the massiveness of the new style. At first this tendency was confined within discreet bounds, but after the first twenty years of the sixteenth century it was extended to an undue degree.

160. The Pitti palace, which was constructed by Brunelleschi, may be considered as the lasting type of the Florentine Renaissance style, at least as far as the architecture of palaces is concerned. These palaces (as is shown by Figs. 149 and 150) are constructed in rustic-work, that is to say, of large blocks of stone with broad joints, of which, during the early period, only the splayed or rounded beds and joints were dressed, but at a later epoch these ashlar-blocks were more elegantly treated, and rustication was of more frequent occurrence. The effect of this bulky rustic-work is considerably heightened by its advancing prominently before the line of the façade; indeed this projection is often to the ex-

tent of from a half to a whole foot. The façade, which thus obtains an appearance of great solidity (Fig. 148), is terminated by a very massive and widely projecting cornice supported by consoles, and is pierced by windows with semi-circular heads and deeply-moulded architraves. The windows constitute a space which, being kept plain, forms a pleasing contrast with the heavy appearance of

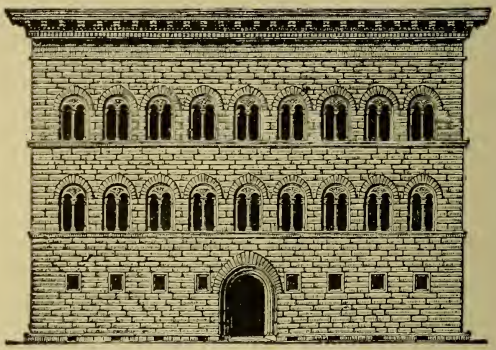


Fig. 148. STROZZI PALACE AT FLORENCE.

the whole façade and a far from unharmonious effect being thereby produced, the building seems to be relieved and animated. The windows are divided by a small shaft into two halves, after the mediæval fashion, and these are both spanned by a semicircle over the impost of the arch of the whole window. Between these two small semicircles and the main arch of the window there is generally inserted a circle, at the sides of which are formed small triangular panels, which are sometimes

pierced with tracery work, or occupied with an enrichment of foliage, whilst at others the panels are left nearly plain.

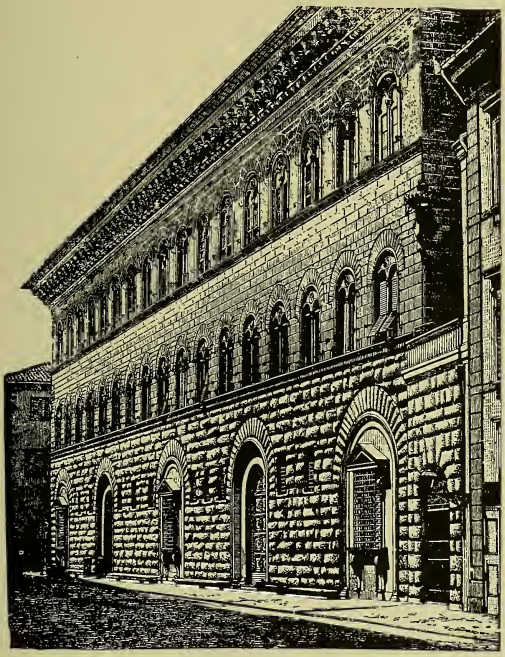


Fig. 149. RICCARDI PALACE AT FLORENCE.

An expression of great massiveness is the main characteristic of this Florentine style, which was principally applied in the architecture of the palaces. The forms

which were borrowed from the Roman columnar construction do not in this style, as they do more or less in the other style of the Renaissance, constitute a pseudo-architecture. The massiveness, however, of the Florentine palaces conveys rather the notion of a fortress than of the mansion of a wealthy nobleman, and this impression is increased by the smallness of the windows in comparison with the rest of the building. This is especially the case with those façades which are entirely constructed of considerably projecting ashlar of irregular size, and to a less degree in the case of those the lowest story of which alone displays these large undressed blocks (Fig. 149).

Those palaces which like the back of the Strozzi Palace (Fig. 150), are constructed of dressed blocks with a less decided projection, present a more elegant appearance.

161. The Florentine palaces which have just been alluded to are, generally speaking, less suitable than all other varieties of the Renaissance style for reproduction and imitation in the mansions and dwelling-houses of our aristocracy and citizens. At any rate important modifications would have to be carried out, such as a toning down of the too prominent masonry blocks, and the total avoidance of that roughness which must necessarily ensue from the employment of blocks of unequal size and arranged after an irregular fashion.

There exist, however, a few Florentine palaces of a smaller type, which externally present a more habitable appearance. In these rustic-work is not the all-important feature, but it is only employed for the quoins of the façade, though it sometimes extends to the whole of the ground-floor. The roof, which projects very considerably, and shows the wooden construction, is not in ac-

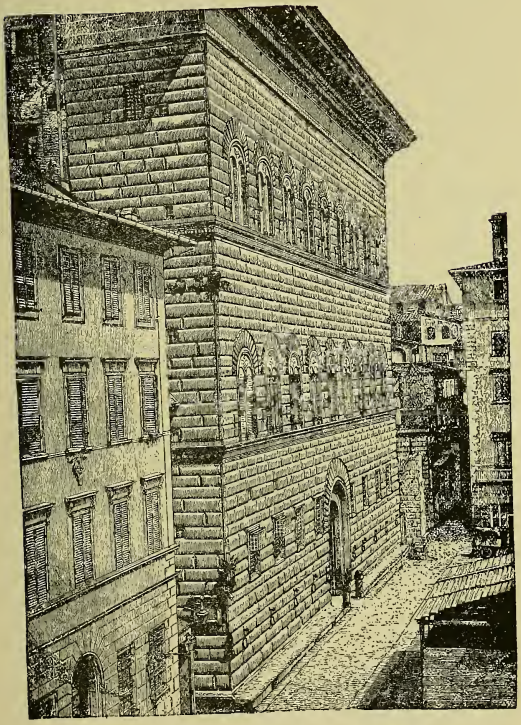


Fig. 150. STROZZI PALACE AT FLORENCE.

the case of the Gondi Palace, which was constructed by San Gallo.

During the early period of the Florentine Renaissance the simple basilica shape was generally chosen for churches of San Lorenzo and San Spirito were constructed in this style at Brunelleschi; but subsequently,

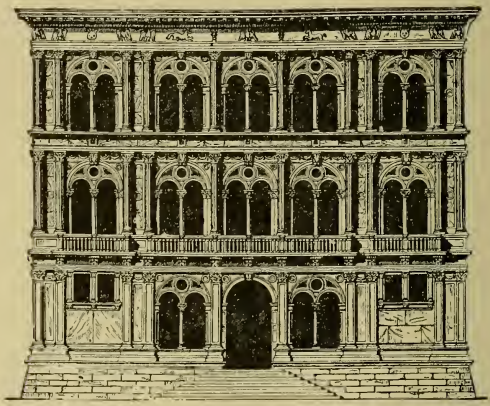


Fig. 153. VENDRAMIN PALACE AT VENICE, BY PIETRO LOMBARDO.

as elsewhere in Italy, the Roman vaulted forms, after the model of St. Peter's, in conjunction with the domical construction, were universally employed, even in the case of small churches.

163. The Venetian Renaissance style first sprang into existence towards the end of the fifteenth century, and

flourished till the close of the sixteenth. This style, like the Florentine, comprises various shades of difference, and is principally remarkable in connection with the architecture of palaces. The arrangement remains similar to the ancient Venetian system, as far as regards the internal distribution of spaces and the division of the façade into main groups, whilst the individual details, as, for instance, the columns and arches, are constructed in accordance with the Roman system. Whilst the Florentine palaces present an imposing appearance, by their simple massiveness, and strike the beholder as severe and gloomy, the Venetian palaces, on the other hand, offer a striking contrast to the same by the elegance and richness of their architecture.

164. A certain originality and freedom of invention is perceptible in the buildings of the early period of the Venetian Renaissance style; the old style is happily blended with the new, which during this first stage is still imbued with Romanesque conceptions (Fig. 153).

A method of decoration is peculiar to these buildings which appears to have been borrowed from Byzantine models. Fine marbles of various colors, of which red porphyry and green serpentine are the most frequent, are inserted in circular and angular panels and borderings, and form a sort of mosaic-work. This style of ornamentation is employed both in churches and palaces, and gives a peculiarly rich and elegant appearance to the façades. Another peculiarity which was borrowed from the Byzantine style consists in the employment of semi-circular gables, both in churches, as in the case of the Santa Maria dei Miracoli, and also in public palaces, of which the Scuola di San Marco is a brilliant example (Fig. 154).

A beautifully picturesque effect is often produced in Venetian palaces by their effective composition, see Figs. 153 and 155.

165. In the first or transition stage of the new style, that is to say, at the end of the fifteenth and beginning

Fig. 154. FACADE OF THE SCUOLA DI SAN MARCO AT VENICE; NOW A HOSPITAL.

of the sixteenth centuries, the productions of Pietro and Martino Lombardo are especially noteworthy (see Figs. 153 and 154). A more determined imitation of Roman architecture is subsequently perceptible in the productions of San Michele during the first half of the sixteenth

century. The conceptions of this architect had a considerable influence on his contemporaries and successors, and display a certain independence and originality (Fig. 155). Next in order are the productions of Jacopo Tatti, or Sansovino, who was born in 1479, and died in 1570.

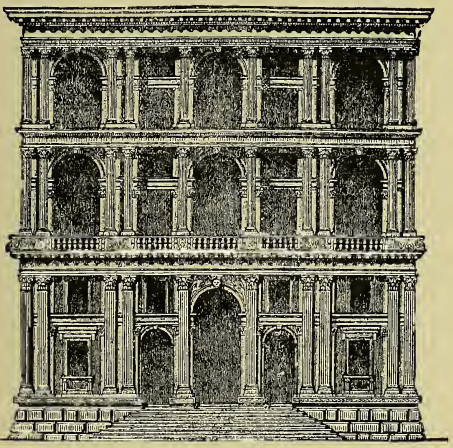


Fig. 155. GRIMANI PALACE AT VENICE, BY SAN MICHELE.

This architect was educated in the Florentine school, and afterwards proceeded to Rome; his masterpieces are less powerful and imposing, but on the other hand are more graceful, and display more richly developed details than those of San Michele (see Fig. 156). In these buildings, as well as in the Vendramin Palace by Pietro Lombardo,

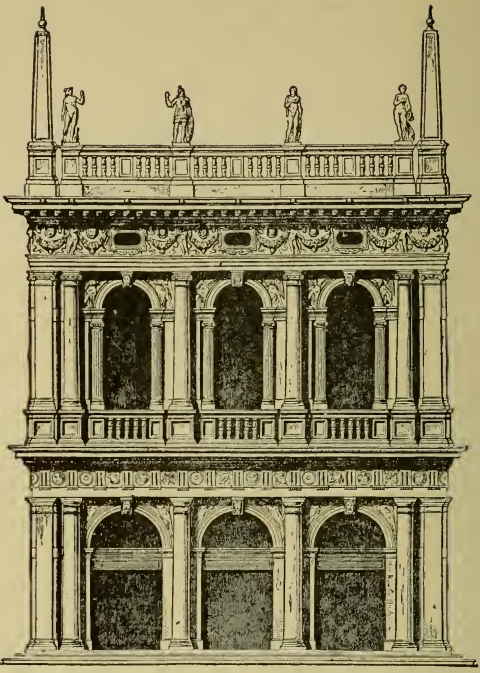


Fig. 156. THE OLD LIBRARY OF ST. MARK AT VENICE, BY SANSOVINO.

which belongs to the first period, the different stories of the façade are ornamented by orders of half or three-quarter columns, which are placed at the sides of the openings, which themselves have semi-circular heads, and the façade is consequently less stiff and heavy than it

appears in instances where Roman architecture was more strictly and decisively employed.

165. Another modification of the style which conformed more closely to the Roman models and to the precepts of Vitruvius than the architecture which has been mentioned in the preceding paragraph, was shortly

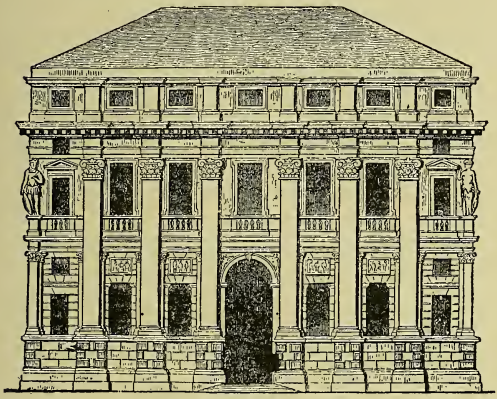


Fig. 157. PALACE AT VICENZA, BY PALLADIO.

afterwards introduced by Palladio. It is consequently only in a local point of view that it can be designated as Venetian, because as regards style it falls under the category of the Roman Renaissance. Palladio, who became the special champion of this style of architecture, was born at Vicenza in 1518, and died in 1580. He was undoubtedly a man of great talent, and, after Michel-Angelo, exercised, perhaps, more influence than anyone else on ar-

chitecture. Still the introduction of great confusion of ideas is attributable to this architect, for he adorned buildings of every kind and of most varied purposes and

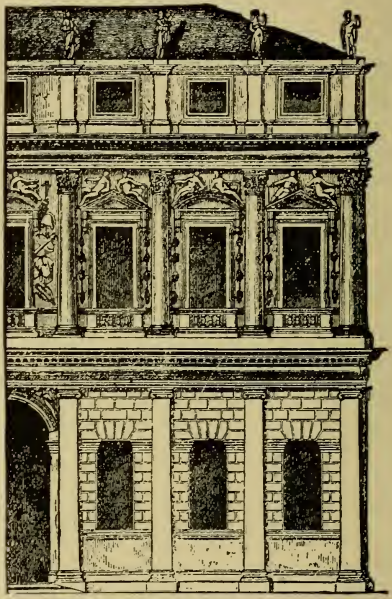


Fig. 158. HALF OF THE FACADE OF A PALACE AT VICENZA, BY PALLADIO.

arrangement with classical temple portals, without taking into consideration their object or the requirements of the building as a whole, so that the order was frequently

carried up through several stories without any reference to its arrangement. But although these reproductions of columns and the employment of pilasters were meaning-

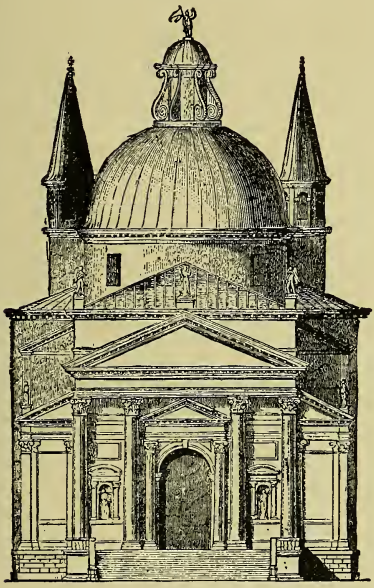


Fig. 159. ST. SAVIOUR'S, VENICE, BY PALLADIO.

less in themselves, they served, in a merely decorative point of view, to give a striking appearance to the buildings (Fig. 157).

The lower story of palaces built by Palladio, the greater part of which are at Vicenza, is generally of rus-

tic work, whilst the upper stories have pilasters or a colonnade; occasionally, however, pilasters or arcades are introduced on the ground-floor (Fig. 158).

More than one cause served to render the compositions of Palladio so celebrated. He possessed an especial felicity in the arrangement of his ground-plans, particularly in instances where he had an unlimited space at his disposal. His command, moreover, of good proportion, ren-

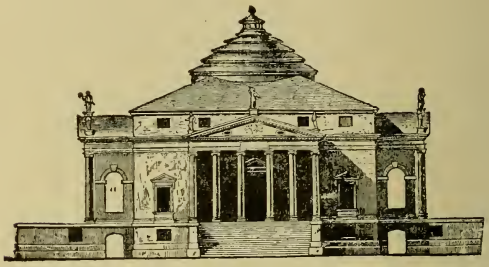


Fig 160. VILLA, BY PALLADIO.

dered his combinations of civic and sacred buildings most pleasing to the eye; whilst the columnar arrangement of his entrances conveyed an agreeable, and at the same time dignified, impression (Figs. 159 and 160). Consequently the works of Palladio, although often composed of heterogeneous elements, remained for a long period the model for an entire style; and even in the eighteenth century, when the total deterioration of architecture, as exemplified in what is called by the Germans "the Zopf-und-Perrücken Styl" (pigtail and periwig style), led architects again in the direction of

the classical, the designs of Palladio became anew a subject of study. Even in the present day they are often immoderately praised by those who are not really conversant with the principles and requirements of art, and who are ignorant of the history of the development of architecture.

Fig. 161. THE DELLA SALUTE CHURCH AND CUSTOM HOUSE.

The most noteworthy of the successors of Palladio at Venice were Scamozzi, and Longhena, the architect of the Della Salute church (Fig. 161).

Some of the churches of this style retain the Byzantine system of the Greek cross with barrel-vaultings and a central dome resting on four pillars or piers. Others,

again, have the form of the basilica, but with a system of vaulting of their own, which produces a beautiful effect. This system consists of a series of large domes in the nave, and of smaller domes in the aisles, all resting on pierced masses of masonry with barrel-vaultings connected with them, as, for instance, San Salvatore.

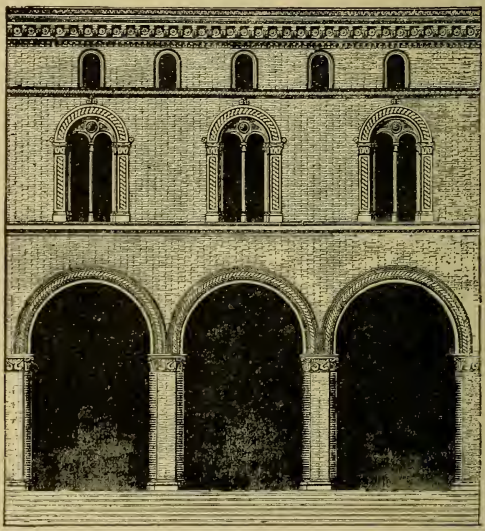


Fig. 162. FACADE OF A PALACE OF ROUGH BRICK AT BOLOGNA.

166. Owing to the rarity and expensiveness of free stone in Upper Italy, an architectural style in brick was developed side-by-side with that which has just been touched upon. This material had already been employed

in the foregoing period for churches, and it now came into frequent use in the construction of the palaces. Bologna is especially rich in palaces of this description, which, with an admixture of earlier forms, belongs for the most part to the Early Renaissance, with semicircles for the heads of the openings, as was necessitated by the character of the material (Fig. 162). The easy multiplication of the ornamental parts in burnt clay, generally led to an undue increase of the decorative element. Inasmuch as the main streets of Bologna have arcades running along them of which the individual palaces only embrace a portion, these buildings do not present the appearance of being totally detached, but seem rather parts of the entire front of the street, and show much similarity in the architecture of their façades with that of the arcades themselves.

167. The Roman Renaissance style. The Roman Renaissance style displays likewise several variations or shades of difference, although the diversities are not so striking as in the Venetian. Whilst the intellectual tendency which caused and fostered the Renaissance in Italy owed its origin mainly to Florence, and was cultivated in that town and in Upper Italy, Rome was suffering under very unfavorable circumstances. Brunelleschi, Alberti, Michelozzo, Benedetto da Majano, Cronaca, Sansovino, and others who, feeling the power and worth of the ancient monuments of Rome, began to make a study of them, and thus gave an impulse to the resuscitation of Roman architecture, were no Roman artists. It was only when the poetic breath of the first inspiration had vanished that Rome began definitely to play its own part in the Renaissance, and to mark out and limit the manifold variations which had been brought about by

the most prominent architects of the different schools. The first and most important school of the Roman Renaissance was originated by Donato Lazzari, known under the name of Bramante (1444 to 1514); this was joined by Balthazar Peruzzi and Antonio di Sangallo; another school was represented by Giacomo Barozzio, known as Vignola (1507 to 1573), whilst a third was directed by Michel-Angelo Buonarotti (1474 to 1564), and by its arbitrary character formed a stepping-stone to the Rococo style which succeeded it.

It was the productions of the above-mentioned architects, as well as those of some others of note, which mainly determined the future course of the Roman Renaissance style, and that not for Rome only, but for all countries; for the palaces and churches of Rome came gradually to be regarded as models, and the Roman Renaissance style was extended over the whole civilized world both during the period of its prime and that of its deterioration.

Except during the period of transition, the Roman monuments and the rules gathered from the writings of Vitruvius, were in general adhered to. When, however, the antique forms did not suit the buildings which new requirements and customs necessitated, an arbitrary deviation was considered permissible, without the rules in question being totally abandoned. A dry method of treatment is the result, which contrasts unfavorably with the freer and more poetic transition period from the Romanesque to the Classical style.

At the period of the earliest development of the Roman Renaissance, free treatment, after the Romanesque method, is exhibited in a much less degree than in the Florentine and Venetian styles; but on the other hand

the Roman Renaissance was from the commencement much more correct as regards its conformity to the ideas of ancient Roman architecture.

168. The productions of Bramante himself, who was the first Roman architect of note, display two different tendencies, of which the earlier, having its origin in

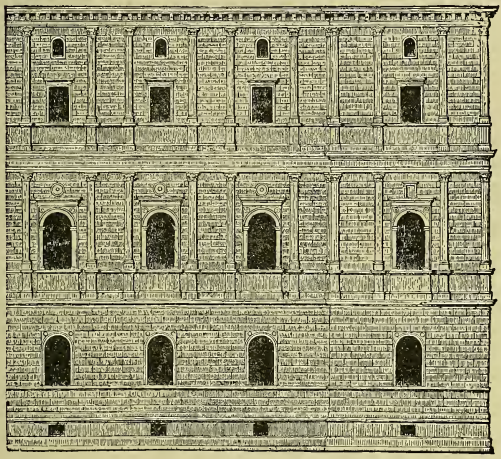


Fig. 163. PART OF THE FACADE OF THE CANCELLERIA AT ROME.

Upper Italy, exhibits more originality together with Romanesque proclivities, as for instance the Choir of the Church of S. Maria delle Grazie at Milan; whilst the later is more strictly in conformity with the antique; a result which was brought about by the archi-

tect's study of ancient Roman monuments. The most remarkable productions of Bramante at Rome are the Cancelleria Palace (Fig. 163), with the Church of San Lorenzo in Daaso contained within its precincts, the Giraud Palace, now the Torlonia (Fig. 164 and Fig. 165 with details of the same), and the Court of the Vatican, with the celebrated Loggie, decorated by Raphael. Bramante also drew the plan of St. Peter's,

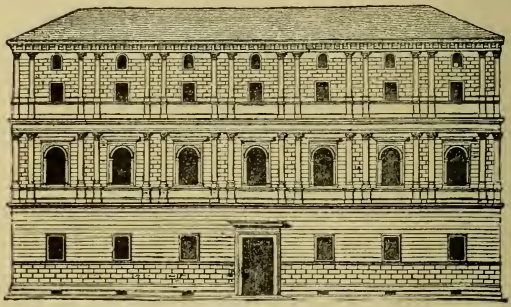


Fig. 164. GIRAUD PALACE AT ROME.

which was afterwards subjected to so many alterations. According to the original design, the church was to have been constructed in the form of a Greek cross, with each of the four ends terminating in a semi-circle, and with a central dome. In the severer forms of this architect's productions a poverty and insipidity is already discernible, which contrasts strongly with the more imaginative and poetic treatment of other structures which are remarkable for their gracefulness. A

want of power in details is one of the most conspicuous of Bramante's failings, and this of course is more noticeable in his later productions, when ancient Roman models were his study, than in his earlier works.

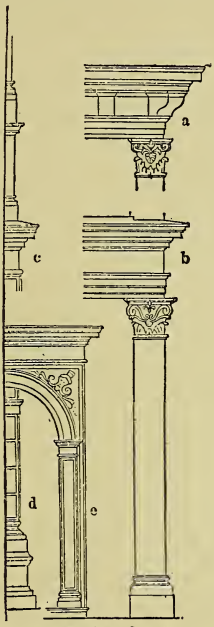


Fig. 165. DETAILS OF Fig. 164 ON AN ENLARGED SCALE.

169. The pupils of Bramante and other renowned architects pursued the path which he had marked out; as, for example, Balthazar Peruzzi (1481 to 1536, Fig. 166); as the principal of his works may be mentioned

the Farnesina at Rome: Ant. di Sangallo of Florence (died 1546), whose principal work in the Farnese Palace at Rome (see Fig. 167, and parts of the same on an enlarged scale in Figs. 168, 169, 170). The third story of this palace is, however, the work of Michel-Angelo. The Farnese Palace forms to a certain

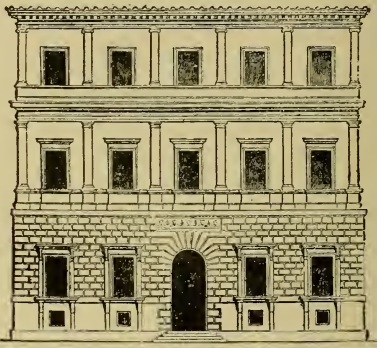


Fig. 166. SMALL PALACE AT ROME, BY BALTHAAZAR PERUZZI.

extent the type of a distinct class in the architecture of Roman palaces, and its chief characteristics is, that the facades are not divided by any orders of columns or pilasters, as for instance in Fig. 166; but the same effect and impressions are produced by the architraves, cornices, and plinths of the windows, which invariably have rectilineal terminations, as well as the doors, and also by the string-courses which divide the stories, and by a far-projecting cornice: at the same time especial consideration is devoted to the effect of good propor-

tions. Ornaments are but sparingly introduced; whilst, on the other hand, the corners are generally marked by rustications.

These palaces convey the impression of solidity without cumbersomeness, of richness without luxury, and above all, of simplicity in conjunction with dignity.

In the constructions of Bramante's nephew and pupil, the celebrated painter, Raphael Sanzio (1483 to 1520), there is perceptible a certain tendency towards pic-

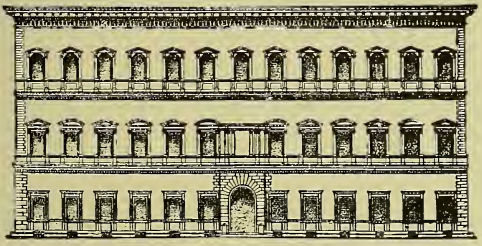


Fig. 167. FARNESE PALACE AT ROME.

turesque effect and attention to detail; this is evidenced in the palaces built by him at Rome, and especially in those at Florence: but this tendency is displayed with more freedom in the works of Raphael's pupil, Giulio Romano (1492 to 1546), who, amongst other works, was the architect of the Villa Madama at Rome, and the Palace Del Te at Mantua.

170. Another school, which displays a still stricter imitation of classical forms than that of which Bramante was the founder, was represented and advocated by Giacomo Barozzio, who is known under the name of

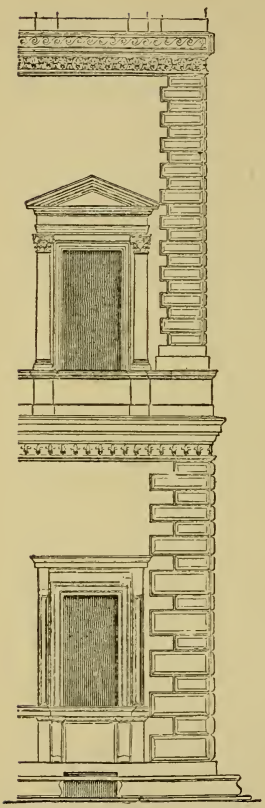


Fig. 168. PORTION OF Fig. 169 ON AN ENLARGED SCALE.

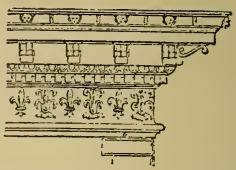


Fig. 169. CORNICE OF Fig. 167 ON AN ENLARGED SCALE.

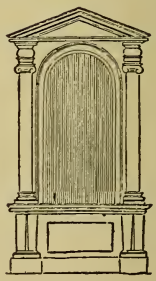


Fig. 170. WINDOW OF THE UPPER STORY OF THE FACADE OF THE FARNESE PALACE IN Fig. 169.

Vignola (1507 to 1573). This architect, by his works and his teaching, exercised very great influence on his contemporaries and successors, and the effect of his example is, like Palladio's, to be traced not only in the architectural bias of his own times, but also in the course of the eighteenth century. This result was principally brought about by means of his book on the five columnar orders of antiquity, and this treatise has been regarded as an authority down to the latest times. His most noteworthy construction is the Castle of Caparola, between Rome and Viterbo (Fig. 171).

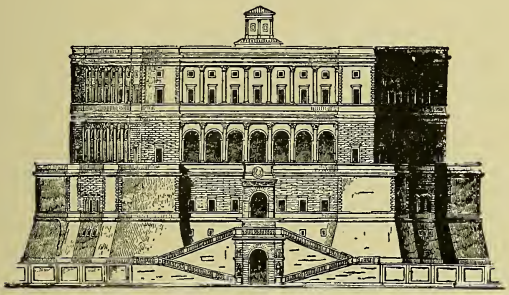


Fig. 171. CASTLE OF CAPRAROLA, BETWEEN ROME AND VITERBO, BY VIGNOLA.

171. The third school was developed contemporaneously with the above by Michel-Angelo Buonarotti (1474 to 1564). This great genius had extraordinary and excessive views, and could not consequently accommodate himself without reservation, as his contemporaries did, to the principles and rules which had already

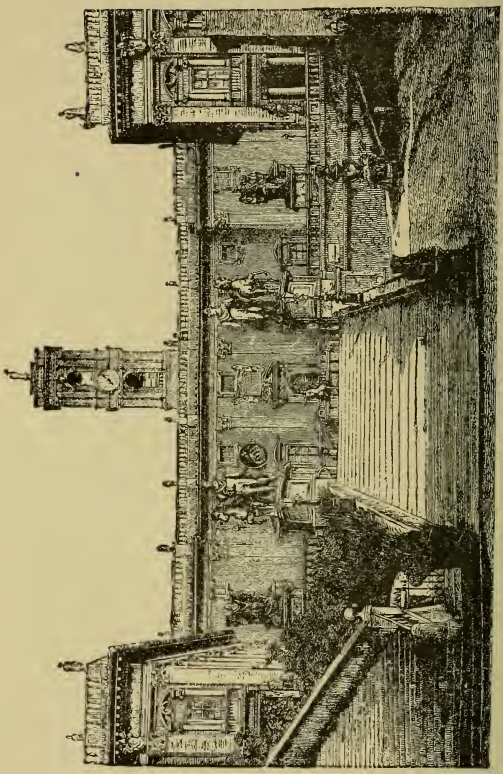


Fig. 172. THE MODERN CAPITOL AT ROME, WITH THE TWO WINGS CONSTRUCTED BY MICHEL-ANGELO.

found universal acceptation. His manner, therefore, of treating architectural forms savored of arbitrariness

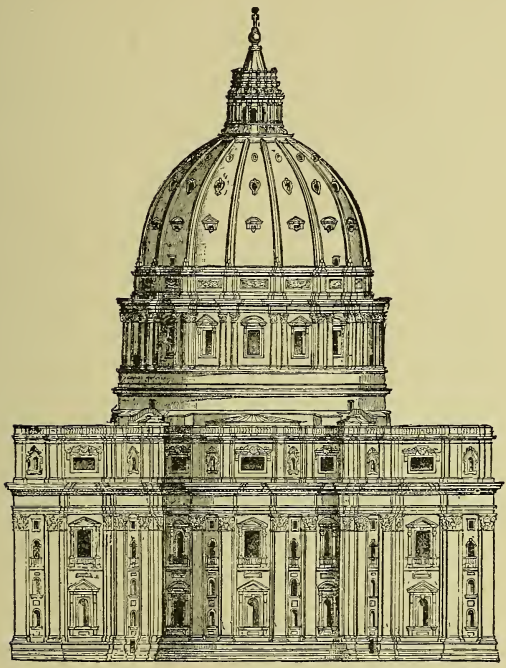


Fig. 173. BACK VIEW OF ST. PETER'S, ROME.

rather than of conformity with constructive and æsthetic principles, and aimed more at picturesqueness of effect than at strictness of style.

Michel-Angelo assumed such a considerable and prominent position by his genius and authority, that his example necessarily entailed imitation and produced effects on subsequent times. When his deviations were moderate, they were considered by his imitators merely as marks of the originality of his wonderful talent, and by this means proved stepping-stones to the degeneration which marked the ensuing period of the Rococo style. Amongst his architectural works, the design of the Capitol at Rome, with its wings (Fig. 172), may be considered as the most pleasing, whilst as a testimony to his lofty genius the mighty and glorious dome of St. Peter's at Rome (Figs. 173 and 174), and which has no rival in the world, must be adduced as a striking instance. This dome was only completed after Michel-Angelo's death. Both as regards its colossal dimensions, as well as its beautiful proportions and lines, it produces, both internally and externally, a most wonderful impression. It should be remarked that Michel-Angelo, like Bramante before him, selected the form of the Greek cross for his church, and planned the dome accordingly, and that the nave, which is by Carlo Maderno, is, both externally and internally, prejudicial to the effect of the dome (see Fig. 175).

172. Though the individual productions of the above-mentioned architects naturally differed from each other, yet the palaces of the Roman Renaissance have this in common, that they all convey the impression of marked dignity and of size in conjunction with simplicity. The most important of the causes that conduce to this result are the proportions and large dimensions. The mouldings and other architectural details are clearly defined, but not so prominent as in the Florentine palaces,

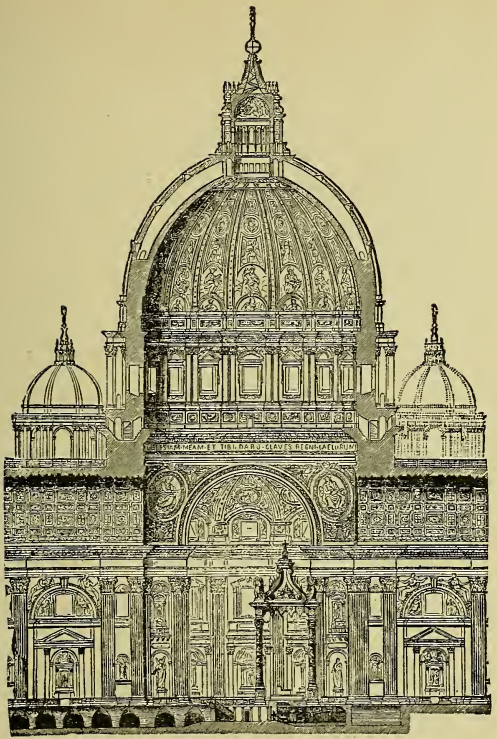


Fig. 174. SECTION OF THE DOME OF ST. PETER'S, ROME.

and for the most part traced upon purely classical Roman principles. This remark is applicable to the earlier period of the Renaissance, for in the later period the bent, broken, and twisted forms which occur, es-

pecially in the jambs of windows and their pediments, differ entirely from those of antiquity. But the palaces which belong to the good period of the Renaissance

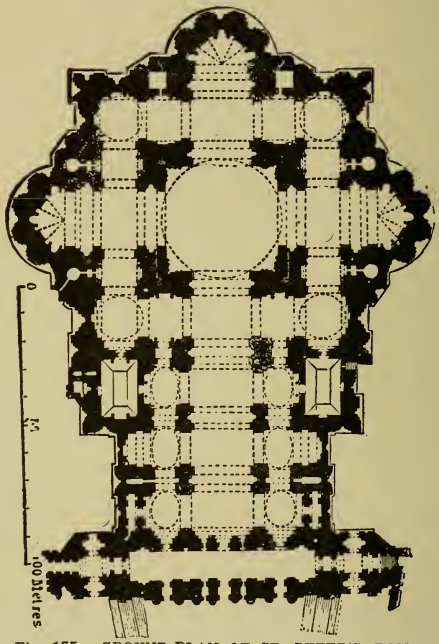


Fig. 175. GROUND-PLAN OF ST. PETER'S, ROME.

are, in fact, isolated examples, as the above-mentioned buildings by Bramante, Balthazar Peruzzi, and some others. The Farnese Palace, by Antonio Sangallo, which is the most imposing in Rome, must be considered as

a solitary exception to this rule. This palace would represent the Roman palatial style in the most complete manner were it not for the fact that the third story, which was designed by Michel-Angelo, detracts so greatly from the facade by its windows, which are in the Rococo style, and do not at all suit the others, that the harmonious unity of the whole is seriously impaired. The desire of novelty, and the abandonment of traditional laws, have, in this instance, clearly given rise to a fault. Not only is it open to censure that the semi-circular heads to some of the windows lack uniformity with the rest of the building, in which horizontal lines are predominant, but even the treatment of their architraves, etc., is very ill-judged, mainly owing to the fact that through a deficiency in height the arches of the windows have been carried up to the horizontal line of the pediments, and that consequently the horizontal architrave and frieze of the window entablature had to be abandoned (see Fig. 170). The worst of the characteristic mistakes of the decadence of ancient Roman architecture are, moreover, here introduced anew, namely, the introduction of columns which do not rest on the ground, but which are supported by brackets, and which support architraves with a profile which coincides with that displayed by the debased profile of the decadence architecture.

Fig. 176 presents a type of the majority of the palaces of the Roman Renaissance style, at least so far as regards the architectural features and their arrangement; for the most important palaces in this style are both more imposing by their great length, whilst at the same time they are less simple and less correct in their details.

The Roman palaces are for the most part without any

important sculptural accessories, and without ornamentation, unless an exception be made as regards the decorated mouldings of the cornice, which is generally Corinthian: such enrichments are usually ovoli, dentils, and consoles. It is the very simplicity of the Roman palaces, in conjunction with their vast dimensions, which gives the impression of dignity. If this

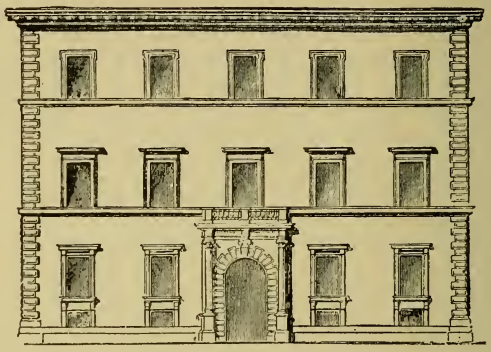


Fig. 176. VEROSPI PALACE AT ROME.

style is applied to our modern dwellings with their curtailed dimensions, more ornamentation is requisite than was the case with the vast Roman palaces, for otherwise the impression would be feeble and uninteresting as soon as the effect produced by the extent of the structure was wanting.

173. The vestibules are generally spacious, but still they do not produce the impression which is conveyed by a richer style of architecture. A more pleasing ef-

fect might have been attained by the employment of columns where now heavy pilasters support the vaults of the vestibule. The arrangement, however, of the vestibules and courts is carried out with some view to picturesque effect: sometimes there are colonnades, while at others they are wanting; niches with statues are introduced opposite the entrance; whilst a fountain at the background of the first court, or still more effectively at that of the second, is seldom wanting. The perspective effect is naturally increased by these courts. It is rarely that the staircase is included in the first

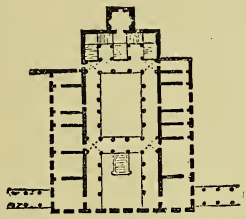


Fig. 177. PLAN OF THE TURSI-DORIA PALACE AT GENOA.

coup d'œil, it is usually placed at the side, and behind a gallery. The remaining space of the ground-floor is generally taken up with stables and coach-houses and other subordinate appliances. The rooms which are used for ordinary or state purposes are on the first floor, whilst the second floor is appropriated to the same purpose, and between or below is the entre-sol, or mezzanine, which generally has windows of a square shape.

174. The buildings of the sixteenth century at Genoa form a distinct species of the Modern Roman style, mainly owing to the fact that they were designed by

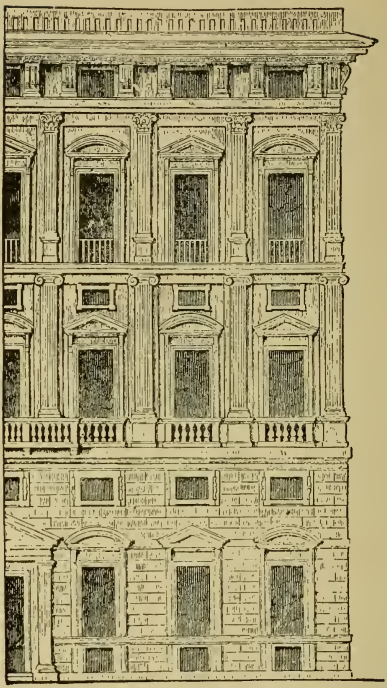


Fig. 178. HALF OF THE FACADE OF A PALACE AT GENOA.

one single artist, Galeazzo Alesso (1500-1572). They are large palaces, which bear an independent character and differ from those of other towns, especially in the arrangement of the interior. The uneven and circumscribed nature of the ground on which they are built

is mainly conducive to this, and picturesque and imposing effects are skillfully produced by the arrangement of the vestibules, halls, and steps (Fig. 177). In this respect the palaces of Genoa are unrivalled, for the Florentine palaces, as well as the Venetian, are entirely wanting in such vestibules. At Rome, on the other hand, where the palaces were not restricted by want of ground, and where the vestibules and courts assume even larger dimensions than at Genoa, no such picturesque effects of light and perspective are produced as, in the latter city, rise from the architecture itself, and from effects of perspective and light and shade.

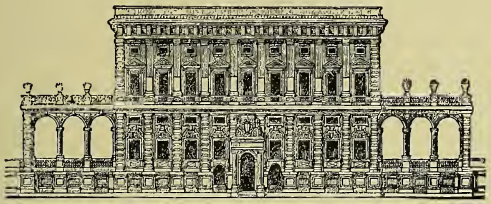


Fig. 179. FACADE OF THE TURSI-DORIA PALACE AT GENOA.

The purity of style, however, of the Genoese palaces is not so great as in the Roman, particularly as regards the heavy, ungraceful forms of details. This is shown by Figs. 178 and 179, and there are other instances in which the faults are more marked than in the palaces in question. The palaces of Genoa may, however, be favorably contrasted with the Roman as regards height; for the ground-floor and the mezzanine are raised considerably, in order to gain more light and

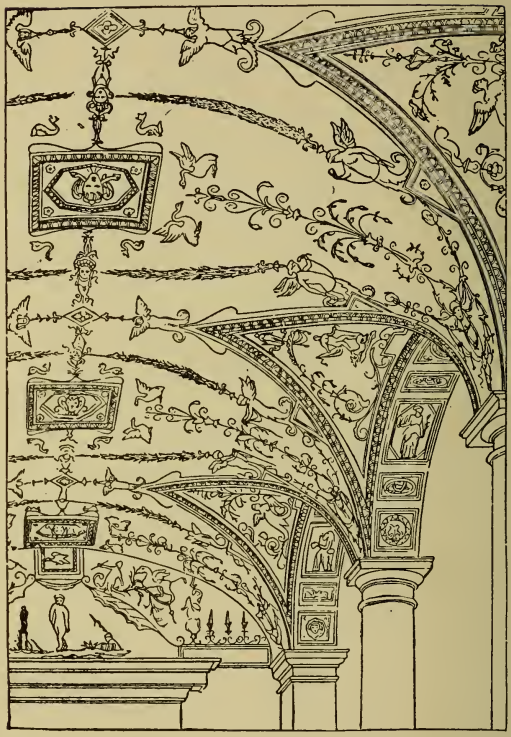


Fig. 180. PAINTED VAULT OF THE FLORENTINE PALACE IN ROME.

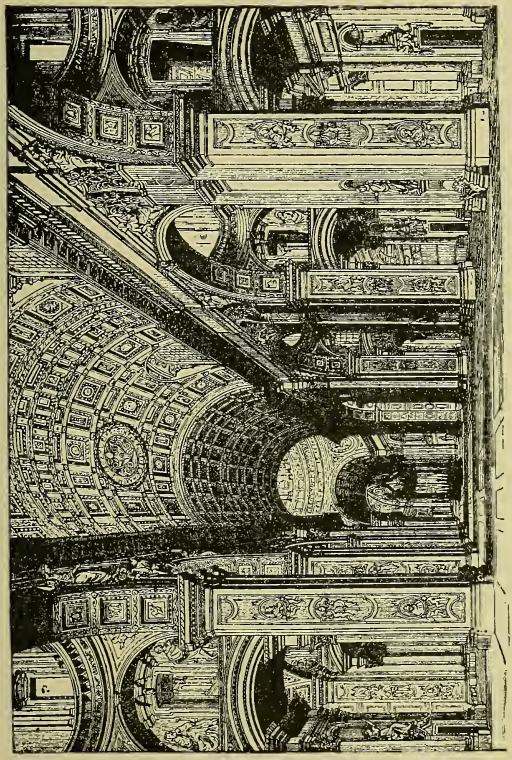


Fig. 181. INTERIOR VIEW OF ST. PETER'S AT ROME.

a better view from the main story. Owing, however, to the extreme narrowness of the streets and the consequent difficulty in obtaining a satisfactory point of view, the object is not obtained to the desired degree.

175. The decoration of the interiors of the buildings of the Renaissance is also copied from ancient Roman architecture. The rooms are either vaulted or have flat ceilings, but in both cases they are adorned with paintings after the manner of those discovered in the Baths of Titus, as is shown in Fig. 180, or by panel-

Fig. 182. CAPITAL OF A PILASTER FROM VENICE.

work, that is, sunken coffers with a regularly distributed enrichment (Fig. 181). These panels are themselves often adorned with historical or allegorical paintings, or with arabesques. Ornamented panels were employed in large palaces for horizontal ceilings, as also in churches, though in the latter case they were more often applied to cupola vaultings, as notably in St. Peter's (Fig. 181).

Amongst other details, a type of composite capital is worthy of notice, because it is of very frequent oc-

currence, with but very slight modifications (Figs. 181, 182, 183). During the later period of the Renaissance style a very extensive application of a kind of carved scutcheon was prevalent; the ends were generally rolled up in imitation of parchment (Figs. 185 and 186).

176. When the monuments of Roman antiquity became a subject of study at the commencement of the era of the Renaissance, the belief was entertained that the architecture of bygone days was to be invested with

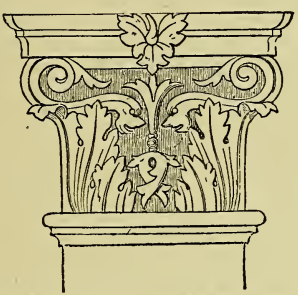


Fig. 183. CAPITAL OF A PILLAR FROM FLORENCE.

a new lease of life. But the organism of the Classic style did not provide for every modern requirement, and for buildings of several stories, the only types which were available were the Roman theaters and amphitheaters, and the then existing Septizonium of Severus: the temples had to serve as models for halls, whilst the triumphal arches were taken as copies for other public buildings, and for the interior vaults the baths were employed as a pattern. Consequently, the early Renaissance style bears an essentially

decorative character, inasmuch as it employed the individual forms of ancient architecture after adapting them to the creations of modern times, not as construc-

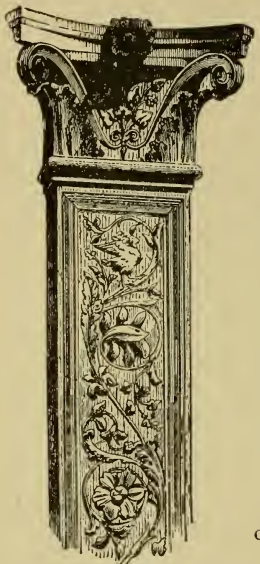


Fig. 184. PORTION OF A DECORATED PILASTER WITH CAPITAL, IN THE CHURCH OF SANTA MARIA DEI MIRACULI AT VENICE.

Fig. 185.

Fig. 186.

ORNAMENTATION PECULIAR TO THE LATE RENAISSANCE STYLE.

tive but rather as decorative elements, which, however, the Renaissance endeavored to reproduce in a manner that was at the same time regular and noble. When the awakened perception of the beauties of Grecian and

Roman buildings led to the resumption of the horizontal architrave instead of the pointed arch, the grotesque treatment of the pointed, angular, and swelling foliage which was employed in the capitals and friezes of the Gothic style, had to give place to the acanthus leaf and other more graceful forms of ornament. When the gloomy spirit of the Middle Ages was forced to vanish before the new zeal for classical studies and the delight which they occasioned, the whole appearance of buildings, in their totality as well as in their details, seemed to be brightened up, and to be imbued with that spirit of regeneration which permeated at the same time through social life.

177. The above-mentioned development of the decorative element of the Renaissance style took place especially in interiors, and sculpture and painting, the sister arts of architecture, working harmoniously together, produced most excellent results. The walls and ceilings were covered with paintings, whilst a method of colored decoration, which came into vogue in consequence of the excavation of the Baths of Titus, was very generally employed. This consists of objects taken from the vegetable kingdom blended in a fantastic manner with figures of men and animals, of masks, of vessels, of shields, and even of entire pictures; and combined with the architectural details of the building, and in conjunction with statuary. The whole forms one of the most praiseworthy features of the Renaissance, and the celebrated Loggie of Raphael are instances of this mode of treatment (Fig. 187). The decorative paintings of Raphael's pupil, Giulio Romano, and of many others, are likewise remarkable. The Gothic method of ornamentation with its mere combinations of lines

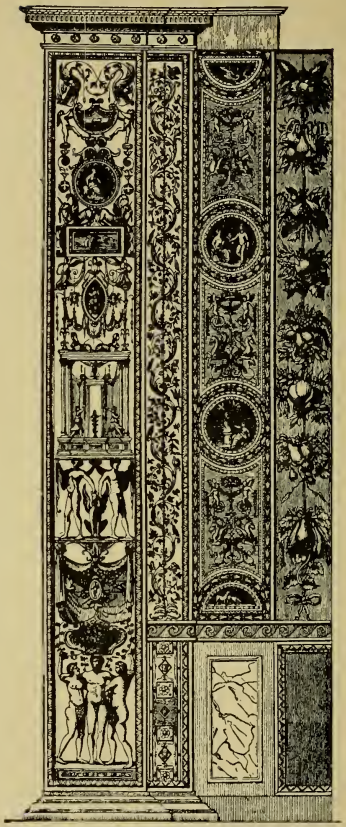


Fig. 187. WALL-PIECE FROM THE LOGGIE OF RAPHAEL AT ROME.

and perpetually recurring borderings and panel-work seems tame and insipid beside the bright and graceful decoration of the Renaissance, in which such ample scope was allowed to the play of the fancy.

178. Besides the walls and ceilings of the interior, the façades were frequently decorated with sculptured figures, and the flat spaces between the windows and mouldings underwent ornamentation. This took place either by a manner of painting called sgraffito, in which the undercoating was black, with a thin surface-coating of white laid over it, and then the design or shading was engraved or scraped away down to the black grounding; or similar designs were executed in bas-relief, as is shown by Fig. 188, whilst Fig. 189 represents part of a façade painted in sgraffito.

179. During the flourishing period of the Renaissance, architecture showed less hankering after mere richness of detail, and strove rather after noble simplicity: and this tendency was exhibited even in interiors, although in a modified degree. This flourishing period lasted scarcely fifty years, and occurred at the middle of the sixteenth century, and during its prevalence decoration was kept within due bounds, and in harmony with the principal forms. At the same time it cannot be denied that a certain architectural beauty, or at least a pleasant effect, was often produced in the later period of the Renaissance when the decoration was no longer so well regulated and when the details were not in such strict accordance with the main object of the design.

180. Whilst the Florentine and the Venetian Renaissance styles remained, with trifling exceptions, confined to their respective districts, the Roman Renaissance

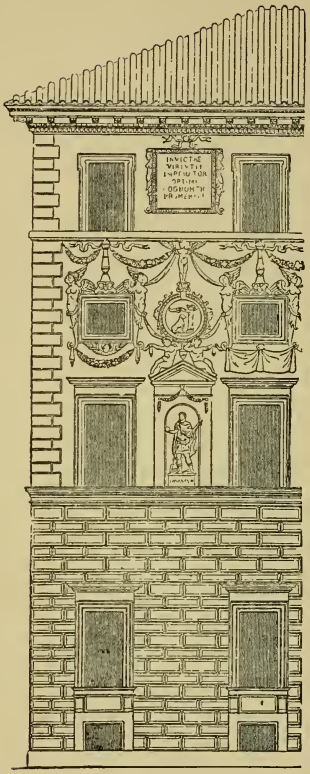


Fig. 188. PART OF THE FACADE OF THE SPADA PALACE AT ROME.

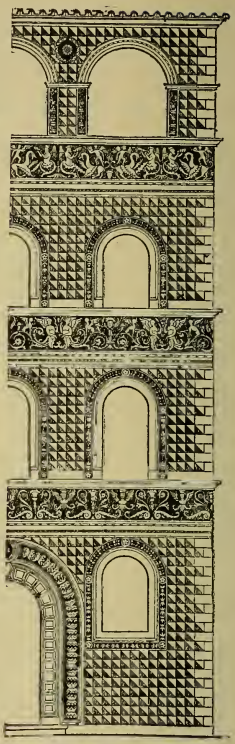


Fig. 189. PART OF A FACADE IN SGNAFFITO AT ROME.

style, as well as the Rococo style which succeeded it, extended over all Western Europe. The adoption of this style, however, took place later than in Italy itself, where the Pointed style had never gained such a firm hold as in other countries. The first influence upon the later developments of this style of the Italian or Renaissance manner is perceptible in a return to horizontal lines with the flat and the semi-circular arch, particularly in secular buildings.

This altered treatment of the Pointed style during the last period of its employment forms the only transition which took place to the Italian Renaissance style. In Germany, this latter is called simply "the Italian style." There is, properly speaking, no transition style, as in Italy; but the Renaissance style was at once accepted as a complete and developed one, and adopted with the principles which prevailed in the land of its birth. It is only in France, where it was introduced somewhat earlier than elsewhere, that many buildings exhibit a free treatment with reminiscences of the Romanesque style.

The alterations and modifications which the Renaissance style underwent in Italy were carefully copied in the countries in which it prevailed. It was, moreover, precisely at the epoch of its greatest deterioration that this style was most extensively employed in non-Italian countries.

No characteristic national features and no local points of difference are therefore to be sought for in the buildings of the various countries, except in those subtle shades of variety which owe their origin to the higher or lower æsthetic development and artistic status of these countries.

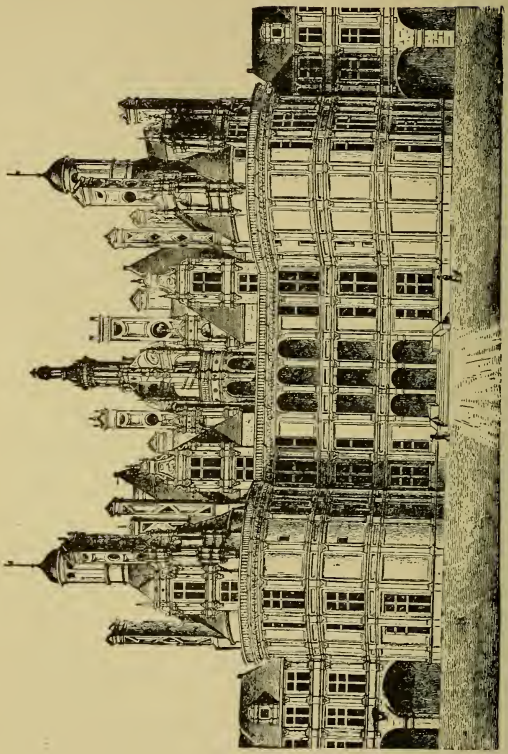


Fig. 190. CHATEAU DE CHAMBORD.

181. The artistic influence of Italy came into operation in France sooner than in other European countries, for as early as the fifteenth century the Renaissance style was introduced there by Italian architects, as, for instance, by Fra Giocondo, who was summoned thither by Louis XII. But at that epoch the Flamboyant style was still in its vigor, and the buildings then erected could not extricate themselves from its influence. The consequence was that a blending of the two styles temporarily prevailed, as, for instance, in the Château de Gaillon, which was built between the years 1502 and 1510, part of the façade of which is preserved in the court of the Ecole des Beaux-arts at Paris, as well as in the Château de Blois, which Louis XII. caused to be built, and which has lately been restored by Duban. It was in these country residences of the nobility, especially on the banks of the Loire, that this architectural activity was displayed during the earlier period of the Renaissance; amongst their number the Château de Chambord (Fig. 190) is most worthy of notice. The pilasters and the mouldings of the Renaissance style were, it is true, somewhat rudely carried out, and in the earlier period were combined with certain elements of the Flamboyant style. Highly ornamental gables and dormer-windows, especially, were executed in the latter style. Buildings were contemporaneously constructed entirely in the Flamboyant style, as, for instance, the Cathedral, the Palais de Justice, and the Hôtel Bourgtheroulde, all at Rouen, and the Hôtel de Ville at Compiègne.

The Italian Renaissance had, as has been shown, to struggle with the Flamboyant style during the reign of Louis XII. It made, however, decisive progress under Francis I., who summoned Serlio and other Italian ar-

chitects from their native country (1515-1547), and under his successor, Henry II. From that time forward the ancient columnar orders were universally substituted for the architectural features which had hitherto prevailed, as, for instance, in the Hôtel de Ville at Paris, which was built by Domenico Cortana in 1533. It must, however, be remarked that the Italian architects who were resident in France modified their ideas, consciously or unconsciously, to suit the French taste. A style

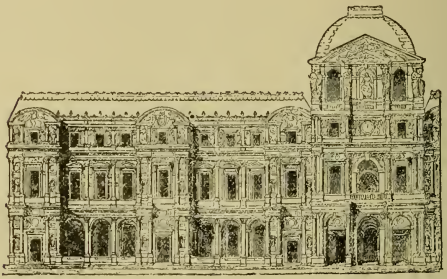


Fig. 191. SECTION OF THE INNER FACADE OF THE LOUVRE.

was thereby produced which may be called French or Italian, according as the proclivities and influence of the one or the other nation predominated. After the period of Philibert Delorme, who completed the chapel of the Château d'Anet in the Renaissance style in the year 1552, the Gothic style was, as a rule, abandoned, in spite of the opposition of many French architects, who struggled against the foreign style of architecture at Beauvis as late as 1555. At the same time the general

arrangement of the Gothic churches was retained, and it was only the Renaissance system of decoration which was substituted for the Gothic: the ground-plan, the proportions, and the whole structure with its flying buttresses, pinnacles, clustered columns, deeply recessed portals, etc., is borrowed from the pointed style, and it was only in the details and in the ornamentation that the Renaissance was followed. The Church of St. Eustache at Paris and the Church at Gisors are instances of this architectural phase.

The three prominent architects, Pierre Lescot (1510-1578), who designed the celebrated Western Façade of the Louvre (Fig. 191 and a portion of the same on a larger scale), Philibert Delorme and Jean Buillant, who was the architect of the earlier portions of the Tuileries (Fig. 193), and of the Château d'Ecouen, exerted such an influence over the architecture of their native country that the Italian Renaissance Style became thenceforward the predominant one in France. The above-mentioned château gradually assumed a typical character. The façade of the Louvre is, however, essentially French in contradiction to Italian, and this is especially noticeable in the ornamentation. Jean Goujon and Paul Ponce executed for this façade the best sculptures which marked the Renaissance in France. Under these joint influences an elevation was produced in which richness is perceptible without excess, and symmetry is attained without stiffness; in fact, a design in which æsthetic laws are fully considered, and the details harmoniously, if not magnificently, executed. Although the French architects who flourished in the reign of Francis I. inclined towards the Italian style of the fifteenth and sixteenth centuries, and especially to that of Bramante,

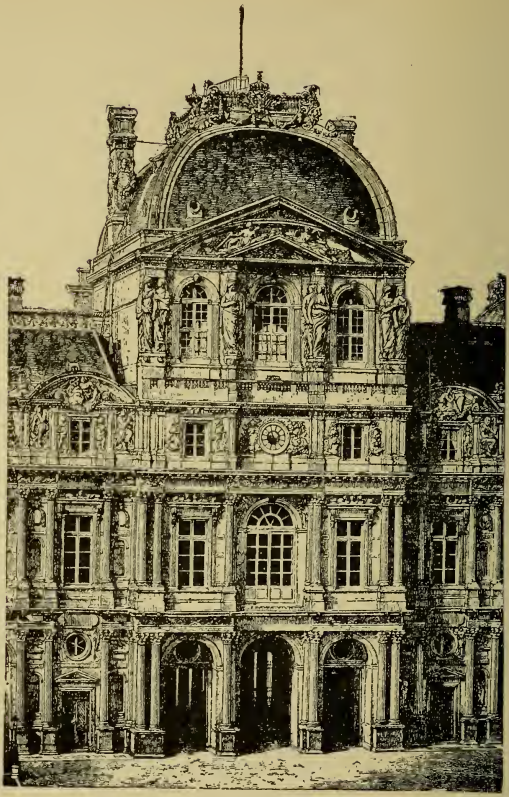


Fig. 192. PART OF THE INNER FACADE OF THE LOUVRE AT PARIS.

yet they succeeded in imparting a peculiar grace to that style, as it was developed in France, which nevertheless vanished towards the end of the sixteenth century. At the same time, however, it must be admitted that the French Renaissance Style cannot for a moment be compared with the Italian during its palmy period, either as regards purity or novelty of design.

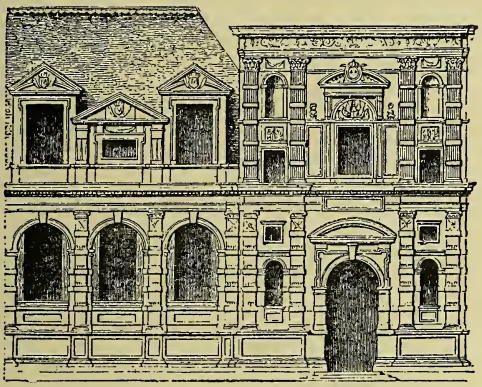


Fig. 193. PART OF THE OLDEST FACADE OF THE TUILERIES.

182. Little by little a method of ornamentation was introduced by successive decorators and architects, which was eminently suited to the French taste. Androuet Du Cerceau and Jean Lepautre are especially noticeable as representatives of this school of embellishment. The sumptuous Apollo Gallery in the Louvre is a characteristic example of the productions of the

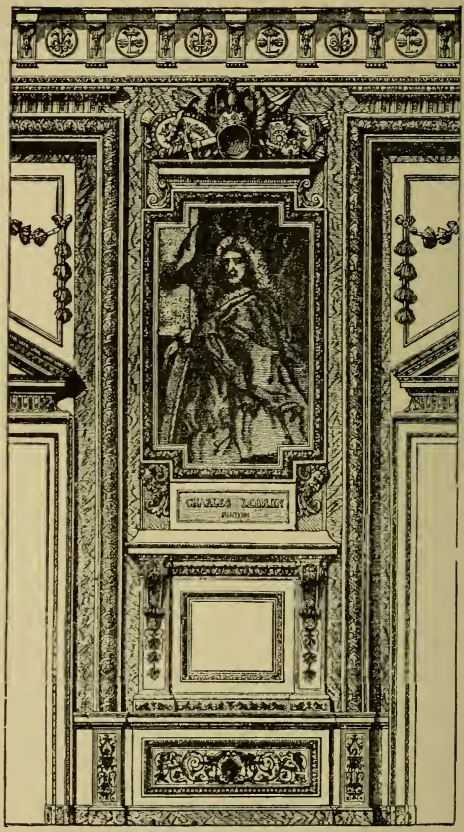


Fig. 194. FRAGMENTS FROM THE APOLLO GALLERY IN THE LOUVRE AT PARIS.

latter. Fig. 582 exhibits a portion of the system of decoration which pervades the whole gallery.

Du Cerceau, who flourished during the reign of Henry IV., connected the block of buildings which belonged to the Louvre, and had been constructed under Catherine dei Medici, by a gallery with the Tuileries (Fig. 195). This architect abandoned the characteristic feature of the French Renaissance, which had pre-

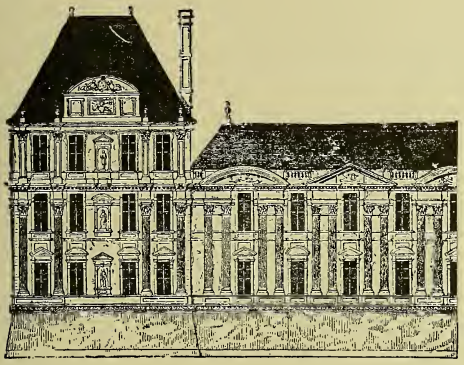


Fig. 195. THE FLORE PAVILION AND PART OF THE GALLERY OF THE LOUVRE, BEFORE THE MODERN RECONSTRUCTION OF THE FACADE.

vailed hitherto, namely, of giving its peculiar columnar order to each story, and assimilated his designs to those of the late Roman Renaissance, in which a striking effect was produced at the expense of truth by continuous columns and pilasters extending over several stories and rows of windows.

Although Du Cerceau was obliged to leave France in the year 1604, the impulse which he had given in the direction of the afore mentioned manner led to its being generally adopted. The new buildings were more cor-

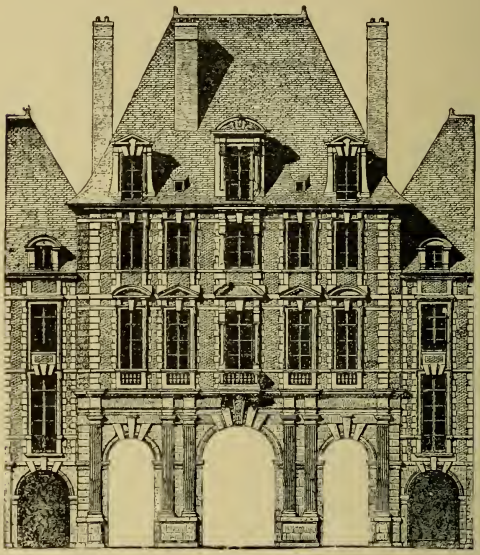


Fig. 196. PART OF A FACADE IN THE PLACE ROYALE AT PARIS.

rect, but less picturesque than those built during the earlier period of the French Renaissance, and a certain insipidity seems to characterize the various structures erected during the reigns of Henry IV., and especially Louis XIII. As is shown by Fig. 196, a com-

bination of free-stone and brick was resorted to in such a way that the former was employed for the mouldings, and for the quoins and dressings of the doors and windows, whilst brick was used for the spaces between. In the case of the windows the free-stone introduced assumed the form of quoins. If ornamentation had been previously excessive, it now retired into the background, and was only employed in moderation; and the method of its treatment began to be distinguished from that of the former period. The forms of the details above all began to lose in purity: rustications were inappropriately introduced in the walls and columns, and the roofs were made high and steep, which gave the rest of the building a heavy and squat appearance, whilst the numerous turret-shaped chimneys, which were necessitated by these high roofs, formed a peculiar feature in the construction. The Rococo, or Baroque Style, which forms a subject of itself, was beginning at the same time to exert its influence. Commencing from the second half of the seventeenth century, this new architectural deviation became prevalent in all civilized countries, owing to the splendor and influence of the French power and manners, and the influence of Italian art was consequently paralyzed. Fig. 197 gives a characteristic example of the French architecture of this period of the Later Renaissance, showing the peculiarities which have been described above.

At the same time that the better tendencies of the Renaissance period disappear in the second half of the seventeenth century, and the new edifices display proofs of a deterioration of taste, the degeneration which had set in continued to increase with time, as may be gathered from the various buildings of the reign of

Louis XIV. The natural laws of architecture were more and more neglected, and replaced by certain conventional rules for the application of the Roman columnar orders. Amidst all this desire for show, this magnificence and a great confusion of means, especially of the popular column and pilaster arrangement in large

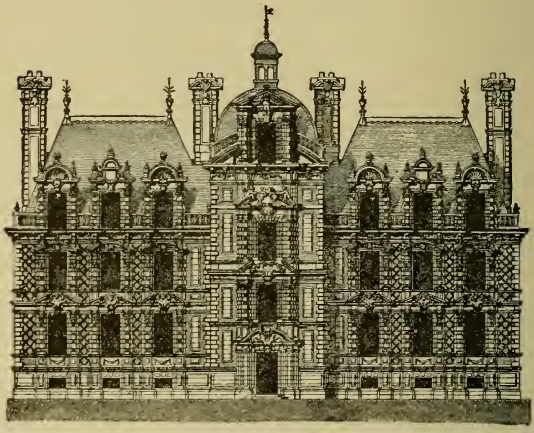


Fig. 197. THE CHATEAU DE BEAU MESNIL.

dimensions, as, for instance, the over-praised Colonnade of the Louvre, there is still a certain insipidity peculiar to the constructions of the period. In accordance with the disposition of Louis XIV., architecture was for the future only to give expression to that proud pomp which characterized all the undertakings and the whole reign of the Grand Monarque.

The principal architectural activity of this period was displayed by Jules Hardouin Mansard, who was head architect to the king and the head of an influential

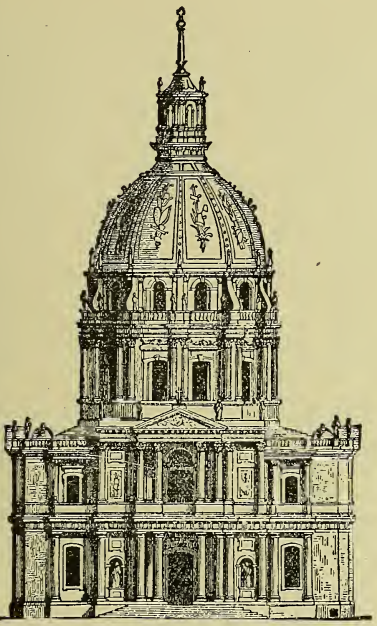


Fig. 198. THE INVALIDES AT PARIS.

school, as Lenôtre at the same time was principal horticulturist. Mansard built the palaces of Versailles (1647-1708), Marly, the Grand Trianon, as also the Invalides at Paris (Fig. 198).

The internal system of decoration which had been brought in by Lepautre was modified by Mansard and Berain. Mirrors were freely introduced in the embell-

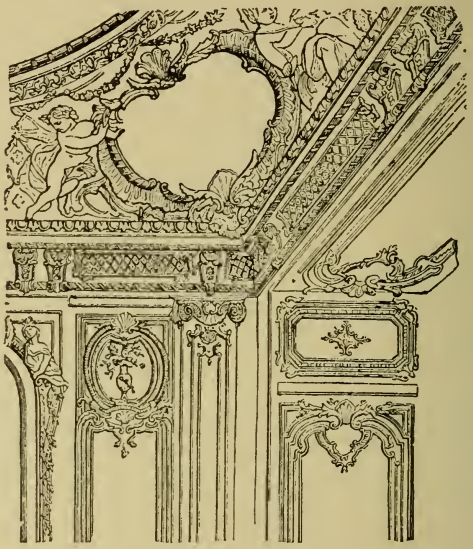


Fig. 199. PORTION OF Fig. 200 ON A LARGE SCALE.

ishment of rooms, especially in connection with the fireplaces, and may be said to have now become a distinctive feature in the decoration of interiors.

It was in the seventeenth century, contemporaneously with the decadence of Italy, that the domineering in-

fluence of France on other countries began to be recognized. This result was mainly attained by the power and glory of Louis XIV., as well as by the brilliancy of his court. In many places French gardens and castles were imitated, and French architects were employed in their construction.

On Mansard's death a considerable alteration took place in French architecture. An entirely new system of decoration arose for interiors, which is often known under the designation Rococo. This is somewhat different from the Italian Rococo style which will be described in §§ 190 and 191, and properly belongs to that division of the work in which the Rococo style is discussed, but it is inserted in this place in order to secure continuity, and to trace the whole course of the French Renaissance without interruption.

183. It was principally the above-mentioned system of Rococo decoration and architectural detail which characterized the architecture of the time of Louis XV.; it is, consequently, sometimes designated as the style of Louis XV. Fig. 199 gives a portion of an interior drawn in perspective, whilst Fig. 200 depicts the entire wall from which this portion is taken.

Internal arrangements and decorations are the main characteristics of the style of this period, and in this direction the best results were doubtless produced. Large and lofty rooms, as well as scope for display, were indispensable; consequently this style of embellishment was most happily carried out in state apartments, especially in the princely castles and palaces, or, as the French call them, the "Hôtels" of the aristocracy.

De Cotte must also be mentioned as well as Berain, as his plans and buildings exercised considerable influence,

and caused the princes of foreign countries to be desirous to avail themselves of his services. Indeed French artists were in great request at this period in Europe, for Paris had become the model which was thought worthy of imitation in other lands.

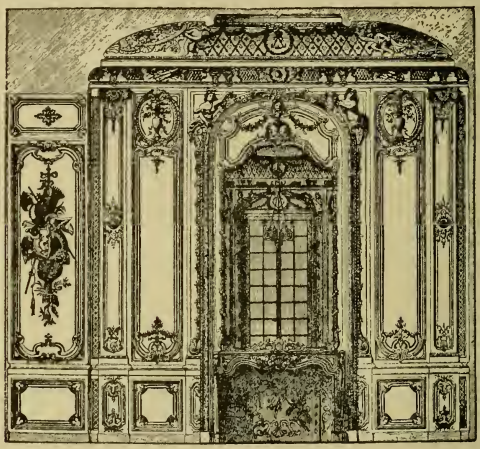


Fig. 200. DECORATIONS OF A SMALL SALOON IN THE PALACE OF VERSAILLES, OF WHICH Fig. 199 GIVES A POPTION ON A LARGER SCALE.

184. Towards the end of the reign of Louis XV. a reaction set in, which was caused partly by the excess and caprice displayed in the application of this style, and partly by the tide again setting in the direction of the antique. This is evinced by the Colonnades de la

Place de Concorde, and by the Church of Ste. Geneviève, which was begun by Soufflot in the year 1755, and subsequently received the name of the Pantheon (Fig. 201). From thenceforth imitations of ancient buildings came into vogue, as they also did in other countries. As

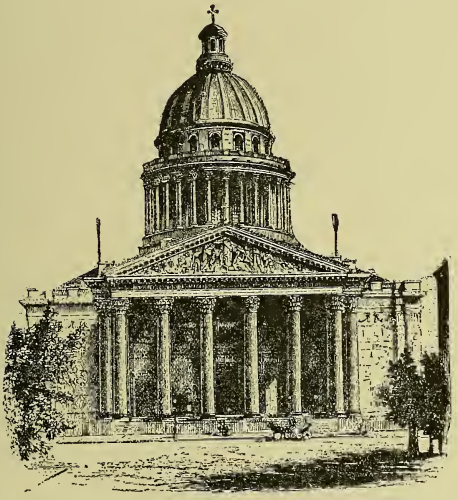
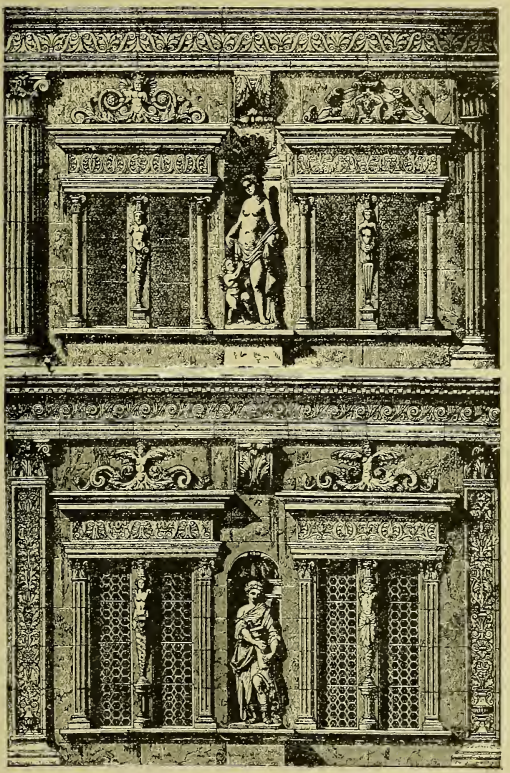


Fig. 201. WEST FRONT OF THE PANTHEON AT PARIS.

a counterpoise to the former license, a certain strictness and moderation in ornamentation was now resorted to, which at last almost approached deficiency. Percier set himself the task of correcting this false step, and succeeded in again placing the art on a proper footing. His

intelligence, his capability and his knowledge were very considerable, and in the year 1792 he opened a school, which must be considered as one of the most influential that ever existed; for the most efficient and renowned architects of the whole of Europe who attained reputation during the first half of the nineteenth century had there acquired their knowledge of their art. The founder of the school himself was considered as an indisputable authority both under the first Empire and in the days of the restored Bourbons; and, in conjunction with Fontaine, he erected structures in the Roman style, amongst which may be mentioned the Madeline, and the Bourse, and the triumphal arch in the Carousel. His numerous freely-treated decorative achievements in the Roman Renaissance style, in castles and palaces, have for half a century been regarded as models, and frequently imitated.

185. The Renaissance style was not employed in Germany before the middle of the sixteenth century, and the most noteworthy instances of it are the Belvedere of Ferdinand I., on the Hradschin at Prague, and the so-called Otto Henry buildings at Heidelberg Castle (1556-1559). The façade of the last-mentioned structure, of which Figs. 202 and 203 represent portions, is peculiar for a richness and variety of details which almost border on excess. At the same time a certain heaviness prevails, which forms a contrast to the graceful elegance of the best Italian buildings in the same style: in fact these faults may be said to characterize the productions of the German Renaissance style in general. A further instance of this is afforded by Fig. 204, which represents a portion of the façade, though, properly speaking, it belongs to the Rococo style.



Figs. 202, 203. PART OF THE FACADE ON THE OTTO HEINRICH BUILDINGS IN HEIDELBERG CASTLE.

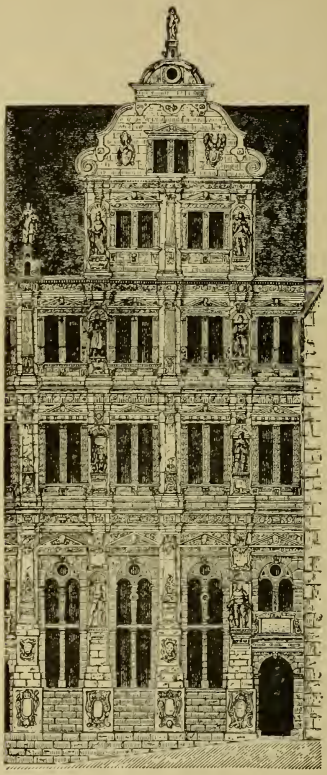


Fig. 204. PORTION OF THE FACADE OF THE BUILDINGS OF HENRY THE WISE IN HEIDELBERG CASTLE, 1601-1607.

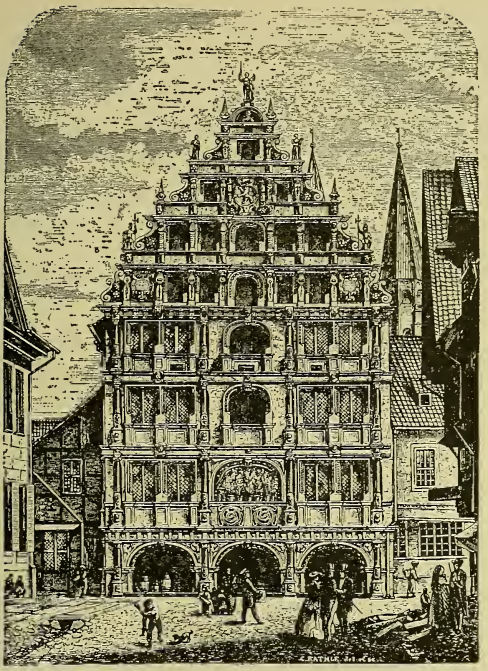


Fig. 205. VIEW OF THE CLOTH HALL AT BRUNSWICK.

The three illustrations which have been taken for this work from Pfnor's very meritorious "Le Château de Heidelberg" should tend to moderate the excessive admiration which is bestowed on this the most esteemed of all the buildings of the German Renaissance. The picturesque beauty of the present ruins ought not to screen

the lack of pure and graceful forms of detail when judging of the architectural and artistic merits of the building. Fig. 205 shows an interesting and pleasing example of the German Renaissance.

In Germany, as in other countries, the elements of the preceding style are intermingled with those of the Renaissance during the early period of its prevalence, particularly as regards details. It was not till the seventeenth century that any architects of note flourished: amongst these may be mentioned Elias Holl of Augsburg (died 1636), in which town he built the Town-Hall and the Arsenal, and Holzschuher, who was the architect of the Town-Hall at Nuremberg.

The architectural activity, which had so long been hampered by the Thirty Years' War, followed the method of treatment advocated by Bernini and Borromini, which is marked by great capriciousness in the treatment and disposition of the architectural forms. Dietterlein also contributed greatly by his publications to the extension of this school. In the year 1685 Nehring began the Arsenal at Berlin which was finished by Schlueter, the architect of the Palace, who died in 1714. The latter was followed by Knobelsdorf, the architect of Frederick the Great; he built the palaces of Charlottenburg and Sans Souci and the new palace at Potsdam. The Zwirner Palace at Dresden, which was built in 1711 by Poepelmann, must also be mentioned as a noteworthy example of this style.

186. In Spain an Early Renaissance Style appears, a kind of transitional Renaissance belonging to the first half of the sixteenth century. It consisted of the application of Moorish and pointed arch forms in conjunction with those of classical antiquity: in this way a

conformation was produced which was peculiar to Spain, and the style is characterized by bold lightness, by luxuriance in decoration, and by a spirit of romance. Naturally there was no harmony founded on a duly concerted organic arrangement: it is rather the excess of magnificence which dazzles the sense and causes a favorable impression in the spectators of the buildings, such, for example, as the quadrangles of the palaces and monasteries of the period.

In the reign of Charles V. this ornate early Renaissance style gave place to a later one, which in reality belongs to the Rococo style. It came into universal use in the second half of the sixteenth century, and was much aided by the extensive architectural undertakings of Philip II. Its principal expositors were the architects Giovanni Battista de Toledo and Giovanni de'Herrera, who were both pupils of Michel-Angelo.

187. The Italian Renaissance style was introduced into England about the middle of the sixteenth century by John of Padua, the architect of Henry VIII., towards the closing years of the reign of that monarch. In the reign of Elizabeth to the end of that of James I., Dutch architects were in vogue in England in consequence of religious and political sympathies. Their peculiarities of taste are reflected in that English branch of the Renaissance style usually known under the name of Elizabethan.

It must be remarked that, as a rule, English buildings in the Renaissance style are distinguished by capricious treatment of forms, and generally exhibit a deficiency in that grace and dignity both in details and ensemble which lend a peculiar charm to Italian structures in the same style. English Renaissance buildings

also differ in the same respects from the French; they display more similarity with those of the Later German

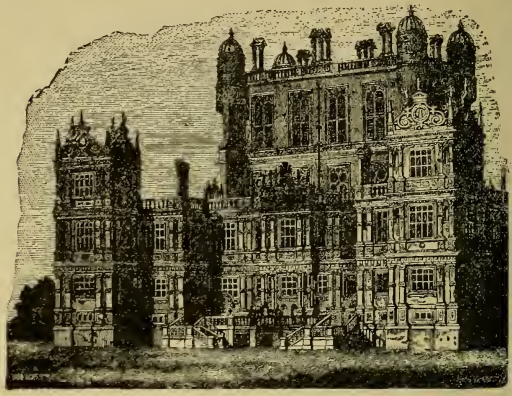


Fig. 206. WOLLATON HALL.

Fig. 207. GROUND-PLAN OF Fig. 206, WOLLATON HALL.

Renaissance, as, for example, the Castle of Heidelberg; where there is much similarity, at least in the treatment of details, to the style known as the Elizabethan.

It is especially this vitiated taste in form and details which characterized the Elizabethan Renaissance (see Fig. 206.) The usual Rococo Renaissance forms also occur in it, as, for instance, the quadrant-shaped gables curving alternately inwards and outwards, as also pilasters and columns intersected by quoins and bands; and various grotesque and debased forms. Enriched quoins are also freely used at angles and jambs. Fig. 208 may serve as a specimen of the details of the Elizabethan style.

Inigo Jones, who was an imitator of Palladio, and who designed the Palace of Whitehall in London, deserves mention as the only English architect of this period who, to a certain extent, preserved the classical Renaissance style in its purity, and free from numerous extraneous innovations. Christopher Wren (1675-1710) followed in his footsteps; he was the architect of St. Paul's, London, a building which, by its dome, recalls St. Peter's at Rome, and though marked neither by elegance of form nor vigor of style, still possesses considerable architectural importance.

188. Fig. 210 and 211 are intended to convey an idea of the details of decoration which characterized the

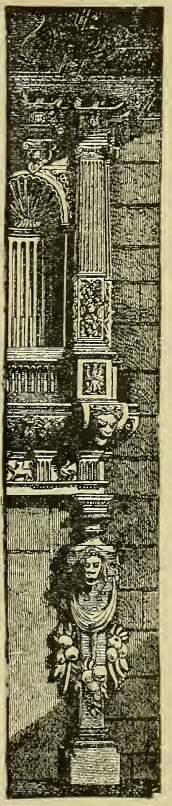


Fig. 208. Corner of a Fire-Place in the Elizabeth Gallery at Windsor Castle.

Renaissance style during its best period, and which display considerable grace and finish. They are based on the antique Roman type, but still display a peculiar independent treatment, as in the deeply under-cut foliage in the arabesques and the lightness and clearness of the stalks and tendrils.

Fig. 209. ST. PAUL'S, LONDON.

The ornamentation of the Later Renaissance is less vigorous in tone, and allows the admixture of animals with vegetable forms, and in this way serves as an introduction to the Rococo style. Festoons are of frequent occurrence, as also cornucopias and garlands, as

Fig. 210. PORTION OF FRIEZE AT VENICE.

Fig. 211. PORTION OF FRIEZE AT VENICE.

well as fabulous subject such as dragons, satyrs, dolphins, masks, lions' heads, and so on.

In conclusion, it must be remarked that the sculptured ornament of the Early Renaissance was distinguished by its excellent effect, due partly to the fact that the separate portions of the decoration were varied both in their bulk and in the degree of projection given to them, but more to vigorous undercutting and skilful disposition of light and shade, so that when seen from a distance only a few salient points stood out in prominent relief. It is only on a close inspection that the more delicate lines of the leaves, tendrils, and figures which connect together these large masses display themselves. The masterly manner with which Renaissance ornament is treated appears chiefly in the fact that all portions are not dealt with alike, the finest effects being obtained by the subordination of individual portions and the prominence given to those which are most important. The ornaments are also so arranged as to form a pleasing contrast with the containing or adjoining architectural lines; and are fitted and subordinated to them; a matter of the highest importance. In this respect the later Renaissance cannot boast of equal success. On the contrary, more salient ornaments began to be uniformly employed, and in too great profusion. Increased richness of effect was, it is true, thus arrived at, but the productions lost in grace what they gained in richness. As a sort of counterpoise to this tendency the architectural mouldings and details were executed in a more decisive and prominent way, so as to keep the decorative details in subordination to the main plan. On the other hand ornamentation tried by dint of increased extravagance to accommodate itself to the exaggerated

architectural features. The result of this was that the style became heavy and inartistic.

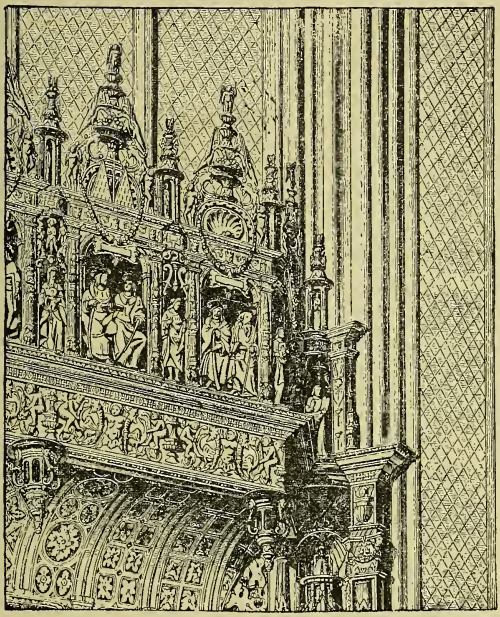


Fig. 212. CANOPY OF THE TOMB OF CARDINAL D'AMBOISE AT ROUEN.

Fig. 212 represents a characteristic specimen of French Renaissance decoration, and with this we will conclude our chapter on Renaissance Architecture.

THE ROCOCO STYLE OF THE RENAISSANCE.

189. As has already been shown in the preceding portion of the work, the tendency was displayed soon after the revival of ancient Roman architecture to consider the columnar orders as the most essential element, and to construct everything in accordance with established rules. As early, however, as the middle of the sixteenth century an opposite tendency was observable, and excessive freedom in the employment of objectless and unusual forms became apparent, which by no means tallied with their original purpose and which consequently led to the total decadence of architecture. It is true that antique forms were still continually employed, but in a manner which was not in accordance with, and even antagonistic to, the original intention.

As has been mentioned in the previous chapter, Michel-Angelo was the first who, with his genial but at the same time untractable proclivities, displayed his unwillingness to conform in imitative art with the laws laid down by nature, and as regards construction, to observe the conditions necessitated by static and architectural canons. For the sake of novelty, he introduced strange and discordant forms which were called into existence neither by actual necessity nor by the original design, and his intention appears to have been to excite astonishment rather than admiration.

It was, moreover, a special misfortune for art that his admirers and imitators endeavored not only to copy but to surpass the faults which could only be pardoned in the case of the towering genius of the Italian architect.

When the principles of noble simplicity and purity of form were no longer followed, a predilection began to be manifested for magnificence and luxuriance. This tendency was in accordance with the spirit of the age, and attained its zenith during the reign of Louis XIV. The characteristic and constructive element, with its great moderation in the employment of ornamentation which marked the age of Louis XIII., had to give way before this new tendency, and solidity and sterling worth were superseded by a more flimsy and highly-embellished method of construction. One advantage, however, is attained in the productions of the Rococo style, at least as regards the productions of the best architects; namely, that the effect of masses and the picturesque arrangement both of the external features and the internal spaces seems to have been thoroughly grasped, and a splendid and imposing result thereby attained; and although the details may display bad taste, yet the effect of the whole is often grandiose and not inharmonious.

This is especially the case with interiors, because the whole architectural ornamentation, as well as the furniture and other decorative objects, are fashioned, even to the smallest detail, in the same style and taste, and complete harmony is consequently secured. This offers a great contrast to our own times, when the objects which influence the general effect of our sitting-rooms, and even of our state apartments, are huddled together in the most heterogeneous way, without any reference to the character of the architectural enrichments. This evil seems only to be avoided in cases where the guiding hand of an artistically trained architect directs not only the architectural ornamentation of such apartments, but also the furnishing and introduction of the smallest details.

The essential points of difference between the Roman, Florentine and Venetian styles cease with the introduction of the Rococo style of the Renaissance.

Apart from some modifications which were based on local traditions and influences, and which bear traces of the foregoing period, the Roman Rococo style may be viewed as that universally prevalent.

190. The Rococo style may, in its turn, be divided into two periods, which are to be distinguished by variety of style. The first period comprises the time between its first appearance, in the middle of the sixteenth century, and the beginning of the seventeenth, during which the pure and simple forms of the Renaissance were not yet entirely abandoned, and the advantages which have just been alluded to are more observable, while the defects which have also been enumerated are less so than is the case in the second period. During this latter the greatest freedom in the treatment of architectural forms prevailed to the disregard of all laws, and free scope was given to the most fantastic combinations. This state of things was mainly brought about by the influence of Lorenzo Bernini (1589-1680), as well as by that of Francesco Borromini (1599-1667). The denomination Rococo is distinctively assigned to the taste of the second period of the style. Many shades of difference have been traced in it, especially of late years, which have been classified as the Jesuit Style, the Capuchin Style, the Spanish Rococo Style, etc. Within its domain fall all the architectural productions from the commencement of the second period till the latest revival of classical architecture during the last century. During this period the deterioration of architecture and taste went hand in hand with the contemporaneous unnatural fashion of wigs, and the senseless want of taste

in the employment of pigtails and powder; and a certain affinity between the architecture of the seventeenth and eighteenth centuries, and a method of dressing the hair

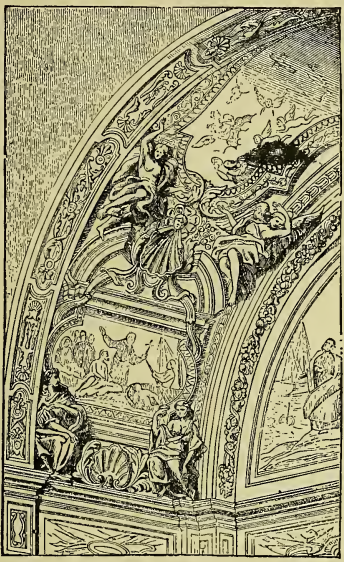


Fig. 213. DECORATIVE FRAGMENT FROM THE JESUIT CHURCH AT ROME.

which then prevailed, has led to the expression "Pigtail and Periwig Style" being employed to describe the period under consideration.

191. The main essentials in all the Rococo Styles are a certain independence in the ornamentation of the

main architectural organism, the prominence of this ornamentation itself, and finally its shapes and design. A luxurious elegance is displayed in the treatment of

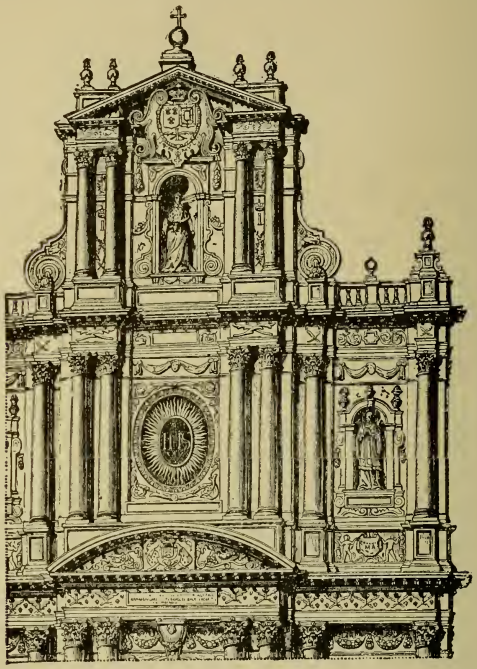


Fig. 214. PART OF FACADE OF THE CHURCH OF ST. PAUL AND ST. LOUIS AT PARIS.

interiors, which was most happily employed in the embellishment of the state apartments. Fig. 213 gives an

example of the absence of connection among the various ornaments employed in the system of decoration, such as was especially peculiar to the churches of the Jesuits.

In this style curved lines of the most varied description supersede all straight lines both in ground plans and in

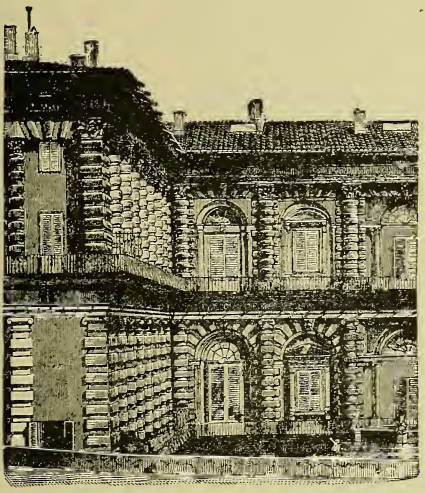


Fig. 215. PART OF THE BACK OF THE PITTI PALACE AT FLORENCE.

designs, whilst the most ordinary and characteristic embellishments are volutes, shellfish, and scrolls; groups of fruit and garlands of flowers, hangings, curtains, etc. (Fig. 214.) Columns, pilasters, and mouldings are intermingled and intertwined in a fantastic and mean-

ingless manner, the cornices are often interrupted; the essentially component parts of the architecture are frequently mutilated; for instance, columns and wall-pilasters are executed in rustic work, *i. e.*, formed of extensively projecting hewn stones, yet are furnished with a capital and base as is shown by Fig. 215, which is an illustration taken from the Late Italian Renaissance. For the sake of peculiarity, the various com-

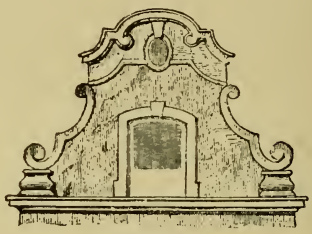


Fig. 216.

ponent elements assumed a form diametrically opposed to their original designation; mere decorative and secondary details were raised to the rank of essentials, whilst the real principal forms sank to an entirely subordinate position.

The greatest variety is displayed in the gables of dwelling-houses. Figs. 216 and 217 illustrate the highest pitch of tastelessness in this respect. At first the same were only boldly curved, or consisted of perpendicular stages, the central one of which was crowned either by a straight sided or a gently curved pediment, whilst the usual scrolls were introduced at the sides (either simple or sculptured). (Fig. 214.)

The following figures, which are taken from French buildings, are intended to illustrate the treatment of the various decorative features during the seventeenth

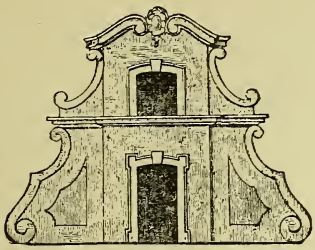


Fig. 217. GABLES OF TWO HOUSES AT HAMBURG.

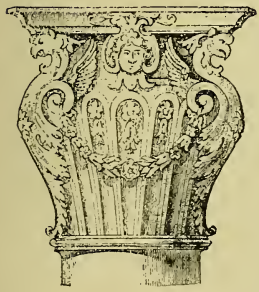


Fig. 218.

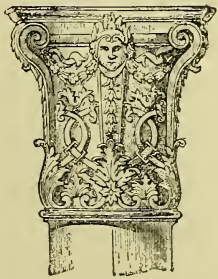


Fig. 219.

century: Figs. 218 and 219 represent capitals, Fig. 220 a cornice, Fig. 221 the termination of a pilaster-strip with panel, Fig. 222 a decorative design in a similar

panel, Fig. 223 the canopy of a panel. All these belong to the period of Louis XIV. Fig. 224 represents the setting of a panel, Fig. 225 the keystone of an arched

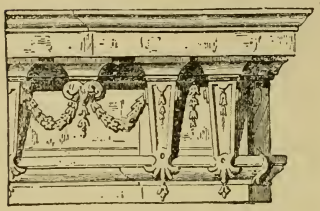


Fig. 220.

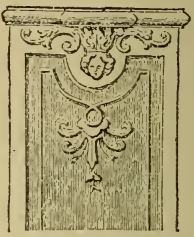


Fig. 221.

Fig. 222.

Fig. 223.

DECORATIVE DETAILS OF THE TIME OF LOUIS XIV.

head-piece, Fig. 226 the same with a rectangular setting, and Fig. 227 a console supporting a balcony, the iron railing of which is also characteristic of the Rococo

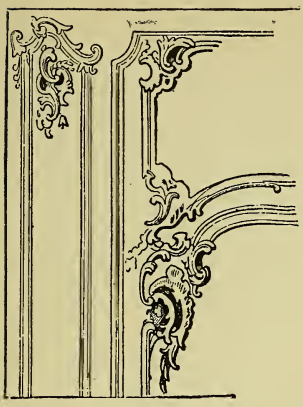


Fig. 224.

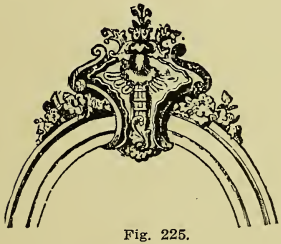


Fig. 225.

Style. These last four Figures belong to the time of Louis XV.

192. A deficiency in organization of form, from which fault the Renaissance was not free from its very commencement, becomes still more perceptible in the Rococo Style, and continues to increase, till at length

the utmost license became usual. But in spite of all this it is indisputably necessary to accord the Rococo Style its due merits, and accurately to determine, on the one hand, in what its defects consist, and, on the other, what were the causes and advantages which secured for it during a space of two hundred years (1580-1780) a predominance over the whole civilized world in spite of

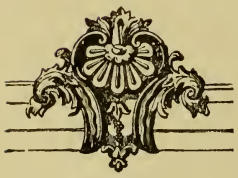


Fig. 226.

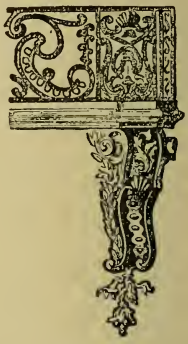


Fig. 227.

DECORATIVE DETAILS OF THE TIME OF LOUIS XV.

the degeneracy of forms which it displayed. In Italy, especially, the numerous buildings constructed in the Rococo Style must be taken into consideration when the architecture of that country is viewed collectively, and its details become the subject of observation and study.

During the time that the license of the Rococo Style prevailed, the elements of the ancient columnar orders were often misapplied, engaged columns and pilasters

were frequently so connected with other side-pilasters which were recessed behind them to the number of one, two, or even three, that the cornices and, in fact, all horizontal mouldings were separately profiled over each column or pilaster. (See Fig. 214.) The shape of the various architectural features was also strikingly arbitrary, especially that of the gables with their varied slopes and curves. Individual forms no longer possess an organic or constructive expressiveness; they were only employed as a means to insure the picturesque grouping of the masses, and were generally constructed in high relief, in order to bring out the due effect of light and shade. The advantage which it is admitted rose out of so unshackled a mode of treatment was that it became easy to secure beautiful proportions, as neither traditional meaning nor constructive motives were taken into consideration, and the object, regardless of these, was merely to create forms and proportions which were pleasing to the eye, and above all a picturesque effect.

193. Churches, more than any other buildings, underwent an entire change as regards interiors during the prevalence of the Rococo Style. Pillars only occur in the naves in isolated instances, and were mainly used in external ornamentation, their place as supports to the broad and lofty upper spaces being taken by masses of masonry and heavy piers with galleries. Domes were frequently introduced, and were found, as they could be lighted from above, to secure fine effects of illumination.

The same love of the picturesque which compelled such changes in both essential and subordinate architectural features led to the employment of a system of internal decoration in which statues were combined with frescoes. This was the case principally, and to an

excessive extent, in the churches of the Jesuits, and this mode of embellishment became so general and so marked in the churches of that order that the expression "Jesuit Style" has been adopted to designate it. The painting of the roofs played a most important part in the decoration of churches. Various kinds of settings were made use of, and other embellishments, such as festoons of flowers and fruits, and conchoidal designs, were freely introduced. The system of well disposed panelled ceilings, which was so prevalent in the Renaissance Style, as exemplified in St. Peter's and elsewhere, had to give way to the new system of painting in fresco. The whole space of the vaulting was frequently taken up by a single painting which covered the entire surface, representing "glories," surrounded by other groups in a sitting or recumbent posture, with architectural details painted in perspective, and the heavenly canopy represented in blue and gold. In order to give an appearance of reality to the hovering figures, detached parts of the same were frequently allowed to extend beyond the setting or enclosing border. Fresco painting consequently became all-important, but its very prominence not unfrequently militated against the general harmonious effect of the architecture.

The same license in the treatment and application of forms is also displayed in secular buildings. The façades and their details were especially treated with the greatest freedom, and the original constructive intention of the latter was no longer a matter of consideration. Fig. 228 gives an example of the Rococo style as applied to dwelling-houses.

The taste for picturesque effect which plays such an important part in the productions of this style, found

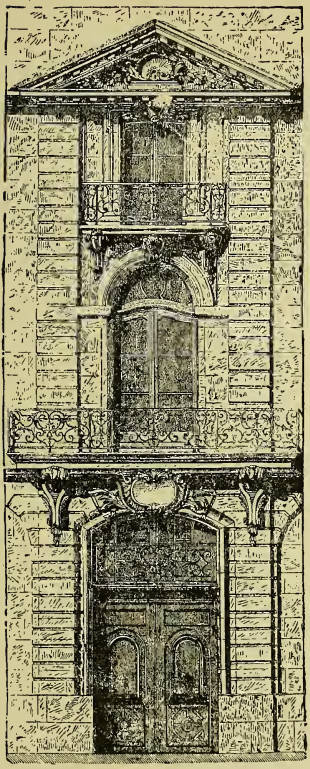


Fig. 228. PORTION OF THE FACADE AT PARIS IN THE STYLE OF LOUIS XV.

ample scope in the designs for vestibules and courts. The object which the architects were eager to obtain was that the view from the gateway should comprise some important detail, and convey an imposing or, at least pleasing perspective effect. Particular attention was also paid to staircases. They were generally constructed with a view to effect, and had several landings with broad low steps, and had for the most part stone balustrades, and were covered over with rich vaults.

194. In the eighteenth century circumstances occurred, which were favored by the national tendency of that epoch, and set a bound to any further deterioration in architecture, though it was scarcely possible to sink to a lower pitch than that which it had then attained. These altered circumstances were, however, not powerful enough to bring about an entirely new development. Rational, or rather restrictive criticism, was, in accordance with the spirit of analysis, more suited to restrain further advance in a false direction than to call a new line of art into existence by means of creations demonstrative of genius. By the discovery of Herculaneum and Pompeii a veneration for antiquity was again aroused, which was, moreover, fostered by engravings of the best works of art that were preserved in museums, such as views of the temples at Pæstum, as well as by Piranesi's masterly views of Roman monuments, and, finally, by new editions of the writings of Vitruvius, with suitable explanations and illustrations. Although in other countries than Italy the Rococo style prevailed for a considerable time longer, yet a reaction set in in favor of the efforts and tendencies of the sixteenth century. The further progress of the Rococo style was prevented, but, on the other hand, artists were

withdrawn from the sphere of art into the colder and reflective regions of science.

195. Although the classical architecture of antiquity came thus again into repute, yet, owing to the want of thorough studies of the monuments themselves, the precepts of Vitruvius and the most celebrated architects of the sixteenth century still remained in vogue, especially those of Vignola and Palladio. The studies were consequently only second-hand, instead of being derived from the original sources. The architects were imitators of imitators. It is therefore natural that their constructions, to which they strove more than ever to impart repose and severity of style, appeared only spiritless and insipid. Architecture seemed especially to lose in life and activity. Although no retrogression took place, still no progress was brought about; but a condition of lassitude supervened, which, after the excesses of the period which had so recently elapsed, had not internal strength enough to expand into a free, renovated, and independent artistic activity.

TIMBER ARCHITECTURE.

196. In the preceding divisions of the work the peculiarities of those architectural styles have been described which required consideration either owing to their monumental and artistic importance, or to the reference they bore to and influence which they exercised upon the succeeding style. It still remains to take notice of a method of building which occurs in connection with several of the styles which have been described, and displays the features appropriate to each,

but in which the material employed, namely, wood, has given rise to a certain general similarity of aspect, differing in this respect from stone or brick. But even in buildings constructed of this material two varieties occur; that is to say, those framed or half timbered houses in which wood is employed in connection with brick, and those in which it forms the only constructive

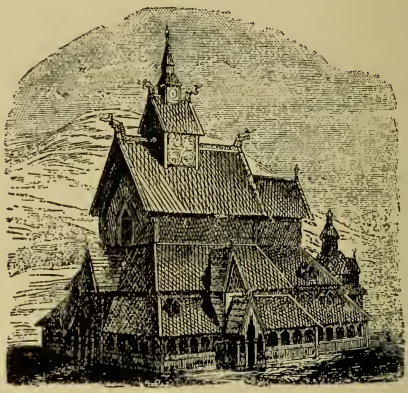


Fig. 229. VIEW OF THE WOOD CHURCH AT BURGUND.

material, and no stone or brick is introduced. To this latter class belong the ancient wood monuments of Norway and the houses which occur in mountainous districts, of which Switzerland, and especially the Bernese Oberland, offers the most beautiful examples. Consequently the designation, Swiss houses, or Swiss cottages, is that which is most generally applied to the entire

class of houses which are peculiar in a more or less similar shape to other mountain districts, especially the Tyrol. The Russian block or log-houses must also be mentioned as being constructed on a similar plan.

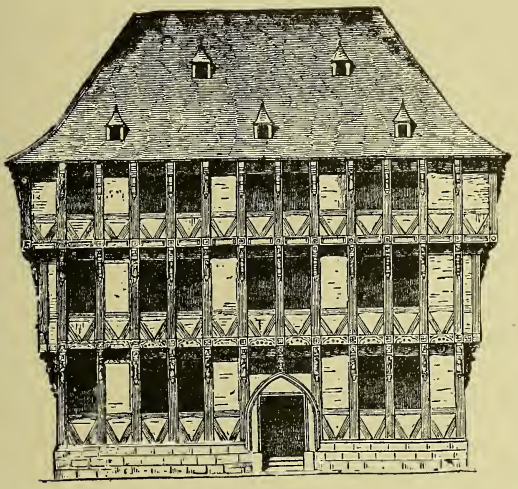


Fig. 230. FRONT VIEW OF BAY-WORK HOUSE AT HALBERSTADT.

The wood buildings of Norway lay claim to a certain monumental and historical importance, partly because they belong to the oldest class of buildings of this description, and partly owing to the purpose for which they were erected, namely, to serve as churches. The case is different as regards the merit of their artistic construction and beauty of shape, in both of which

points the standard attained is not a high one, as is shown by Fig. 231. The details principally show traces of the architectural styles prevalent at the time

Fig. 231. DETAIL OF Fig. 230.

of their erection, viz., the Romanesque and Byzantine, while the main forms must be considered as the result of a severe climate. The perishable nature of the material employed was also naturally prejudicial to any

advanced and regular development of architectural skill. From these causes the whole design assumed a pyramidal shape, whilst the climate necessitated a mode of construction which is peculiar to the buildings in question. As a protection against its rigors the structures were surrounded by covered passages ornamented externally with those little arcades which are a distinguishing feature of the Romanesque style, whilst the roofs were necessarily very steep in shape on account of the heavy falls of snow, and were covered with wood shingles, tiles, or slates. The form of construction is rather rough, for the corners are generally formed of rude logs, whilst the walls between merely consist of upright boards joined to one another. Churches of this description are known in Norway by the name of Fascine Churches. Although the construction is thus artless, yet an effort to enrich the whole by individual details and by the employment of painted embellishments is frequently to be noticed. This is especially effected by means of arabesque-like carvings on the doorways and gables.

In the interior, columns wrought out of trunks of trees, support either a barrel vault which lies over the nave of the building, and is constructed with boards, or else a flat roof of the same material. The capitals of these columns, when they do not consist merely of rings, are generally an imitation of the Romanesque cubical capital. The churches are usually dark, inasmuch as the only light which they receive is from little windows let in high up in the structure.

Framed houses are especially numerous in the Harz Mountains in Germany. In the oldest specimens the ornamentation has affinity with the Gothic style, whilst

the larger number show traces of the later Renaissance. The most characteristic feature of these buildings is that the stories are not placed perpendicularly one above another, but that each overhangs the one im-

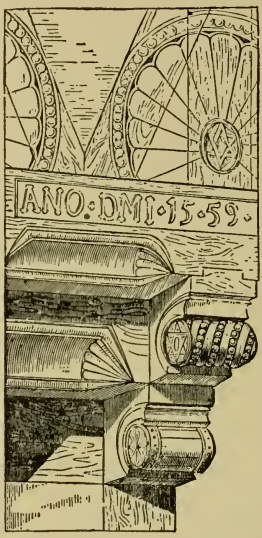


Fig. 232. DETAIL OF A BAY-WORK HOUSE.

mediately beneath it (Fig. 230). This overhanging construction gives scope for much external enrichment, and especially for that which forms the peculiar ornament of these buildings, namely, the carved or fluted brackets which support the walls of the story above, and the spaces between these brackets (Figs. 231 and 232). The

wall-space below these is not always fluted or carved, but sometimes covered with a more or less ornamental outer coating of upright or sloping timbers (Fig. 233).

It was by endeavors such as these just mentioned that an attempt was made to bring wooden buildings within the range of artistic productions, and though the buildings remained tasteless, still an attempt was made to gain enrichment by chamfering the projecting ends of the beams, and very frequently by filling in between the timbers with courses of various kinds of stone. This kind of architecture is frequently employed both in town

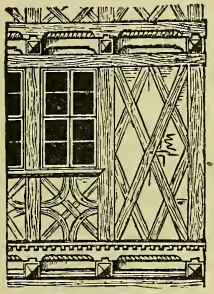


Fig. 233. PORTION OF BAY-WORK HOUSE.

houses and public buildings, as, for instance, in the Town Hall at Wernigerode; and in a simple form in domestic buildings in the country.

The third class of timber buildings which has to be described is the so-called Swiss-Cottage style (Fig. 234). This class belongs exclusively to the country in contra-

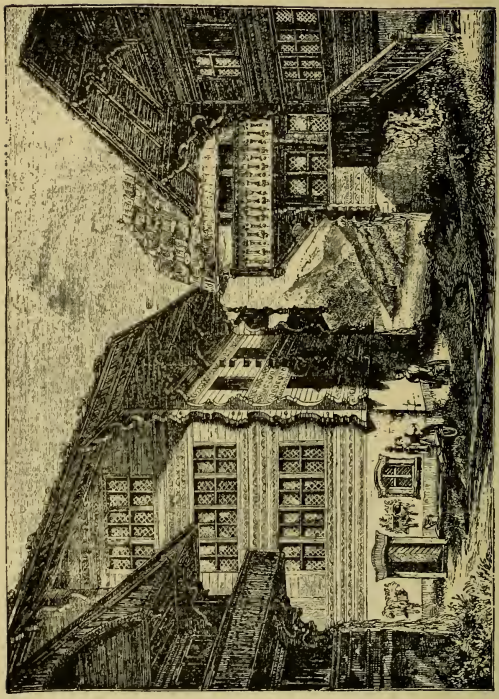


Fig. 234. SWISS HOUSES.

distinction to the town. It is only quite lately that its application has been extended to other purposes, as for example (and in combination with framed half-timbered construction), to railway-stations, &c.

The external walls of Swiss houses are, in the case of the log-houses, generally formed of trunks of trees arranged horizontally and overlapping one another, the interstices being closed up and daubed over. At the present day, however, solid walls are of frequent occurrence, or, at any rate, the lower part of the house is frequently solid. In the first-named mode of construction the trunks are either carved and left visible, or they are cased by wrought boards.

The main characteristic of these houses is the broad overhanging roof, which projects over both the gables and the sides, and underneath which elegant galleries with carved wooden staircases are sheltered. These galleries frequently occur one above another in the different stories of the building, and they sometimes run all round the house, though they are more frequently met with on one or two sides only. Wooden steps generally lead up to these galleries from the outside, when they are not high. The rafters of these projecting roofs are left bare, and generally carved in a curved shape. The gables and the eaves of the roof are lined by boarding carved with various ornaments, which materially tends to increase the picturesque effect and the elegance of the building. The roof is not steep in its pitch, and is covered with wood, slate, or slabs of stone.

Although the characteristics of this class of buildings are generally uniform, yet shades of difference occur here and there. These deviations are perceptible in the various countries where wooden houses are met with, and

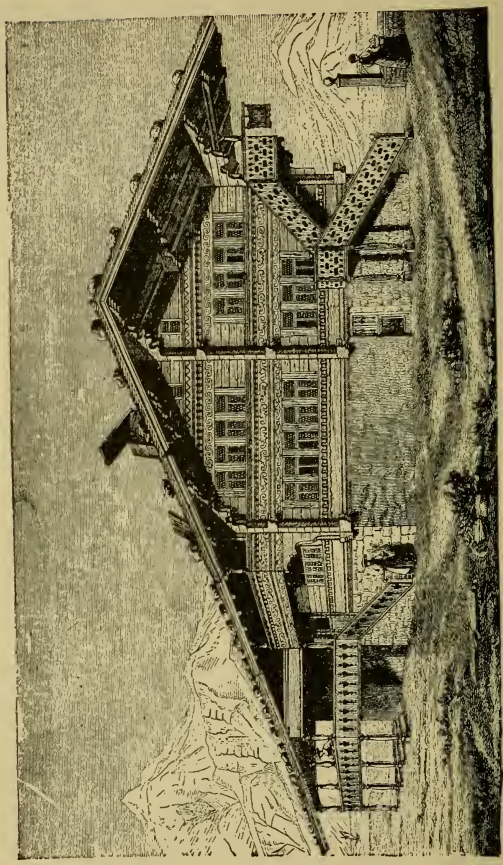


Fig. 235. SWISS HOUSE IN THE CANTON OF BERNE, ISELTWALD.

are found even in the different cantons of Switzerland. It would, however, carry us too far to enter more fully into these various points of difference. Fig. 235 exhibits a characteristic example of one of these Swiss-cottages or châlets.

TABLES OF STYLES BY COMPARISON.

After the detailed description of architectural styles which has now been given, it may not be amiss to add the following table of styles, which is to a certain extent the résumé of the whole.

I. Old Indian Style.—Childlike helplessness. Pretentious mode of expression combined with mythical freedom of imagination.

II. Egyptian Style.—Solemn earnestness and imposing aspect.

III. Grecian Style.—Nobility of expression and of the whole effect. Stately calm.

IV. Roman Style.—Manly vigor in form and conception.

V. Chinese Style.—Punchinello.

VI. Early Christian Basilica Style.—Expression of independence with the struggle for freedom from foreign influences.

VII. The Romanesque Style.—An expression of melancholy, but at the same time combined with geniality in sacred and private buildings, and grimness in castles and strongholds.

VIII. Moorish Style.—Free-vent to over-wrought fancy, and eccentric tone in conjunction with spectacular display. The spirit of chivalry permeates the whole.

IX. The Pointed or Gothic Style.—The expression of inward faith till it attains exaggerated enthusiasm, ever pointing heavenwards.

X. English Late-Gothic (Tudor) Style.—Gives the notion of practical worldly-wisdom and self-reliance, and pursues its own course when allied to what is incongruous.

XI. Renaissance Style:—

Commencement: Delight at meeting again after a long separation.—Approaches.

Middle: Appreciation and influence of new relations, established after a long interruption.

End: Feeling of uneasiness; efforts to attain freedom.

XII. Baroque Style.—Freedom when attained misused to excess.

Afterwards the following phases occur:—

1st Phase: Stagnation.—Physical and moral exhaustion. —Sleep.

2nd Phase: Transition to waking and rousing, owing to various influencing forces and visions of the past.

3rd Phase: Beginning of the nineteenth century lethargic and meaningless wanderings, clinging now to this, now that prominent object.

4th Phase: The present day.—Fully brisk and awake, but still under control.—Efforts to find the right path, at one time approaching, at another departing from the smooth track, because the goal still appears indistinct and assumes various aspect.

The relations between artists and the world at large are reciprocal; art is neither formed nor developed by one of them alone. The endeavors of the artist can only be effective when they correspond to the spiritual and intellectual feelings of the people. Artists are only able

to raise art to its highest pitch when an appreciation of and a desire for artistic productions have become universal, and are conjoined with a general perception of what is good and beautiful in art. After this level has been attained, the criticism of the people at large who have been trained and rendered intelligent judges by good works of art, reacts on the artist and urges him to attain a higher stage of development.

It therefore seems necessary, if the efforts of architects are to attain the wished-for results, that the principles to be followed should be known to non-professional persons, and especially to all educated people, who exercise any influence over public opinion, and, lastly, to those engaged in industrial pursuits, who by their works are called upon to second and facilitate these efforts on the part of the architect.

It is hoped that this book will in some degree contribute to bring about this happy result, by helping to arouse a feeling for, and a general interest in, architecture as an art and in its works, and by explaining much that renders it difficult to discriminate between the good and the bad. Much would be gained by the whole community beyond the satisfaction which persons of culture cannot but feel, in critically distinguishing various styles, and estimating the value of each.

ARCHITECTURAL DRAWING

SELF-TAUGHT

PREFACE

Having been more or less interested in Archi tecture and the building trades for nearly a half a century, I have in that time become acquainted with a great many workmen, who, while filling a subordinate position, possessed aspirations and ambitions, which, had they had a fair knowledge of drawing and geometry, would have lifted them to the hightest place in the department in which they labored. To give similar good fellows a chance to obtain the necessary knowledge to enable them to apply for the better positions with a certainty of their being able to fill them with credit is the motive which has prompted the compilation of this book, and, knowing the quality and magnitude of their wants, by personal contact with the workmen in the shop and on the building, I think I am qualified, to a large extent, to cull from the vast treasure house of industrial and technical literature, which added to my own experience, to present to the workman in the simplest form possible the material he requires to help him along in the struggle for

better conditions. To attempt to write a book on the subject of architectural drawing and claim for it originality, is simply out of the question; for very little that is original can be said, indeed very little is wanted to be said, for the literature now obtainable seems to cover every point and every phase of the subject.

It may be asked then: "Why make another book on the subject?" This seems a just and reasonable query, and one that deserves a well considered answer, and I will, to the best of my ability, endeavor to make such answer. First, then, while admitting that all that need be said on the subject has been said, and better said than I can say it, yet, it is so scattered and broken up, a bit here, and a bit there, that the student for whom this work is prepared would require to own a gold mine to be able to purchase all the works containing just what he requires; secondly, as this work is specially designed for active workmen who have no time to wade through ponderous tomes to find what may be a simple matter after all, they would probably be forced to forego the knowledge if it could not be obtained in a cheap and handy form, therefore, it is thought that by gathering together, and putting within reach of those who want them, a

series of instructions containing what is considered the most suitable to satisfy the requirements I have undertaken to fill, and which I hope will prove satisfactory to the young workman. Doubtless there are many things in this little work that, in the opinion of many persons, might be dispensed with; it may be, and likely is, that there are many good things omitted, many things that would have proved extremely useful, but in palliation I can justly say, that everything I have found on the subject, that was plain, simple and within the capacity of most of the persons this book will reach, and that were not too extensive, I have made use of, and to the best of my ability have placed them before my readers in such language as I am sure will meet with their approval.

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Architectural Drawing Self Taught

INTRODUCTION

Before entering into the subject on which this work is being prepared, the editor and compiler would like to say a few words to the reader, in connection therewith.

It will be noticed that the title of this work is "Architectural and Builders' Drawing Self-Taught"; and this title fairly conveys to the intelligent reader, the scope of the volume, as the work is intended solely for young progressive carpenters and builders who are not going to drag out a tiresome existence by remaining at the bottom of their trades, and who have not had an opportunity of acquiring a knowledge of architectural drawing or the use of drawing instruments. Many of the best draftsmen in the United States, Canada, and Great Britain, came from the ranks of the working men; men who had gained the most of their knowledge of the laws of construction and exactness in the workshop, at the bench, or on the buildings where

they were employed; and I may say that it is within the power of ninety per cent of workmen to become fairly good draftsmen, by their own efforts, and the aid of such books as the one I have now prepared for this purpose; and the young man who has by his own efforts, perseverance and ability, succeeded in being able to place on paper or board with pen and pencil, a plain elevation of a door, window, house, stone wall, or veranda, drawn to scale, and so made as to convey to his fellow workman a correct idea of what is intended, that man has achieved a result which should—and generally does—advance his wages, increase his importance, and make him a more valuable and useful citizen. It is not to be supposed that this little work alone, even though thoroughly digested, will enable the reader to become a finished draftsman, nor is it so intended, but it will aid him materially in acquiring such knowledge as will give him a good start on the highway to success.

Wherever the student can attain access to a school for drawing, there he should at once proceed, for a few hours spent over a drawing board under competent supervision, will do more towards giving him an insight into the methods and practice of good draftsmanship than it is

possible to obtain by many days of book study. Where there are no such schools available the student should try and get into an architect's office, or into the office of some mechanical draftsman, and either pay for, or work for, a series of lessons on drawing, but when none of these conditions exist, he should take up a series of studies in practical geometry in connection with drawing; as a knowledge of geometry as presented in either "Modern Carpentry and Joinery", or other works published in this series of work-manuals, by Messrs. Frederick J. Drake & Co.

The construction of geometrical figures is exceedingly good exercise and will not only give the reader good theoretical knowledge, but will help him in his drawing lessons and practice him in exactness.

By application and determination "to fight it out to a finish" the earnest student will be sure to make a good—perhaps a first-class—draftsman, for, to the really earnest man, nothing is impossible within the range of human accomplishments.

I have referred in the foregoing to "exactness." This is the first "necessity" in a drawing that is intended to be used as a guide for actual work.

A drawing may be rough, dirty and inartistically done, but if it be complete and correct it serves its purpose, and is immeasurably superior for practical uses to the inexact artistic one, which may dazzle with its shade and shadows and fineness of execution, but leads to confusion and failure and consequent chagrin and loss.

I have thought it necessary to inject into this little work a few remarks and a few illustrations on Free Hand Drawing, as many persons are gifted with the power of being able to make a fair drawing of objects on sight, and it was thought that, perhaps, a few hints in this direction would be necessary to make the book complete, as these hints may aid those who have these gifts, and stimulate those who have them not, to cultivate the art, as a knowledge of it is one of the most useful aids the drawing student can possess.

It must be remembered this work does not pretend to lead the student beyond the realm of plain practical drawing, such as the everyday workman will find useful and convenient, whenever he wishes to convey to others an idea of what he intends to erect, or to lay out on paper or board a piece of work he is about to execute. I have eschewed perspective, and

elaborate drawings of any kind, but, should it be thought wise, I may hereafter, prepare a work for this series, dealing with perspective and a higher grade of work than is herewith presented.

SOMETHING ABOUT DRAWING INSTRUMENTS

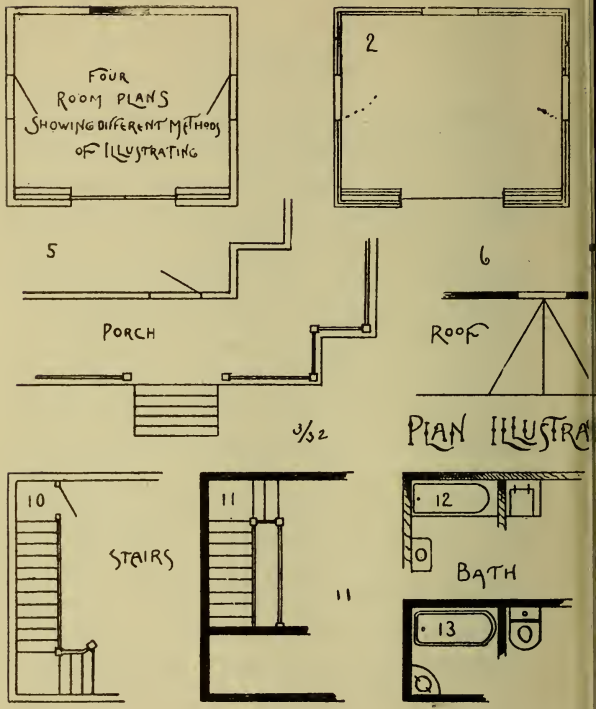
In all kinds of geometrical, architectural and mechanical drawing, the accuracy of the work will depend much, in theory, on the excellency of the drawing instruments used.

Practically, these instruments are not quite perfect, and any carelessness or negligence of the draftsman when using them, may render them unfit for accuracy of operation. Indeed, the hand and eye of the operator, viewed simply as instruments, for executing conceptions of form, are vastly superior and more varied than the best of appliances used by the draftsman, and well directed efforts should, and will, bring out this capacity so that, other things being equal, he will make the most expert and elegant draftsman whose eye is most reliable in its estimate of form and size, and whose free hand is most skilled in expressing these elements of figure. Instruments, however, are necessary, and a little talk on the subject will not be out of place, and may prove of practical value to the reader.

PLATE 1.

This plate exhibits some eighteen different sketches. No. 1 shows a plain method of laying out a room having sliding doors in it. No. 2 shows the same room presented on another method. No 3 exhibits another simple plan of marking off the same room, while No. 4 shows the walls in plain black. These four examples are intended to convey to the student some idea of the various methods of illustrating. No. 5 shows the layout of a porch, with an angle on one corner. No. 6 shows the plan of the porch roof. Nos. 7 and 8 show plan of semi-octagon bay-windows, and roof plan, while No. 9 shows the roof plan for a pentagon bay-window. Nos. 10 and 11 show two plans of stairs that are suggestive. Nos. 12 and 13 exhibit two styles of laying out a bath room. No. 14 shows several ways of laying out fireplaces, while 15, 16 and 17 show portions of a pantry and kitchen.

never be less than 12 by 17 inches. Indeed, it is


FOUR
ROOM PLANS
SHOWING DIFFERENT METHOD
OF ILLUSTRATING
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PORCH
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ROOF
PLAN ILLUSTRA
3/32
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STAIRS
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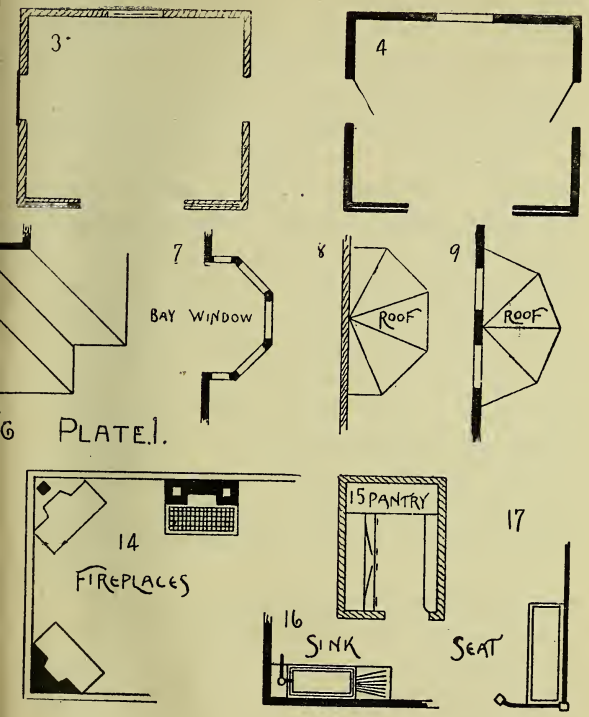
BATH
13



never be less than 12 by 17 inches. Indeed, it is

Almost, in every department of life the best results can only be obtained by the skilful employment of the best means available. Sometimes a genius accomplishes supreme results with the most primitive of means, but it is not for geniuses this work is prepared, but for everyday sort of people, people who do not expect to build houses without materials, or become draftsmen without long and careful preparation; and such being the case it is in order that the reader be advised to purchase the best instruments and accessories his means will admit of.

"A fine workman requires fine tools," and no man can do a fine piece of work not having the proper tools wherewith to do it, so no man can do a good piece of drafting without having the necessary tools; therefore, it will not be out of place to commence with a description of the instruments required, and the manner of using them.

The first thing the young student will require, will be a drawing board. This may be made at home, but should be true on its face and the edges should be exactly at right-angles with each other, or perfectly *square*. The board may be made in size, to suit requirements, but should never be less than 12 by 17 inches. Indeed, it is

better to have two or three boards of sizes varying from 12x17 to 36x60 inches.

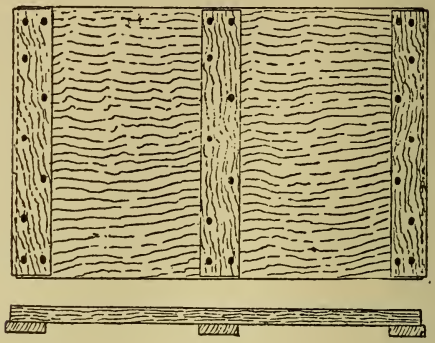


Fig. 1.

They may be clamped on the ends with stuff about 1¼ inches wide and the thickness of the board, or they may be held together with battens either screwed on to the underside as shown at

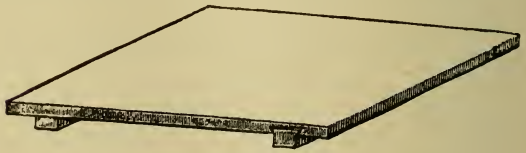


Fig. 2.

Fig. 1, or dovetailed into the board across the grain as shown at Fig. 2. At Fig. 3 a much

better board is shown and one I can recommend as possessing nearly all the qualities of a perfect board.

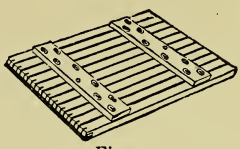


Fig. 3.

A glance at the illustration will explain the good qualities of this style of board. The wood used should be carefully selected pine or basswood with hardwood cross-bars at back. To prevent the warping of the wood, the board is sawed half way through at about every two inches, and for the purpose of allowing to contract and expand, the cross bars are not glued on, but fastened with screws, which run in oblong metal slots. At the ends, pieces of hardwood are inlaid, to give the T-square a smooth working edge. They are also cut at every few inches, to allow for contraction and expansion of the board.

While the cheapest boards are made of white pine or basswood, it doesn't necessarily follow that boards may not be made of other woods; cedar, mahogany and straight grained walnut make very fine boards and answer very well where you do not require to use pins for securing the paper to the board. When, then, hardwood

boards are used, it is as well to employ glue or mucilage in fastening paper to the board.

Drawing paper comes in rolls of indefinite lengths, and from 36 to 54 inches wide, and in sheets of various sizes. It is made in different tints, is generally very tough, and is chiefly used for details; it is much cheaper than Whatman's, and for many purposes answers just as well. There is also a paper comes in rolls called "Cartridge paper" of a buff color, very strong and cheap, and admirably suited for details and like work. Tracing cloth, also, comes in rolls, 18, 30, 36, and 42 inches wide; it is convenient and durable, and may be folded up almost any number of times without injury.

Tracing paper is made of different qualities and sizes; it is rendered transparent, and qualified to receive ink lines and tinting without spreading. Like tracing cloth, when placed over a drawing already executed, the drawing is distinctly visible through the paper, and may be copied or traced directly by the ink instruments; thus an accurate copy may be made with great expedition. We cannot give reliable price quotations of these papers, as they vary somewhat, and may be different prices in different localities.

The paper should be fastened to the board with pins or thumb-tacks similar to those exhibited in Fig. 4. These are made with a broad flat head, of brass, white metal or silver, and rounded so as to permit the square to slide easily over them, and the stem should be of steel and riveted or screwed into the head.

Fig. 4

Fig. 5 exhibits several styles of "thumb-tacks," all of which are well enough in their way. There is a number of other styles of tacks of various kinds besides the ones shown.

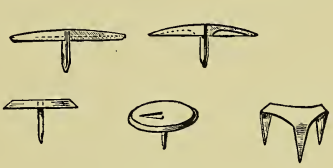


Fig. 5.

When the young student gets down to "real work" and makes use of good paper, he should first damp the edges of the paper, then glue the edges and place fairly on the board, holding it in place with pins or other suitable appliances, which may be removed when the work is dry and ready to operate upon. This method of fastening is sufficient where no shadowing or coloring is to be applied, and if the sheet is not too long a time upon the board. It has the

advantage, too, of preserving to the paper its natural quality of surface. With mounted paper, there is no other proper way of fastening. For large, colored, or elaborate drawings, however, a damped sheet is preferable, and where the coloring is a flat tint, damp stretching is indispensable, as the partial wetting by water color causes the surface to buckle; partial wetting of loose paper by water color causes the surface to buckle.

Damp-stretching is performed in the following manner: lay the sheet on the board, with the face side under, and have the thick edges trimmed from the paper; draw a wet sponge freely and rapidly over the upper side, beginning at the center, damping the entire surface, and allow the sheet to rest for a few minutes till it be damped through, and the surface-water disappears. Those parts which appear to revive sooner than others, should be retouched with the sponge. The damping should be done as lightly as possible, as the sponge always deprives the paper of more or less of its sizing. The sheet is now turned over and placed fair with the edges of the board—sufficiently clear of the working edges to permit the free action of the drawing-square. The square, or an ordinary straight-

edge, is next applied to the paper, and set a little within one edge, which is then turned up over the square and smeared with glue. The paper is then turned down and pressed on the board, after which it is rubbed down all along the "lap" with some smooth article. The same process is performed on the other edges of the paper. The whole is then left to dry, which, when completed, leaves the surface flat and tense.

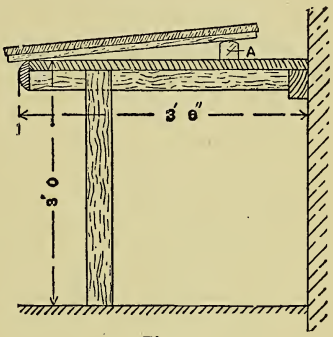


Fig. 6.

It is not likely the ordinary workman will want to color his drawings, therefore he will find it safer, and less trouble, to simply tack his paper on the board with the thumb tacks, and then make his drawings first in pencil, then in ink, but I have thought it well to give some hints regarding the manner of preparing the papers for coloring. Further on, I will have more to say on this subject and on the subject of color.

Having prepared a drawing board, the next thing will be to provide a table or desk to rest the board on. I show a very good scheme for this purpose in sketch Fig. 6, and which can readily be made by any workman who can use tools. This should be fixed in some place where there is an abundance of light and in such a position that the light will fall on the board from the left side as shown in Fig. 7. The height and

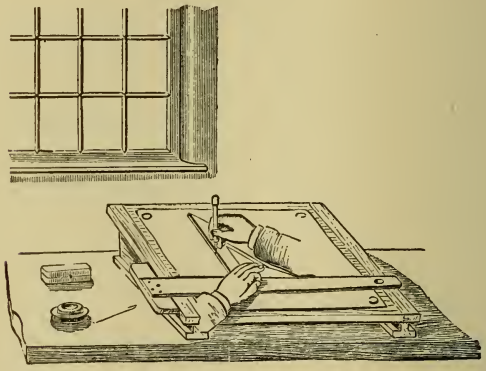


Fig. 7.

projection of the table or desk are marked in Fig. 6, and a movable block of about 3 inches square is shown at A, which can be moved in such a fashion that the angle of the board may

be made to suit the operator. This block must of course be as long as the drawing board.

Fig. 7 shows the board in position with the paper tacked on, and the proper position of the hands are shown as they should appear while making the drawing.

The next thing to be considered is the T square. This needs but little description, as every workman is supposed to know what this instrument is; it may, however, be noted that T-squares differ in construction. In the commonest the "blade", or thin portion, is fixed flush with one side of the "butt", or "head", as at A, Fig. 8. In other forms the blade is fastened in the middle of the butt, B, and this is the preferable form for large squares; others, at C, Fig. 8, have the blade above the level of the

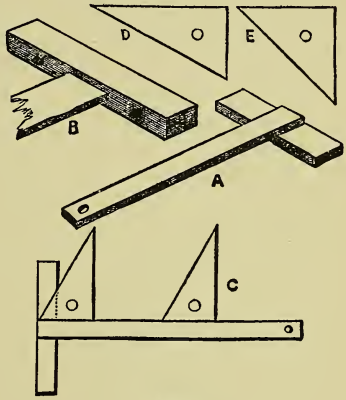


Fig. 8.

head, to permit set-squares to go over it. Very large squares have a couple of little studs, as shown in the figure B, to steady them.

French curves, L, Fig. 9, are made in a great variety of combinations. They are extremely handy for drawing curves not easily struck by the compasses, and also for eccentric curves, which the compasses are not able to describe as in medieval mouldings of some forms. In inking-in a curve by the aid of one of these appliances the edges must be turned about on the pencilled drawing until some part is found which corresponds, when the edge of the curve will guide the drawing-pen. There are a great variety of these curves as may be seen at Fig. 10. These variable or irregular curves are made of thin wood, hard rubber or celluloid, and are sold for a few cents each.

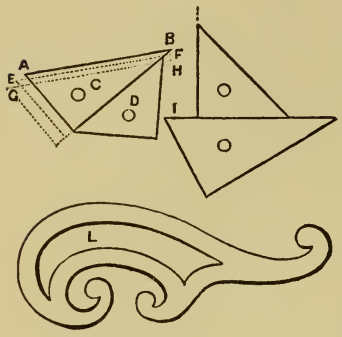


Fig. 9.

The set square or squares, similar to those shown at Fig. 9, C, D, K and B, are great aids

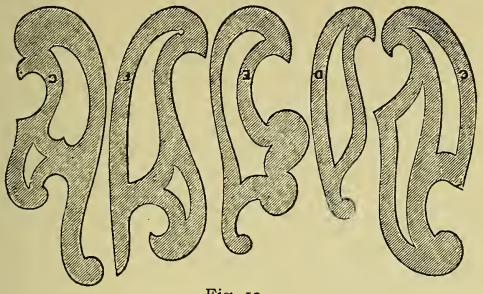


Fig. 10.

to drawing as they may be employed in conjunction with the T-square, for lining off angles, or laying off parallel lines as shown by the dotted lines EG, and FH. These set squares are made

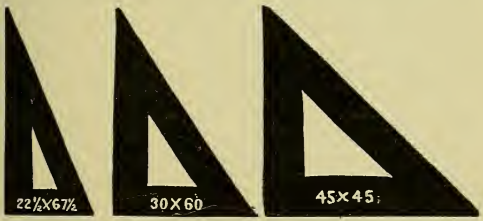


Fig. 11.

to suit different angles, and in many styles, as will be seen in Fig. 11. The manner of

using them will suggest itself as the work proceeds.

T-squares of a superior kind may be obtained from any dealer in mathematical instruments for from $1.00 to $6.00 each, but in most cases the workman can make his own squares, as well as his own drawing boards, and save money by the operation. The squares shown at Fig. 12 are of a superior kind, the blades and one edge

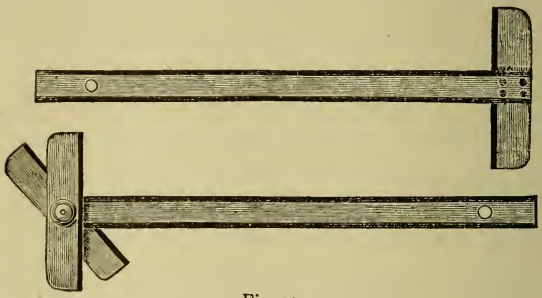


Fig. 12.

of the stocks having ebony or other hard wood glued on the edges to prevent them from wearing. The lower square has a movable stock, which is operated by a thumb screw, thus enabling the draftsman to set the blade to any angle desired. The working of this will be easily understood by the reader.

Another accessory, and one the workman can make for himself, is a straight edge—or several of them—which may be made of hard-wood, or it may be made of good clean straight grained soft wood, and have hardwood edges glued on as shown in Fig. 13. Perhaps it would be well to have three or four of these straight edges in different lengths and widths, say one 16 in. long,

Fig. 13.

one 30 in. long, and another 40 in. long. The widths may be 2 in., 2½ in., and 3¼ in. respectively. They should not be more than three-sixteenths of an inch thick, but would be better if they were thinner.

A rule or scale is always necessary, for all architectural or other drawings that are intended to be worked from, must be made to scale. Usually, in this country, scales are made and marked off to some proportion of the English foot, when intended for architectural work. One sixteenth of an inch may represent one

foot or one yard, as the case may be, so also may one eighth, one quarter, or one half of an inch represent one foot or one yard, just as the draftsman determines. One eighth of an inch is the most used, though one quarter of an inch is

Fig. 14.

the scale generally employed. For workmen's use three quarters of an inch scale is handy, as this makes one sixteenth of an inch represent one inch of the actual work, which is quite convenient in a working drawing.

Scales may be had flat or triangular, and in boxwood, ivory or hard rubber, and one foot

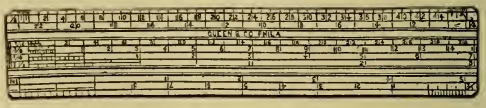


Fig. 15.

long. The flat scales are very handy, but are sometimes confusing, because often two or more scales are laid off on one edge. Perhaps the handiest scale for actual use, is the triangular one, which is similar to Fig. 14. There are six

edges on this scale, each edge having a different marking or scale. The flat scale is shown at Fig. 15. This scale is 12 inches long, with 16 scales, as follows: 1/8, 3/16, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1 1/4, 1 1/2, 1 3/4, 2, 2 1/4, 2 1/2, and 3 inches to the foot, the first division of each scale subdivided in 12 parts, each.

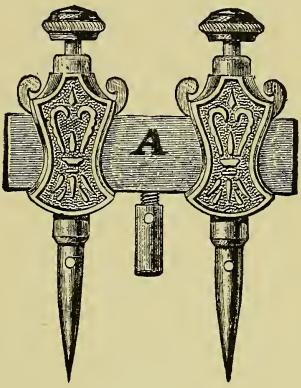


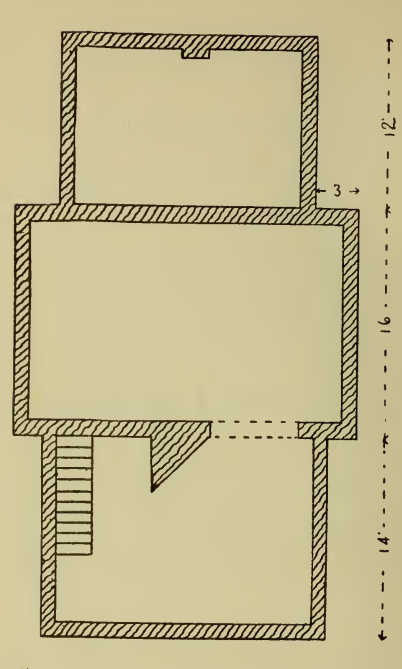
Fig. 16.

Besides these there are many other kinds of scales made use of by Architects, Engineers, and Surveyors, but these shown and described, will suffice for the purpose for which this book is prepared, as it is not intended to embody in this work other than the simplest methods of plain architectural work, and such as can be executed with the simplest kind of instruments.

There is a number of other accessories used in drawing besides these mentioned, that are not placed in a regular box or case of instru-

PLATE 2.

Following up the ideas presented in Plate 1, I give herewith the plans for a small cottage and show the cellar plan, first floor plan and chamber plan. This is drawn to a scale of $\frac{3}{32}$ of an inch to the foot, but I would advise the student to double the size, which, as a matter of fact, the original drawings of these examples is the scale to which they are made, namely $\frac{3}{16}$ of an inch to the foot. Every item necessary for a house of this description is shown on these plans.


3
12'
16'
14'
2'
20
2'
FOUNDATION
PORCH
5×5
PANTRY
5'×7'
DINING ROOM
12' × 16'
HALL
8'×14'

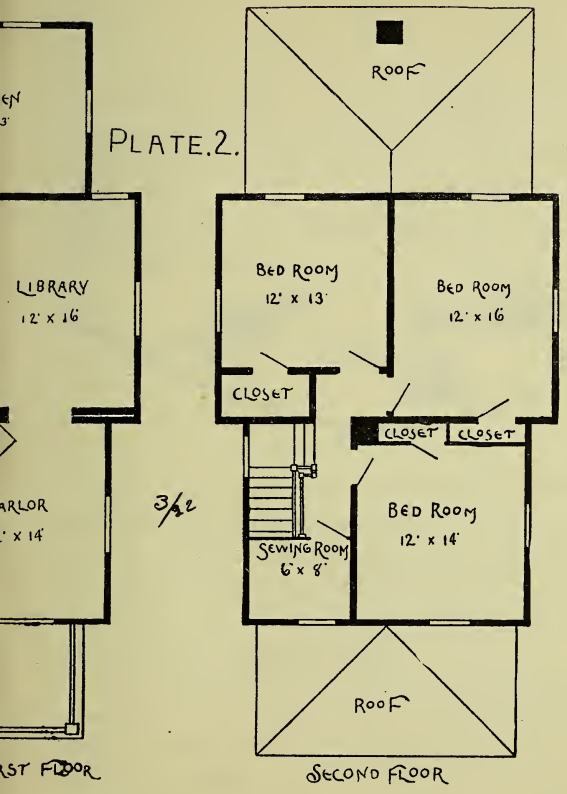


PLATE.2.
LIBRARY
12' x 16'
ARLOR
' x 14'
RST FLOOR
3/12
ROOF
BED ROOM
12' x 13'
BED ROOM
12' x 16'
CLOSET
CLOSET
CLOSET
BED ROOM
12' x 14'
SEWING ROOM
6' x 8'
ROOF
SECOND FLOOR

ments, such as splines, ellipsographs, and beam-compasses; the latter being designed for drawing circles of large diameter, and are so made that the points can be moved to the desired distance apart. One steel point may be removed and a pencil or inking pen inserted. Set screws hold the heads in position on the sliding bar A, Fig. 16. This bar may be of wood, or of metal, preferably the former, and it may be of any desired length.

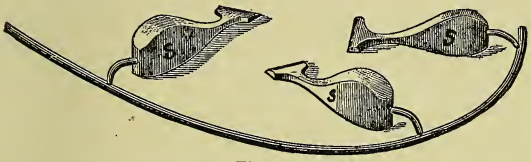


Fig. 17.

Splines are flexible strips of wood or metal, and are used for forming curves—regular or variable—and are held in position by a peculiar attachment which serves to hold the curve in position as shown at S S S, Fig. 17. These attachments are made of lead.

The ellipsograph is a costly instrument and one which the ordinary workman would seldom require; besides, there are a number of ways by which an ellipse may be drawn, and figures approaching an ellipse, so I would not advise

the young draftsman to purchase the more expensive one until his means or business warranted it. I give an illustration, however, of

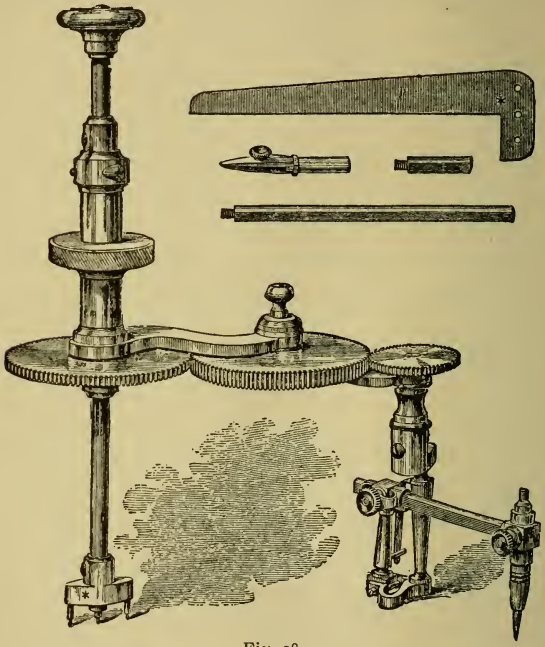


Fig. 18.

Browne's patent ellipsograph in order to acquaint my readers with the style of instrument. This is an excellent device, and can be adjusted to

form ellipses or ovals of all kinds within the limits of the instrument. It is shown with some of the attachments at Fig. 18. The price of this device varies from $9.00 to $14.00. A very good one may be obtained for about $12.00.

Apart from the conventional box of instruments, the appliances now described will be about all the young workman will require unless, of course, he intends to study for an architect or mechanical engineer, when, of course, he will have passed beyond the limits of this work which is intended only for such workmen as have no other opportunities of learning the rudiments of draftsmanship.

It will be in order now to say something about the instruments proper the beginner will require, so I will, as briefly as possible, describe the instruments, explain their uses, and offer a few suggestions as to their care and management.

A BOX OF INSTRUMENTS

It is not my province to recommend any particular make of instruments for, so far as I am aware any of, the ordinary makes—that are not intended for school children—will serve the purpose of learning their use, and afterwards, the student, when advanced sufficiently, a more

costly and more complete set may be obtained if found necessary. While, of course, purchasing drawing instruments is like purchasing tools, that is, it is always better to buy the very best that can be bought, and I may say that the best may be obtained in single pieces or in boxes containing only three or four pieces. However, perhaps, it is best in our case to get a set similar to the case shown at Fig. 19. This is a Morocco case which contains two dividers, pen and pencil points, drawing pen, and a six inch flat scale. This case can be bought for about $4.00, for which sum instruments ought to be fairly good; if, however, the student can afford it, and feels that he had better purchase a set of instruments that will meet all his needs, present and future, why then he had better invest in a better quality of goods, and purchase a case containing a greater number of instruments and of a finer grade, such as I show at Fig. 20, which may be obtained for about $20.00 or $25.00. This case

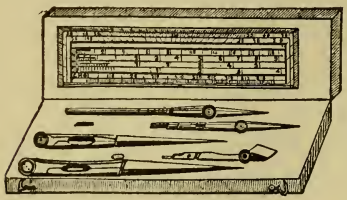


Fig. 19.

contains, besides the box, one 5½ in. dividers, with pen, pencil and needle points, lengthening bar; 3½ in. dividers, with pen, pencil and needle points; 5 in. plain dividers; 5 in. hair spring

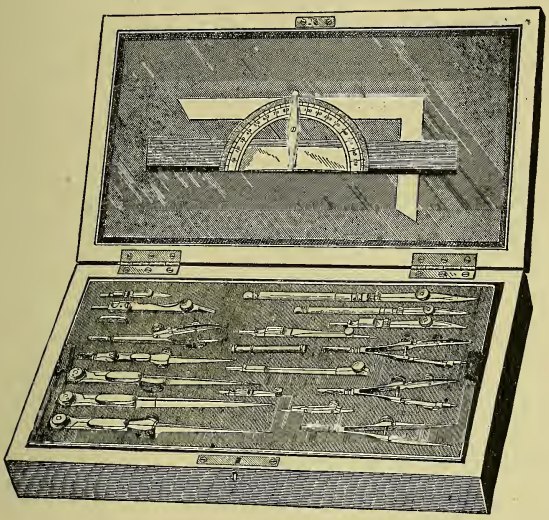


Fig. 20.

dividers; spring bow dividers, pen and pencil, needle points, ivory handle; 4½ in. ivory handle hinged drawing pen, needle point; 5½ in. ivory handle hinged drawing pen, needle point; German silver protractor, ebony rule and scale.

These instruments are made of fine German silver with superior steel points.

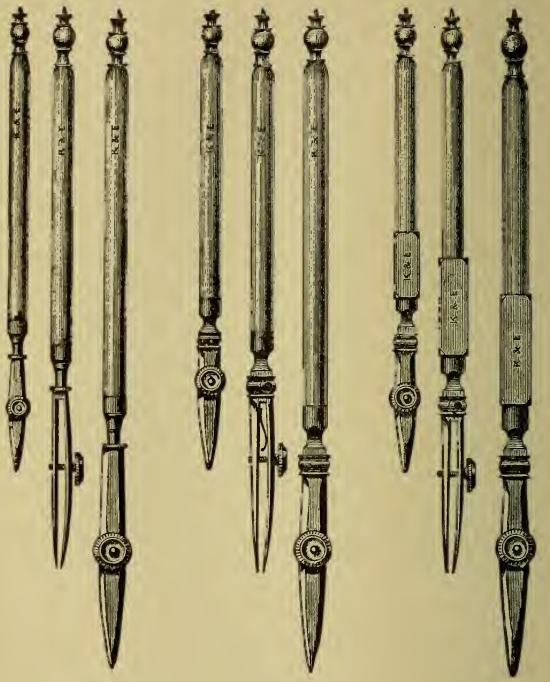


Fig. 21.

Fine Swiss made instruments cost more than German ones, as some of the Swiss cases run up

to $150.00 and $175.00. English and American made instruments are high priced, but as a rule are more substantial and in the end give better satisfaction than other makes.

The first things to be considered in a set of instruments are the compasses. These generally include dividers and pen and pencil attachments. It is not necessary to illustrate or describe the form of these instruments, as they may be seen in the case as shown in Fig. 20, and the interchangeable parts will easily find the place they are intended for when required for use; so I will not dwell on the subject of compasses longer.

Perhaps the most important article in the case to the young student is the pen, and I will therefore devote more space to a description of it than I will to any other of the instruments, as a proper knowledge of its use and care will be of great assistance in the work before us.

A DRAWING PEN

This is the most useful and the most used instrument in the case. Fig. 21, which is taken from Keuffel and Esser Co.'s catalogue, shows a variety of pens of the very best make, pens that are suited for any kind of line drawings in ink.

The prices of these, with ivory handles, range from $1.40 to $2.50 each, and they are warranted to be the best of their kind.

A few words as to the use and care of this instrument may not be out of place at this juncture, as it is important the instrument should be well understood by the student so that he may the better be able to make the best of it. The man who devotes himself exclusively to any particular vocation, day after day, for several years, acquires an intimate knowledge of its details that is not easily imparted to the novice through the medium of pen and ink, and often when it is attempted, the finer details which contribute so much to success are passed over lightly or are omitted altogether. "In the course of his experience he acquires ways and means of prosecuting his work, if he be intelligent and progressive, which makes its execution easy and places him on the list of "skilled operators."

The art of mechanical drawing contains a few of those mysteries which, if published at all, have not been given a very wide circulation.

Our scientific libraries and dealers in technical works are copiously supplied with books on mechanical drawing, in any of which may be found the illustrations of tools, curves, inks,

colors, etc., carefully reproduced from the catalogues of dealers, but the accompanying description does not always give a clear idea of the relative merits of the different tools shown, how they should be selected, handled, and kept in repair, and, while it is not intended in this work to describe the methods of caring for and repairing all the instruments a box contains, it is necessary the pen should have more than a passing notice.

It is a custom with many makers of first-class instruments to hinge one jaw of the ruling pen to the little separating block above the adjusting screw, so that it may be opened after the adjusting screw is removed. In a pen of this kind the joint should be very snug, as the least amount of play will allow the point of one jaw to slip ahead of the other, which would destroy the efficiency of the pen. In the opinion of the writer this joint is altogether unnecessary. It increases the first cost as well as complicates the instrument, and if used often, will get out of order, even with the very best workmanship. If used properly the points need never be separated further than the adjusting screw will permit. Many draftsmen have the hinge joint brazed or soldered so as to fix the movable jaw to the

separating block and make it permanent. The points of a pen should never be separated for sharpening, which is the only purpose for which the hinge is made. When the point has become dull from use it will be found with a shape similar to Fig. 22. To restore it to the proper form the jaws should be closed by the adjusting screw, so that the points press gently against each other; then with a fine oilstone worked with a circular motion on the high corners it should be ground to a shape similar to Fig. 23. The point will then be blunt, but will have the proper working when the sides are reduced, which should be carefully done by laying the side of the pen on the stone at an angle with its surface that will allow the metal to be ground in a straight line to a distance of about one quarter of an inch from the point. The jaws should be opened frequently as the work progresses and the points examined to avoid grinding through the point of one jaw into that of the other. The sides are to be reduced till the points of each jaw are equal and just fine enough to slide smoothly over the paper without producing a

Fig. 22.

Fig. 23.

cutting or scratching sensation. When the points are not sharp enough to make a clean fine line the blunt part is easily visible with the naked eye, but when it is sufficiently reduced it is hardly possible to see it. The shape of the curves in the sides, or jaws, of a pen is also an important feature. If the pen is too open near the point on account of the jaws being too much curved, as in Fig. 24, it will leave too much space for ink, causing it to dry quickly or to fall out in using. Fig. 25 shows about the proper amount of curve in the jaws to give sufficient ink space.

Fig. 24.

Wooden handles, though not quite as elegant as bone, are preferable as they are not liable to break when accidentally swept off the drawing-board—an accident that destroys nine-tenths of the bone handles.

For spring bow pens and pencil compasses it is advisable to have on the adjusting screw, when the pen or pencil is set to draw its largest circle. With a pen that is not too strong in the springs an experienced draftsman will never change his centers to draw a shade line on one side of

Fig. 25.

the circle, as this may be easily accomplished by springing the pen gently toward the side to be shaded, as he continues the movement of drawing the circle. The pivot, or needle point, should always be adjustable. When it is made solid with the leg of the instrument it is generally shaped like the point of a sewing needle, and will pierce a large hole through the paper or tracing cloth with the slightest pressure if used several times in the same center; and should a small piece be broken off the point, the pen will be useless unless a similar length be ground off the nibs of the pen.

A very common source of annoyance in nearly all bow pens and pencil compasses is found in the eye or socket provided for the pencil. In many cases it is found too large to hold the ordinary naked lead, and too small for those covered with wood. Frequently draftsmen are obliged to overcome this difficulty by the clumsy makeshift of reducing the wood till it fits the socket.

Sometimes a small bushing is provided with the compass, that will fit in the eye and hold the lead. This is unsatisfactory, as the pencil cannot be readily adjusted as the point wears away. The most effective treatment an instrument of

this kind can have is to file away the metal in the parting or "split" of the socket and close in its sides so as to reduce the eye sufficiently to grasp the hexagon lead of a 6H pencil; this makes the pencil-holder very convenient as well as economical, the butts of worn pencils may be stripped of their wood and the leads used in the compasses.

So much for the pen in its various forms; and now a few words concerning some of the other instruments. Among these may be found some possessing various degrees of usefulness, and others having no merit whatever. Some of the devices that have been invented for making broken or dotted lines may be classed among the latter. The proportional compasses or dividers is a very good tool to have in stock, but it should never be used for transferring drawings from one scale to another when accuracy is required; not only is the instrument liable to be in error, but if there should be any mistakes in measurement in the original drawing they will be transferred to the new in a greater degree.

A much more effective and convenient pointer than that usually found in sets of instruments may be made on the one end of a 6H pencil by reducing it to a fine point. The dot or point left

by it, indicating the dimension, is always easily found, and, as the other end of the pencil may be made "chisel shaped" or flat for drawing lines, the operation of laying off dimensions and drawing the lines may be carried on without changing tools or losing time. For sharpening pencils, it is very convenient to have a fine file, attached by a string to the under side of the drawing board, or what is still better, as the file very soon gets dull, a piece of wood made about the shape of a small flat file with a piece of emery cloth glued to each side. In using, the pencil should be rubbed on the emery.

The boxwood scale with triangular section, same as shown at Fig. 14, has served its purpose well, but it, too, has its weak points. The requirements of a good scale are that the graduations and figures shall be plain and indelible, that it be perfectly straight and the edges sharp, so that the division lines may be brought close to the paper. The boxwood scale does not possess the first of these features as the lines will be often dimmed or partially obliterated with two or three years' use.

Some draftsmen have a habit of taking off dimensions by placing one leg of the dividers on any particular division and extending the other

to the distance required. When this is done with a boxwood scale its usefulness is limited to a very short time. The grain of the wood must be straight, or it will be apt to warp or spring. Some excellent scales are made of hardened steel, by a firm in Providence, R. I., which seem to me to be as near perfection as possible. Draftsmen as a rule, however, object to making use of steel scales, and they have not come into general use; and for this reason, these scales, we are informed, cannot be obtained unless specially ordered at the factory.

Every metallic instrument the draftsman uses should, when possible, be nickel-plated. There is nothing contributes so much to their preservation, no amount of careful polishing and wiping will so effectually prevent rusting and discoloring, and nothing improves their appearance so much or makes them so agreeable to handle. The cost of plating is insignificant compared with the benefit derived, as the average cost of plating would not exceed ten cents for each tool or instrument.

In selecting triangles it is essential to have them of a material that will not change shape with each atmospheric disturbance. For a number of reasons hard rubber is the best that

PLATE 3.

On this Plate I show the side frame of the small cottage with all the openings for windows, also two sections of the framework, with the heights marked on for the different stories and sizes of timbers. The stonework and cellar windows are shown.

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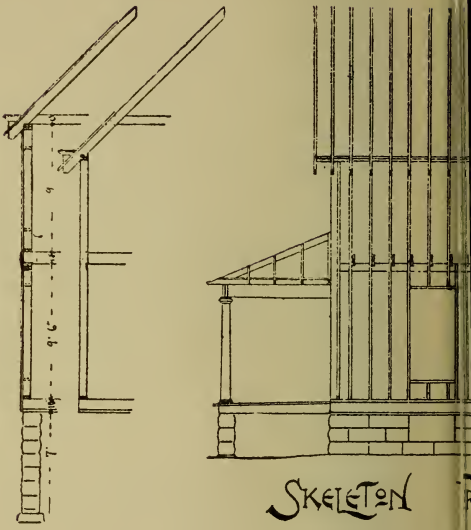

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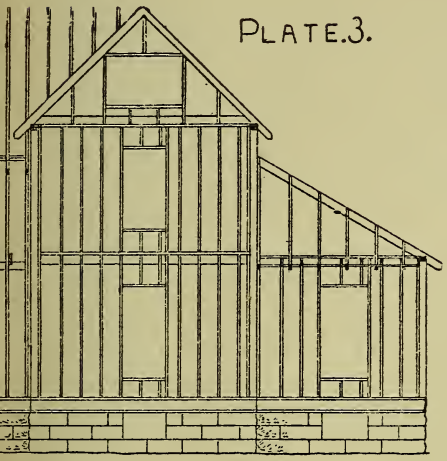

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a thin piece of brass plate with a knife-edge inserted in the working edge of the blade. This

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has been offered to the trade. It is unchangeable, under ordinary conditions, and may be made into angles from $\frac{1}{16}$ to $\frac{3}{32}$ of an inch thick, which is about right for handiness and strength. There are very few woods that are adapted to this purpose, because of their liability to warp and twist, and generally they have to be made too thick for convenient use. The same rule holds good in the selection of a T-square; the blade should be as stiff as possible and the edges not more than $\frac{1}{8}$ of an inch thick; when the edges are thicker it is difficult to draw long parallel lines, particularly with the pen, as the point of contact between the pen and the blade of square is on the upper corner, while the position of the point, when the pen is held vertically, must be the same distance from the lower corner of the edge of the blade on account of the angle formed between the side of the pen and the edge of the blade. On the other hand, it is not advisable to have the edge less than $\frac{1}{16}$ of an inch thick; this would bring the point of contact too close to the point of the pen and would render it liable to smear the ink. An excellent T-square patented some time ago has a thin piece of brass plate with a knife-edge inserted in the working edge of the blade. This

does very well when only a pencil is used, but a pen cannot be worked successfully against so thin an edge. A blade made of two different kinds of wood similar to that shown in Fig. 12, such as a mahogany center and ebony edges, while being excellent in their way, are liable to warp and "buckle" and require watching. Squares with swivel butts are very convenient for certain kinds of work, but for general purposes and for such students as this book is intended, the swivel stock had better be eschewed. It is much more convenient to have the blade secured to the stock as shown at A and C, Fig. 8, than to have it dovetailed or mortised into the stock as shown at B, Fig. 8. By this means the upper surface of the stock is on the same level as the drawing-board and does not interfere with the angles or scales when working near it.

Perhaps the most troublesome appendage to a draftsman's outfit is found in the many forms of porcelain ink saucers and "piles." For holding and mixing soft colors the pile of saucers does very well, but it takes a long time to rub ink by this method before a good black ink is produced as the smooth bottom of these dishes does not abrade the stick of ink rapidly. There are

several preparations of liquid ink that may be purchased, but they lack that solid black body in fine lines that is so necessary for drawings or tracings that have to be copied by the blue printing process. Prepared liquid ink requires a longer time to dry and is more liable to smear than ink made fresh from the stick. There is an ink saucer made by a firm in New York City that seems to meet all requirements. It is simply a slab of slate about four inches square and three-fourths of an inch thick, having a cup or saucer shaped cavity for holding the ink turned in its center, and covered over with a piece of plate glass. A good black ink may be mixed in this saucer in a few minutes by the grinding action of the slate on the stick when being rubbed. While it is quite necessary to have the ink with some "body" in it, it is not best to make it too thick, as it will not flow well then, and will be apt to dry too quickly and clog up the pen.

Fig. 26.

When the ink is ready to use, a portion of it

may be inserted between the nibs of the pen until there is about as much ink in the pen as shown by the shaded part in Fig. 26, where two pens are shown, one charged and one empty. The ink may be put in the pen by the aid of a

Fig. 27.

camel hair or sable brush, such as shown in Fig. 27, which is full size. Clean off all superfluous ink from the outside of the nibs of the pen with a piece of chamois leather or a clean linen cloth, and you are ready for work. The pen may be filled by another method which is often adopted by draftsmen, as follows: Take the pen and open it, say, about a sixteenth of an inch, clean the nibs well with chamois, then close the pen with the screw until the light just shows between the nibs, then breathe gently between the nibs and dip them carefully into the ink, just

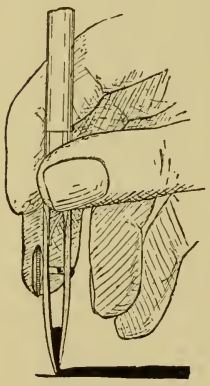


Fig. 28.

touching the surface of the liquid, and the ink will run up between the nibs by attraction of the moisture caused by the breath on the inside of the nibs.

We suppose the paper to be stretched on the drawing board, and either held in place by being pasted or by thumb tacks, such as shown in Figs. 4 and 5. When all is ready, hold the pen as shown in Fig. 28, and carefully ink in all the

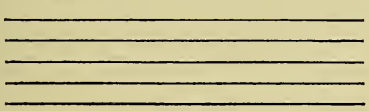


Fig. 29.

horizontal lines, both full and dotted, correcting where possible any slight irregularities that may have been made in pencilling. In drawing the graduated lines, Fig. 29, begin with the thinnest, then with the middle finger, as shown in Fig. 28, turn the screw of the pen back, say, about a quarter of a revolution for each of the others, the last opening being about the right thickness for the border line. As the border line takes longer to dry it is very easy to smear, but of course this may be avoided by letting the ink dry while preparing the ink-leg for the compasses. It is well to practice this method of

drawing lines a number of times until a certain amount of perfection is attained.

In drawing circles, care must be taken in holding the compasses in order to get an even

Fig. 30.

Fig. 31.

thickness of lines, and the pen should always stand vertically over the work, as shown in Fig. 30. When a number of circles drawn from a common center is necessary, as shown in Fig. 31, be sure to draw the outside, or the one having

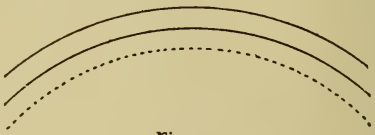


Fig. 32.

the greatest radius, first, when the other circles may follow in regular order. The sharp curves as shown in Fig. 31 are always the most difficult to draw correctly, while the flat curves, or curves with greater radius, are, within certain limits, much easier to describe. The curves shown at Fig. 32 are flat ones, and well within

the range of the ordinary compass. The inner curve is "dotted" and to form this without a dotting pen, with any degree of regularity, requires considerable care and practice, but it is much better to make all dotted lines with the ordinary pen, than to make use of a dotting pen, which to a new beginner is generally a source of

Fig. 33.

Fig. 34.

Fig. 35.

trouble and disappointment. The examples of circles shown at Figs. 33, 34 and 35 offer good practice in curve drawing with the compasses. Before drawing them, however, it will be best to draw a pair of center lines for each circle, cutting each other at right angles in the center, and it is a good rule never to draw a circle under any circumstances without having two center lines to mark its proper situation. In the first circle, Fig, 33, mark off points one quarter of an inch apart along one of the diameters from the circumference to the center, and then describe the concentric circles with the compasses, taking

care not to bore a large hole through the paper with the point. The compasses, if properly sharpened, should barely penetrate the paper and leave no impression on the board.

To fill up the middle circle, Fig. 34, set the compasses to the radius, and then, putting the point at the intersection of one of the center lines with the circumference, mark across the circumference on each side; do the same at each intersection of the center line with circumference, and it will be found that the circumference is then divided into twelve equal parts. Now join each opposite joint by a line passing through the center and the figure will be complete.

The last figure to be drawn, Fig. 35, is the most difficult, but has the best effect, so it is worth taking some pains over. Draw the two center lines, put in the large circles and divide the horizontal diameter into ¼ in. spaces. Take the small compass, set it to ¼ in. radius, and then put in the smallest semicircle on each side. Then set it to ½ in. radius, and put in the next semicircle; then to ¾ in. radius for the next two semicircles, which should exactly meet at the center. Now to 1 in. radius, and, lastly to 1¼ in. radius, checking the curves before actually

drawing them, by seeing how they fit with those already drawn.

Here is an example, Fig. 36, made up altogether with curved lines and which offers good practice. This requires accurate division and correct draftsmanship.

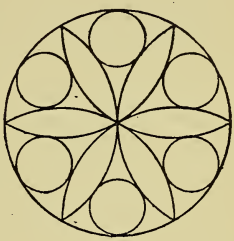


Fig 36.

A few practical examples of the use of curves are shown in the following figures: Fig. 37 shows a scheme by which an ornament may be constructed where all the

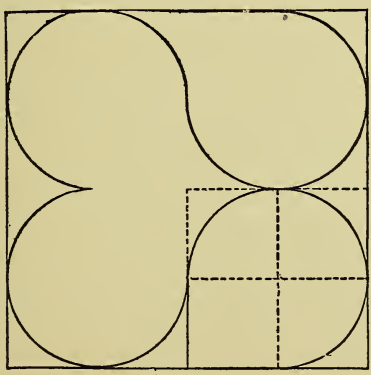


Fig. 37.

curves are drawn with one radius. The manner of getting the centers is shown by the dotted lines. Figs. 38 and 39 exhibit another combination of curves which is easy to draw. To make Fig. 39 is perhaps the easiest of them all, as it is formed of curves drawn with one point of the

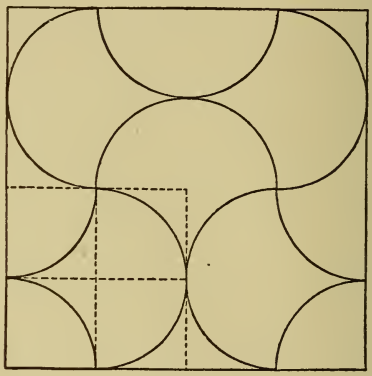


Fig. 38.

compass resting on one corner of each of the smaller squares which are shown by the dotted lines.

The three examples shown in Figs. 40, 41, and 42 are a little more difficult to draw than the previous ones. Fig. 40 may be termed a trefoil ornament, as the central divisions are drawn

from the three points of an equilateral triangle, which is shown by the dotted lines. This style

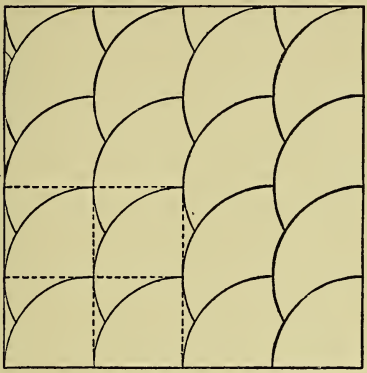


Fig. 39

of an ornament is in frequent use in church work as the triangle is supposed to be symbolic of the Trinity. The student should copy this often enough so that

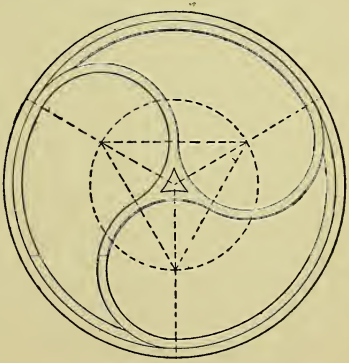


Fig. 40.

he can draw or describe it from memory alone.

Fig. 41 is simple enough when the principle is understood. The circles inside are drawn from

Fig. 41.

six centers, or from the six points of a hexagon. Care must be taken not to cross the lines at the intersections of the circles, when such crossings are not intended. This will give good practice.

Fig. 42 is somewhat complicated, but it is surmised that no trouble will be found in the formation of the ornament; at least, there ought not to be, if the student has been mindful of what has gone before.

There are many situations in which a curved

line is required that calls for more or less skill to properly adjust to the purpose, and in order to arm the student with the proper knowledge to find centers for this purpose, the following problem is laid before him: Suppose we have three points that are not in a straight line, as ABC, Fig. 43, through which we want to draw a portion of a circle. Let BHC be a chord of the segment H, and BJA a chord enclosing the segment. Bisect or divide in equal parts the chord BC at H, and square down from this point to D. Do the same with the chord AJB, squaring over from J to D, then the point where JD and HD intersect will be the center of the circle.

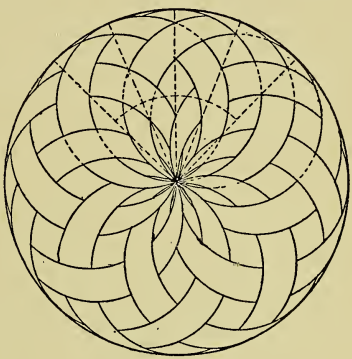


Fig. 42.

This is a very important problem, and will be found useful in many ways.

The same result may be obtained by the use of the compasses alone as may be seen as follows:

Suppose AB, Fig. 44, to be the curve, from the point A and B strike ares of equal radius inter-

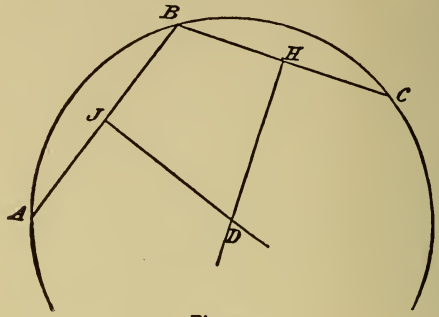


Fig. 43.

secting at *c* and *d*, and draw a line through the intersections cutting the arc at *e*. This line will pass through the center. Then from points *e* and *b*, with a rather shorter radius, strike arcs intersecting at *f* and *g*, draw a line through these intersections, and where the previous line is cut will be the center as shown at *h*.

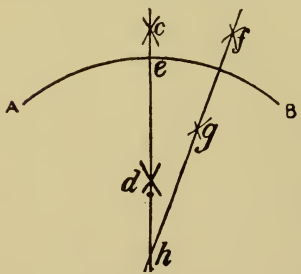


Fig. 44.

A practical application of this example may be

used on Fig. 45, where it is desired to round off a corner as shown at BAC. The center of the curve is shown at O, from which the curve is struck.

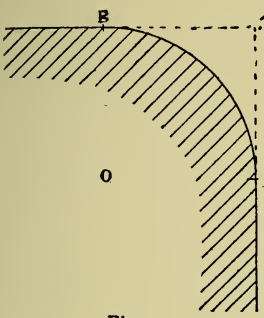


Fig. 45.

Fig. 46 shows the method just described applied to three straight lines forming two right angles and having two adjacent corners rounded.

Fig. 47 shows how to deal with two parallel lines that are to be joined tangentially by a semicircle. In this case bisect the space between the two lines by a perpendicular line that must contain the center of the circle from

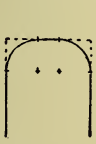


Fig. 46.


Fig. 47.


Fig. 48.


Fig. 49.

which the required circle is drawn. Determine the extreme position of the curve and mark from it, along the center line, a distance equal to half the distance between the lines, and this mark

PLATE 4.

This plate shows the disposition of the joists in first and second stories, also the position of rafters and ridges on the roof. These sketches show the trimmers for fireplace and stairs. The manner of drawing is very simple and should offer no difficulties to the student.

will be the center of the required circle. The

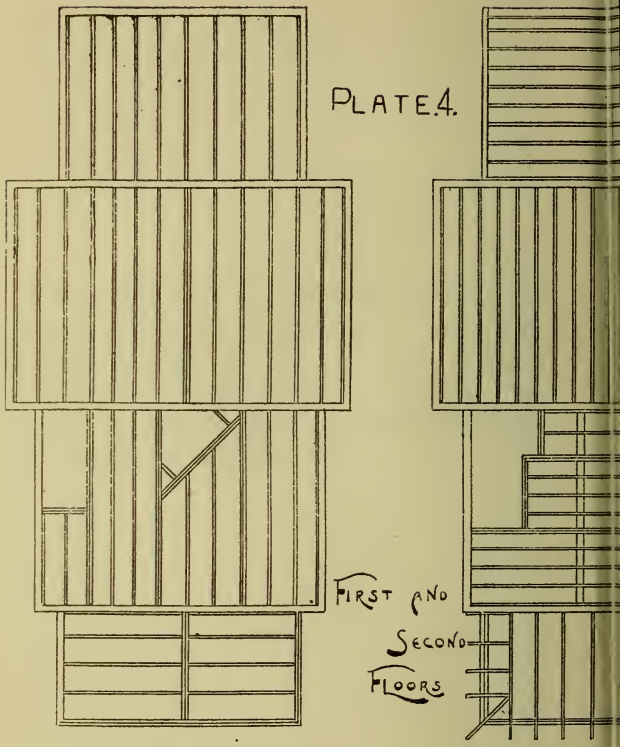
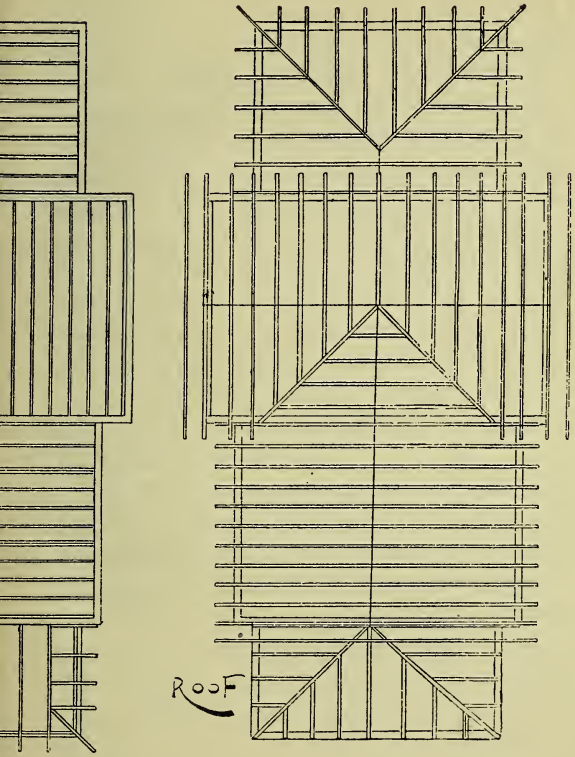


PLATE 4.
FIRST AND
SECOND
FLOORS

will be the center of the required circle. The



will be the center of the required circle. The example shown at Fig. 48 is a little more difficult to deal with, as in this figure the lines which it is desired to join by a curve, are not at right angles. Therefore inside these, and at a distance from them equal to the radius of the curve which it is desired to use, draw two parallel lines. To do this, take the radius in the compasses and strike two arcs at some distance apart along the inside of each line. Tangent to these draw the two inner straight lines shown dotted, and their intersection will give the center required. The exact points of junction of the straight lines with the curve can be found by drawing perpendiculars from the center to the straight lines by the method shown on the left hand side of Fig. 48.

The illustration, Fig. 49, on the left side, is exactly similar to Fig. 48 with the exception that it represents a sharper angle than that shown by the angle or corner of the previous example.

At Fig. 50 is shown a method of joining a curve to a straight line by a smaller curve. In this example, after drawing the given straight line and circle, set the compasses to the required radius, and from any point in the circumference of the circle describe a short arc outside it.

From the center of the circle draw a straight line through this last point, and its intersection with the arc will give the radius of an arc concentric with the large circle, which must be drawn towards the given line. Then, with the required radius, again set off arcs from the given line to give a parallel line, as in Figs. 47 and 48. The intersection of this parallel line with the larger arc will give the center to use for the connecting

Fig. 50.

Fig. 51.

Fig. 52.

curve. In every case it will be observed that the perpendicular line from the center of the junction curve to the line, or the line joining the centers of the two curves, will give the exact termination of the junction curve.

Fig. 51 is practically the same as Fig. 49 with different radii.

Fig. 52 shows two circles of different size joined by two curves of equal radii set off upon the same principle as Figs. 50 and 51.

Fig. 53 shows a straight line cutting a circle

and joined by small curves on the inside. After drawing the circle and straight line, take the required radius of connecting curve and draw a short arc on the inside of large curve—say, on the center line—and from the main center draw an arc concentric with the large circle, but inside it. Then, with the required radius, obtain a line parallel to the given line, and the intersections

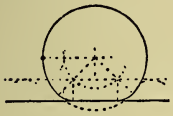


Fig. 53.

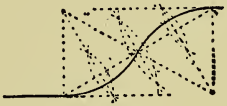


Fig. 54.

of this parallel line with the large arc will give the centers for the connecting curves.

Fig. 54 shows two given parallel straight lines which are to be joined by an ogee or reversed curve. Select a point on one of the lines from which the curves may start, draw a horizontal line and also an inclined line, making an angle of 60 degrees with it. The latter line produced to cut the other given straight line will mark the termination of the curves. Bisect this inclined line, and it will give the junction point between the two curves. Bisect each half of the inclined line and produce the bisection to meet the

horizontal lines, to give the centers for the curves. Before drawing the curves, join these centers, to see that a straight line will pass exactly through the junction of the two curves, and then put in the curves with a radius equal to half the length of the inclined line. This is a very useful curve, and is similar to those used for cross-over roads on railways. In architecture the best curves are produced from conic sections or freehand. Circular curves have a harsh appearance. There are nevertheless, many cases where they are necessary or desirable.

The draftsman will often be called upon to describe mouldings of various kinds, and it is proper he should know how to form these so that they may accord with the style for which they are intended, whether this be Greek, Roman, or otherwise. The following examples are old, but are of a kind that will always be in vogue and it is but fitting the young student and workman should know how to draw them correctly.

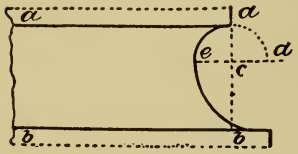


Fig. 55.

The example shown at Fig. 55 is a Scotia or

cove and is drawn as follows: Divide *a*, *b* into three equal parts; with *c* as a center and the radius *c*, *a*, describe the semi-circle *e*, *a*, *d*. Then with *d* as a center and *d*, *e* as radius, describe the quadrant *e*, *b*, then *a*, *e*, *b*, will form the line of moulding.

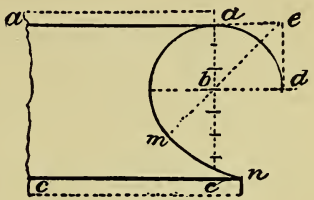


Fig. 56.

Fig. 56 shows another method of getting a deeper moulding. Let *a*, *a*, be the upper line and *c*, *c*, the lower; from *a*, drop a perpendicular to *c*; divide *a*, *c*, into seven equal parts; through the third of these, from *a*, draw a line parallel to *a*, *a*; from *b*, with *b*, *a*, draw the semicircle *b*, *d*, and from *d*, draw to *e*, perpendicular to *b*, *d*; produce *a*, *a*, to *e*; from *e*, as a center, r, with *e*, *m*, as radius, describe part of a circle to *n*.

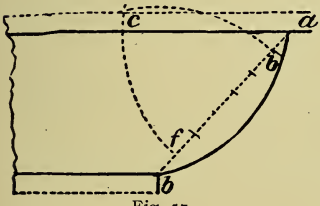


Fig. 57.

Fig. 57 shows an "echinus," or "ovolo." This is one of the most useful of mouldings, and was

employed largely by the Greeks in many positions. Let *a*, *b* be the two points; join them by a line *a*, *b*; divide this into seven equal parts; from *b*, with *b*, *c*, and from *a*, with the same radius, describe arcs cutting in *c*; from *c*, with *c*, *a*, describe the arc *a*, *b*. Another method of describing an ovolo is shown at Fig. 58. Let *a*, *b*, and *c*, *d*, be the two horizontal lines of the figure. Divide *b*, *d*, into four equal parts; make *d*, *e*, equal three of these; draw *e*, *f*; then with any radius greater than half of *d*, *f*, with *d*, and *f* as centers respectively, describe the arc, cutting at *g*, from which, as a center, describe the arc, *d*, *f*.

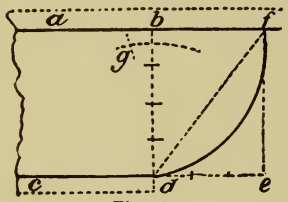


Fig. 58.

At Fig. 59 I show a moulding called a "quirked ovolo." The projection in this case is made equal to five-sevenths of its height, as seen by the divisions, and the radius of the circle *b*, *c*, is made equal to two of the divisions, but other proportions may be taken. Describe the circle *b*, *c*, forming the upper part of the contour, and from the point *g*, draw *g*, *h*, to form a tangent to the lower part of the curve. Draw

g, *a*, perpendicularly to *g*, *h*, and make *g*, *f*, equal to the radius *d*, *c*, of the circle *b*, *c*; join *f*,

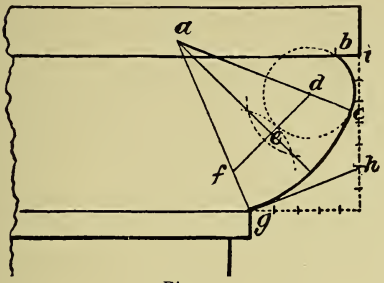


Fig. 59.

d, by a straight line, which bisect by a line perpendicular to it, meeting *g*, *a*, in *a*; join *a*, *d*, and

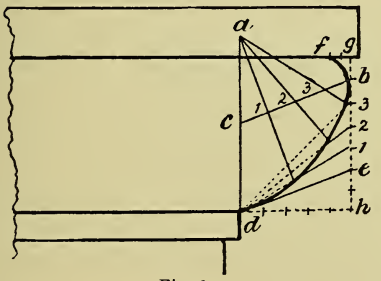


Fig. 60.

produce the line to *c*. Then from *a*, as a center, with the radius *a*, *c*, or *a*, *g*, describe the curve *c*, *g*.

Fig. 60 is a method where the tangent *d*, *e*,

and the projections are given. Through the point of extreme projection *b*, draw the vertical line *g*, *h*, and through *b*, draw *b*, *c*, parallel to *g*, *h*, and produce it to *a*, making *c*, *a*, equal to *c*, *d*. Divide *e*, *b*, and *c*, *b*, each into the same number

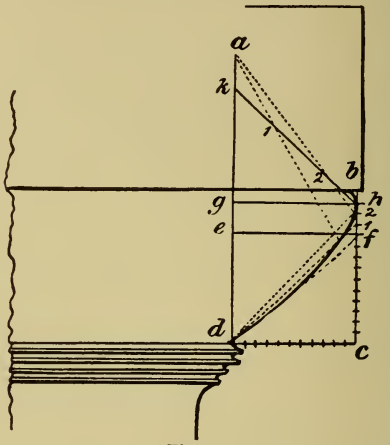


Fig. 61.

of equal parts, and through the points of division in *e*, *b*, draw from *a*, straight lines, and through the points of division in *e*, *b*, draw from *d*, right lines, cutting those drawn from *a*. The intersections will be the points through which the curve is traced.

In Fig. 61 I exhibit a method of describing the

hyperbolic ovolo of the Grecian Doric capital, the tangent *a*, *c*, and projection *b* being given. Draw *d*, *e*, *g*, *k*, *a*, perpendicular to the horizon and draw *g*, *h*, and *e*, *f*, at right angles to *d*, *e*, *g*, *k*, *a*. Make *g*, *a* equal to *g*, *d*, and *e*, *k* equal to *d*, *e*; join *h*, *k*. Divide *h*, *k* and *f*, *h* into the same number of parts, and draw lines from *a*, through the divisions of *k*, *h*, and lines from *d* through the divisions of *f*, *h*, and their intersections are points in the curve.

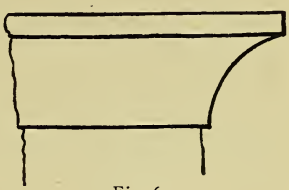


Fig. 62.

In Figs. 62 and 63 I show a cove or "cavetto" mould. To describe it let *ab*, *cd*, Fig. 63, be the lines at top and bottom. From *b*, draw to *d*, perpendicular to *a*, *b*; divide *bd*, into three equal parts; from *d*, lay on *dc* to *e* equal to two of these parts; join *be*, from *e* and *b*, with radius greater than half *eb*, draw arcs cutting in *f*; from *f*, with *f*, *b*, draw the arc *be*.

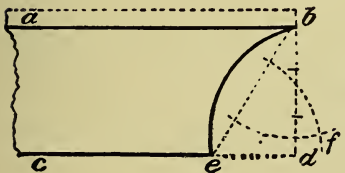


Fig. 63.

Another method of describing this moulding is shown at Fig. 64. *ab* and *cd*, are the two lines, divide the perpendicular into five equal parts, make *de* equal to five of these and proceed as in the last example.

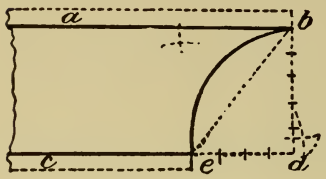


Fig. 64.

The next example is the *cyma recta* moulding. This is considered the most beautiful of mouldings; and this figure is the simplest form, and is easily described; *ab*, and *cd*, Fig. 65, are top and bottom lines of the moulding, *be* the height and *de* the projection. Divide the line *d*, 167*nb* into twelve equal parts; take six of these parts as radius, with *b* and 6 as centers, describe the arcs *g*, with 8 as a center, and the same radius, describe the arc 67*b*, then with 1 and 6 as centers describe the arcs at *h*, with *h* as a center, describe the arc *d*, 6.

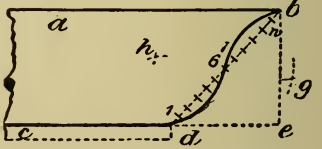


Fig. 65.

Fig. 66 shows a *cyma recta* formed by two

opposite curves, shown by the use of ordinates. By taking a greater number of points than shown, as centers, the figure will resemble an elliptical curve. The manner of drawing the curves is shown on the diagram and may be easily followed.

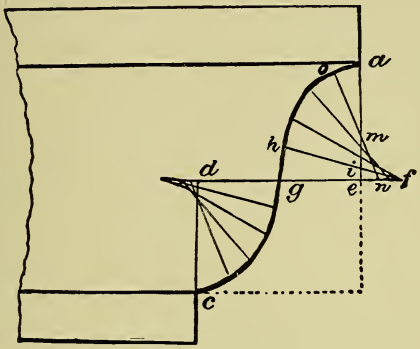


Fig. 66.

Fig. 67 shows a *cyma recta* formed with true elliptical quadrants. These curves may be obtained by following the lines in the diagram, or by any of the methods given for obtaining elliptical curves. This moulding can best be described by the use of a trammel, an instrument I will describe later on; or the curve may be obtained by the use of the ellipsograph, shown in Fig. 18.

These examples will fully suffice to give the learner good practice on circular curves, as by a combination of these, nearly every form of moulding may be made. A few words on elliptical and some of the higher curves may not be amiss, but I do not think it wise to over-

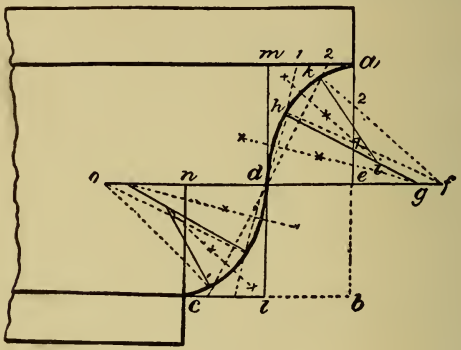


Fig. 67.

burden this work with examples and instructions that the ordinary draftsman or workman may never be called upon to make use of.

One of the simplest methods of forming an ellipse is by the aid of two pins, a string and a lead pencil as shown at Fig. 68. Suppose F B to be the major or longest axis, or diameter, and D C the minor or shorter axis or diameter, and E and K the two foci. These two points are

obtained by taking the half of the major axis A B or F A on the compasses, and, standing one point at D, cut the points E and K on the line F B, and at these points insert the pins at E and K as shown. Take a string as shown by the dotted lines and tie to the pins at K, then stand

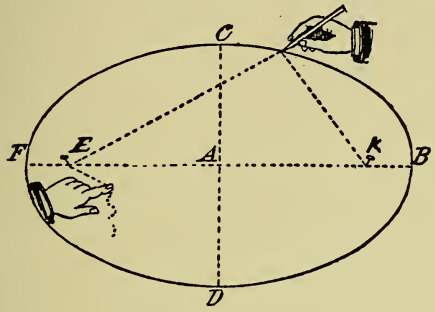


Fig. 68.

the pencil at C and run the string round it and carry the string to the pin E, holding it tight and winding it once or twice round the pin, and then holding the string with the finger. Run the pencil around, keeping the loop of the string on the pencil, and it will guide the latter in the formation of the curve as shown. When one-half of the ellipse is formed, the string may be used for the other half, commencing the curve at F or B, as the case may be. This is commonly

called "a gardener's oval," because gardeners make use of it for forming ornamental beds for flowers, or in making curves for walks, etc., etc. This method of forming the curve is based on the well-known property of the ellipse that the sum of any two lines drawn from the foci to their circumference is the same.

The illustration shown at Fig. 69 shows a trammel and the method of using it which is very simple. The instrument consists of two principal parts, the fixed part in the form of a cross as C D, A B, and the movable tracer H G. The fixed piece is made of two triangular bars or pieces of wood of equal thickness, joined together so as to be in the same plane. On one side of the frame when made, is a groove forming a right-angled cross; the groove is shown. In this groove, two studs are fitted to slide easily. These studs are to carry the tracer and guide it on proper lines. The tracer may have a sliding stud on the end to carry a lead-pencil, or it may have a number of small holes passed

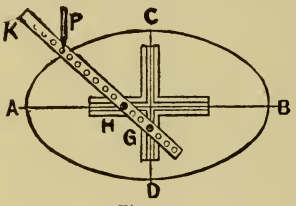


Fig. 69.

through it, as shown in the cut, to carry the pencil. To draw an ellipse with this instrument, we measure off half the distance of the major axis from the pencil to the stud G, and half the minor axis from the pencil point to the stud H, then swing the tracer round, and the pencil will describe the ellipse required. The studs have little projections on their tops, that fit easily into the holes in the tracer, but this may be done away with, and two brad-awls or pins may be thrust through the tracer and into the studs, and then proceed with the work. With this instrument an ellipse may easily be described.

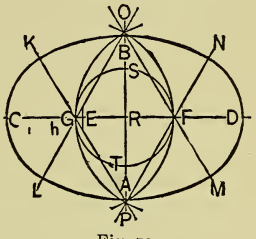


Fig. 70.

A figure that approximates an ellipse may be described by the compasses, and it is well for the draftsman to acquaint himself with the manner in which this is done, and to this end I submit perhaps the most useful method for this purpose. Let us describe the oval shown at Fig. 70. Lay off the length C D, and at right angles to it and bisecting it lay off the width A B. On the larger diameter lay off a space equal

PLATE 5.

This elevation shows the front and side elevation of the cottage in finished order. Two styles of drawing are shown, the one being in plain line and the other shaded. I would not advise the student to attempt shading until such time as he feels assured he can make a presentable piece of work. Of course, I mean, he should not attempt to shade any drawings for exhibition until he has had good practice on preliminary work. This plate is a very good one to copy.

to the shorter diameter or width, as shown by D E. Divide the remainder of the length or larger diameter F G into three equal parts; with two

be useful to the draftsman, and it may be well to illustrate one or two methods by which this figure may be described.

Let us describe a diamond or lozenge-shaped

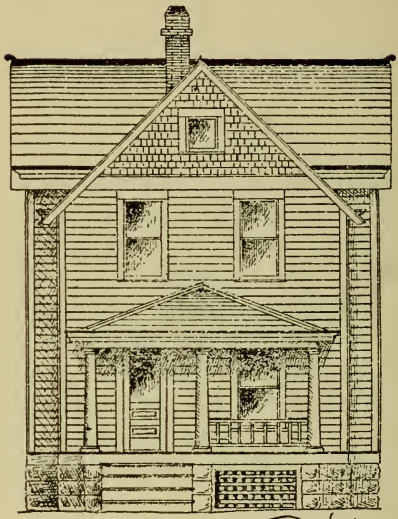


PLATE 5.

FRONT AND SIDE

to the shorter diameter or width, as shown by D E. Divide the remainder of the length or larger diameter F G into three equal parts; with two

LEVATIONS

be useful to the draftsman, and it may be well to illustrate one or two methods by which this figure may be described.

Let us describe a diamond or lozenge-shaped

to the shorter diameter or width, as shown by D E. Divide the remainder of the length or larger diameter E C into three equal parts; with two of these parts as a radius, and R as a center, strike the circle GSFT. Then, with F as a center and F G as a radius, and G as a center and G F as radius strike the arcs as shown, intersecting each other and cutting the line drawn through the shorter diameter at O and P respectively. From O, through the points G and F, draw OL and OM, and likewise from P through the same points draw PK and PN. With O as center and OA as radius, strike the arc LM, and with P as center and with like radius, or PB which is the same, strike the arc KN. With F and G as centers, and with F D and C G which are the same, for radii, strike the arcs NM and K L respectively, thus completing the figure.

The oval is not an ellipse, nor are any of the figures obtained by using the compasses, as no part of an ellipse is a circle, though it may approach closely to it. The oval may sometimes be useful to the draftsman, and it may be well to illustrate one or two methods by which this figure may be described.

Let us describe a diamond or lozenge-shaped

figure, such as shown at Fig. 71, and then trace a curve inside of it as shown, touching the four sides of the figure, and a beautiful egg-shaped curve will be formed. For effect we may elongate the lozenge or shorten it at will, placing the shorter diameter at any point.

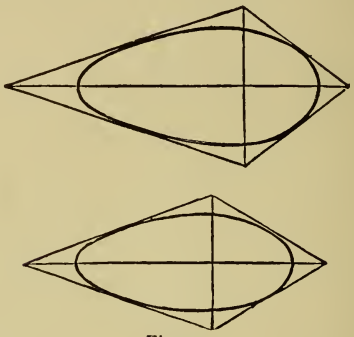


Fig. 71.

An egg-shaped oval may also be inscribed in a figure having two unequal but parallel sides, both of which are bisected by the same line, perpendicular to both as shown in Fig. 72. These few examples are quite sufficient to satisfy the requirements of the ordinary draftsman, as they give the key by which he may construct any oval he may ever be called upon to form.

Scrolls often have to be drawn by draftsmen, and these may be obtained, more or less accurately, by various methods. One method employed, is by making use of two lead pencils well sharpened and arranged as shown in Fig. 73. A piece of string is tied tightly around one of the pencils and wound around the conical end as shown, while the point of the second pencil

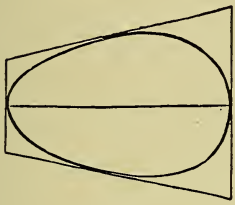


Fig. 72.

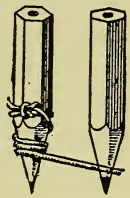


Fig. 73.

either pierces the string or the string is looped to hold the pencil, near the other pencil, which leaves the arrangement ready for work. To draw the scroll the pencils must be kept vertical, the point of the first kept firmly in the hole or center of the figure, and the second pencil must then be carried around the first, with the marking point held in touch with the paper, the distance between the two increasing regularly as the string unwinds.

This is a rough-and-ready means of drawing a

scroll, but it has the quality of being fairly correct.

Another similar method is shown in Fig. 74, only in this case the string unwinds from a spool on a fixed center A, D, B. Make loop E in the end of the thread, in which place a pencil as shown. Hold the spool firmly and move the pencil around it, unwinding the thread. A curve will be described, as shown in the lines. It is evident that the proportions of the figure are determined by the size of the spool. Hence a larger or smaller spool is to be used, as circumstances require.

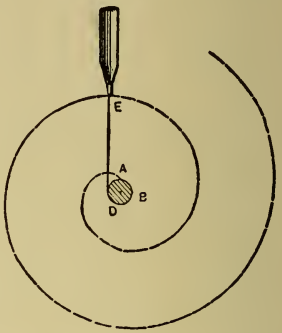


Fig. 74.

A simple method of forming a figure that corresponds to the spiral somewhat is shown in Fig. 75. This is drawn from two centers only, a and e, and if the distance between these centers is not too great, a fairly smooth appearance will be given to the figure. The method of describing is simple. Take a1 as radius and describe

a semicircle; then take e1 and describe semicircle 12 on the lower side of the line AB. Then with a2 as radius describe semicircle below the line AB; lastly with a3 as radius describe semicircle above the line and the figure is complete.

These examples, and what may be deduced from them, will be quite enough to satisfy the requirements of the draftsman who does not intend to follow this art further than as an aid

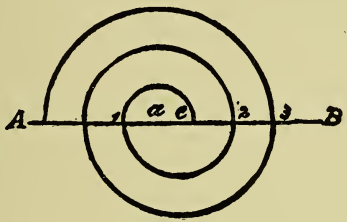


Fig. 75.

to his profession as a builder and workman, so now I will offer a few pages on straight line work.

LINE WORK

In previous pages I gave a few suggestions regarding line work done with the ruling pen, and I now supplement them by submitting the following examples numbered from Fig. 76 to 78 inclusive, which the student is advised to

draw and redraw, first by measuring off the distances, and then by attempting to get the exact distances without measurement. If the lines in the examples are placed less than one-sixteenth of an inch apart, they will appear, at a little distance, like an even tint of shading, and the closer they are the more difficult will it be to get the appearance quite uniform, but this

Fig. 76.

Fig. 77.

Fig. 78.

kind of work makes excellent practice for the pen.

These examples are selected from a large number of possible combinations, as giving variety of practice while not appearing too difficult. They are, however, more difficult than they appear, so that they must be commenced with the determination to produce very neat and accurate drawings.

After drawing the border line in pencil, ¾ in. from each edge of the paper, find by measurement the center of the paper, so that the second

square, Fig. 77, may be placed in the middle, rule a horizontal line for the square to rest upon, draw the middle one in outline first, and then the others, each measuring 3 in. along one side. The spaces between the border line and each of the squares should be equal. In the upper half of the first square, Fig. 76, mark off equal divisions of ¼ in. each, and draw horizontal lines; then, in the lower half, mark off similar distances and draw vertical lines. In the second square, Fig. 76, equal distances must be set off from each of the sides, and parallel lines drawn, so as to make a number of complete squares. These should be drawn with a fine chisel-pointed pencil, and then tested by drawing diagonal lines from opposite corners. If the squares have been correctly set out, all the angles will be upon one or other of the diagonal lines. In the third square, Fig. 78, the inner squares are drawn with their angles tangent to the sides of the one next larger. If very fine pencil lines are drawn across opposite angles of the outer square, and then two other lines bisecting the sides, it will be found easy to join up the inner squares to the points so found.

After the squares are completed in pencil, fill in or line over with the ruling pen and ink.

The set of lines shown at Fig. 79 are of different strength or breadth, all of which may be drawn by a skilful use of the pen. In simple work of this kind the lines need not be penciled only perhaps, to define the limits of the lines.

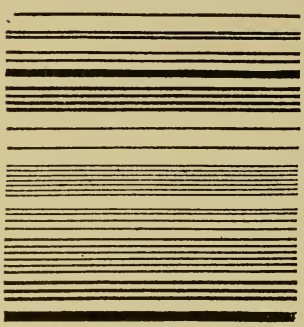


Fig. 79.

Fig. 80 gives practice in drawing dotted lines.

Such lines are necessary in all kinds of working drawings. The more important ones should be first drawn with pencil.

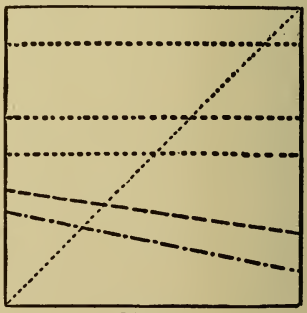


Fig. 80.

These methods of lining should be practiced until the student can make them clear and clean without much effort. The illustration shown at Fig. 81 exhibits a method of cross lines, in

making of which the student must be careful and see that one set of lines are perfectly dry before being crossed by the others. It is well to try the pen upon a separate piece of paper before applying it to the drawing.

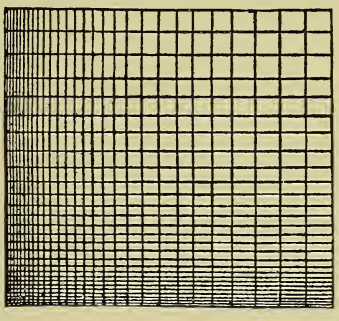


Fig. 81.

Where the drawings are complex or very particular, they should always be made first in pencil and inked in afterwards; then, if any corrections are necessary, they may be made before the inking is done, and the superficial lines can be taken out by erasing them. To erase strong pencil marks requires hard rubbing, which destroys the surface of the paper. Be careful in making pencil lines and do not get in more than are wanted, as confusion in inking is sure to follow if too many lines are in evidence.

The penciling being done, the drawing may be inked in, but before starting the following instructions must be considered. The drawing

pen is filled by dropping the ink between the nibs while held in a nearly vertical position, as before stated. The pen can be used with a straight edge ruler; the taper to the point is sufficient to throw it far enough away from the edge to prevent blotting if care is taken. The breadth of the line is regulated by adjusting the screw. If the pen is not in use, even for a short time, be sure to take out the ink with a blotter and dry the pen thoroughly. The nibs should be kept perfectly bright and clean. The liquid India ink which comes in bottles is now generally used.

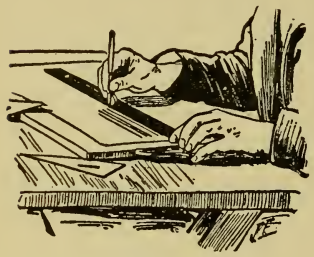


Fig. 82.

This much being thoroughly understood, I will now try and give a few hints as to the proper method of using the drawing pen. Fig. 82 shows the method of holding the pen. The pen is held between the thumb and two forefingers, and carried along the ruler from left to right, with the flat blades always parallel to the direction of the line; otherwise the pen will either be

running on the edge of the blade only, or in such a position that the ink cannot flow freely from its points. The result in either case would be a broken or ragged line, a condition to be avoided, or a bad drawing will result.

In marking off dimensions on a drawing, a system of rough lines is generally adopted which is illustrated at Fig. 83, when a dimension is shown guiding the sight from arrow-point to

Fig. 83.

arrow-point. These lines should consist of strokes not more than one-sixteenth of an inch long and should have not less than a quarter of an inch space between them. It will be worth while to measure these distances for a few times at first when drawing them so as to get into the practice of getting them about right, though in a very short time the draftsman will be able to strike the distances near enough without measuring. When making finished drawings in practice, it is found best, when inking in, to use straight blue or red ink lines terminating at the ends by black arrow-heads.

When it is desired to show the interior con-

struction of any object, an imaginary cut is made through it, and the representation of the cut surface is called a section. The direction of the cut is marked upon the original drawing by a

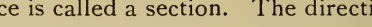


Fig. 84.

line of section, formed of strokes and dots placed alternately, with a letter at each end, as A B upon Fig. 84. This line is usually in red ink, but as all the work in the present lessons is black and white, this dotted section line may be made the same as the other lines.

The mode of marking off distances between two points is shown at Fig. 85, where the

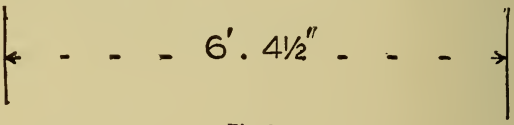


Fig. 85.

arrow-heads mark the limitation; that is, the distance between the lines which are touched by the points of the arrows, is 6 feet four and a half inches. This is marked off regardless of scale, and the method will be found useful when roughing out a house plan, elevation, or other similar work, as the dimensions of rooms, sizes

of windows and doors, heights of ceilings, and all other dimensions can be given without drawing to scale. I will have more to say of this later on.

THE LEAD PENCIL

So far I have said but little regarding the lead pencil, which is a very important factor in the

Fig. 86.

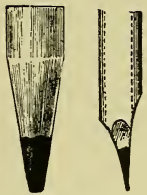


Fig. 87.

draftsman's hands. As before stated, all drawings of any importance should first be made in pencil; and a hard pencil should be used for the purpose; in fact, there should be two pencils, one of which should be pointed similar to those shown at Fig. 86, and the other should be sharpened with a chisel-point similar to those shown at Fig. 87. These two illustrations, Figs. 86 and 87, show two methods of sharpening, either of which will answer the purpose quite well.

The pencil should be used solely at first for practicing, and the most expensive drawing pencils are often the most economical to use in drawing. There are many well-known makes that may be depended upon to work smoothly and evenly without grittiness or inequality of texture. The number of H's marked upon the pencil indicates its relative hardness. For general use those marked H or HH will be suitable, while for particularly fine work HHHHHH may be necessary. For roughly sketching details on a large scale, a very soft lead, such as BBB, will be found pleasantest to work with. Pencils of unvarnished cedar are to be preferred, and those of a hexagonal section do not roll off the sloping surface of the drawing-board or desk.

Almost the first lesson for a draftsman is how to properly sharpen a pencil, which is not easy for the beginner to accomplish satisfactorily. A pencil point should be well sharpened so that when the pencil is passing along the edge of the square it should be close against it; and in ordinary drawing or tracing, a clear view should be obtained completely around it on the paper.

A round point wears away very rapidly, and will hardly make even one fine line, whereas if

the edge be kept the full thickness of the lead in the direction of the line the pencil will last very much longer and produce better work; the flat faces of the lead point may be slightly rounded.

If properly sharpened, one operation of the knife on the wood will be sufficient to allow of several re-sharpenings of the lead, whilst a badly-sharpened point requires further hacking

Fig. 88.

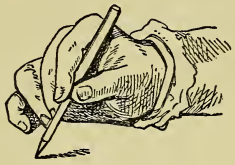


Fig. 89.

of the wood every time the lead is slightly worn.

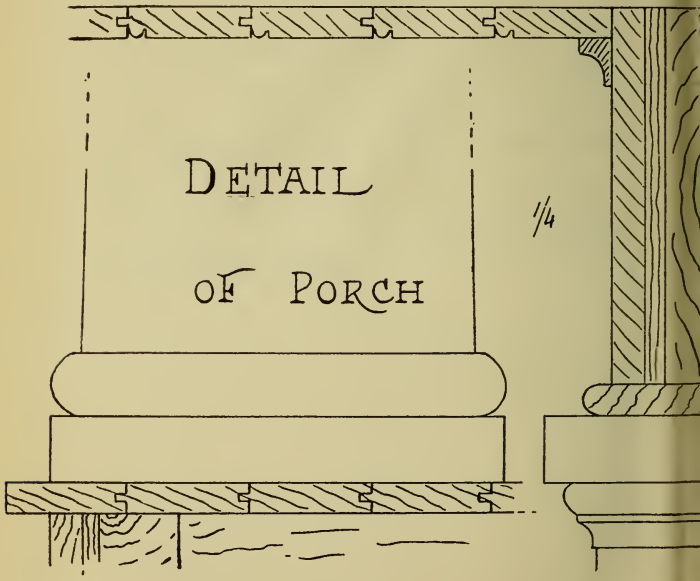
Fig. 88 shows the T-square and pencil with the two hands in position for drawing an ordinary horizontal line. The pencil should be upright when looking in the lengthways direction of the line, and sloping about five degrees from the upright in the direction in which it is being drawn, as would be seen at right angles to the line, and in Fig. 89 the method of holding the pencil for freehand or tracing work is shown. This is on a larger scale in order to show the

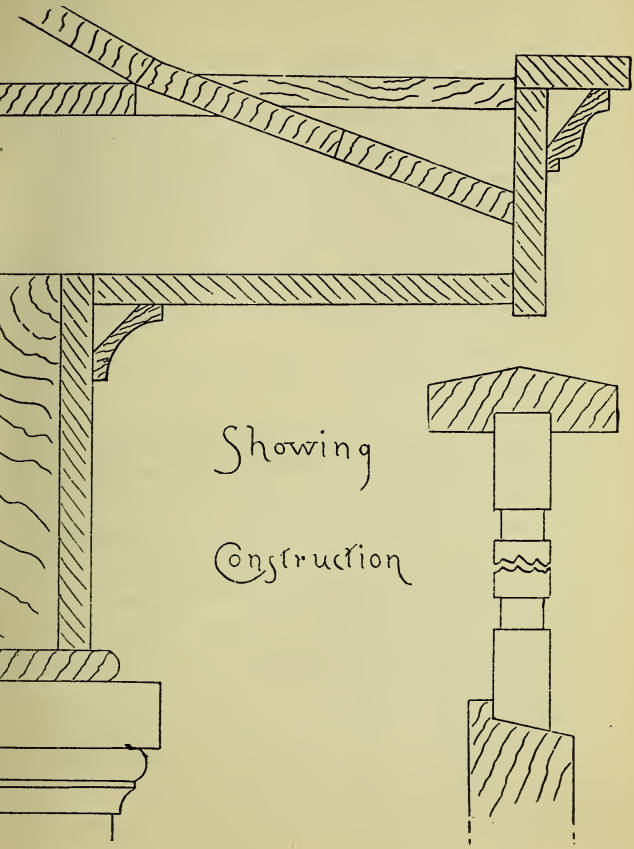
PLATE 6.

This plate shows the draftsman how to prepare details so that they may be followed by the actual workman. This shows some details of the porch, giving the construction of cornice and other work.

This is shown here to a scale of one quarter of an inch to the foot. It represents, of course, a portion of the cottage.

PLATE I




Showing
Construction

manner of holding the pencil for this kind of work.

After this from each edge of the paper mark off ¾ in. and draw a border line all round, with plain square corners. The three fingers at the back of the stock of the T-square keep it close to the edge of the board, which is not easy to do at first starting, but with a little patience and perseverance every border line can be drawn with equal facility. It is important to note that all pencil lines upon a drawing should be thin;

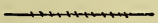


Fig. 90.

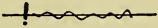


Fig. 91.

if made thick they cannot be inked over so neatly, and the paper will have a greasy feel to the pen. The india rubber should be used very sparingly and if possible only after a drawing is completely inked in.

A pencil line drawn in error should have a wavy mark across it, as in Fig. 90, and one drawn full, but intended to be inked in dotted, should be marked as in Fig. 91; this is instead of rubbing them out at the time. Another fundamental principle is always to draw a line far enough at the first attempt, but not to draw it beyond the distance it is known to be wanted.

An unnecessary line takes time to draw, wastes the pencil point, and takes time to rub out; all matters of moment when excellence is in view.

Of course, all corrections must be made whilst the drawing is in pencil, for a drawing, while in ink, cannot be corrected, without great injury being done to it, as erasions of ink spoil the surface of the paper and disfigure the whole work.

Fig. 92.

When a drawing is completed, the pencil lines may be erased by using a proper rubber similar to that shown at Fig. 92, which can be purchased for a few cents. Some of these erasers are made so that one end of them is specially devised for rubbing out pencil lines while the other end is intended for erasing ink lines. Never use the ink end when it can possibly be avoided, as it will destroy the fine surface of the paper and disfigure the drawing.

When it can be afforded, it is best to buy a case of assorted pencils. They will come cheaper this way, and a case will last for years

and the draftsman will always have at hand pencils to suit all sorts of work. Faber's pencils were considered the best for many years, but they are rapidly being driven out of the market by pencils of American manufacture. Dixon's pencils are excellent and may be relied upon to give good results, but, in my own practice I make use of "Eagle Pencils" and find in them the best of satisfaction. This, however, is perhaps after all merely a matter of taste, a preference for a name or firm.

Pencils—like all other drawing appliances—should be kept in a case and should always be in order for work, so that in a hurried job, there will be no need to hunt all over for a pencil, or a knife to sharpen it. These few hints regarding pencils will, I hope, prove useful to the young draftsman.

PRELIMINARY ROUGH SKETCHES

Often workmen are called upon to make a rough sketch of a piece of work before making a drawing of it in order to get a fair understanding with the employer. A rough sketch taken off-hand with dimensions put on in figures will often give to the person ordering the work a clear idea of what he intends and thus

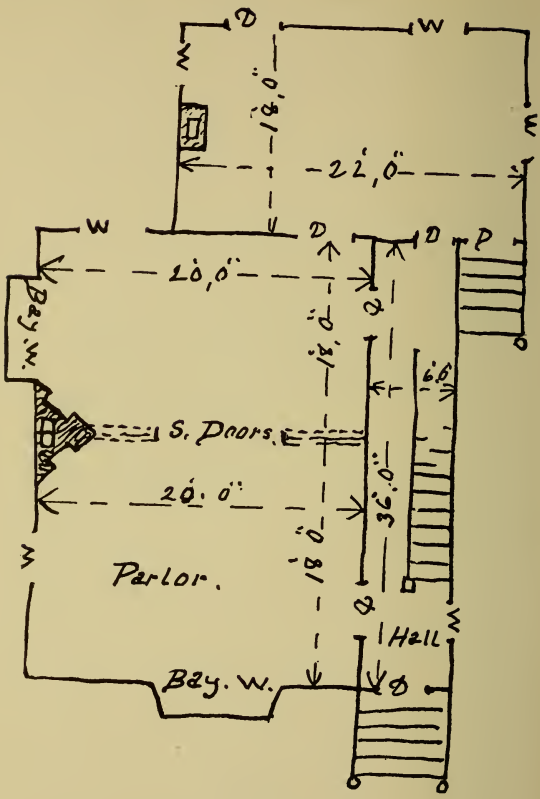

D
W
W
E
18'0"
22'0"
W
D
D
P
20'0"
Bay. W.
12'0"
6'8"
S. Doors
20'0"
36'0"
W
Parlor.
18'0"
Hall
Bay. W.

Fig. 93.

prevent disputes, annoyances and misunderstandings.

Rough sketches may be made of any size and without reference to scale or regard to exactness, providing always, the dimensions are given. In order to illustrate this I show a rough sketch of a house plan at Fig. 93. We suppose, for instance, a man wants a small house; in the house he desires a parlor 18x20 feet, a dining room 18x20 feet and a kitchen 18x22 feet, and a side hall with stairway, 6'6", length of the house, with all the necessary windows, bays, and doors, also chimneys and fire-places. The whole may be drawn, without scale, as shown in the purposely rough illustration. This at once gives a correct idea of the plan of the house and the general lay out. After satisfying all the conditions required in the plan, a rough sketch of the elevation, showing height of ceilings, pitch of roof, windows and other necessaries; may be reduced to scale and drawn on paper in regular order. Another rough sketch is shown at Fig. 94, on a much smaller basis. I do not advise making these sketches too small, particularly if they are intended to submit to a prospective owner, as then they are apt to be misleading.

Any one acquainted with building matters or

the reading of plans, will have no difficulty whatever in thoroughly understanding these rough sketches, or in making a scale drawing from them, if they have the least knowledge of drawing. The windows and doors are shown so far as position is concerned, and are marked respectively, W and D. Where the dimensions of these are decided upon, these dimensions may be marked on the plan, and a rough sketch of the elevation given; if for a door, make it as shown in 95, showing number of panels, and in such style as intended. If the door is elaborate, then, of course greater pains will have to be taken, and this can best be done by making it a scale drawing. If the design wanted is for a window, then a rough sketch may be made similar to the one shown at Fig. 96, which is a simple 6 light window. A more elaborate sash is shown at 97, which may be roughed out to the style shown, or to any other style desired.

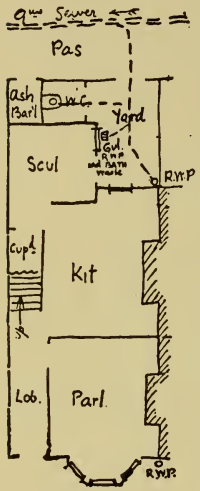


Fig. 94.

These five rough examples are quite sufficient to convey to the student an idea of how he can lay out a rough sketch from which he may construct an exact scale drawing. In the plans shown, I have not given thickness of walls; this

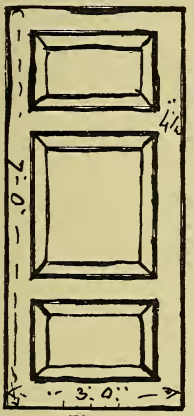


Fig. 95.

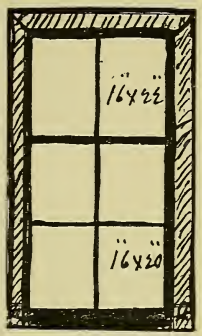


Fig. 96.

the draftsman can arrange when he plots out his plan.

I now present a few examples which show the method of marking off measurements and showing the thickness of walls, dimensions of windows, etc. The illustration shown at Fig. 98 is supposed to be the front of a building having a front entrance and windows, and an "over-all" meas-

urement of 39'6". This shows 18'0" for the projection, and 21'6" for the reserved part.

These measurements should be again subdivided, showing the lengths of brickwork. widths of openings, etc.; and the line of measurements inside gives the thickness of the walls, dimensions of rooms, etc. The distance that the part projects should also be noted as shown by 3'0". The inside measurements and the smaller dimensions should exactly agree with the "overall" measurement given.

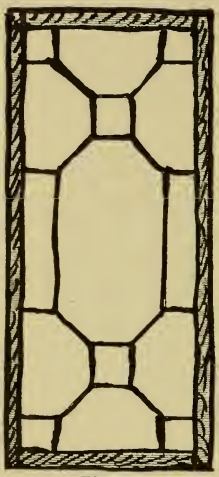


Fig. 97.

In drawing pencil lines they should always be drawn longer than the actual length of the lines to be inked in, so that the exact point of intersection with other lines can be better seen. When the drawing has been inked in, these extra lengths, of course, have to be cleaned off with india rubber, as well as a great many other pencil lines which are necessary in the process of making the drawing, but which form no part

of the finished drawing. These "construction lines," as they are called, should be drawn as lightly as possible, so as to be easily removed without greatly damaging the surface of the paper. When drawing circles or arcs of circles with the compasses, a little pencil mark should be made round the center point, so that it can be found without any trouble when it is desired to ink in the drawing. It is useless to draw in

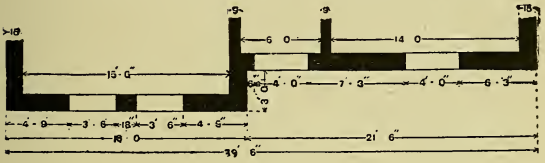


Fig. 98.

pencil every one of a long series of circles or arcs which are alike; it will be more expeditious to mark the centers only after drawing one or two, for in the inking-in of the work when the compasses are once set to the correct radius, the centers will be all that is required to draw them in full.

Every working drawing when it leaves the draftsman should be carefully and completely figured as shown in Fig. 98. A little time spent in figuring builders' drawings, so that the sizes

of window and door openings, thickness of walls, etc., are clearly stated, will save time, worry and inconvenience. A measurement of feet only should always have a cipher in the place of the inches as 28'0", and arrow-heads, as before described, should show the extreme limits of the intended dimensions. Perhaps it may not be necessary to explain to the student the use of the foot and inch marks, ' and " which should always be placed over dimensions figures The single mark denoting feet, and the double mark representing inches, when employed they greatly assist in reading of plans.

Vertical measurements showing the height of rooms or stories are best figured from floor to floor—rarely from floor to ceiling—but allowance must be made for the depth of joists and thickness of floor and ceiling. The height of windows should be always figured from the top of the sill to the underside of the head, and their position from the level of the floor to the top of the sill, this giving exactly the opening in the frame or brickwork. When a drawing is carefully figured it is much easier for the workman to understand, and mistakes and misunderstandings are less liable to occur.

We have now reached a point where the

student may venture to attempt a rough drawing for a small cottage, and to this end the following illustrations are submitted.

We will suppose that a brick cottage 31 feet long and 19'6" wide is to be built, having three rooms and a hall on main floor, a cellar, and attic containing three bedrooms, and attic. The foundation is to be of stone, the superstructure of bricks, and the roof of wood, shingled. Having the paper properly tacked on the draw-

Fig. 99.

ing board, ready for work, we next decide upon a scale. I would suggest a scale of four feet to the inch; that is, each quarter of an inch should represent one foot of the building; and as this is an easy scale, and one that can be readily understood by the student, he will have no trouble in dealing with it. A scale is shown at Fig. 99. Of course, the quarter inch must be divided into twelve parts—which will be found on any good rubber or ivory scale—then square off a fine pencil line from your left hand across the paper near the lower edge of the board. From this line, draw another at a convenient point at right angles to the first line. Make these lines with a

fine pointed HB pencil, and so light that they may be easily erased. From the junction of the two lines, F, Fig. 100, measure off 7¾ inches, which will equal 31 quarter inches, which again represent 31 feet by scale. From this point, B, square up another line. From E to F, is a

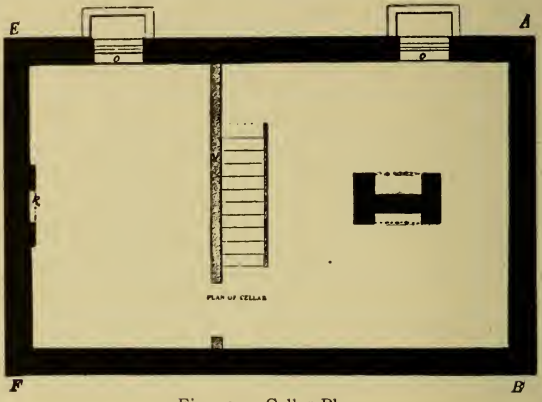


Fig. 100. Cellar Plan.

distance of 4⅞ inches, which contains 19 quarter inches and one ⅛ of an inch. The 19 quarter inches represent 19 feet on scale, and the ⅛ of an inch represents 6 inches, thus, making the total distance between E and F, 19 feet and 6 inches. Square over from E to A, and the lines A B, E F, form the boundary of the cellar plan.

The cellar walls are supposed to be of stone, and are therefore 18 inches thick, so we measure off, working to the inside always, ⅜ of an inch, which according to our scale, represents 1 ft. 6 in., the proper thickness of the wall.

It will be noticed that at R we have projected the wall inside the cellar; this projection is intended to carry the chimney and fireplace. Here we show two projections, but in practice the projection is made in one as shown by the dotted lines. The same is also done with the chimney foundation shown at S. While the shaded parts shown would be ample to carry the chimney and fireplace above, it is generally more economical to make a solid block of stone-work, as shown by the dotted lines. In actual practice, the first stones laid should project beyond the faces of the wall six or more inches on each side in order to give the foundation a wider base. These bottom stones are called "footings." They should never be less than 6 inches thick.

The partition V is built of bricks laid on stone footings. This wall is nine inches thick—the length of a brick—and runs up to the floor joists. The partition on the opposite side of the stair-way is a studded, lathed and plastered one. The

openings, O, O, are for the cellar windows and are three feet (¾ inch) wide. The framework outside the windows are curbs, built around the windows to prevent the earth from filling in against the glass. The student need not mind the shading unless he desires to fill in the walls.

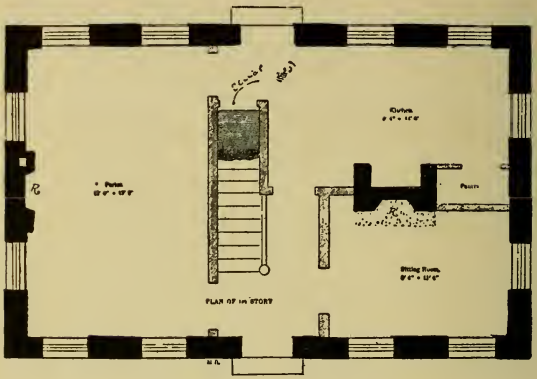


Fig. 101. First Floor Plan.

This sketch is now a complete plan of the cellar, and one that can be worked to.

It will now be in order to draw the first floor plan, as shown in Fig. 101. Proceed the same as before, only in this case the outer walls are made ¼ inch thick, which represents one foot, making the wall one and one-half bricks thick. Measure off the openings as shown, making the

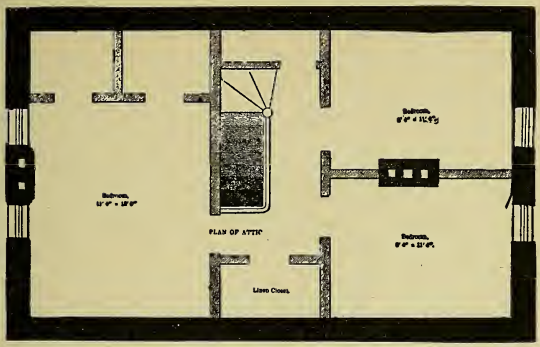


Fig. 102. Attic Plan.

window openings which are represented by three lines running through the openings (¾ inch wide), which is three feet. The two door open-

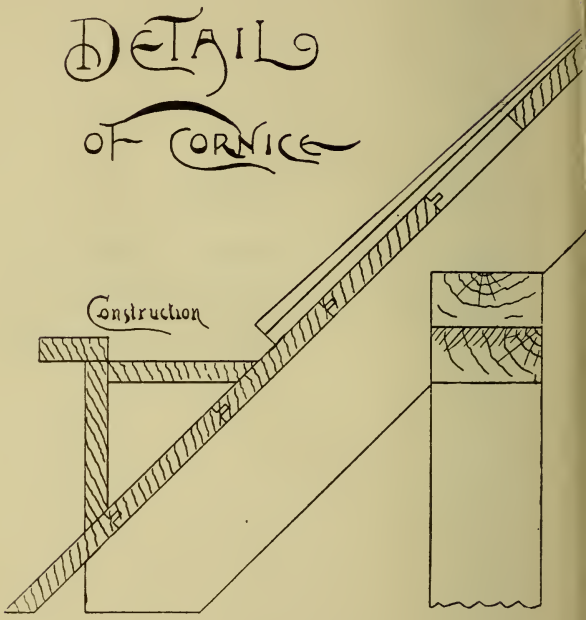
Fig. 103. Front Elevation.

PLATE 7.

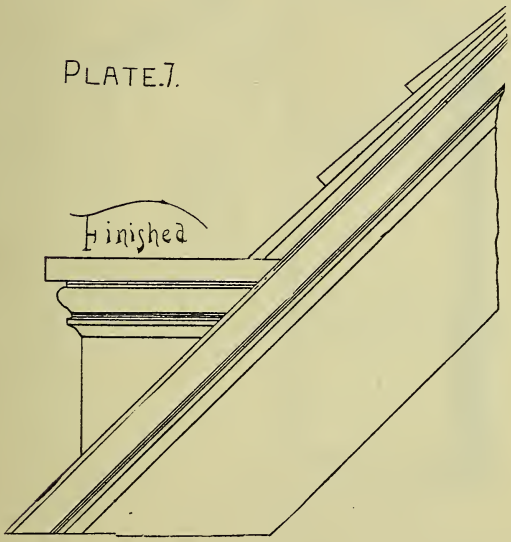
Plate 7 exhibits a portion of cornice and roof of main building. This shows the construction, with roof boards and shingles, also the finished portion of roof and cornice.

ings are 13-16 inch, or 3 feet 3 in. Measure off the partitions and lay off to sizes as figured. Be careful to have the chimneys and fireplaces R.

shown in this plan. The projections shown at the doors are steps.


DETAIL
OF CORNICE
Construction

ings are 13-16 inch, or 3 feet 3 in. Measure off the partitions and lay off to sizes as figured. Be careful to have the chimneys and fireplaces. R.



shown in this plan. The projections shown at the doors are steps.

ings are 13-16 inch, or 3 feet 3 in. Measure off the partitions and lay off to sizes as figured. Be careful to have the chimneys and fireplaces, R.

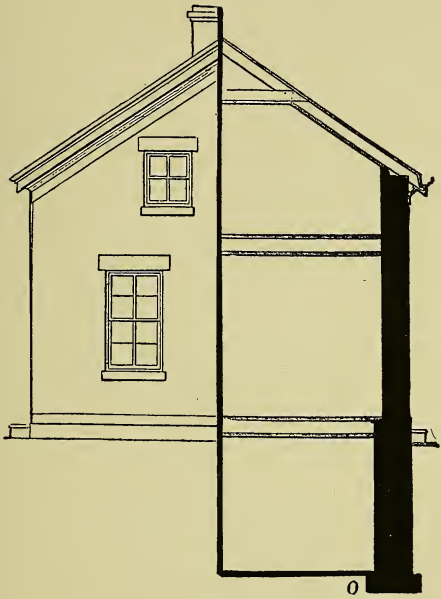


Fig. 104. End Elevation and Section.

R. S., directly over those in the cellar. The stairs in cellar are directly under the stairs as shown in this plan. The projections shown at the doors are steps.

The plan shown at Fig. 102 is for the attic story. A part of the height of this will run up into the roof as will be shown in section Fig. 104. Here the chimneys take another shape and are "drawn in" to suit the flues. The partitions are varied and the stairs land in the hall by three

Fig. 105.

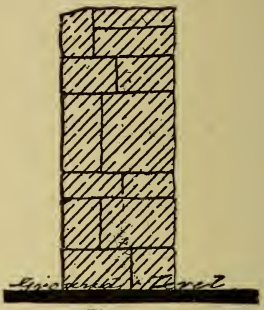


Fig. 106.

winders. The windows are not so wide as those in the stories below, only being 2 ft. 3 in. in the openings. Measure off the rooms as they are figured, making the partitions of 2x4 in. studs, and marking off the newel and rail for stairs as shown.

The elevation shown at Fig. 103 requires but little explanation, as it is simple and easily understood. The windows are 3 feet wide in the opening and 5 ft. 3 in. from lintel to sill; so,

keeping these figures in mind, the window and sashes may be laid out readily. The door, from floor to lintel, including fanlight, is 8 feet high, by 3 ft. 3 in. in width. The rest is easy.

A part of the end elevation and a sectional view are shown at Fig. 104. In the section the

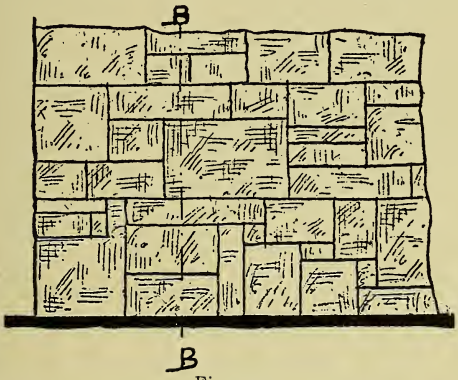


Fig. 107.

foundation footing is shown at O; the projection of door-steps is also shown on the ground line.

All these examples should first be made in pencil, after which, when corrected, they may be "filled in" with ink.

I have mentioned something regarding "footings" for foundations and it may not be out of place at this point to say something more of

them. The illustration shown at Fig. 105 shows the footing and a portion of section of wall that would be suitable for the brick partition running through the cellar of the cottage we have just discussed. Here is a flat stone footing with three courses of bricks on top before the regular wall commences. The dotted lines show the top of cellar floor whether it be plank or cement. When the whole foundation and wall are to be of stone, the student may lay it off in accordance with the class of masonry employed. One method of showing square rubble work in a wall, is exhibited at Fig. 106. This shows a section of the wall, through B, at Fig. 107. Coursed rubble work is shown at Fig. 108, while random rubble work is shown at Fig. 109.

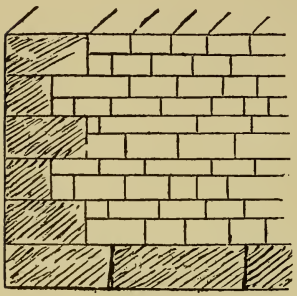


Fig. 108.

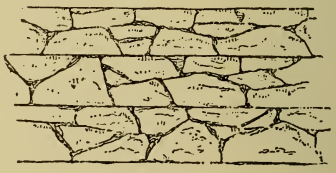


Fig. 109.

In this style of masonry, the wall is brought to a level throughout its length at about every 12 or 14 inches, in height, so as to form courses of that depth. This wall is built of stones rough from the quarry, regardless of size or shape.

Another style of masonry built up of irregular stones that have been broken up from large field stones is shown at Fig. 110. The foundation and corners are built up of squared stones. This kind of work is sometimes called irregular rubble, rustic work, or field stone masonry. It does very well for garden walls, retaining walls, cellar walls for small buildings, but should not be used where great strength is required.

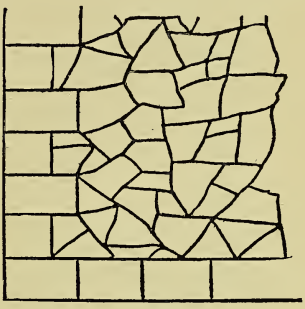


Fig. 110.

Block course masonry is where the courses of stone run in straight horizontal lines as shown at Fig. 111. Ashler masonry is built up in courses of more or less uniform depth, generally from 10 to 14 inches deep, ranging with the quoins or corners, and other dressings; it goes

by different names, according to the face put upon the stone—from quarry-pitched, or rock ashler, to wrought ashler. A sample of the work is shown in Fig. 112.

There are many other forms of stonework, but the examples given are quite sufficient for the purposes of this work, and other forms may well be left to the trained architect. Perhaps a

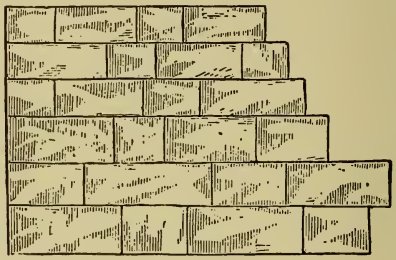


Fig. 111.

few examples of brickwork will not be out of place at this point, as they will give to the student a slight insight into the manner of "bonding," which is quite an important matter in brickbuilding.

At Fig. 113, the end section of a single brick, or 9 inch wall, is shown, having a two brick or 18 inch footing. This will be easily understood as will also the section shown at Fig. 114. The

latter shows the section of a brick and a half wall, known generally as a 14 inch wall. The footing for this is formed of three bricks,

Fig. 112.

making it 28 inches wide. The footing is diminished until it is only two bricks wide on which the actual wall commences. Other thick-

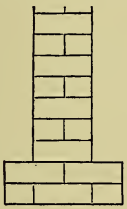


Fig. 113.

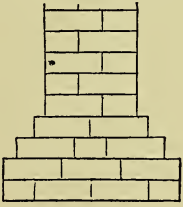


Fig. 114.

nesses of walls are formed on the same principle so other examples of this kind are unnecessary.

At Fig. 115 I show two plans of an 18 inch

wall which illustrates the method of "bonding" or breaking joints. I also show a section of the wall shaded.

Before proceeding further, it may be well to explain the meaning of the term "bond," or "bonding." "Bond" is an arrangement of bricks

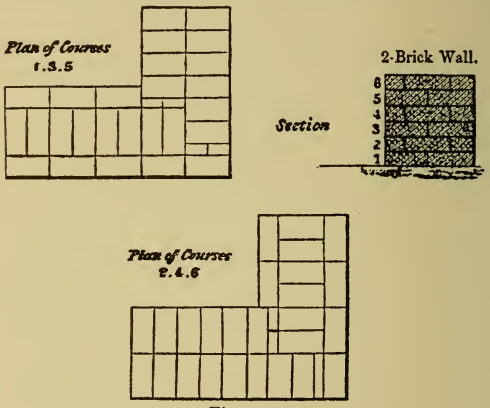


Fig. 115.

or stones placed in juxtaposition so as to prevent the vertical or plumb joint between any two bricks or stones falling into a continuous straight line with that between any other two. This is called "breaking joint," and when it is not properly carried out, that is, when two or more joints do fall into the same line, as at x y.

Fig 116, they form what is called a straight joint. Straight joints split up and weaken the part of the wall in which they occur, and should therefore be avoided. A good bond breaks the vertical joints, both in the length and thickness of the wall, giving the bricks or stones a good lap over one another in both directions, so as to afford as much hold as possible between the different parts of the wall.

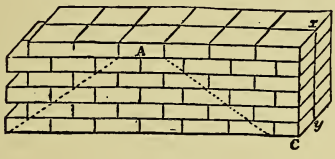


Fig. 116.

A further effect of bond is to distribute the pressure which comes upon each brick over a large number of bricks below it. Thus, in Fig. 116, there is a proper bond among the bricks forming the face of the wall, and the pressure upon the brick A is communicated to every brick within the triangle A, B, C.

A defective bond, either in brickwork or masonry, may look very well upon the face of the work, as in Fig. 116, where the bricks regularly break joint vertically, but in which

there is no bond whatever across the thickness of the wall, which, it will be seen, is really composed of two distinct slices of brickwork, each 4½ inches thick, and having no connction with one another, except that afforded by the mortar. To avoid this defect, the bricks or stones forming a wall are not all laid in the same direction as in Fig. 116, but some are laid parallel to the length of the wall and others at right angles to them, so that the length of one of the latter overlaps the width of the two below it, as shown in Fig. 115. In this figure, a wall is shown in section at the top, two bricks in thickness. The second diagram shows a plan of the courses, 2, 4, 6, as numbered in the section, while the lower diagram shows the plan of the courses, as they are laid in the wall, of the courses numbered 1, 3, 5, in the section.

When bricks are laid lengthwise in the wall, as shown in Fig. 117, they are called "stretchers"; when they are laid across the wall, as in Fig. 118, they are called "headers." "Stretchers" are bricks or stones which lie parallel to the length of the wall, those in the exterior of the work showing one side in the face of the wall.

"Headers" are bricks or stones whose lengths lie across the thickness of the walls, the ends, or

"heads," of those thin walls like the diagram, or in the outside of thick walls, being visible on the face.

If the student copies these examples and thinks as he draws, grasping the reasons why

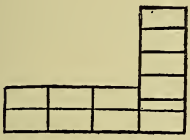


Fig. 117.

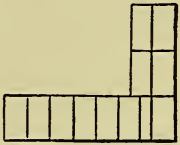


Fig. 118.

the bricks are laid in the manner shown, he will accomplish two purposes, learning to draw and acquiring a constructive knowledge.

There are a variety of "bonds" in brickwork, all of which it will be necessary for the architectural student to be familiar with, and I propose to offer a few examples for practice and to explain them at the same time.

The bond chiefly used in this country for ordinary work is called running "bond." This consists of three, four or five running courses of stretchers, and then a course of headers, as shown in Fig. 119, where there are three courses of stretchers and one course of headers. The small portions of bricks, or "bats," designated by

XXXX, are termed closers, and are required to fill out the courses.

In English "bond" there is in the face wall a course of headers, then a course of stretchers, and so on all the way. This arrangement is for the front of the wall, and in the thick walls the bricks are made to join in to the best advantage.

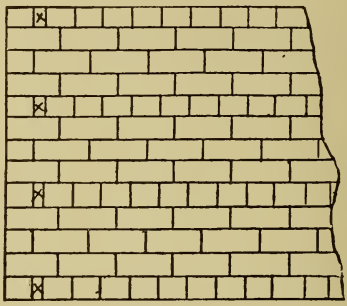


Fig. 119.

Thus, an English bond nine-inch wall will have for each course of stretchers two rows side by side, breaking joint horizontally. The joints in the inside courses should be one-half the width of the brick from the vertical joints of the stretchers above and below. A fourteen inch wall in English bond is shown at Fig. 120, which represents four courses in elevation, and the

second course and the top course, from the top, in plan. It is absolutely necessary in this wall to have a row of headers back of the stretchers, as if they were all stretchers in this course, there would be a mortar joint all the way up through

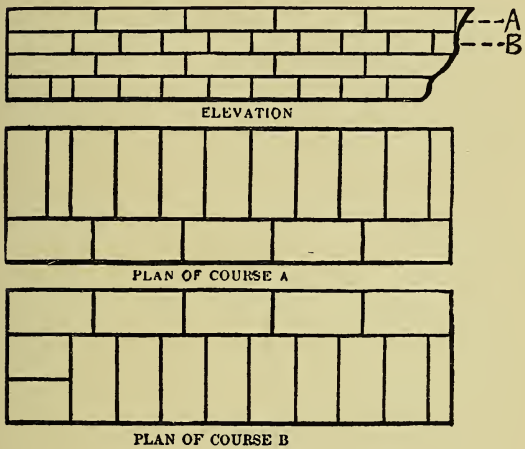


Fig. 120.

the wall along the line A B. There are shown two ways to make the headers in any course; break joints with the stretchers in the same course. In the plan of course A at the left-hand end there will be seen a closer X, which is half of a brick split lengthwise. This piece,

9x2¼x2¼, being put in next to the last stretcher. In the plan of course B it will be seen that the same thing is done by using three-quarter bricks laid flatwise.

The example shown at 121 exhibits several

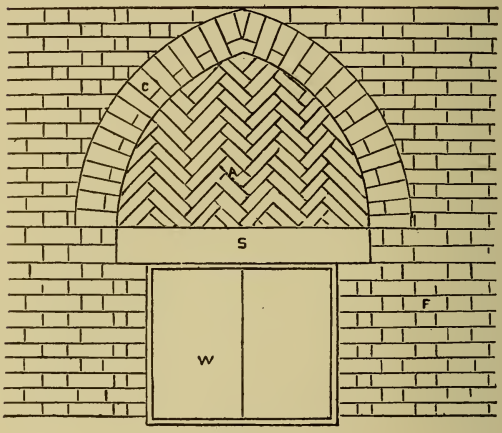


Fig. 121.

styles of laying bricks; C shows the arch A, herring bone filling over a window, S, a stone sill, F the general brickwork and W the window opening. This is a good example to draw, though it is not by any means good architecture.

These examples are sufficient for my purpose,

and should the student desire to know more about the bonding of brickwork, he may procure a copy of a manual on brick and stone work I have in preparation, and which will be published by Drake & Co. shortly.

DRAWING ARCHES

It is absolutely necessary the draftsman should know how to draw the forms of arches that are in common use, and in order to instruct

Fig. 122.

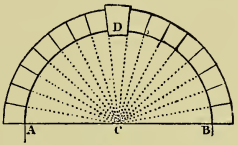


Fig. 123.

him on this point, the following examples are submitted for him to study and work out. The arch shown at Fig. 122 is simply a semicircular one, and the simple line of arch is drawn from a center as shown. When an arch of this form is used for brick or stone work as shown at Fig. 123, a new set of conditions arise, as the joints of the bricks or stone must be shown so that the right bevels or angles may be given them. These joints all radiate to the center of the arch as shown. It may not be out of place at this

PLATE 8.

This plate shows the outside of a plain window frame, a door frame, corner board, and a sectional elevation of sash and frame. This is a very simple plate, and the young draftsman will find no difficulty in re-drawing these details.

(7) The INTRADOS of SOFFIT ... rch

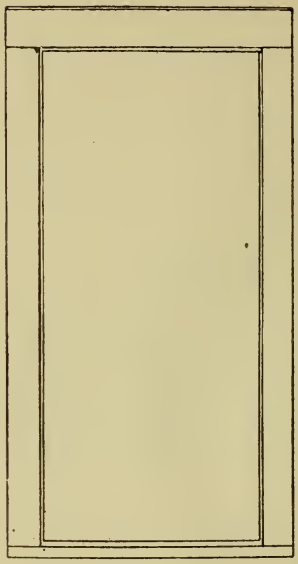
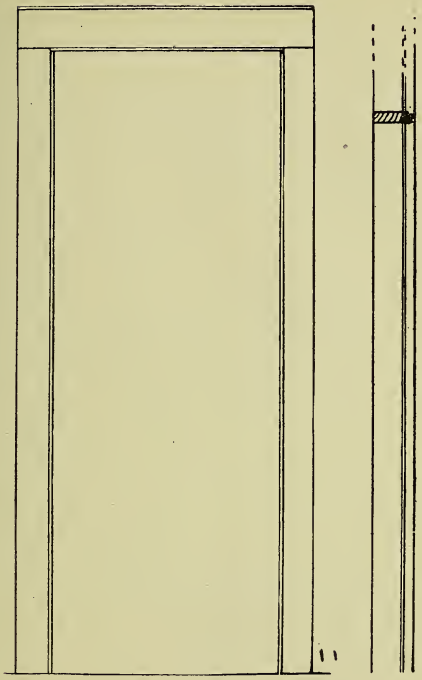


PLATE.8

OUT SIDE FRAMES AND CO



(7) The INTRADOS or SOFFIT of an arch

point to give a description of the arch, with the terms used in connection therewith, and, I may say, the definitions given apply to all other arches as well as to the one in Fig. 123:

(1) The SPAN of an arch is the distance between the points of support, which is generally the width of the opening to be covered, as A B. These points are called the springing points; the mass against which the arch rests is called the ABUTMENT.

(2) The RISE, HEIGHT OR VERSED SINE of an arch is the distance from C to D.

(3) The SPRINGING LINE of an arch is the line A B, being a horizontal line drawn across the tops of the support where the arch commences.

(4) The CROWN of an arch is the highest point, as D.

(5) VOUSSOIRS is the name given to the stones forming the arch.

(6) The KEYSTONE is the center or uppermost voussoir, D. so called because it is the last stone set, and wedges or keys the whole together. Keystones are frequently allowed to project from the faces of the wall and in some buildings are very elaborately carved.

(7) The INTRADOS or SOFFIT of an arch

is the under side of the voussoirs forming the curve.

(8) The EXTRADOS or BACK is the upper side of the voussiors.

(9) The THRUST of an arch is the tendency which all arches have to descend in the middle, and to overturn or *thrust* asunder the points of support. The amount of the thrust of an arch depends on the proportions between the rise and the span; that is to say, the *span* and *weight* to be supported being *definite*, the thrust will be diminished in proportion as the rise of the arch is increased, and the thrust will be increased in proportion as the crown of the arch is lowered.

(10) The JOINTS of an arch are the lines formed by the adjoining faces of the voussoirs; these should generally radiate to some definite point, and each should be perpendicular to a tangent to the curve of each joint. In all curves composed of arcs of circles, a tangent to the curve at any point will be perpendicular to a radius drawn from the center of the circle through that point, consequently the joints in all such arches should radiate to the center of the circle of which the curve forms a part.

(11) The BED of an arch is the top of the abutment; the shape of the bed depends on the

quality of the curve, and is explained in the diagrams.

(12) A RAMPART ARCH is one in which the springing lines are not on the same level

(13) A STRAIGHT ARCH or, as it is more properly called, a *plat-band*, is formed of a row of wedge shaped bricks or stones of equal depth placed in a horizontal line; the upper ends of the pieces being broader than the lower, prevents them from falling down.

(14) ARCHES are named from the shape of the curve of the underside, and are either simple or complex. The simple curves may be defined as those that are described from one center, as Fig. 122, or by a continuous motion, as the ellipse, parabola, hyperbola, cycloid, and epicycloid; and complex arches are those which are described from two or more fixed centers, as many of the Gothic and Moorish arches are.

Fig. 124.

Fig. 124 shows the manner of drawing a segmental arch. The center of this is below the springing lines. A segmental arch, drawn out for brickwork, is shown at Fig. 125, in which the joint lines are marked off.

A segmental arch drawn from two centers is shown at Fig. 126. The centers are shown so that the student will have no trouble in describ-

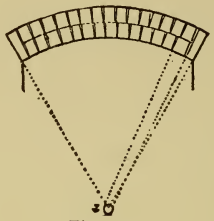


Fig. 125

Fig. 126.

ing it. The joints for brick or stone work may be laid out around this arch, by using the centers as fixed points and running radial lines through the curved lines.

The diagram shown at Fig. 127 illustrates a

Fig. 127

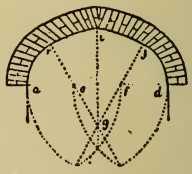


Fig. 128

Tudor arch. It is struck from three centers as shown. It is sometimes called an elliptical Gothic arch, and may be struck as follows:

Divide the span, *ad*, Fig. 128, into three equal parts by the points, *ef*. From *a*, with radius *a*, *f*, describe an arc, and from *e*, *f*, and *d*, describe similar arcs, which intersect at *ij*. Now bisect the span, *ad*, and raise *a* perpendicular to *i*. Draw a line through *if* and *je*, and produce these lines. With compasses from *f* with radius, *fd*, describe arc to *j*, and from *e*, with the same radius, describe a similar arc to *nh*. Then from *i* with radius *ij*, describe arc, *ji*, and from *j* same radius, the curve *hi*, when the interior curve of the arch will be completed, the remainder of the arch being set out in the usual manner.

The elliptical arch can best be described with the trammel shown at Fig. 69, or with a string as described at Fig. 68, but the joints for brick or stone work must be obtained by a method very different from that illustrated for circular arches. To obtain the correct lines for the elliptical arch shown at Fig. 129, we must proceed as follows: Let ZZ be the foci, and B a point on the intrados where a joint is required; from ZZ draw lines to B, bisect the angle at B by a line drawn through the intersecting arcs D produced for the joint to F. Joints at 1 and 2 are found in the same manner. The joints for the opposite side of the arch may be transferred

as shown. The semi-axes of the ellipse, H G, G K, are in the same ratio as G E to G A. The

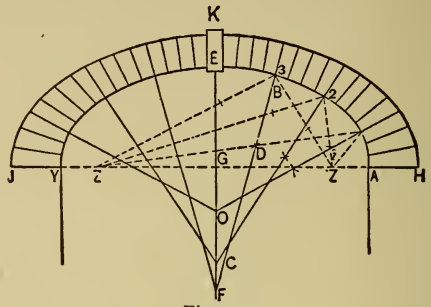


Fig. 129.

voussoirs near the springing line of the arch are thus increased in size for greater strength.

The diagram shown at Fig. 130 shows a lancet

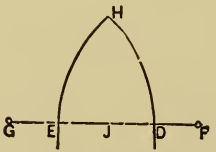


Fig. 130.

Fig. 131.

arch. This is drawn by placing the centers of the curves outside the figure as at G and F. E O, show the width of the opening, and H J, the height.

A completed lancet arch is shown at Fig. 131, the radial or joint lines being exhibited. These lines are drawn from the centers in all cases.

The diagram shown at Fig. 132 represents an equilateral, Gothic arch. This is drawn with the compasses set to the width of the opening, one leg being placed at the junction of the springing line when the other leg describes the curve of

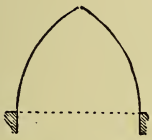


Fig. 132.

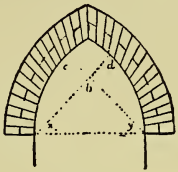


Fig. 133.

one side. The same process forms the other side of the arch.

The completed equilateral arch is shown at Fig. 133, with the method of laying out the curves. The centers being X and Y. As before stated, the joints in all these arches should be struck at right angles to tangents of the curve, which in the case of arcs of circles will cause the joints to radiate to the center from which the curve is struck. There are cases, however, when this rule cannot be followed, as take the last illustration Fig. 133, for instance, when the

bonding is not what a good workman would desire, yet it is better than the bonding shown in Fig. 134, though perhaps not so handsome; that, however, is a matter of taste. The employment of the method shown at Fig. 133 gets rid of the small angle closers which show in the crown of Fig. 134. To get the lines properly, as shown in Fig. 133, run up the two dotted lines at an angle of fifty degrees, with the springing line X Y, on each side of the arch. These are produced to cut through the curve lines at C and D.

Fig. 134

The joints of the arch from X to C are radiated to Y, those from D to Y to X, and those in the upper portion of the arch to the intersection of the two inner lines at B, whereby the bricks at the crown are eased off. In pointed or two-centered arches, other than equilateral, the same method may be followed, the angles of the dotted lines being greater or less as the circumstances of the case may require.

In setting out gauged arches care must be taken to draw first a middle or "key" brick at the crown of the arch, the object being to provide a brick to resist the increased strain at the

point; and secondly, to have the effect of producing an equal number of bricks in the arch excluding the key, so that it may be finished the same on each side.

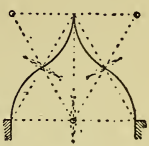


Fig. 135.

The next arch is drawn upon the same principles as the ogee curve shown in Fig. 135, and with the construction lines given requires no further explanation. It is defective as a scientific arch, but occurs often in the Decorated Period, towards the end of the fourteenth century. After that period the arches were made flatter, examples of which are the segmental, or two-centered, and the Tudor, or four-centered, arches.

To describe an equilateral ogee arch, like Fig. 136, proceed as follows: Make YZ the given span; make YX equal YZ, bisect YZ in A;

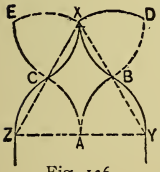


Fig. 136.

on A as center, with A Y as radius, describe the arcs Y B and Z C; on B and X as centers describe the arcs B D and X D, and on C and X as centers describe the arcs C E and X E; on E and D as centers describe the arcs B X and C X.

The flat ogee arch shown at Fig. 137 requires

some little different treatment to the previous one. To obtain the proper curves and centers for this style of arch proceed as follows: Let A B be the outside width of the arch, and C D the height, and let A E be the breadth of the rib.

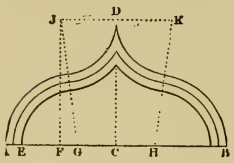


Fig. 137.

Bisect A B in C, and erect the perpendicular C D; bisect A C in F, and draw F J parallel to C D.

Through D draw J K parallel to A B, and make D K equal to D J.

From F set off F G equal to A E, the breadth of the rib, and make C H equal to C G.

Join G J and H K; then G and H will be the centers for drawing the lower portion of the arch, J and K will be the centers for describing the upper portion, and the contrary curves will meet in the lines G J and H K.

This style of arch is seldom used in substantial work other than in Gothic architecture; the carpenter, however, often makes use of it in porch, veranda and arbor work, and sometimes in grille work, so it is well to have a knowledge of it.

Another arch, not in common use, is the

horseshoe or Moorish arch; two examples are shown at Figs. 138 and 139. In the first the curve is struck from a center situated above the springing line. This is said to be the strongest

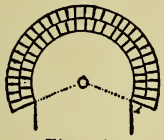


Fig. 138.

Fig. 139.

of all arches when properly constructed and is often employed for tunneling and other heavy work where great resisting strength is required.

The figure shown at 139 is sometimes called a Gothic horseshoe arch because of its being pointed. It is somewhat similar to the last, but is struck from two centers, I and J. The special peculiarities of these arches is, that they are narrowed in on the springing lines, which gives to them a pleasing appearance.

Often arches are formed by having them two or more bricks deep, or they may be rough and turned in half-brick rings, 4½ inches thick, as shown at *hh* in Fig. 140. In arches of quick curve, with not more than 2 or 3 feet radius, this method is absolutely necessary to prevent

very large points at the extrados. In the section of portions of small arches shown in the illustration, of which one *ww* is turned, in nine inch rings consisting of headers. It will be seen that

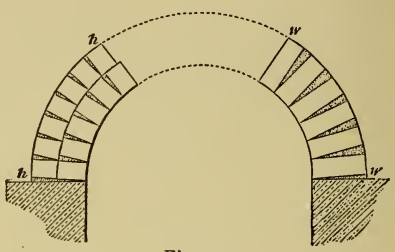


Fig. 140.

the mortar joints in this are much wider at the top than those of the portion *hh*, built in rings half a brick in thickness. The line of joints in both these examples are radial, all being drawn from the center point.

The most common—so-called arch—is what is termed "gauged straight arches," and with these, in brickwork, the draftsman will have the most to deal, and I purpose showing him several examples. Such arches are in very common use, and are generally 12 inches, or four courses of brickwork, in depth.

The *sommering* or splay of the bricks depends

upon the angle given to the skewbacks or springings, and varies with the distance of each voussoir from the springing.

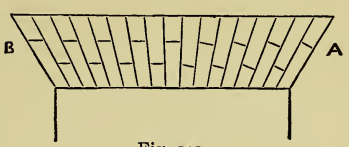


Fig. 141.

The skewbacks are generally inclined at 60° from the horizontal, and are struck by prolonging the sides of an equilateral triangle, as shown on Fig. 142.

The joints give a better appearance when horizontal as at B, Fig. 141; but to save labor they are frequently formed as at A, and carefully concealed by rubbing over, false horizontal joints being marked on the face, though in course of time the true joints are sure to show up and expose the sham.

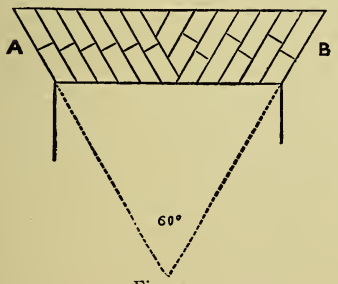


Fig. 142.

The arch shown at Fig. 142 is sometimes called a *French* or *Dutch* arch. It is sometimes used by builders when intended to be plastered or covered over. Such arches

are unreliable, and the draftsman should never make them if intended to be built, unless they are to be built up in good Portland cement mortar. The joints may be arranged as shown at A or at B; if, as at A, only whole bricks should be used.

Sometimes, in building arches of this kind, it may be necessary to "plug" the brickwork as shown at PPPP, Fig. 143, for the purpose of

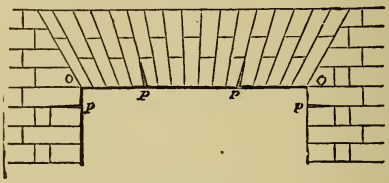


Fig. 143.

attaching finished work to them by screws or other devices, and the draftsman must note this on his drawings in order to save future trouble. The manner of forming the skewbacks is shown in this illustration, at o o; the angle of this line should be about sixty degrees.

In placing in arches of this kind, there must always be timber or concrete lintel behind the face bricks to carry the wall, and over this lintel, there should be a relieving arch built.

This latter arch is generally built up roughly unless it is intended to carry a great weight, then care must be taken in its construction.

Before leaving the subject of arches it may be well to exhibit some examples in stone, and should the student never be called upon to prepare drawings for such work, their con-

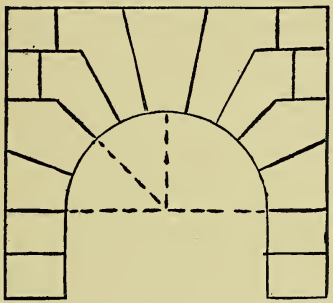


Fig. 144.

struction on paper will make good practice. The example shown at Fig. 144 is a very common one in stonework and shows how the style of work is prepared. It will be seen that the joints are generally radial, while horizontal joints are formed to receive the stone above.

Another style of opening in stonework is shown at Fig. 145, where the head of the

PLATE 9.

Plate 9 shows three examples of inside finish—a door, a window, and sliding door—opening with trim. These like the other examples shown in Fig. 8 are easily understood.

where the walls are formed of square stones laid

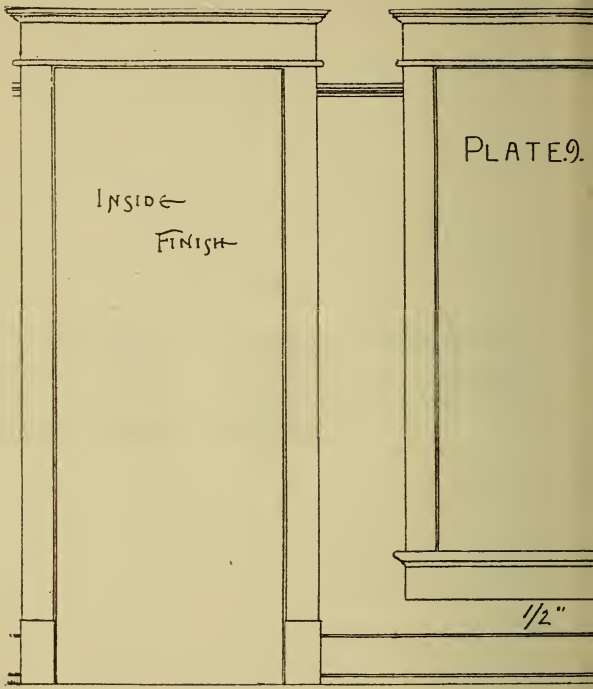
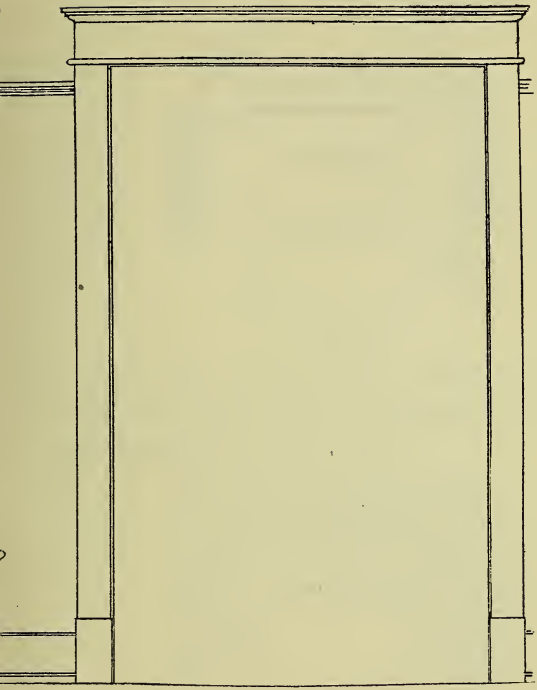


PLATE 9.
INSIDE
FINISH
1/2"



where the walls are formed of square stones laid

window or door is flat. There is a relieving arch thrown over the lintel or cap to carry the

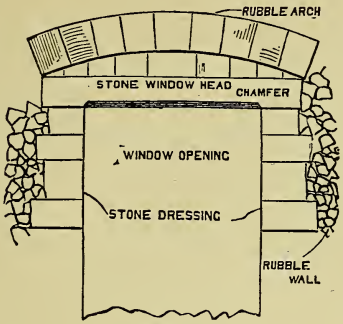


Fig. 145.

weight over to the jambs. The face of the window is all of dressed stone, while the walls are formed of irregular stones.

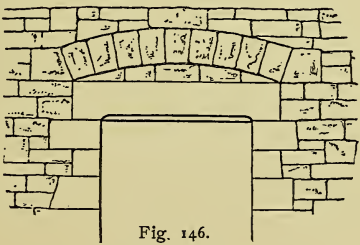


Fig. 146.

Another style of work is shown at Fig. 146, where the walls are formed of square stones laid

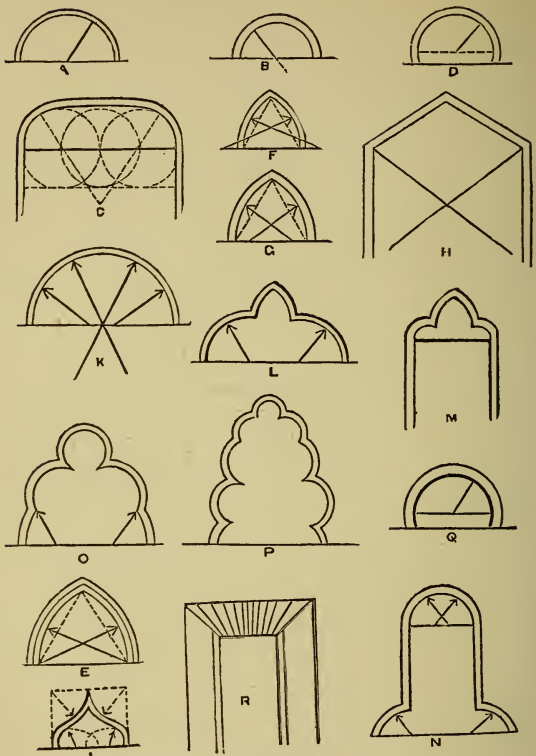


Fig. 147.

up in irregular courses, and the relieving arch ends against a regularly prepared skewback.

At Fig. 147 are grouped some of the principal forms of arch shown in architecture. At A is the semicircular arch, describing half a circle. B is a form of elliptical arch, not unfrequently employed. It is not, in reality, elliptical at all, save in appearance, being a segmental arch, or one formed by the segment of a circle, which is struck from below the springings. The elliptical arch C is formed of several circles. The stilted arch D rises from points below its center. The Gothic architects employed various forms of the pointed arch at different epochs. E is what is usually termed an equilateral arch, so called because the two springing points and the crown of the arch form an equilateral or equal-sided triangle. F, the lancet arch, is more pointed than the preceding. It is struck from outside the springings, and has the outline of an isosceles or equal-legged triangle, of which the base is, of course, less than the sides. G, the "drop" arch, in contradistinction to the last example, is less pointed than the equilateral arch. It is struck from within the springings, and has a triangular outline, in which the base is longer than the sides. H, the "segmental Gothic arch", is composed of two segments of a circle, meeting obtusely. I, the "ogee" arch, was introduced at

a late period of Gothic architecture, and is struck from four points. K, the "Tudor," arch prevailed during the close of the Gothic, and takes its name from the then ruling family of the English dynasty. It has a much flattened arch, low mouldings, and a profusion of panelings. I now come to arches of the form that are designated "foiled" arches, imitating the foils or leaflets of a leaf, which are generally divided into three varieties, viz., trefoils, cinquefoils, and polyfoils. L, M, N exhibit three forms of the "trefoil" or three-lobed arch, O is an example of the cinquefoil or five-lobed arch, and P, one of the "polyfoil" or many-lobed arch. The latter form is principally confined to Romanesque and Saracenic architecture, and is especially met with in Moorish and Saracenic buildings. The latter people also employed a peculiar arch, special to themselves, and generally styled the "horseshoe" arch, shown at Q. This is only found in Arabic or Moorish buildings. The so-called "flat" arch, R, is in reality not an arch at all, though the voussoirs are so arranged as to radiate from a center, and are laid in parallel courses. This arch is employed in doorways, windows, and fireplaces of buildings, and the intrados are generally supported by a bar of

iron or beam of wood. In some very ancient examples the voussoirs are cut to a peculiar form, with the idea of securing great stability and strength, as shown at Fig. 148, which is copied from the fireplace of Coningsbergh Castle.

I think the foregoing illustrations of arches and the accompanying description are quite sufficient for my purpose, as the student can

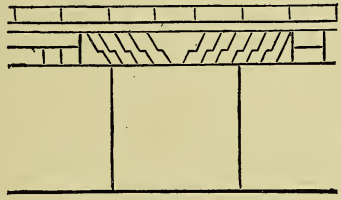


Fig. 148.

gather from them all he will immediately require to know, and after a thorough mastery of these examples he will have no difficulty in obtaining a higher knowledge from the thousand and one other sources that are available, should he so desire.

SOME MISCELLANEOUS PRACTICE

Suppose it is necessary to show a door and casings in a brick wall, with jamb linings, grounds

and other finishings, we commence by first laying out the plan as shown at Fig. 149; we decide upon the height and width of door, also

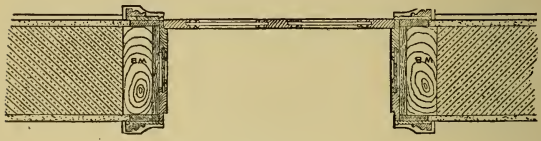


Fig. 149.

style of door, and finish, and work to scale accordingly. In this case I show an elevation, Fig. 151, and plan respectively with a four paneled door with jamb and soffit lining. Fig. 150 shows a portion of the plan enlarged.

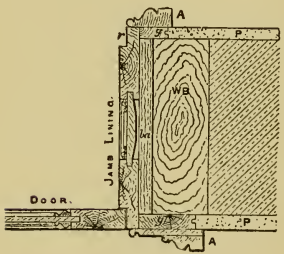


Fig. 150.

In this case it will be seen that the door is hung to the jamb lining itself; the latter is attached to a backing *ba* dovetailed in between the framed grounds, and secured to wood bricks in the wall, the edges of which may be seen in section Fig. 152.

In some cases the grounds are tongued into

the jamb linings, but this is very seldom done.

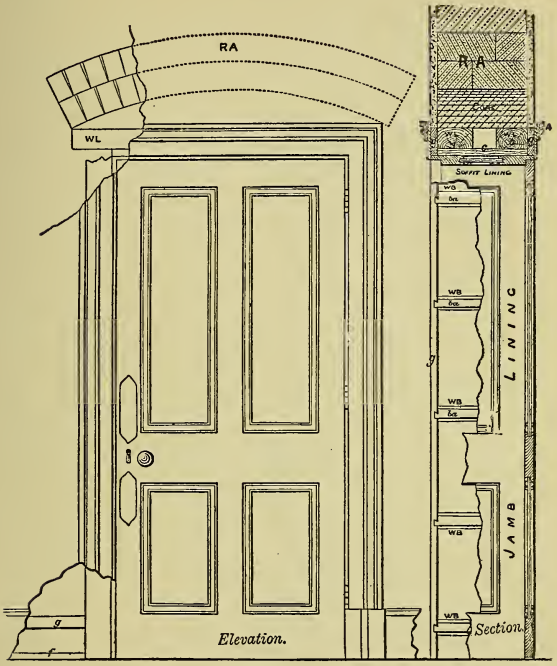


Fig. 151. Fig. 152.

The jamb linings go right through the depth of the opening, and on one side of the wall have their edges rebated to receive the door; the

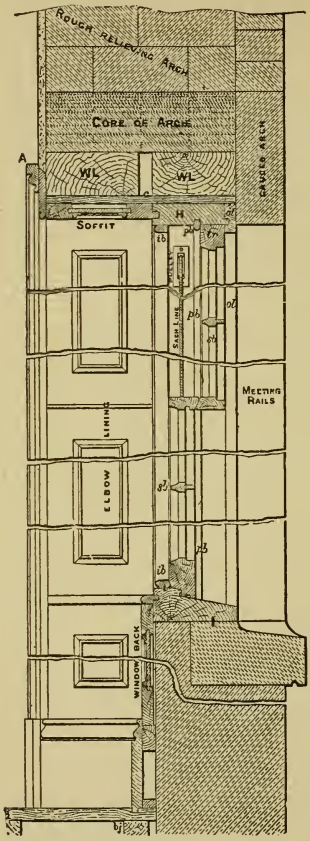


Fig. 153.

edges on the other side of the wall being (in superior work) similarly rebated to correspond.

The soffit lining is secured to cradling or backing *c*, consisting of rough stuff attached to the under side of the lintels over the opening.

Of course the doorway might be spanned by a rough brick arch, or by a concrete beam, without wood lintels, in which case the framing would be secured to plugs let into the arch or beam.

The enlarged

plan in Fig. 150 differs slightly from Fig. 149, inasmuch as a smaller architrave is shown on the inside of the doorway. The paneling of the soffit lining is often shown in dotted lines upon the plan of the doorway.

The whole elevation of one side of the door is shown at Fig. 151, and a section is shown at Fig. 152, with a portion of the jamb lining removed. This latter is a good scheme as it shows the workman exactly what is required of him.

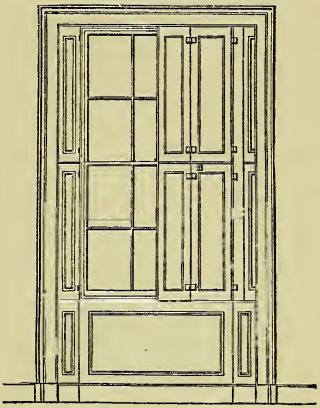


Fig. 154.

The illustration shown at Fig. 153 shows a vertical section of a window and frame for a brick house. It is purposely cut short in order to show all the parts. It will be readily understood, as WL stands for wood lintel, b j for bottom joints, *ib* inside blinds, etc. Fig. 154 shows the same window in elevation with shutters or blinds in sight.

The plan is shown at Fig. 155. This shows the shutters box splayed from the wall. The dotted lines show the shutters partly folded.

In redrawing these examples the student should make them at least twice or three times the size shown herewith; this can readily be

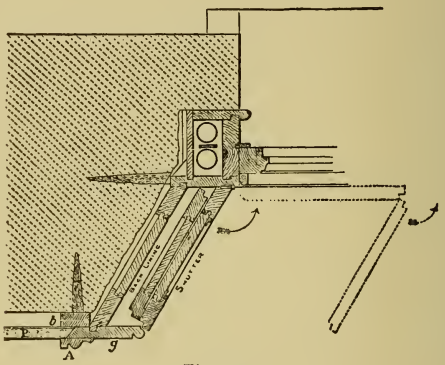


Fig. 155.

done by taking the distances on a compass and transferring to the paper on which the drawing is to be made. If the drawing is to be twice the size of the original, then space off the distance of each feature twice, if to be three times the distance, then space off three times, and so on for other sizes. By following this advice, the student will become familiar with his instru-

ments and with the various kinds of work. Indeed, this work is intended, besides being a teacher of primary drawing, to be a helper in obtaining some knowledge of architectural construction as well; for, it is supposed, it will fall chiefly into the hands of young students, apprentices, and fellows who have not had a fairly good opportunity of acquiring a knowledge of either drawing or construction, but who are desirous of learning what they can of both, during their spare moments.

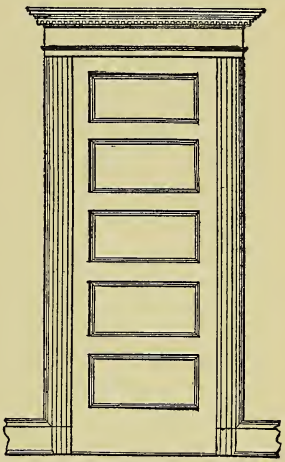


Fig. 156.

The plates, following the general illustrations, will place before the student many things not as yet touched upon, but I have deemed it necessary to show a few miscellaneous items both for practice, and because of their constructive value to the young builder.

The door and casing shown in Fig. 156 is a

good example for drawing; its proportions are nearly perfect, and the style is modern. This is an inside door as shown by the base.

The sliding doors shown at Fig. 157 are very nearly built in the same style as the single door

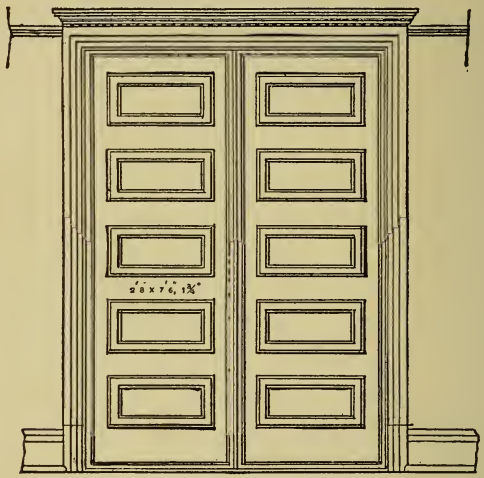


Fig. 157.

shown in Fig. 156. These may be drawn to any special scale, or they may be transferred from the illustration. I show a section of the wall into which the sliding doors run at Fig. 158. This drawing shows the method of construction,

the end-wood of the studding being seen; also, the linings to protect the pocket.

The illustration, as Fig. 159, shows a method

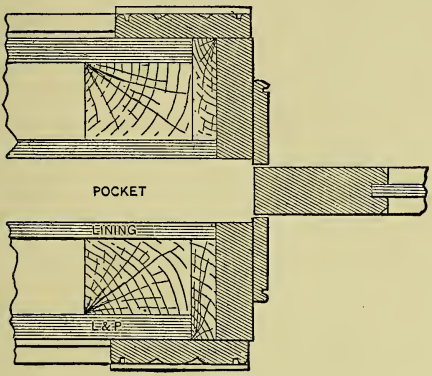


Fig. 158.

of adjusting the joint at the junction of the doors. The section shows clearly how the joint is hidden from view.

A section and elevation of trim for a door is shown in Fig. 160. In this drawing the door, the step, the stud, the plaster and the trim are shown in place, and at the bottom, the plinth block and base are also

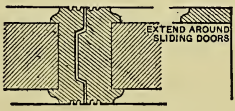


Fig. 159.

shown in section. This style of finish is called "block finish," because of the turned block being placed on the corner.

Fig. 161 exhibits a corner of a balloon frame, showing the manner of placing the studs, corner boards and other finish.

I show at Fig. 162 a drawing of a cornice for a balloon frame house. The

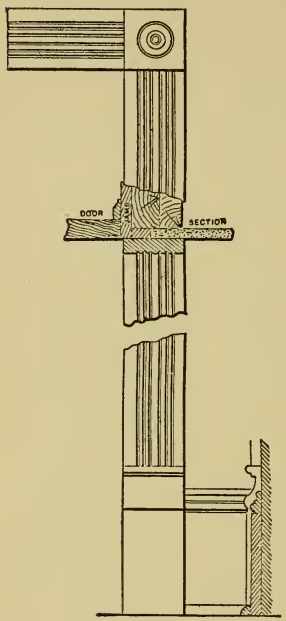


Fig. 160.

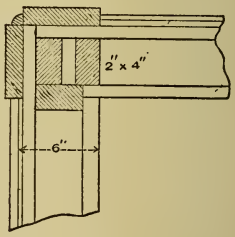


Fig. 161.

method of construction is made quite apparent and can easily be followed. The walls are boarded or "sheeted" on the outside, and then covered with siding or clapboards.

The next drawing, Fig. 163, shows a section of a corner for a brick wall. The gutter and com-

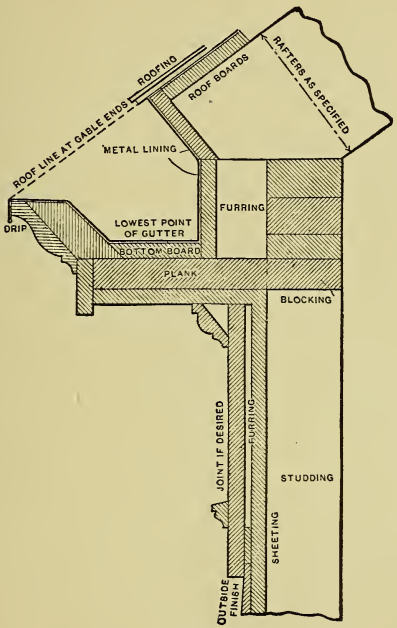
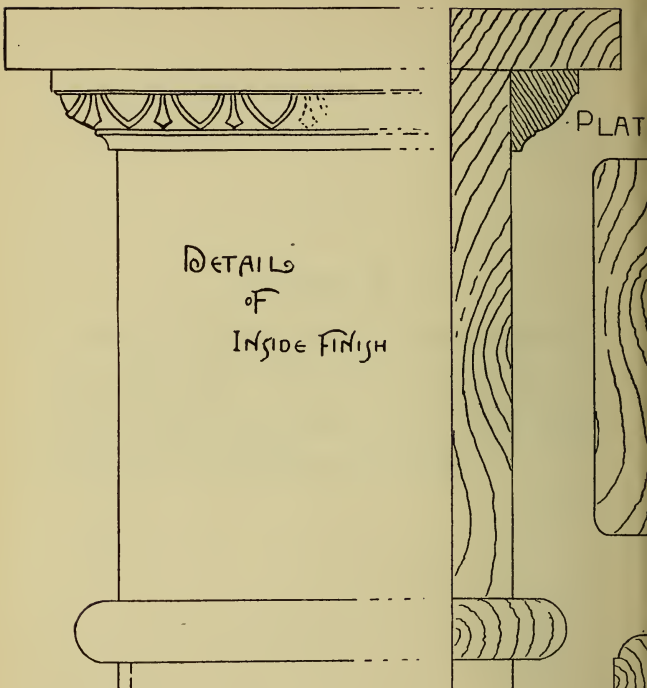


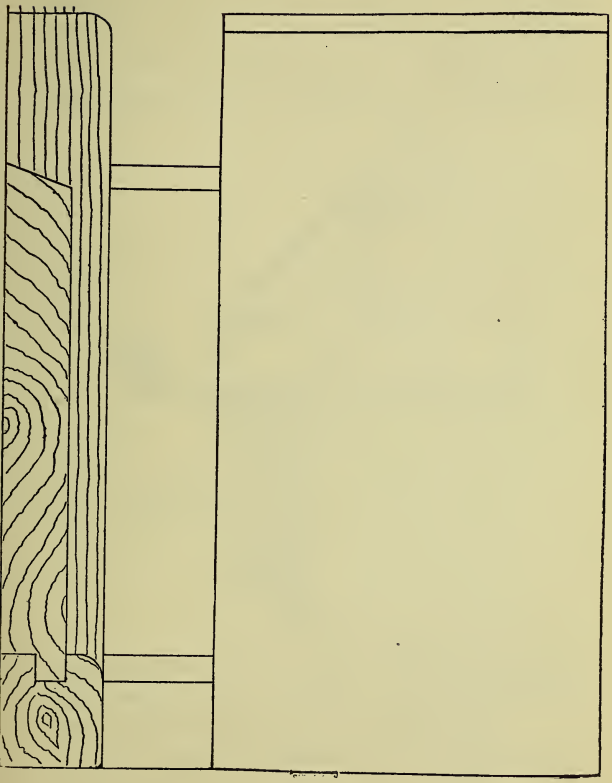
Fig. 162.

plete finish for cornice are shown; also, an iron rod or anchor built into the wall, having a nut on the top which is intended to hold the plate

PLATE 10.

This plate shows a number of details half life size. A portion of elevation and section of trim head are given, also section of casing, picture frame mould, plinth-block, base and floor step. The face of plinth-block is also shown.


PLAT
DETAILS
OF
INSIDE FINISH



in its place on the wall. A section of a box window frame is shown at Fig. 164. The weights are seen in the box, the stud forming part of the box. This is designed for a balloon frame house, and it will be seen that the inside trim

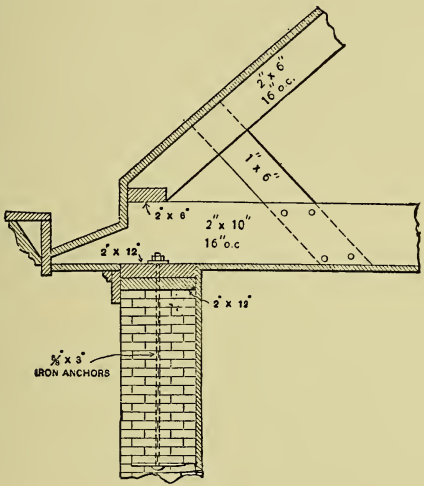


Fig. 163.

forms one side of the box. This is an exceedingly cheap way to make a frame as but very little stuff is required in its construction.

The section of window frame shown in Fig. 165 exhibits the portion cut at the sill. This

shows the construction of the frame at the bottom, including inside and outside finish.

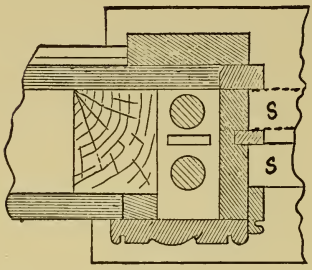


Fig. 164.

It will be in order now to follow the plates I have prepared, in which a large number of constructive details are presented. I would advise that the student copy each item as presented, making each one twice the size as shown on the plates; this will make instructive practice and will soon fit the young draftsman for work of a higher and more elaborate kind.

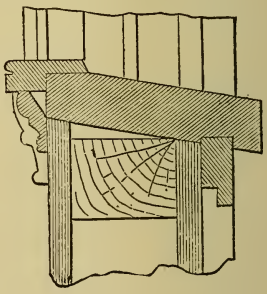


Fig. 165.

The foregoing illustrations have been especially prepared and drawn, with a view of leading the student by easy steps to a fair knowledge of the use of his instruments and the laying out of work on paper.

Each item, too, has a constructive value, as all are drawn from examples of actual work, and will, therefore, convey in some measure a true knowledge of construction, without which the work of the mechanical draftsman has but little value.

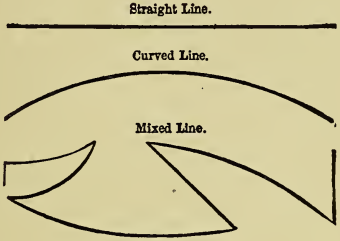


Fig. 166.

SOME ORNAMENTAL EXAMPLES

We have now reached a stage where an attempt at ornamental geometrical drawing is permissible, and though it is not my intention to go deeply into this subject, a few examples along with brief descriptions will probably start some of my readers on a course of drawing extending far beyond the limits of this work.

This kind of drawing—like most other drawing—is composed of straight lines, curved lines and mixed lines, as shown in Fig. 166, but

such lines are regular, and are made by the aid of compasses, or other instruments, and this

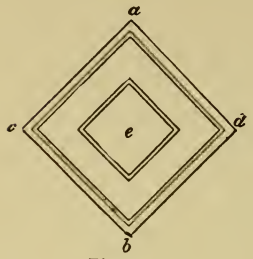


Fig. 167.

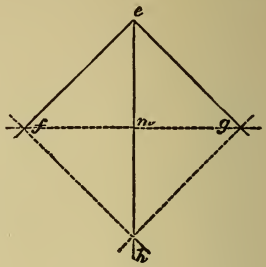


Fig. 168.

fact distinguishes geometrical drawings from drawings wrought freehand. Suppose we desire

Fig. 169.

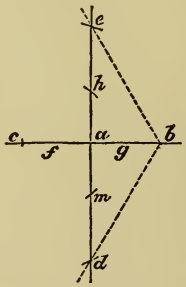


Fig. 170.


Fig. 171.

to show a square diagonally either for ornamental or practical purposes, we simply proceed as

follows: Figs. 167 and 168 show the diagrams; join the lines a b, c d, Fig. 167, crossing at e, as shown in Fig. 168. Take half c d, Fig. 167, as c e, and set it off from m, Fig. 168, to e h, g f; join these, and parallel to them draw the internal squares and we have a figure more or less ornamental. Again, suppose we desire a "lozenge" or diamond shape; this can be accomplished by a similar method as shown at Figs. 169 and 170. Fig. 170 shows the manner in which it is drawn; two lines c b, and e d, intersect at a; a c, a b, a e, a d,

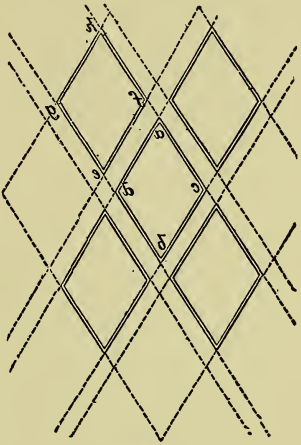


Fig. 172.

are each equal to half of a b, e f, Fig. 169; and a h, a m, a g, a f, Fig. 170, to half of h m, e d, Fig. 169. Let us put one of these examples to some further purpose; this is done in Fig. 171, which shows how this style of drawing may be used for filling in spaces.

The example shown at Fig. 172 exhibits a method of drawing a design for a diamond-shaped pattern. The dotted lines show the construction, the distance between the diamond as e f g h, a b c d, being equal to the distance a f, a d e. The use of this is probably shown at Fig. 173, when a design for tile patterns is shown, the lines a b c d f are drawn to the angle shown and are parallel to

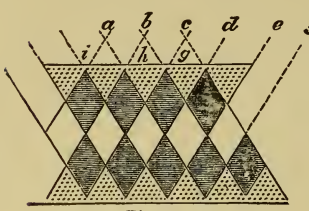


Fig. 173.

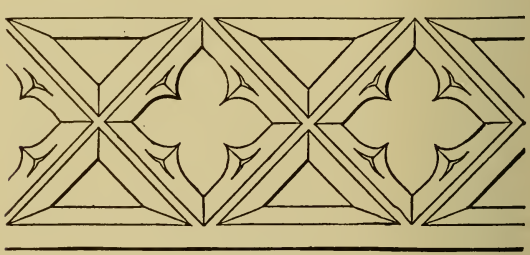


Fig. 174.

each other, the distances being shown at i h g.

Another illustration of a square being set diagonally is shown at Fig. 174, which illustrates

an open balustrade in Gothic style. The student should have no difficutly whatever in laying this diagram off, as it is a very simple matter.

Figs. 175 and 176 show another design having

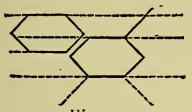


Fig. 175.

Fig. 176.

six sides, which is often employed in decoration and in Gothic architecture. The manner of laying it out is shown in Fig. 175, and completed figures are shown at Fig. 176.

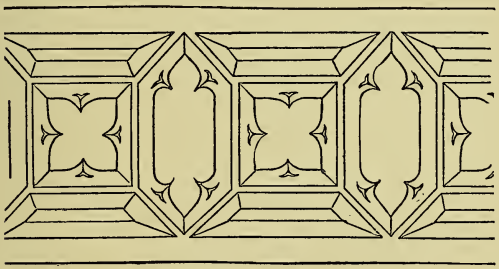


Fig. 177.

The same figure in conjunction with the square is shown in finished work at Fig. 177. This represents a perforated balustrade or parapet; the curved lines are obtained by the compass, centers being easily found.

A still more complicated figure is shown at Fig. 178. This may be formed as follows: If the points 12, 23, 34, 45, 56, 67, 78 are joined, an octagon will be formed, and a square by joining 9 10, 12 11. The octagon forms the basis of the combination, and is the first thing to be drawn,

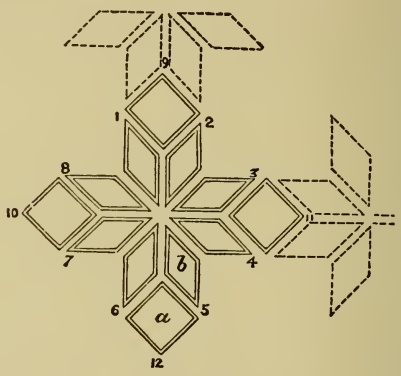


Fig. 178.

which may be done as in Fig. 179, by forming a square, and thereafter an octagon the side of which is equal f e, f g. Draw lines, i i m, distant from each other equal to the distance between the rhomboids in Fig. 178. Parallel to the diagonal lines c b, a d, draw lines equal to i i. From e, one end of the octagon side, draw a line

perpendicular to c d, joining the diagonal a d in h. From n, the end of another side of the octagon, draw parallel to c d, a line cutting the diagonal d a in o, parallel to e h, k t; draw lines p t, n s; two of the rhomboids will thus be formed; the remainder are drawn in a similar way. These being obtained, the squares, as in Fig. 178, are easily drawn.

Some good examples in straight line work are shown in the following illustrations. Thus, we

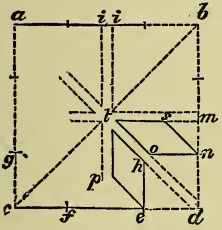


Fig. 179.

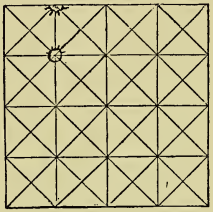


Fig. 180.

see by making diagonal lines, as shown at Fig. 180, the character of the example becomes ornamental, and this may be very much changed again by the introduction of small circles at the junction of the lines, as shown in one instance. This may again be elaborated by adding a line or dot to the circle as shown.

Another example formed of squares and half

squares is shown in Fig. 181. This arrangement shows how "squares" may be placed so as to exhibit stars or other pointed ornaments. The shaded portion shows the star figure.

Another example partaking of the same nature is shown at Fig. 182. This may be

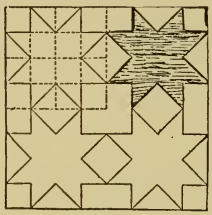


Fig. 181.

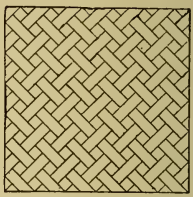


Fig. 182.

termed a basket pattern and is formed of interlacing straps. This pattern is an exceedingly good one for exercise, as it is composed of short lines and requires careful work to prevent overlapping, which would spoil the work. In starting and ending a line, endeavor to have the line clear and distinct and of an even thickness as shown in the example. Lines must not be left short, but must join the cross lines as though they were under them. To draw a panel of interlacing strap work, as shown in example, without a flaw, is fairly good workmanship.

The example shown at Fig. 183 is a little more difficult to plot out than either of the previous ones, and the student will have to use his

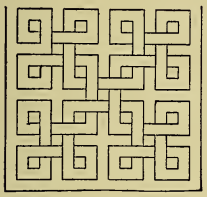


Fig. 183.

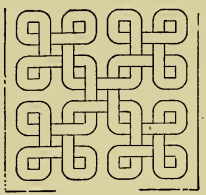


Fig. 184.

compasses and set squares and exercise considerable judgment. This example is a strapwork fret, and is a good one to follow for practice.

Fig. 184 is a modification of the same ornament, a quarter circle being used on all external angles instead of having the lines join with a right angle. In other words, the ornament is a combination of curves and straight lines.

Fig. 185.

Copy these examples four or five times and you will be astonished at your own expertness.

For practice I offer a few simple examples of frets; the first three figures, 185, 186, and 187, are

purely Greek examples, the first being the simplest form of running Greek fret. Its construction is very simple and easy, and may be reproduced with a T and set squares alone. Fig. 185 is constructed nearly in the same manner, there being two more angles in the latter than the former. The next fret is a little more difficult to lay off, but I apprehend the student will have no great difficulty in producing Fig. 186.

Fig. 186.

Another style of fret, partaking somewhat of the arabesque, is shown at Fig. 187. This can be repeated or continued at will. After drawing one complete figure, its combination will prove quite easy, though some little trouble and care will be experienced in forming the first complete figure as shown.

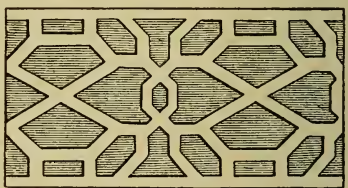


Fig. 187.

At Fig. 188 a very different kind of fret is

shown. This is composed of different figures, as e e forms a complete square, a number of which are set off at regular intervals, then arrange so that the points a o d will be covered, by the points b o c, and continue the fret to the required length.

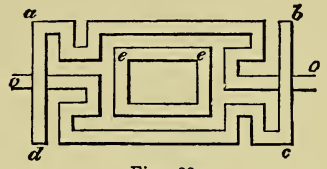


Fig. 188.

In working ornaments having curved lines in them, many examples can be presented, but I do not intend to illustrate more than I think will be necessary to enable the student

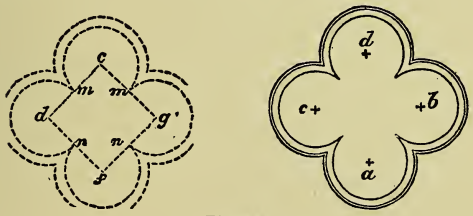


Fig. 189.

to fairly understand the principles on which the ornamentation is based. The diagram shown in Fig. 189 will suggest to the draftsman something of the method in which combination of circles

may be used for ornamental purposes. Here a diagonal square, c d f g, is first formed, one side of which is equal to the distance between the centers of the circles, as a, b, c, d. The radii of the circles described from the points d c g f is equal to half the side, as d m, f n, etc. Exemplifications of this figure are often found in Gothic perforated parapets and similar work.

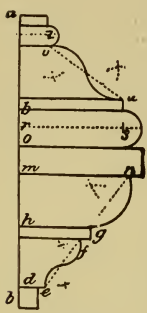


Fig. 190.

Another class of drawing is shown in Fig. 190, where parts of circles and straight lines are used in order to form the ornament. In order to make this, proceed as follows: Draw the base line b first, then make a b at right angles to the first line. The respective depths of the moulding must then be measured off on this line, as d, h, m, o, and r, z, t, show the center line of the torus s, and e f, and u v show the centers of the ogees, and g n, the quarter round. Here in this example we have most of the mouldings in use in architecture—the ogee, or cyma recta, and the reverse ogee, or cyma reverse, the torus, the astragal, the quarter-round, and the fillet.

Fig. 191 shows a design for a baluster that can

readily be drawn by the student, as the centers for the various curves are given. The center of the lower curve is at a; centers for the upper curves may be found by drawing a line c b; from a and b describe arcs cutting in d, with radius d

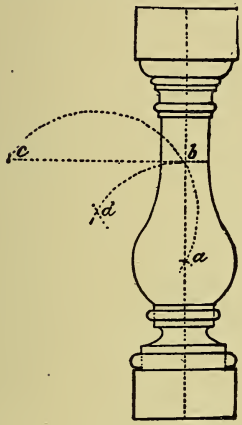


Fig. 191.

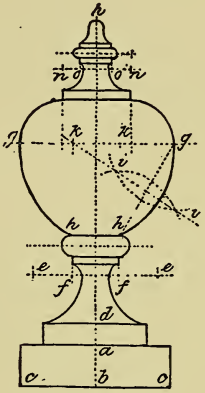


Fig. 192.

a describe an arc cutting the line c d in c; c in the center of the curve which is continued to the dotted line c b; a straight line is then continued to the neck of the baluster. The other curves and lines are readily obtained.

The urn-shaped ornament shown in Fig. 192 is somewhat more complicated than the previous

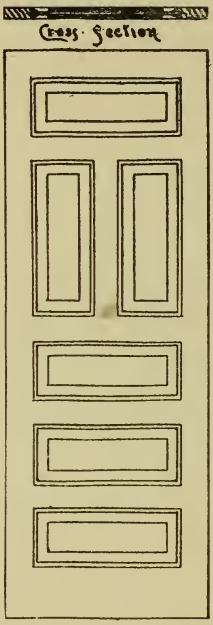
PLATE 11.

Plate 11 shows four doors of the style to be used in the cottage. These doors are drawn to a scale of one-half inch to the foot. The same character prevails in these four examples, the sliding doors being merely one of the second floor doors. The front doors are chamfered around the panels instead of being moulded, as the others are. The front and rear door may be fitted with glass if so desired, in the second panel from top.

example. It is suited to many purposes, par-

in severity and accuracy of form.

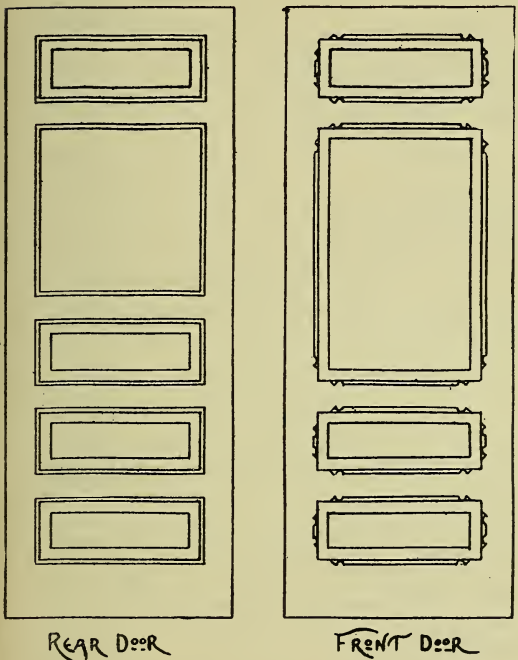
Figs. 194 and 195 are studies of the wave-line.



SECOND FLOOR DOOR

SLIDING DOOR

example. It is suited to many purposes, par-



study, in order to give the student ... in severity and accuracy of form.

Figs. 194 and 195 are studies of the wave-line.

example. It is suited to many purposes, particularly that of terminal. To form it we first draw a center line b h, then the base a b, c c, the fillet d, and the curved lines f f, g g; f f and e e are the centers of the circles; join g h; bisect it by the line i i, cutting g g in k k; from k, with the radius k h, describe arcs g h, and the line n n, the centers of the cap moulding are found.

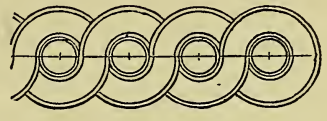


Fig. 193.

The last three examples are of a purely practical kind, and their determination suggests many other forms which will doubtless appeal to the student's imagination.

The ornament shown at Fig. 193 is called a *Guilloche*, or chain, and is formed by concentric circles overlapping each other. This pattern is easily drawn with compasses, but is here given as a freehand study, in order to give the student an exercise in severity and accuracy of form.

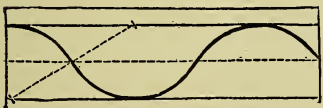


Fig. 194.

Figs. 194 and 195 are studies of the wave-line.

They are, in fact, the cyma recta repeated, the depth being lessened in Fig. 195.

Fig. 196 is a study of the elementary lines of a running scroll, formed of the wave-line, with the addition of spirals. Care must be taken in drawing these spirals, so that they may proceed from the stem in a smooth and continuous manner. They should start as a continuation of the wave-line so gradually, that

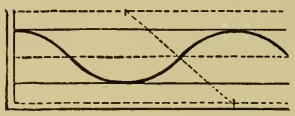


Fig. 195.

Fig. 196.

if the stem beyond the spiral were removed the scroll would be perfect, and that if the scroll were

Fig. 197.

taken away the wave-line would remain uninjured. This should also be the case in Fig. 197, in which tendrils are added to the scrolls.

Fig. 198 is a further elaboration of the same design, the lines being doubled.

Fig. 199 is another simple running pattern based on the wave-line.

The example shown at Fig. 200 is an orna-

Fig. 198.

mental moulding adapted for wood-carving, and gives the pattern and half the repeat.

Having drawn the upper and lower horizontal lines, draw A B, C D, E F, and G H; the distance between them being equal. Then it

Fig. 199.

will be seen that C D and G H are the center lines of the heart, and that A B and E F are the center lines of the tongue or leaf between the hearts. Now draw the curve J, and balance it by the curve I.

It will of course be understood that although

the instructions and lettering refer to the complete figure, it is intended that the corresponding lines in the repeat are to be drawn at the same time; in fact, whatever length of the moulding is to be drawn, these divisions or compartments should be first set out, and the single curve

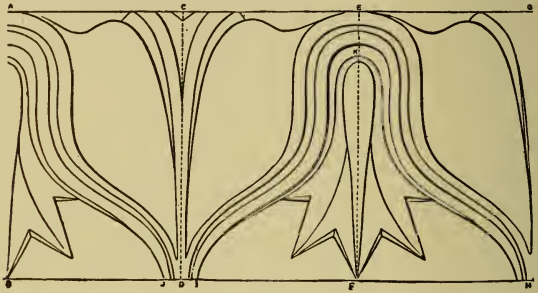


Fig. 200.

drawn in each before proceeding any further. On no account should one portion be completed before the others have been sketched, for as each set of curves is drawn the drawing becomes more complex, and the difficulty of accurate balancing is increased.

When these curves have been completed, the interior ones which depend *upon*, but are not parallel *to* them, are to follow. In drawing these the greatest care is necessary so that the curves

may run gracefully downwards, the space between the inner and outer curves becoming gradually narrower.

The center part at C is now to be drawn, following the plan already laid down, viz.: to draw first the left and then the right side of the figure; and after this the leaves between the hearts are to be drawn in the same manner.

The pattern shown at Fig. 201 is for a running, arranged so as to repeat; *a* will therefore join on to *b*, and thus the design may be continued.

It will be seen that in order to equalize the spaces so as to carry out this arrangement, the whole is divided into squares, and the central flower is placed on the intersection of the diagonals.

In commencing this design, the general form is to be sketched of each scroll rising out of the previous one. At this stage no notice should be taken of the husks or foliage *c d*, etc., but the scrolls should be sketched as if consisting of the main stem only, and the husks should then be drawn outside the original form.

Great care must be exercised to insure the smooth, spiral character of the curves. There must be no angular breaks, but the eye must be carried onward towards the center of each

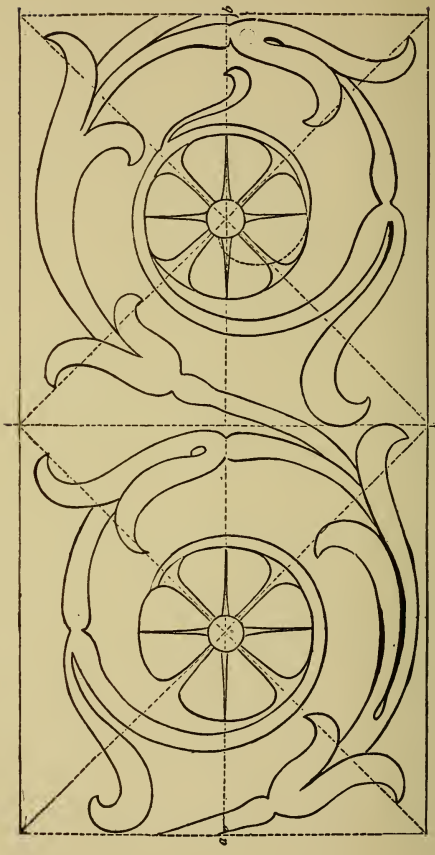


Fig. 221.

scroll, and the husks must appear as additions, but not as excrescences. In order to test the correctness of the forms, turn the sketch upside down, place it vertically, or in any other direction, and if the design has been correctly sketched, the scrolls should be equally perfect in whatever position they may be viewed. This

Fig. 202.

Fig. 203.

should be repeatedly done during the progress of the work, so that any part which may be too full or too flat may be improved before the husks, flowers, foliage, or other details are added.

The ornament shown in Fig. 202 is called the *Echinus*, the egg and tongue, or egg and dart moulding. It is much used by carvers for borders and similar work.

The moulding shown at Fig. 203 is the Greek astragal, chaplet, or knuckle-bone ornament; this, also, is quite a favorite moulding with carpenters and cabinet-makers, because it can

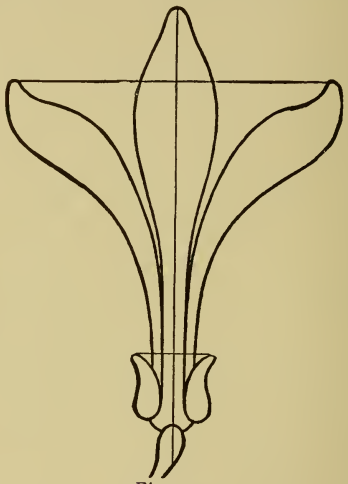


Fig. 204.

be turned in a lathe and then split in two or quartered.

Fig. 204 shows the Greek conventional lily form. It has a faint resemblance to the Egyptian lotus, but has a Grecian delicacy about it that is absent in Egyptian forms.

The ornament shown in Fig. 205 is the Greek

Anthemion. This is a very good example for practice. It can all be drawn by the aid of compasses.

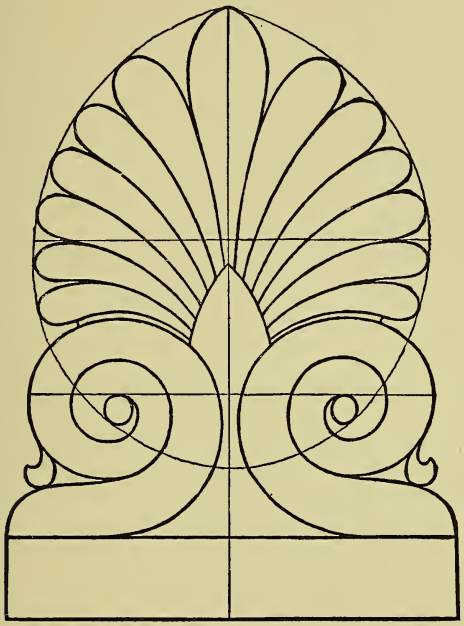


Fig. 205.

The border shown at Fig. 206 is purely Egyptian, and is partly made up of the open lotus flower and the bud. This is a very

common ornament for stenciling, incised work and low relief carving.

A circular or rosette ornament is shown at Fig. 207 which is formed of a circle and four

Fig. 206.

lotus flowers. This may be drawn free-hand or by the aid of compasses. A conventional form of the lotus, in a more finished and elaborate state, is shown in Fig. 208. This ornament was much in use with the ancient Egyptians, and was considered as being a sort of sacred emblem with them. Indeed, the lotus was known by Egyptians as "the sacred flower."

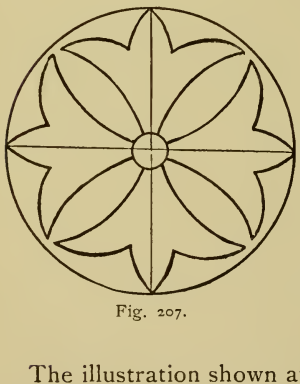


Fig. 207.

The illustration shown at Fig. 209 is a Roman border, and is composed of curved and straight

lines. This border is found on many of the old Roman buildings now extant and appears to

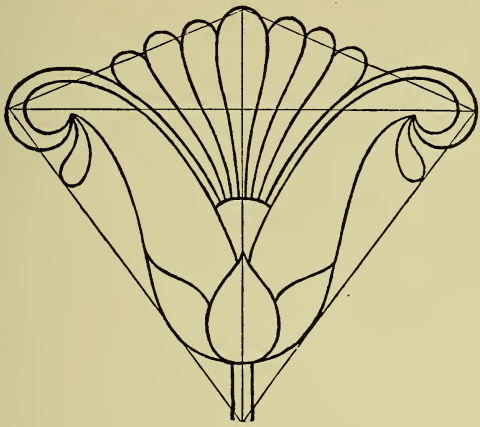


Fig. 208.

have been a favorite ornament with the old designers.

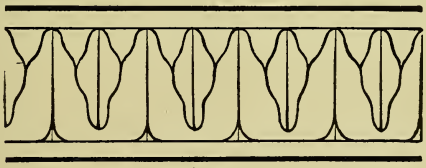


Fig. 209.

The ornament or rosette shown in Fig. 209½ is a Roman one used largely during the period of

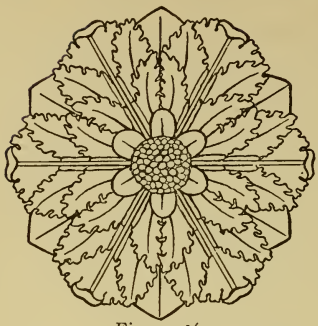


Fig. 209½.

the decay of art, about the second century of our era. It is quite elaborate, but is not by any means effective. The ornament shown in Fig. 210 is also Roman but is the product

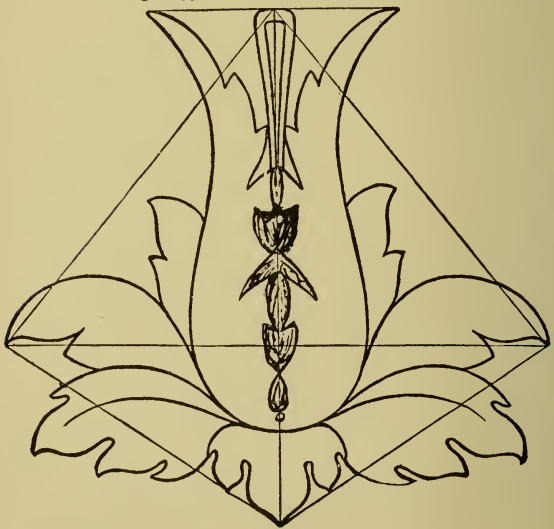


Fig. 210.

of a better period and offers some advanced lines for the student's consideration.

Fig. 211.

The scroll border shown at Fig. 211 is of the Byzantine style of architecture. and is quite

Fig. 212.

effective in its way The rosette shown in Fig. 212 is also of that style and offers good practice to the student.

These latter examples are taken mostly from

classic executed work, and while they only touch the fringe of classic ornament, they will, to some extent, give to the student an idea of the ornaments employed in the historical styles, and thus enable him to design his work on these lines with intelligence.

GOTHIC ORNAMENT

Gothic style is so much different to the styles that preceded it, that a separate chapter may well be devoted to it in order that the student

Fig. 213.

may have a fair opportunity of judging for himself the peculiarities of the style.

The first example presented is a Gothic border, Fig. 213, which, it will be seen, has a character of its own, that is far apart from other ornamentation. The main features of this style lie in the fact that its members all have a vertical

tendency as may be noticed in its pointed arches, its sharp spires, its pinnacles, its buttresses, its cluster columns, and its wonderful traceried windows and doors. Its chief elements are window tracery, trefoils, quatrefoils, cinquefoils, zigzags, gargoyles, fleur-de-lis and ball flowers. These, along with many other examples of ornamentation, and peculiar lay-out of plan and elevation, may be said to constitute the Gothic style.

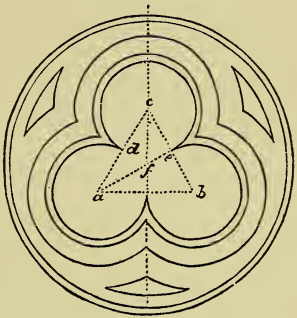


Fig. 214.

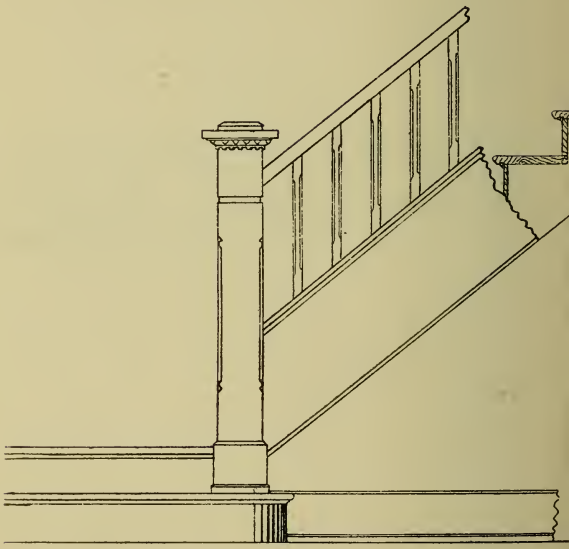
The illustration shown at Fig. 214 represents the trefoil ornament, as used in windows and other decoration, and is formed as follows: Draw the equilateral triangle as shown by the dotted lines a b c, then bisect it as at c f and a e, cutting the line c f, which gives the center for the surrounding circles; a b and c are the centers of the trefoil curves.

The next illustration, Fig. 215, is the quatrefoil and is described from the corners, h m, f g, of a

PLATE 12.

This plate shows a portion of the stairs, complete and under construction. The newel post and balusters are plain and chamfered. The bottom step is rounded off at the newel.

Detail of Stair



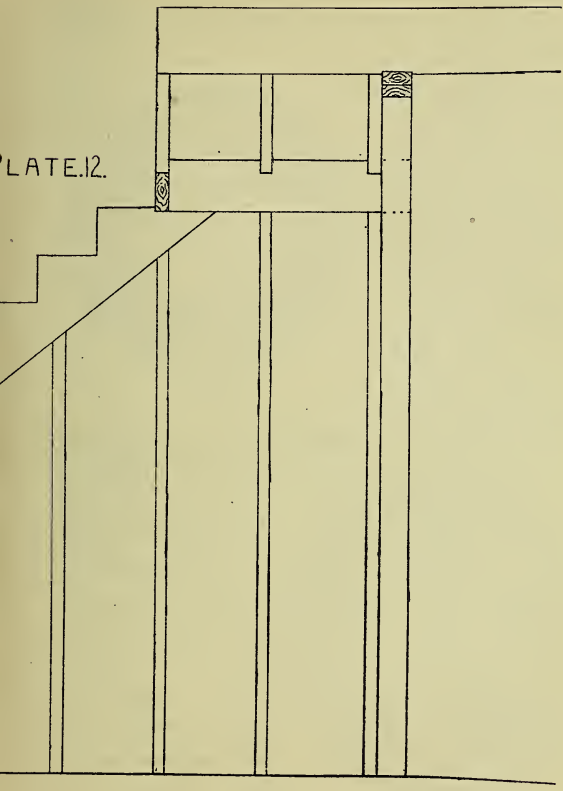


PLATE.12.

square; a is the center of the surrounding circles, found by the intersection of the diagonals, a b, c d, of the square; the curves, s s s s, are drawn from the center a; while those meeting in t t t t are described from the centers, h m, f and g.

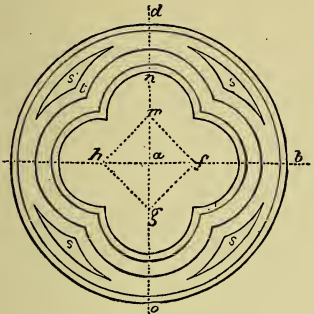


Fig. 215.

The cinquefoil, Fig. 216, is described from the corners of the pentagon, a b, d e f; by dividing e d equally on the point g, and drawing a line from a to it, cutting the perpendicular e c in h, the center n is the point from which the surrounding circles are drawn. The other parts of this ornament are easily drawn.

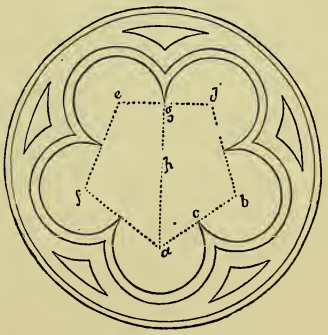


Fig. 216.

Two more examples, and then I have finished in this style, but these are elaborate and will, doubtless, try the skill and patience of the student, but the results will well repay for the labor,

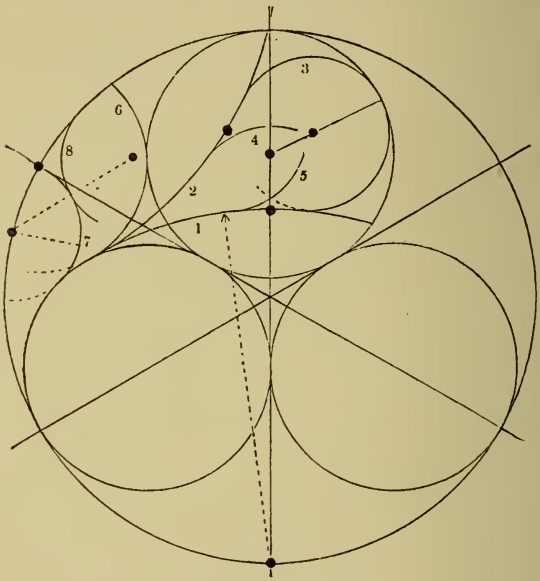


Fig. 217.

and will open up new and unexplored fields for practice, for hundreds of designs may be formed by aid of the knowledge gained in understanding the examples herewith presented.

The diagram shown at Fig. 217 exhibits the skeleton work for the finished tracery shown at Fig. 218. The centers for all the curves of one third of the work are all shown by the heavy black dots. By a little study and patience the

Fig. 218.

student will soon be able to draw the completed work, Fig. 218.

In Fig. 219 we have another skeleton for a still more elaborate piece of work. The centers

are all shown by black dots, and portions of the curves are also given. The completed work shown at Fig. 220 has a very rich and ornate appearance. These two examples are quite

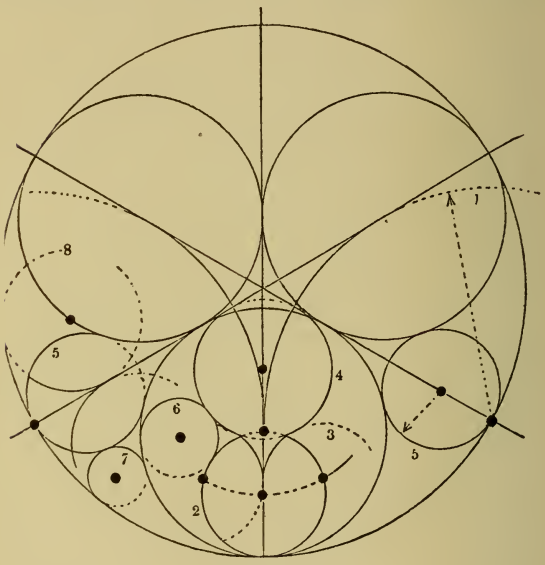


Fig. 219.

sufficient to give the student a good insight into Gothic tracery work, but it must be remembered that in Gothic work the designs of this character are innumerable. Portions of these designs are

used in window and door heads, and in a hundred other places, always with effect.

It will be noticed that in these two designs given, that the trefoil, or three circles, forms the

Fig. 220.

foundation of the whole of the work. All the other ornamentation seems to cluster around the three larger circles; this is the peculiarity of these two examples, but it must be borne in

mind that the trefoil is not the only basis around which the old Gothic designers built their tracery; but these are sufficient for our purposes.

SOME PRACTICAL EXAMPLES OF ORNAMENTATION

The studious draftsman will soon discover many new worlds to conquer if he pays much attention to his work, and he will find that, for ornamental work, the power of his compasses is almost without limit. I offer a few simple examples herewith,

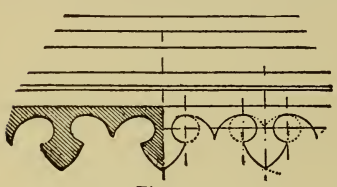


Fig. 221.

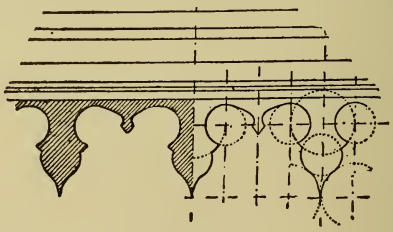


Fig. 222.

and will follow them up with others of a more complicated nature.

The illustrations shown at Figs. 221 and 222

show the finished work, and working diagrams. The method of drawing these curves and ornaments is quite apparent, the centers are all given, and the dotted lines show the direction of the curves. A very little practice on these

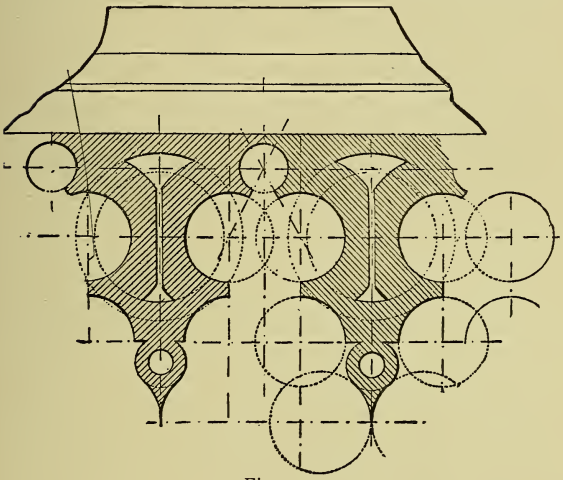


Fig. 223.

examples will enable the draftsman to describe them in quick time, and will give him an insight into the methods employed in designing ornaments of this kind.

Another very simple design, and one that requires but little description on the manner

of making it, is self-evident, and is shown at Fig. 223. This is a very effective ornament, and at one time was much in vogue.

The ornament shown at Fig. 224 is drawn right and left, one-half being complete, and the other half exhibiting the various centers from

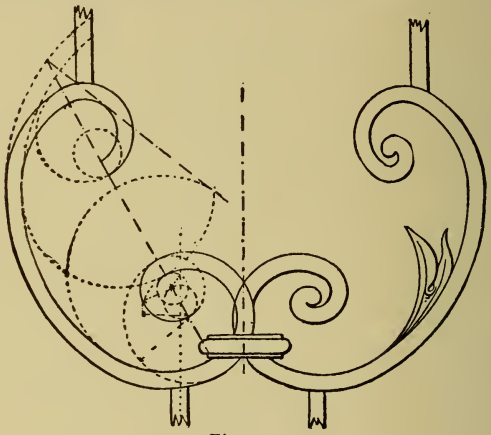


Fig. 224.

which the curves of the pattern are drawn. The method of forming scrolls has been described in a previous chapter, so that it is unnecessary to repeat at this stage. The design is simple, the centers being all given and the dotted lines show the radii of the curves.

The design shown at Fig. 225 is taken from an old example of panel work and has rather a quaint look. The draftsman will have no great difficulty in lining out this design.

The ornament shown at Fig. 226 is intended for a double barge-board, having a belt running along the center, dividing the upper from the lower portion. This design is somewhat complicated, and I therefore give herewith a full description of the method of describing it. To properly divide the diameter a, b, of the circle a b, c, d, into six equal parts, through the third of these, drawing the line c, d, e, f, g, at right angles to a, b. From 3, with distance equal to one of the parts on a, b, set off the line a, c, to the points 6 and 7, and through the points, 2, 4, 6, and 7, draw lines, forming a square. Then from the point 3 as a center, with 35 or 31 as radius, describe the circle hI, i5d. Then with half the distance 5b, nIa, and upon the lines 6

Fig. 225.

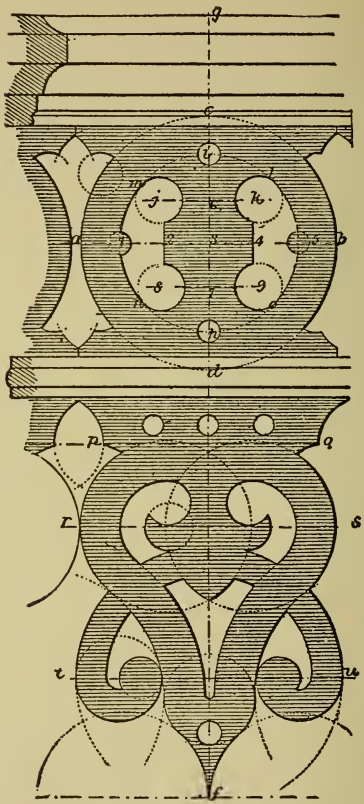


Fig. 226.

and 7, produced to right and left, describe from the centers j, k, 89, the arcs of circles which will join the parts of circle, i5, hi, as 5l, Im, hn, 50, with the sides 2 and 4 of the square. The small circles as j, k, 89, give the standard for the

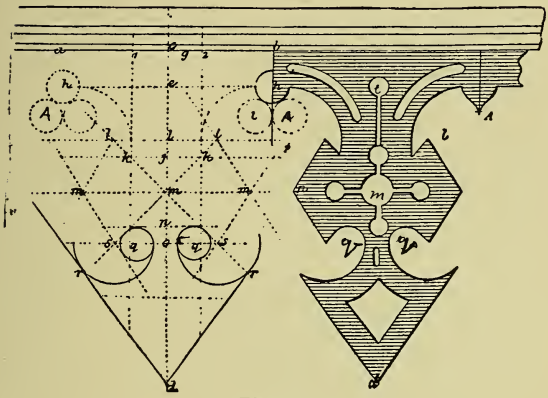


Fig. 227.

various centers and center lines, the moulded part d, being drawn to depth as shown. Set off from the d the distance of the diameter of small circles as k, from the point d, nine and a half times to the point f, which terminates the design. The line p, q is drawn at right angles to g f, through the first part, r, s, through the third and the line t, u, through a point midway between

the sixth and seventh points. All the circles and arcs of circles are either equal to parts or multiples of the standard circle as k, or f, any one of the six divisions on the line a, b.

The design shown at Fig. 227 is also a pattern for a verge board, and is a very good example of the kind. The centers for the circles are all shown in the working diagram, the cutting lines all being represented by the dotted lines. I purposely leave this without a further description so that the draftsman may exercise his own skill in working it out, not a very difficult matter when the reference letters are given.

The drawing shown at Fig. 228 is a design for a balcony panel, showing frame and drop mouldings. Suppose a, b, to be the total height; then divide it into seven equal parts and through the fourth of the points draw a line c, d at right angles to a, b. Make the facia at top equal to the distance between the sixth and seventh points. From the line d, set off to e, and f, and make f, g; e, h, each equal to two-thirds of one of the parts on a, b, as 7, 8. Through the point 2, draw a line parallel to c, d, through e, f; g, h, draw lines parallel to a, b. Make b, j, equal to e, f, and through j, draw a line parallel to c, d, joining f, e. Bisect 2, j, in the point k, and

through k, draw m, k, l, parallel to c, d. With one-fourth of the distance of g, h, or e, f, set off

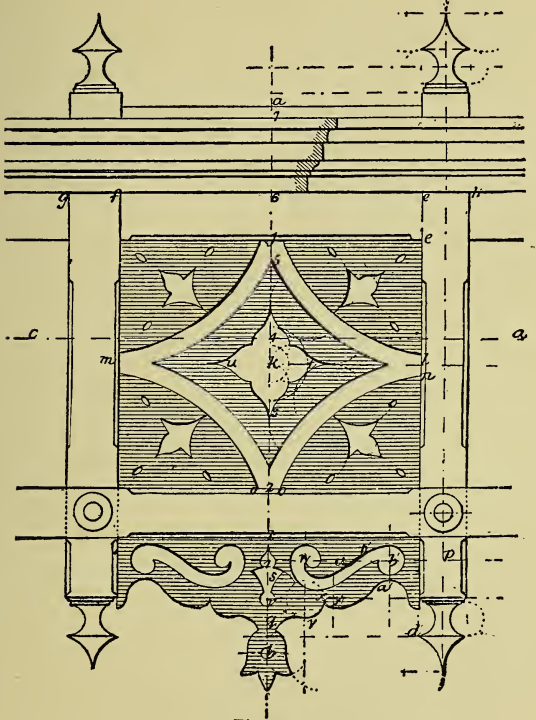


Fig. 228.

from the points j, k, o, and m, on each side of the center lines, as to o, and n, from 2, and 1.

From these points as centers, as o, and n, with radii equal to o, 1, describe arcs cutting as at p, and from p, describe an arc joining o, n. Do the same at all the other points, and describe the double arcs. Divide one of the parts into which a, b, is divided, as the lowest part b, I, into four equal parts, as in the points of r, and s. With two of these as radius, from the point k, in center describe the circle k, t, u, and put in the ornament with the arcs as shown. Through the points I, s, 2, and q, as the line a, b, draw lines with distance q b set off from q to v, and from v draw a line parallel to a b, parallel to m, k, l. With r, s, as radius, from v, as center describe the arc v, x. With half the distance q, v, set off from x, to y, and through y, draw a line parallel to v, w, as y, z; the point z, is the center of the arc y, a. The arc from a, is described with radius x, y, and through the center a line to b, is drawn parallel to w, v. The arc c, is described from the point d. The dotted lines and radii show how the other parts are put in. The ornaments at f, are put in the lines drawn from the center k, to the corner points, as at e.

These examples make splendid practice for the young student, and if repeated two or three times, they will become so impressed on the

mind that they may be produced at will without copy, and enable one to form designs, with the aid of rule and compass, to suit almost any situation. All these examples are formed in exact architectural proportions, a matter that is often lost sight of by the draftsman, who is sometimes astonished at his own uncouth creations, which become as offensive to the trained eye as vulgar language does to the cultivated ear. In the formation of ornaments, like everything else in this world, there is an "eternal fitness," a fact which should never be lost sight of.

The design shown at Fig. 229 is a very useful one and will answer very nicely for a drop or an eaves board. Suppose a, b, to be the height of the lower part of the design which is divided into thirteen equal parts. Then, through the second, sixth, seventh, and eleventh of these, draw lines at right angles to a b. From point I, with half the distance of the space between points I and 2, as radius, describe the circle d. From the point 2, draw lines at an angle of 45° to the line c f, cutting the semicircle; these points, as g and h, give the centers of the semicircles. From one center of the circle described between the points 3 and 4 draw lines at right

PLATE 13.

Plate 13 shows a mantel in elevation and section, also a plan of the shelf, with construction lines. This is drawn to a scale of ¾ of an inch to the foot.

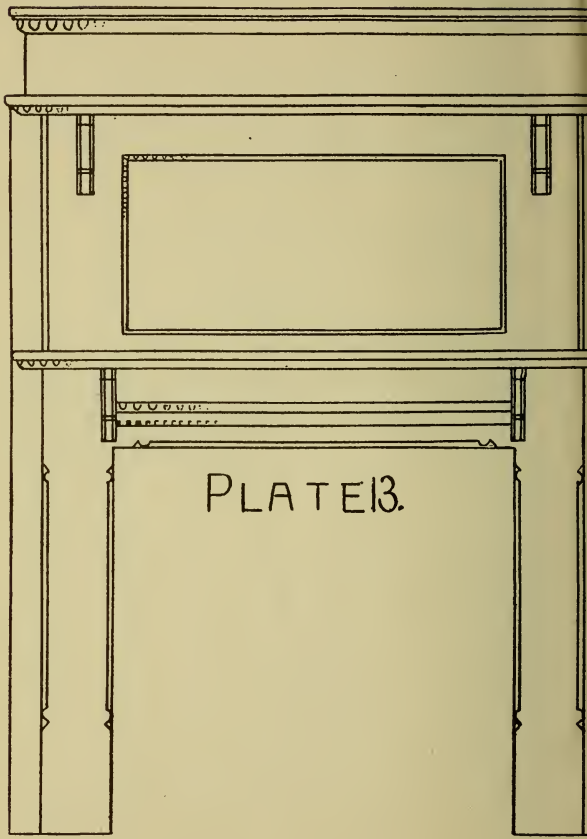
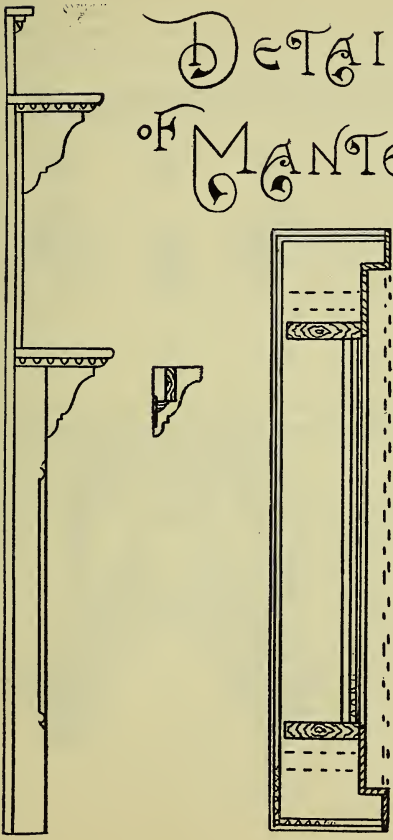


PLATE 13.

Detail of Mantel



3/4"

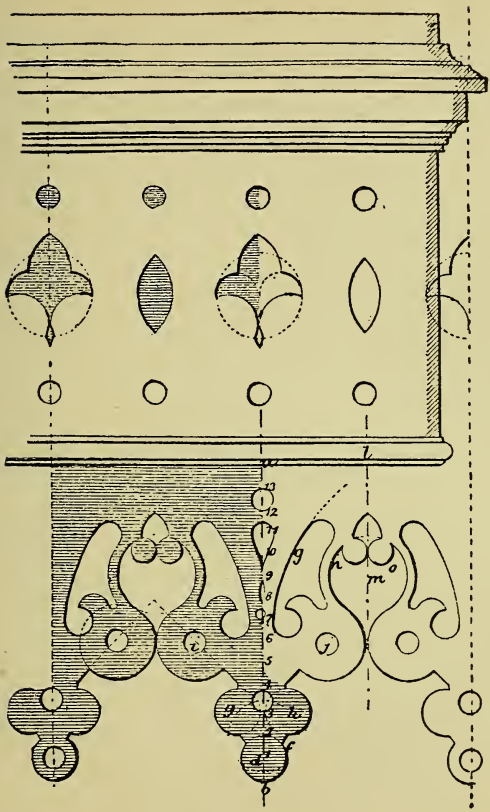


Fig. 229.

angles to the line e, f, to i and j. These are the centers of the parts of circles thus shown. Finishing the circle at the point k draw the line k, l, parallel to a b; on this line the center m, of the arcs n and o, is found. 6 and p are the centers of the arcs q and r. The remaining portions of the design may readily be put in from the lines, curves and centers given.

The example shown at Fig. 230 illustrates an elaborate design suited for a balustrade and many other purposes. Let a b be the height; divide this into two equal parts in the point c, through c, draw a line at right angles to a b, as d c d. Draw the distance a b, into eighteen, or a c, into nine equal parts. With one of these, from the center c, describe the circle e, f, g, h, and from the point where this cuts the line, a b; d, d, describe circles, the radius of which is one-fourth of one of the parts, or a, c. Then with the distance as h, g, from these points as centers, describe arcs cutting in the point i; from i, as a center with e, the same radius still kept on the compasses, describe an arc j. Do the same from the other points, as g, f; f, e; e, h, and thus find the centers from which the arcs corresponding to j, are described. From the points k, l, where the outside of the small circles

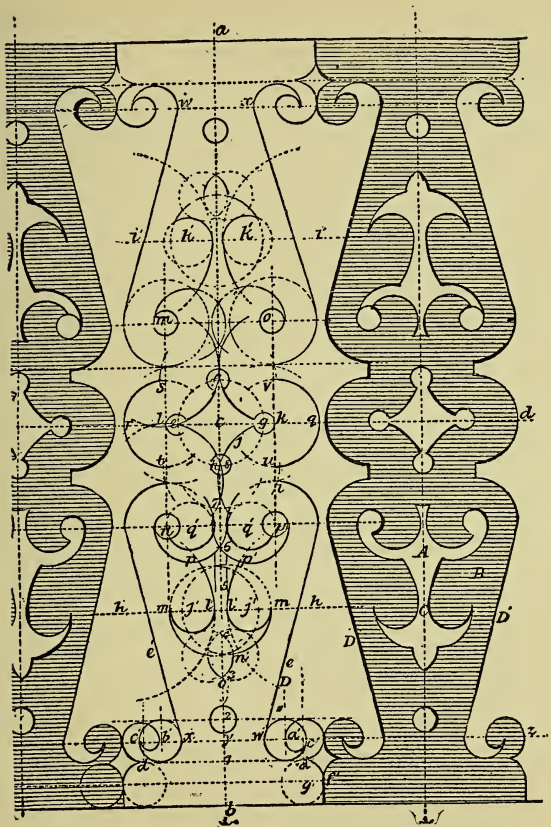


Fig. 230.

e and g, cut the line d, d, as centers with i, j, or c, g, as radius, describe arcs as t, r, s, or u, q, v, stopping at lines n, m; o, p, drawn through the points k, and l, parallel to a, h. Next, from i, set off to the point p, and do the same at the other and corresponding points, thus finding the four centers m, n, o, and p. From these, with e, c, d, or i, j, as radius, describe arcs which are joined by straight lines with the semicircles w, and x, at the upper and lower ends of the design. To find the centers of these semicircles, divide the distance between the points I, and 2, on the line a b, into four equal parts, and at the points draw a line z, z; from the point y set off in the line z z, a distance equal to b g, to the points a and b. From these points a and b with a radius equal to y, I, or y, 2, describe semicircles, as w, c; x, c. Join the points w, and x, by straight lines e, e, with the arcs described from the points p, and n. From a point in the center between b, and c, and a, and c, describe a small arc, and join this with another arc with the points, as d, d; the center of the arcs being at c, c. The lower arc, d, f, is described from the center g, which is on a line drawn through a point the third in the distance b, I, on the line b a. To describe the part marked A, cut out the part B,

B. From the point m, o, and n, and p, describe small circles, the radius being one-fourth part of one of the parts on a b. With a radius equal to half of one of the parts as I 2, on the line a b, describe circles from the point f, f; k, k, having a

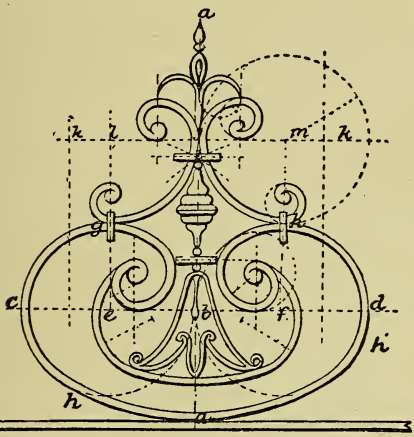


Fig 231.

space between them equal to the space at c, as l, l, and with a radius equal to the diameter of these circles, describe from the points l, l, the arcs m, n; m. n. From n, n, which are equidistant from the center line, a space equal to the radius of the small circles n, p; describe with radius of these small circles the arcs meeting in the point

o. With w, v, or s, t, as radius, set off on the line h, h; from the points l, l, to h, h, and from h, h, describe the arcs l, p, l, p, the centers of the arcs p, p, are q, q.

These examples are quite sufficient for our purpose so far as woodwork and decoration are concerned, but it may not be amiss to supplement them with a few on the same line, that will answer for iron, for wood, or for designs in stencilling or other decorative work. To this end, I present an ornament in Fig. 231, that is suitable for a central ornament, and one that may be employed for many purposes. Carvers frequently make use of this as a skeleton figure for carved panel work as it may be elaborated to almost any extent. The manner of drawing it is as follows: Let, a a, be the center line, and a, b, the distance from upper rail to center of lower part of design; through b, draw the line c, d, at right angles to a, b; c, d, in the length of the lower part of the design. Divide c, b, b, d, into two equal parts in the points e, and f, with radius e, c, describe an arc cutting in the point i; from i, with i, a, describe the arc b, a, h. From the point b, set off the distance e, f, to the point j; and through j, draw a line k, k, parallel to c, d. From j, with the distance b, f, set off to the

points l, and m, and these will be the centers of arcs forming the upper part of the design. The lines and centers for the spiral terminations of

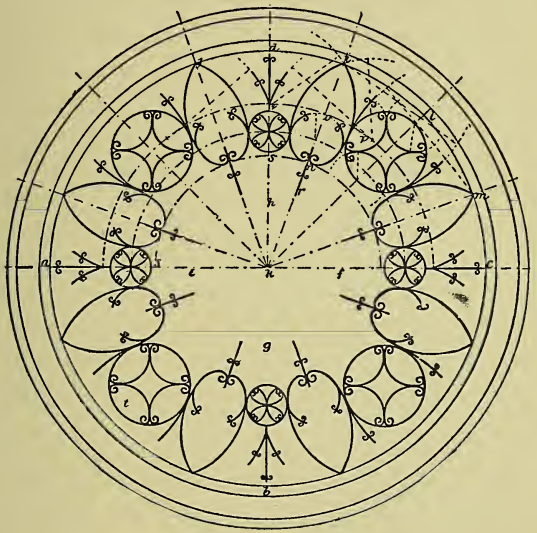


Fig. 232.

the leading curves thus described as shown in the drawing.

The skeleton shown in the illustration, Fig. 232, exhibits an ornament drawn altogether with the compass. The centers are all shown and lettered for reference; r being the general

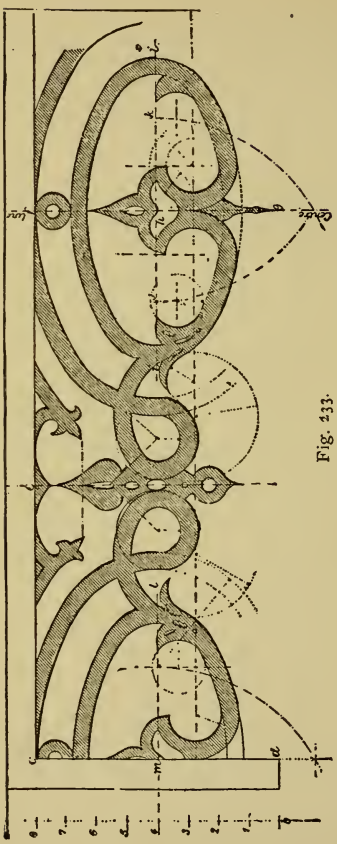


Fig. 233.

center, while a, j, d, i, m and c show the divisions and radiating lines of one-half of the figure. As the centers may all be framed at the intersections of the dotted lines, further explanations are unnecessary.

I close this department by illustrating an ornament in which the ellipse predominates, Fig. 233, which exhibits a running scroll suited to many purposes. On the continent of Europe scrolls of

this kind are often used as window screens, being attached to the frame and covered with gauze, or woven wire, to prevent insects getting in the house when the window is open. This shows only half the design. The height of this section, a, b, is divided into nine equal parts, the width of the framework is equal to one of these parts. From c, at right angles to c, d, draw the line c, f, and with the distance a, b, from the point c, set off to the points e and f, and through these points draw lines at right angles to c, f; f, g, is the center line of the design. From the point f, with four of the parts on the line a, b, set off to the point h, and through h, draw at right angles to f, g, the line i, i. From the point h, set off to i, i, five of the parts in a, b, making i, i, equal to ten of these parts; divide i, i, into five equal parts; the first j, and fourth k, are the foci of the elliptical ornament, which draw as shown. Through the point 4 on a, b, draw a line 41, and make the distance m, l, equal to h, i; put in the elliptical part as shown, and finish as in the diagram, in which all the centers and center lines are given. Rules for describing the ellipse were given in previous pages, that should the student experience any difficulty in describing the

elliptical curves, he may refer to those pages for assistance.

SOMETHING ON ORDERS OF ARCHITECTURE

It is not my intention to enter deeply into a description of the orders of Architecture or to give the student a history of their rise and growth, or analyze their peculiarities; it is

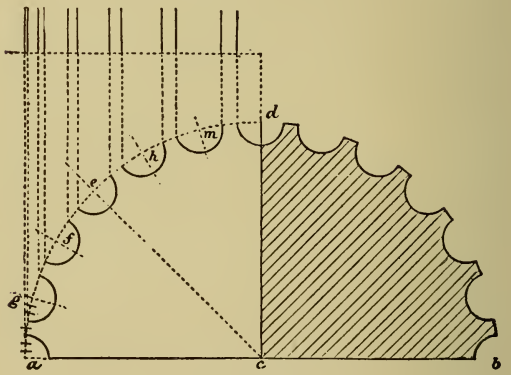


Fig. 234.

enough for our purpose, to be able to draw them, and to give to each order its own proportion and arrangement. Before we can do this, however, it will be necessary for us to be able to lay off a section of a column, showing

the position of flutes and fillets in plan and elevation. This is brought out nicely in Fig. 234, where the dotted lines show the width of flutes and fillets as they will appear on the elevation. Suppose a b Fig. 234 to be the diameter of the column, then bisect it in c; and

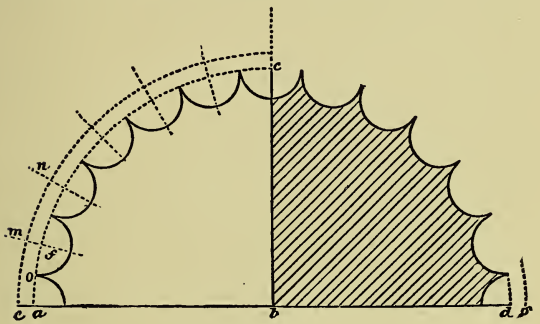


Fig. 235.

draw c d. Make lines corresponding to these, and from the point c, with c b, describe the semicircle a d b, representing half the column. Bisect the quadrant a d, in the point e, and divide the arcs a e, e d, by points g, f, h, m. Mark the position of these by radial lines from c, as in the example. Divide the part a g into eight equal parts; and with three of these as radius, from the points in the quadrant, as g, f,

etc., describe semicircles. Six parts will thus be given to each flute, and two to each fillet; and the column will have twenty-four flutes.

To describe the flutes in a Doric column without the fillets, proceed as follows: Lay out the portion of column as in the previous example, by dividing the quadrant b e c, Fig. 235, into six

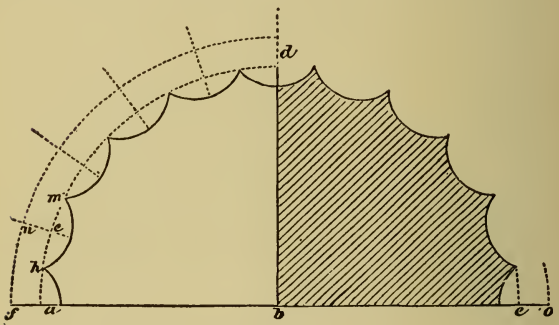


Fig. 236.

equal parts, as e, m, n, etc., giving to the entire column twenty-four flutes as before. Draw radial lines from b. Divide a f into four equal parts, and lay one of these on a b produced to e; from b, with b e, describe a semicircle as e m n, cutting the radial lines. Bisect a f in o, and with f o as radius, from the points—where the dotted semicircle intersects the radial lines—as

centers, describe the arcs as in the example. Another method is shown in Fig. 236, which is formed as follows: Make the semicircle a d e and divide the quadrant b a d into five equal parts, so as to give twenty flutes to the column. Produce a b to f; bisect a e in h, and from e lay off e h to m; join h m, and with distance h e lay

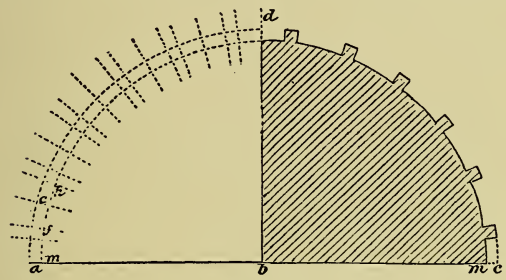


Fig. 237.

off on the radial line b e to n. From b, with b n, describe the dotted semicircle, f n o. The centers f the flutes are placed where the radial lines intersect this semicircle. From n, with n m, describe the lines as shown, and finish the section.

A section of a column having flat flutes and fillet is shown at 237. To describe this draw the semicircle a d c, and divide the quadrant b a d into six equal parts, divide a e into five equal

parts. With two of these from the radial line lay off on each side, as f h. With one part lay off from c to m, and from m, with b m, describe a semicircle c d a; complete the diagram as shown. This will give the depth of the flutes,

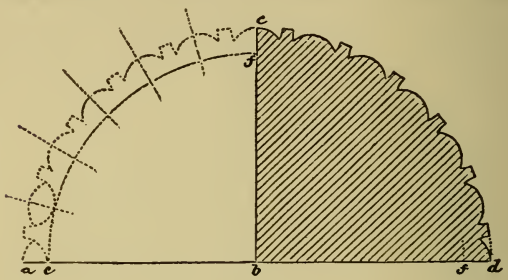


Fig. 238.

one; the width four, and the width of the fillets, one.

In Fig. 238 we give a method of describing the cabled moulding with fillets between. Divide the semicircle a c d in the same proportion as in Fig. 234, giving an equal number as in that example. From b, with b e on the compass, describe the semicircle c f f. From the points where the radial lines intersect this, as centers, with a e, describe the curves as in the example.

I will now endeavor to explain what are known as "The orders of Architecture," showing their

various members, their proportion, and the manner of arrangement.

"Order, in architecture," says an authority, "is a system or assemblage of parts subject to certain uniform established proportions, regulated by the office each part has to perform. An order may be said to be the genus, whereof the species are Tuscan, Doric, Ionic, Corinthian and Composite; and consists of two essential parts; a column and an entablature."

These again are subdivided, the first into three parts, namely: the base, the shaft and the capital; the second also into three parts, namely: the architrave or chief beam, C Fig. 239, which stands immediately on the column; the frieze B, which lies on the architrave, and the cornice, A, which is the crowning or uppermost member of the order. In the subdivisions certain horizontal members are used, which from the curved form of their edges are called mouldings, the construction of which depends on a certain knowledge of geometry. This application may be seen in the illustration; thus a is the ogee, b, the cornice, c the ovolo, d the cavetto, which with fillets compose the cornice, f f the facia.

The capital of the column consists of the upper members or abacus, g, the ovolo moulding

PLATE 14.

This plate shows an elevation for a cheap book-case suited for the cottage under consideration. The end elevation is also shown with the face of drawers laid off. The scheme for a box stall shown in the drawing is somewhat out of the usual course, but may be found very convenient in stable construction.

an elevation of any
diameter of the column must be determined, and

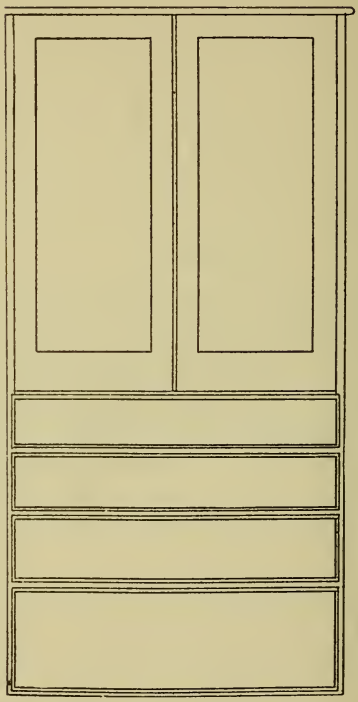
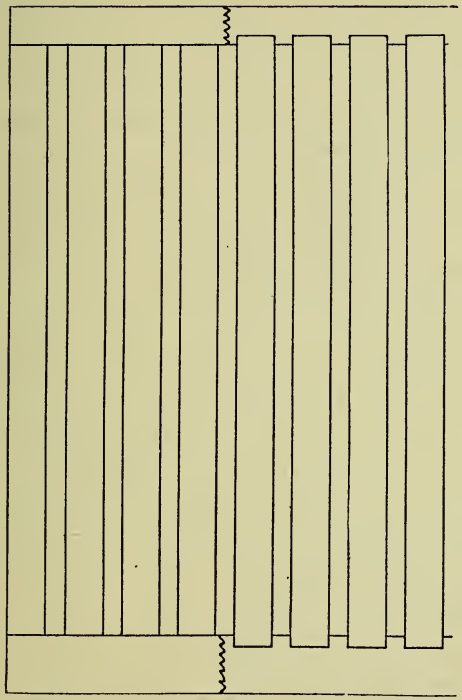


PLATE
BOOK
CASE



an elevation of any
diameter of the column must be determined, and

c, the astragal i i, and the neck h. The base consists of the torus k, and the plinth l. The character of an order is displayed, not only in its columns but in its general forms and details, whereof the column is, as it were, the regulator; the expression being of strength, grace, elegance, lightness, or richness. Though a building be without columns it is nevertheless said to be of an order, if its details be regulated according to the method prescribed for such order.

In all the orders a similar unit of reference is adopted for the construction of their various parts. Thus, the lower diameter of the column is taken as the proportional measure of all the other parts and members, for which it is subdivided into sixty parts, called minutes, or into two modules of thirty minutes each. Being proportional measures, modules and minutes are not fixed ones like feet and inches, but are variable as to the actual dimensions which they express — larger or smaller according to the actual size of the diameter of the column. For instance, if the diameter be just five feet, a minute being one-sixtieth, will be exactly one inch. Therefore, before commencing to draw an elevation of any one of the orders, the diameter of the column must be determined, and

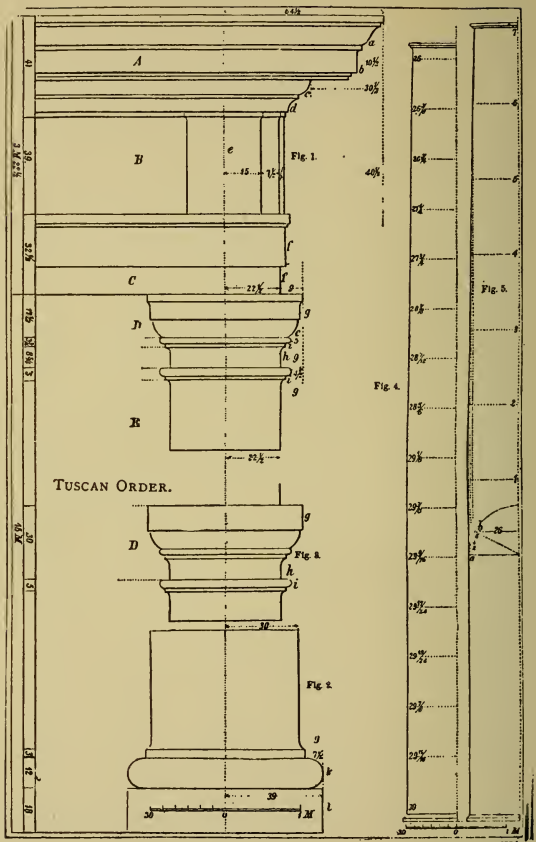


Fig. 239.

from that form a scale of equal parts, by sixty divisions, then lay off the widths and heights of the different members according to the proportions of the required order as marked on the body or on the sides of the illustrations.

Fig. 239 presents an illustration of the Tuscan order, considered by architects as a spurious or plain sort of Doric, and hardly entitled to remark as a distinct order. E in the frieze corresponding to the triglyph, illustrates still further the connection of the two orders; but by many architects this member is not introduced. No. 1 is an elevation of capital and entablature, No. 2 of the base, and No. 3 of a detached capital. Our example is constructed according to the rules given by Vincent Scamozzi.

Examples of two capitals are given, differing merely in the number of mouldings in the abacus.

In fact, this introduction of simple mouldings is about the only variety allowable in the order. Ornament is not admitted, nor are the pillars ever fluted.

A slightly convex curvature, or entasis, is given in execution to the outline of the shaft of a column, by classic architects, just sufficient to counteract and correct its appearance, or fancied appearance, of curvature in a contrary direction

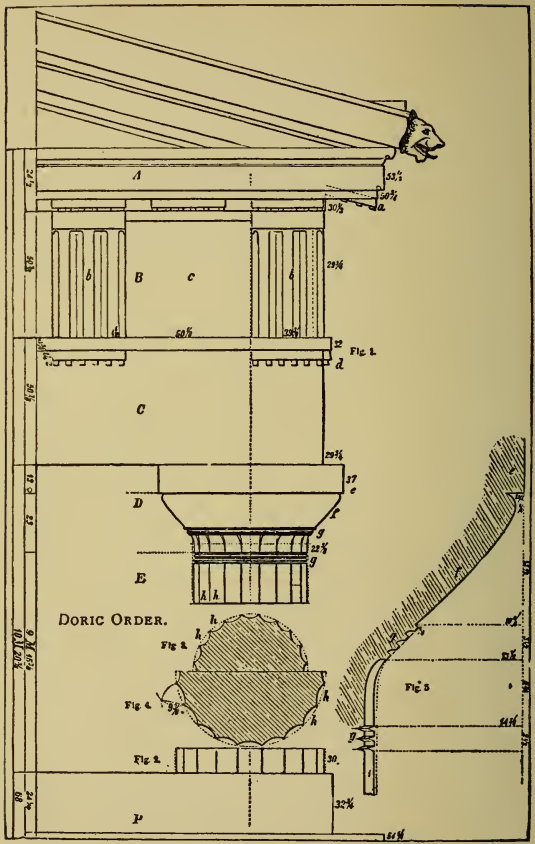


Fig. 240.

(i. e., concavely), which might else take place, and cause the middle of the shaft to appear thinner than it really is.

No. 4 represents the form of a half column from the Pantheon at Rome. In No. 5 another example of entasis, the lower third of the shaft is uniformly cylindrical; the two upper thirds are divided into seven equal parts. On the semicircle shown in the figure, is a chord cut off parallel to the diameter, the length of which is fifty-two parts only one-half being shown. Divide the part a b of the circumference between the diameter and chord into seven equal parts, and draw parallel lines from each division to those of the upper part of the column, which will give the diameter of the shaft at each division; by increasing the number of the divisions, more diameters for different parts of the shaft may be found.

Fig. 240 exhibits an example of the Doric order, from the temple of Minerva in the island of Egina. The dimensions are given in parts of the diameter, as in the preceding example, and the same capital letters denote corresponding parts. No. 1 is an elevation of the capital and the entablature. No. 2 of the base, and a part of the Podium. No. 3 shows the forms of the

flutes at the top of the shaft, and No. 4 at the base. No. 5 the outline of the capital on an enlarged scale.

The Doric order may be said to be the original of the Greek orders, of which there are properly but three; the Doric, Ionic, and Corinthian, which differ in the proportion of their parts and in some of their ornaments and mouldings. Of the Doric, the mutules a a, the triglyphs b b, the guttae or drops d d of the entablature, the echinus f and the annulets g g of the capital, may be considered characteristic. With regard to the arrangement of triglyphs, one is placed over every column and one or more intermediately over every inter-column—a span between two columns—at such a distance from each other that the metopes c, or spaces between the triglyphs, are square.

In the best Greek examples of the Doric order there is only a single triglyph over each inter-column. One peculiarity of the Grecian Doric frieze is, that the end triglyphs, instead of being like the others in the same axis or central line as the column beneath, are placed quite up to the edge or outer angle of the frieze. The mutules are thin plates or shallow blocks attached to the under side of soffit of the

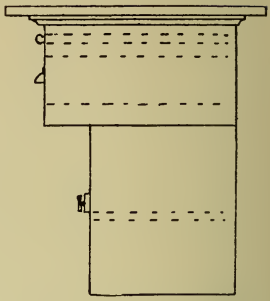
corona, over each triglyph and each motope, with the former of which they correspond in breadth, and their soffits, or under surfaces, are wrought into three rows of guttae or drops, conical or otherwise shaped, each row consisting of six guttae, or the same number as those beneath each triglyph. Though a few exceptions to the contrary exist, the shaft of the Doric column was generally what is technically called fluted. The number of channels or flutes is either sixteen or twenty, afterwards increased in the other circles to twenty-four, for they are invariably of an even number, capable of being divided by four, so that there shall always be a center flute on each side of the column.

Fig. 241 presents an example of the Ionic order, taken from the temple of Minerva Nolias at Athens. No. 1 is an elevation of capital and entablature, No. 2 the base, No. 3 is a half of the plan of the column at the base and the top; No. 4 an elevation of the side of the capital. In the proportions of its shaft, which are more slender, and the addition of a base, it differs from the Doric; but the capital is the indicial mark of the order by which it is immediately recognized. It is far more complex and irregular than the other orders of capitals; instead of

PLATE 15.

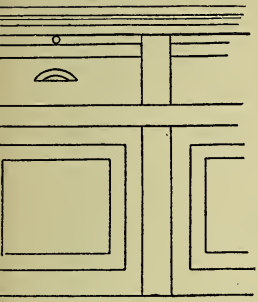
Plate 15 exhibits an odd piece of furniture, termed a "kitchen desk." Twelve students can sit around this desk and work with ease. The elevations show the manner of finish, with drawers on top of case under the desk top, and doors below, that cover shelves, intended for books or other similar materials.

PLATE.15.



KITCH

FOR TWE



DESK

E STUDENTS

½"

showing four equal sides, it exhibits two fronts, with spirals or volutes parallel to the architrave and narrowed, baluster sides (No. 4), as they are termed, beneath the architrave.

When a colonnade was continued in front and along the flanks of the building, this form of capital occasioned an offensive irregularity; for, while all the other columns on the flanks showed the volutes, the end one showed the baluster side. It was necessary that the end column should, therefore, have two adjoining volute faces, which was effected by placing the volute at the angle diagonally, so as to attain their two voluted surfaces placed immediately back to back. This same diagonal disposition of the volutes is employed for all capitals alike, in Roman and Italian examples of this order.

The capital admits of great diversity of character and decoration—it sometimes is without necking, sometimes with; which may either be plain or decorated, to suit the entire design. The capital may also be modified in its proportions, first as regards its general proportion to the column; secondly, as regards the size of the volutes compared with the width of the face. In the best Greek examples the volutes are much bolder than in the Roman. The spirals

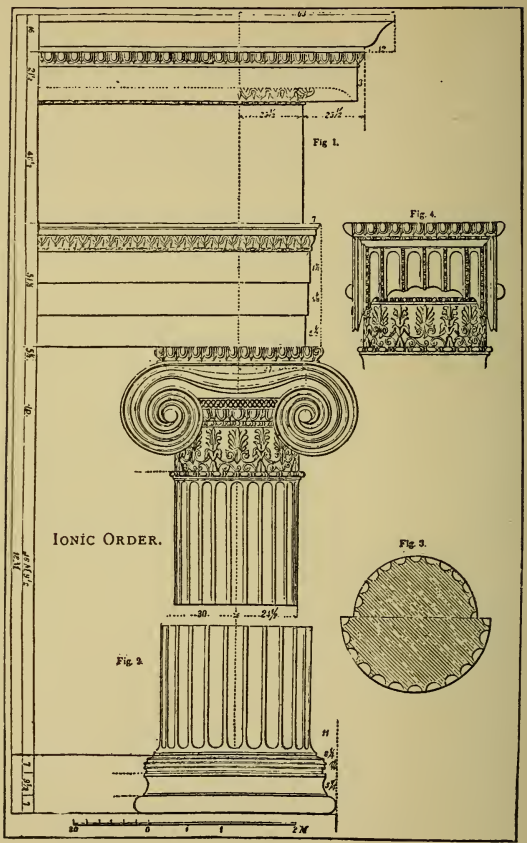


Fig. 241.

also of the volutes may be either single or maniold, and the eye or center of the spiral may be made larger or smaller, flat or convex, or curved as a rosette.

Fig. 242 represents an example of the Corinthian order, from the Arch of Hadrian, at Athens. This order is distinguished from the Ionic, more by its deep and foliated capital than by its porportions—the columns of both have bases differing but little from each other, and their shafts are fluted in the same manner.

Although the order itself is the most delicate and lightest of the three, the capital is the largest, being considerably more than a diameter in height, varying in different examples from one to one and a half diameter; upon the average about a diameter and a quarter.

The capital has two rows of leaves, eight in each row, so disposed that of the taller ones, composing the upper row, one comes in the middle, beneath each face of the abacus, and the lower leaves alternate with the upper ones, coming between the stems of the latter; so that in the first or lower tier of leaves there is in the middle of each face a space between two leaves occupied by the stem of the central face, above them. Over these two rows is a third series of

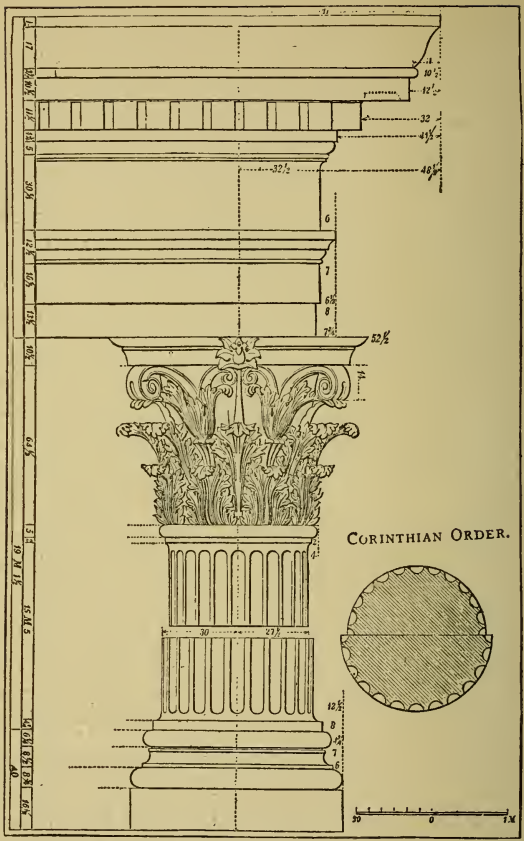


Fig. 242.

eight leaves, turned so as to support the small volutes which, in turn, support the angles of the abacus. Besides these outer volutes, which are invariably turned diagonally, as in the four-faced Ionic capital, there are two smaller ones, termed caulicoli, which meet each other beneath a flower on the face of the abacus. The abacus itself is not, properly speaking, a square, although it may be said to be so in its general form. But instead of being straight, the sides of the abacus are concave in plan, being curved outwards so as to produce a sharp point at each corner, which is usually cut off.

The proper Corinthian base differs from that of the usual Ionic or Attic, in having two smaller scotiae, separated by two astragals; however, both kinds are employed indiscriminately. The shaft is fluted, in general, similarly to that of the Ionic column, but sometimes the flutes are cabled, as it is called; that is, the channels are hollowed out for only about two-thirds of the upper part of the shaft and the remainder cut so that each channel has the appearance of being partly filled up by a round staff or a piece of rope, hence the term cabling.

The cornice is very much higher than in the other orders, which makes more projection also.

From this greatly increased depth of cornice, it consists of a great number of mouldings beneath the corona, for that and the cymatium over it invariably retain their places as crowning members of the whole series of mouldings. In the illustration square blocks or dentels are introduced, but often to the dentels is added a row of modillions immediately beneath and supporting the corona. These modillions are ornamental blocks, curved in their under surface somewhat after the manner of the letter S laid on its edge, and between them and the dentels, also below the latter, are other mouldings, sometimes cut, at others left plain. Sometimes a plain, uncut dentel band is substituted for dentels; sometimes, in simpler cornices, that is omitted altogether and plainer blocks are employed instead of modillions; or else both dentels and modillions are omitted. The dentel is not peculiar to this order, but is considered as more properly belonging to the Ionic.

The composite order is very much akin to the Corinthian, and is sometimes called the Roman Corinthian. It is frequently formed with square *plinths or pedestals* beneath the column. The base is nearly like those of the Doric and Ionic. The shaft is channeled with twenty-four flutings

separated by fillets. The capital consists of two rows of acanthus leaves, eight in each row; the upper row being placed over the meeting points of those in the lower row. Four spiral volutes in each face spring from two bunches of acanthus leaves; and two of them are so connected at the corners as to support the abacus of the capital. (See Fig. 243.) Each face of the abacus, besides being moulded into an ovolo form, is a slight difference between the Corinthian and Composite. The Corinthian architrave is divided into three facias, the Composite into two; the facias being in both cases separated from another by small enriched mouldings.

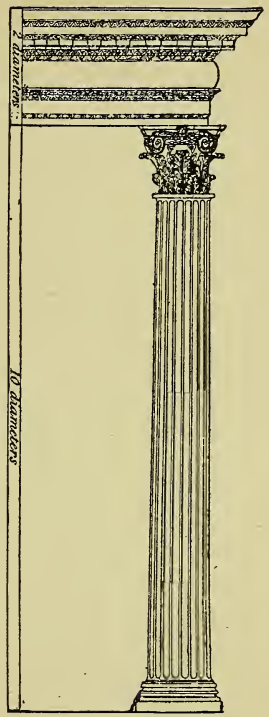


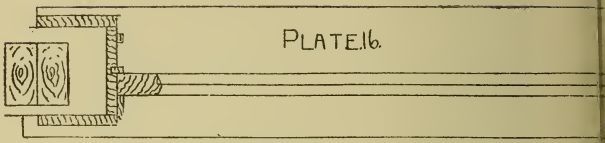
Fig. 243.

PLATE 16.

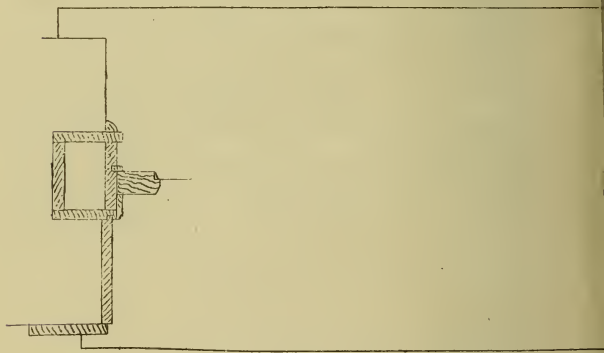
Plate 16 shows sections and plans of windows, for wood and for brick buildings, with weights where the mullion is narrow and will not admit of two weights passing each other. One section shows the manner of constructing the angle of a bay window where boxes and weights are required. This is a very useful plate for the young draftsman.

The frieze is enriched nearly all over with sculptures or other ornaments. The cornice,

sometimes a little puzzling to decide on what style of letter to employ, I thought I would give a few examples, so that the draftsman may

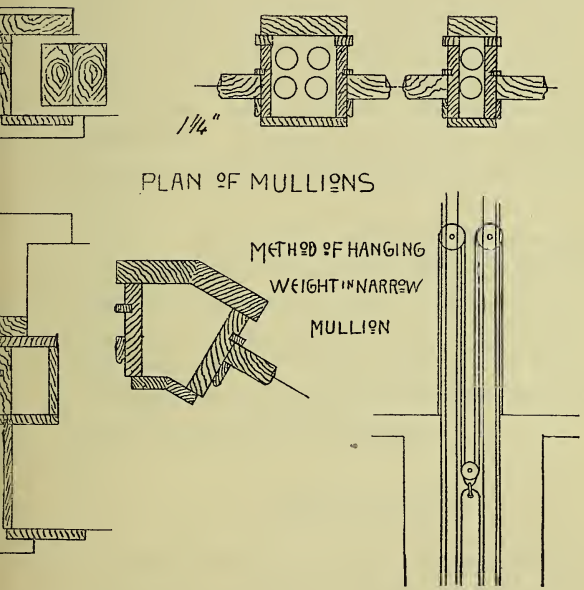


PLAN OF WINDOWS FOR WOOD BUILDIN



AND FOR BRICK

The frieze is enriched nearly all over with sculptures or other ornaments. The cornice,



sometimes a little puzzling to decide on what style of letter to employ, I thought I would give a few examples, so that the draftsman may

The frieze is enriched nearly all over with sculptures or other ornaments. The cornice, besides a number of small enriched mouldings above and below the corona, has a row of those square blocks which obtain the name of dentils. The Composite has mutules on the soffit, or underside of the corona, like the Doric; but the Corinthian has peculiar ornaments, called modillions. Between every two modillions, along the under side of the corona, is an enriched panel.

If the student has followed the foregoing closely, he will, by this time, not only be a fair draftsman, but he will have obtained a knowledge of general architecture and construction that will make of him a valuable and efficient mechanic, and one whose services will be sought after and paid for at a good rate.

MISCELLANEOUS

A good draftsman is always supposed to be a good letterer, and as every drawing must have a brief description of some sort, and as it is sometimes a little puzzling to decide on what style of letter to employ, I thought I would give a few examples, so that the draftsman may

have something to aid him in deciding. Ornamental letters had better be avoided until such time as the draftsman feels he can make them with ease and celerity, and plain lettering had best be the rule; however, I give a few examples

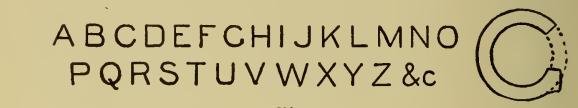


Fig. 244.

of both plain and ornamental, so that the student can determine for himself the styles of letter he will employ.

A simple block letter is shown in Fig. 244, with one letter G enlarged at the end. These letters, as will be seen, may be made in single or double line, as may be desired. Figures

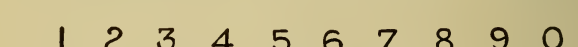


Fig. 245.

appearing in the heading, Fig. 245, should be the same size as the letters, but as dimensions on the drawing they should not be more than $\frac{1}{8}$ in. deep, nor less than $\frac{1}{12}$ in. When dimensions are put upon a drawing, the distance to which they should extend should be carefully shown by dotted lines, with arrow-heads at the extremi-

ties, keeping the fractions level, and with the small figures two-thirds the size of the large ones. The feet should be marked by a single accent thus ′, and the inches by a double accent thus ″, with a full stop on the line between the figure. If the dimensions consist of an even number of feet, then inches should be represented by 0″. The omission has led to serious mistakes in practical work, which should always be guarded against, and, notwithstanding the examples of text-books and the practice of some examiners, this is an important point always observed by practical draftsmen.

After inking in all the figures, pencil out the heading very carefully, making the letters a little thicker than those used in Fig. 244; G, R, S, C, and M will be found the most difficult. The distance apart of the letters should not be quite uniform, but should be such as will look uniform. For example, as I between M and N would require more than the usual space to look right; on the other hand, a T between L and J would require to slightly overlap to give the right effect. The junction points A, M, N, V, and W should not be sharp but the same width as the thickness of the strokes.

Leave ½ in. between the words of the heading.

It is then much easier to read than if cramped closer together or spaced wider apart. Remember that the printing—being thicker—will take longer to dry, and be careful not to use the india rubber too soon. It will be observed that the guide lines for the square and center lines for the circle, as described above, have not been inked in, as they would spoil the

Fig. 246.

effect of the drawing, but on machine drawings it is usual to put the center lines in red, using a little crimson lake for the purpose.

Another block letter is shown at Fig. 246, which is easy to make and quite effective. This, and the three following examples, are taken from "The Draftsman," an excellent little journal for the young draftsman, as it is full of useful matter, and will help him along materially. The journal is published monthly, in Cleveland, Ohio, and only costs one dollar a year.

The letters shown at Fig. 247 have some pretentions to ornamentation, but on the whole they are very simple and easy to make.

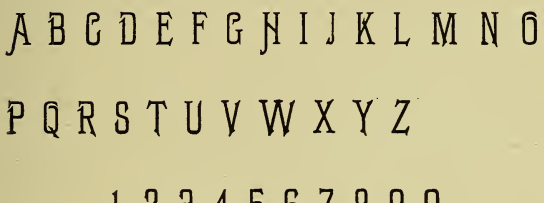


Fig. 247.

Fig. 248 exhibits a sort of Runic letter that is quite ornamental and would require considerable practice before it could be formed nicely.

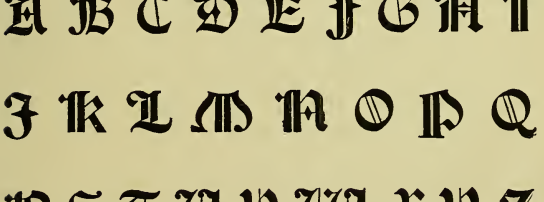


Fig. 248.

The letters shown at Fig. 249 are good old style characters and are always in order for almost any kind of work.

The two styles of open letters shown in Fig. 250 may sometimes be found useful, but as a rule I do not recommend this style of letter; it does not "show up" enough for the trouble; at the same time, it offers excellent practice for the draftsman.

These examples are quite sufficient for my purpose, but the student will do well to try his

A B C D E F G H I

J K L M N O P Q R

S T U V W X Y Z

Fig. 249

hand on other styles, many of which he can find in public prints, headings, and other places.

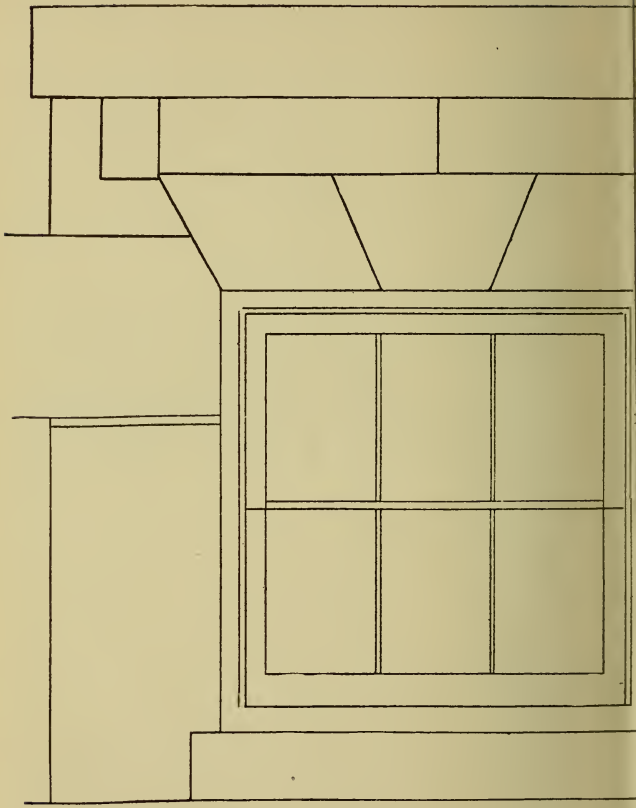
While I do not advise the young student to attempt the coloring of drawings, yet, if he advances himself sufficiently to be able to make a good drawing, there is no reason why he should not attempt to color some of his work, and to aid him in doing so I submit for his guidance the following hints and suggestions regarding this work. The first thing to do when

coloring is intended is to see that the paper has all the superfluous sizing removed by being sponged lightly with clean water. The paper, and everything about it, must be kept perfectly clean. Line off the spaces, with *very fine* pencil marks, that are to be tinted. Never use the eraser on the part to be tinted, either before or after tinting. Try the tinting process on a piece of waste paper until the proper

Fig. 250.

PLATE 17.

This plate shows a basement window in a stone wall, the elevation showing the outside of the window, and the section exhibits the manner of constructing the frame and placing the sashes. This is drawn to a scale of ¾ of an inch to the foot.



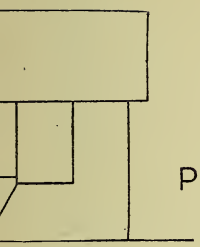
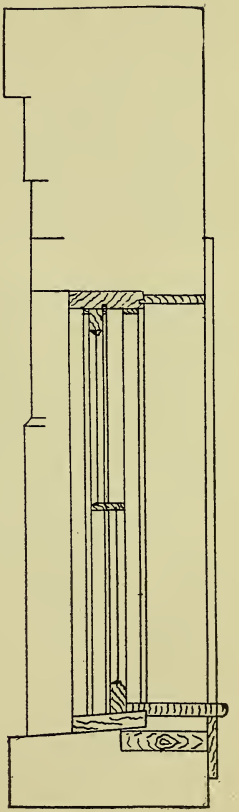


PLATE 17.

STONE BASEMENT WINDOW

3/4"



tint is obtained, before applying to the drawing. Dark tints are formed by applying a number of light ones over each other, but a second tint should not be applied until the first one is perfectly dry. Always finish tinting one portion of drawing before leaving it. Otherwise it will be cloudy. See that the paper is damp before you begin to tint. Ink in all lines after the tinting is completed and the drawing is perfectly dry.

The colors used for representing wood, iron, and other materials, are as follows: For soft pine, a very pale tint of sienna; for hard pine, burnt sienna with a little carmine added; for oak, a mixture of burnt sienna and yellow ochre is used. Mahogany is represented by burnt sienna and a portion of dragon's blood. For walnut, dragon's blood and burnt umber are used. For bricks, burnt sienna and carmine make a good color. Gray stones are represented by a mixture of black and white, with a little Prussian blue and carmine added—pale ink alone is sometimes used for stone work. Brown freestone is represented by burnt sienna, carmine, and ink. Wrought iron is represented by a light tint of Prussian blue, and cast iron by a gray tint composed of black, white, and a little indigo. Brass

is tinted with gamboge. Gamboge, slightly mixed with vermilion, makes a good color for copper. Silver is represented by an almost invisible blue.

Many draftsmen have a natural talent for using suitable colors, and putting them on in a suitable manner, but others must go through the drudgery of careful practice according to rule. A perfectly uniform tint such as desired on an engineer's drawing is not required on an architect's drawing, and still less on that for use by a builder; but unless the draftsman learns first to lay on a flat and uniform wash of any tint, he is not likely to be able to put on an appropriate rough tint. For water-color sketching a flat tile with shallow recesses is suitable for mixing the colors, but this is quite unsuited for a draftsman's use. He should invariably use the nests of round saucers fitting one on the other, and of a size to hold as much color as would be required to completely finish the coloring of any one material on one sheet. The saucers should be kept covered while in use, and washed out when done with. The lightest tints should, as a rule, be put on first, and the brush should always be of ample size. Color brushes should be kept scrupulously clean,

never put in the mouth, always washed after using, the surplus moisture shaken out, and then put away in the box and not laid on a dusty shelf to dry.

A little practice in the laying of colors one over another will be used for impressing on the memory the general effect of combination, and also a knowledge of the primary colors and their secondaries. Nearly all water-colors are transparent, and a medium tint of any one color, if laid over another after it is dry, will allow the first color to show through. A more intimate combination may be made by mixing the colors together in the same palette and putting them on with the brush in one operation.

Wipe the brush lightly on the edge of the saucer to remove the surplus color, and hold it as described for a lead pencil when about to draw a vertical line; commence at the top left hand of the space to be colored; pass the brush downwards, then along the top, then down by short strokes from the top to the length of the first stroke, and so carry the color downwards for the whole width, finishing at the bottom right-hand corner.

To produce good and uniform coloring, never damp the paper before commencing, refill the

brush often, gently wiping it on the edge of the saucer each time. The margin of the color must not dry before the next stroke reaches it, and a part once colored must never be retouched, even though it looks uneven. Retouching is a fruitful source of failure; for color, looking uneven when wet, may dry even, but if touched again when partially dried it is certain to show uneven when dry.

There is an advantage in having plenty of color in the brush, but when nearing the bottom boundary the amount must be reduced, so that there is not a pool left at the lower corner. By regulating the amount of color any slight excess may be picked up with the brush by simply raising it slowly, point last, from the corner. The brush should not be wiped in any way, but simply washed in clean water, when done with, or before use with another color. It will soon be found that with a given amount of color in the brush more or less of it may be left behind as the brush is allowed to trail or is used sideways, and it is by unconscious adjustments of this kind that a good colorist produces uniform results.

There are certain tints employed by architects to designate works of various kinds, and I give

them herewith so that the student may have them within reach if he has occasion for their use. It must be understood, however, that nearly every drawing office of any note has rules of its own for marking and coloring drawings, so that the rules given herewith may differ materially from many others in vogue.

Banks (Steep)—Shaded with graduated warm sepia, darkest at top of bank; vertical hill-shading in India ink or dark sepia.

Brass—Gamboge with yellow ochre or burnt sienna.

Bricks (Blue)—Elevation, indigo and India ink; section, indigo. (Red)—Elevation, light red (pale); section, India red (dark).

Brickwork (New)—Elevation, Roman ochre; section, crimson lake. (Old)—Elevation, India ink (pale); section, India ink (dark).

Buildings (Brick or Stone)—Crimson lake. (Wood)—Sepia.

Cast Iron—Payne's grey; neutral tint.

Chain—Elevation, Prussian blue (dot and stroke); section, no color.

Concrete—Sepia with black marks; or indigo, or Payne's grey with black marks and small light spots left.

Copper—Gamboge with lake; elevation,

crimson lake and burnt sienna; section, crimson lake and burnt sienna (dark).

Earth—Burnt umber or warm sepia, left jagged at edges; or sepia, light and dark.

Electric-bell Wires—Yellow.

Fields and Vacant Lands—White.

Fir and Deal (rough)—Elevation, burnt sienna or gamboge; section, burnt sienna (edged round and hatched).

Footpaths (Flagged)—Yellow ochre.

Glass—Green; Prussian blue; neutral tint.

Glass Roofs—Cross-hatching of Prussian blue.

Granite—Purple madder; pale India ink.

Greenheart—Elevation, indigo and gamboge; section, indigo and gamboge (dark).

Gun-metal—Elevation, Indian yellow; section, Indian yellow (dark).

Lead—Indigo; indigo with India ink.

Leather—Elevation, burnt umber (very pale); section, burnt umber (dark).

Mahogany—Elevation, light red and burnt sienna; section, light red and burnt sienna (dark.)

Meadows and Cultivated Grass—Prussian green; Hooker's green.

Oak—Elevation, burnt umber (pale); section, burnt umber (dark).

Pine and Spruce (wrought)—Elevation, burnt sienna (pale); section burnt sienna (dark rings).

Pipes (Cold-water)—Prussian blue. (Gas)—Indigo with lake. (Hot-water)—Crimson lake. (Rain-water)—Elevation, Prussian blue (outline); section, Prussian blue (outline). (Soil)—Elevation, burnt sienna; section, burnt sienna (outline).

Plaster—Payne's grey. Plaster and Cement—Elevation, India ink (pale); section, India ink (dark).

Railways—Neutral tint between the rails of each track.

Rope—Elevation, burnt sienna (dot and stroke); section, no color.

Rosewood—Burnt sienna with lake.

Sewers and Drains—Prussian blue.

Skies (in perspectives)—Cobalt blue.

Slate—Elevation, Payne's grey; section, Payne's grey (dark).

Steel—Elevation, violet carmine (very pale); section, violet carmine (dark); or indigo with a little lake.

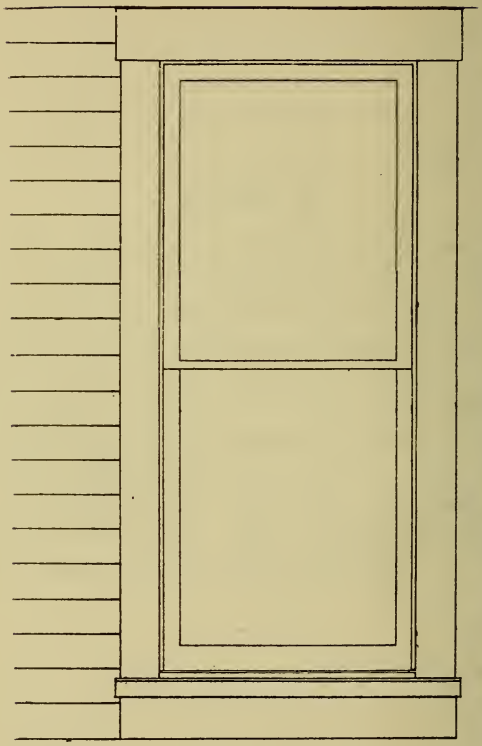
Stone—Yellow ochre; gamboge with Indian red and burnt umber; sepia; Prussian blue.

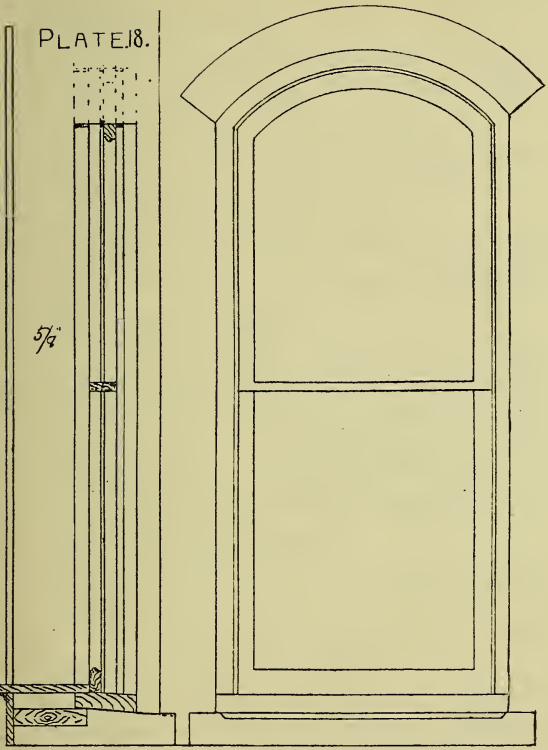
Representing stone in section by Prussian blue is to be avoided, though in common use.

PLATE 18.

This plate shows two elevations and sections of windows, one designed for wooden buildings, and the other for brick buildings. The vertical sections of frames and sashes are shown in both cases, and the manner of constructing the sills is given. The segmental headed window shows finish around the frame suited for brick. Both frames show exterior finish, and that designed for wood shows the lines of siding on one side. These examples are drawn to a scale of ⅝ of an inch to the foot.

number of sections are given. By this means


ELEVAT



SECTION OF WINDOWS FOR WOOD AND STONE BUILDINGS

number of sections are given. By this method

Prussian blue should be retained entirely for wrought-iron work.

Stone Dressings—Elevation, French blue (very pale); section, French blue (dark).

Streets (Paved)—Neutral tint.

Timber (Existing) — Elevation, India ink (pale); section, India ink (etched).

Tubes (Speaking)—Green.

Water—Elevation, Prussian blue (washed); section, Prussian blue (lines). Water may have graduated blue edges.

Windows Inside—Elevation, French blue (pale); section, Hooker's green, No. 2 (dark).

Windows Outside—Elevation, Payne's grey (dark); section, Hooker's green, No. 2 (dark).

Wrought-iron (Bright)—Elevation, Prussian blue (very pale); section, Prussian blue (dark). (Rough)—Payne's grey.

York and Soft Stone—Elevation, sepia (very pale); section, sepia.

Zinc—Elevation, French blue (very pale); section, French blue (dark).

Often various materials are shown by the manner in which the sections of such materials are hatched or lined off as may be seen by the illustration shown at Fig. 251, where a large number of sections are given. By this method

the material is recognized by the method of hatching, and no color is required, the whole being done in black and white.

It may be necessary sometimes for the draftsman to shade portions of his work, and, though this book does not pretend to deal with the

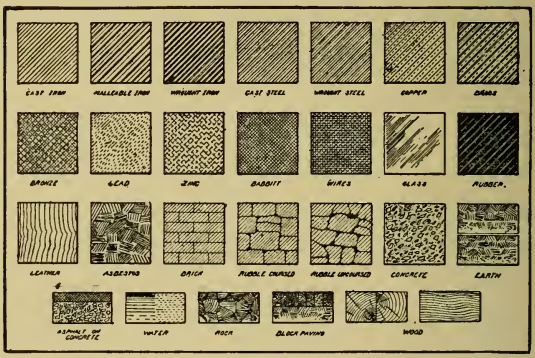


Fig 251.

higher class of drawing, it may not be out of place to say a few words on shading, and offer a few rough illustrations, showing how some objects may be shaded even by an inexperienced hand. The principles of shading are very simple, but do not seem to be generally understood, even by architects. All the exhibition drawings of an Architectural Association were

spoilt one year by the roof shading being reversed, presumably in order to comply with some fancied natural requirement. The principles are as follows: (1) The more distant the object the less distinct the light and shade,

Fig. 252.

and vice versa; (2) for the sake of uniformity the light is usually supposed to come from the left, and on a drawing is generally taken as coming down the long side of a 45° set square, when one edge is placed diagonally on the paper and at right angles to it; (3) on inclined surface in the light the farthest part is the darkest and in the shade the nearest part is the darkest; (4) cylindrical surfaces follow the same rules, but on the right hand or lower sides the effect appears as though some reflected light were shown towards the edge. The accompanying

illustrations, Fig. 252, show the application of these rules.

When ink lines to any considerable extent have to be erased, a small piece of damped soft sponge may be rubbed over them till they disappear. As, however, this process is apt to discolor the paper, the sponge must be passed through clean water, and applied again to take up the straggling ink. For small erasures of ink lines, a sharp erasing knife should be used; this is an instrument with a short triangular blade fastened to a wooden or ivory handle. A sharp rounded pen-blade applied lightly and rapidly does well, and the surface may be smoothed down by the thumb nail or a paper-knife handle. In ordinary working drawings a line may readily be taken out by damping it with a hair pencil and quickly applying the india rubber; and, to smooth the surface so roughened, a light application of the knife is expedient. In drawings intended to be highly finished, particular pains should be taken to avoid the necessity for corrections, as everything of this kind detracts from the appearance.

A little Prussian blue, mixed with the ink makes it flow freer and adds to the color. In inking in on ordinary tracing cloth, the student

will find the ink will "creep" in such a manner that the lines will be broken. This can be prevented if a drop of ox-gall be mixed with the ink, but where ox-gall is not available, Prussian blue may be substituted, and this will, to some extent, work freer over the cloth.

As this book is not intended for making finished draftsmen, I have avoided in all cases—except in the orders of Architecture—offering any very elaborate or finished examples, as the student can find a number of works in the market that will lead him to a higher plane if he so determines, after he has well mastered what I have served up to him. Neither have I thought it desirable to describe the method of making blue prints, as this method, or methods, has been rendered over and over again in the technical journals, for years past. If, however, the student desires to learn how to make blue prints, I would advise him to purchase a copy of "Blue Print Making" by P. Reissmann, which can be had from the publishers of this book, price 25 cents. This is an excellent little work, and goes into the subject thoroughly.

It must be understood that this work is prepared purposely for the workman who has no time to attend night school, or money to spare

to take a course in any one of the excellent correspondence schools; therefore, the illustrations have been left in a plain state, so that the student would not be frightened on the threshold of his work by fancy and elaborate drawings. I state this fact, partly to make it easy for the student, and partly to disarm critics, who can, if they are so disposed, find many defects in the illustrations.

FINIS

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"The Clark"

Price of Plans and Specifications

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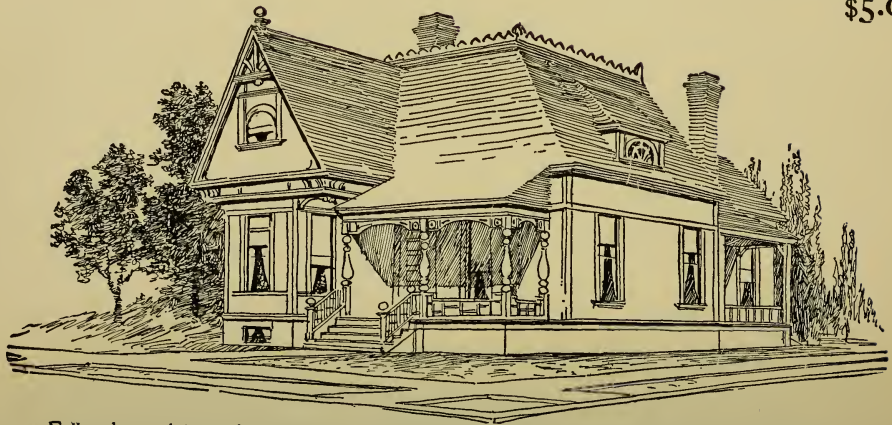

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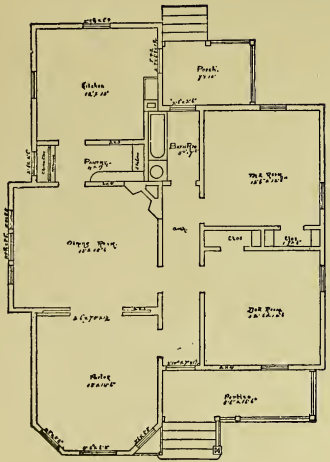
Floor Plan of "The Clark"



FIRST FLOOR PLAN

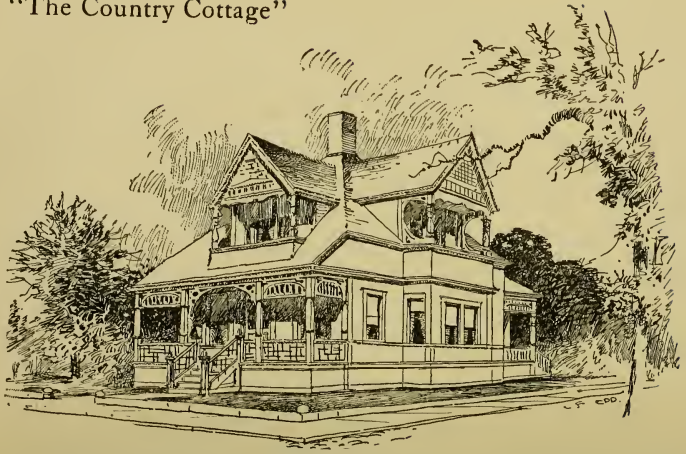
SIZE

Width, 32 feet Length, 46 feet

Blue prints consist of cellar and foundation plan; floor plan, roof plan; front and side elevation.

Complete typewritten specifications with each set of plans.

"The Country Cottage"

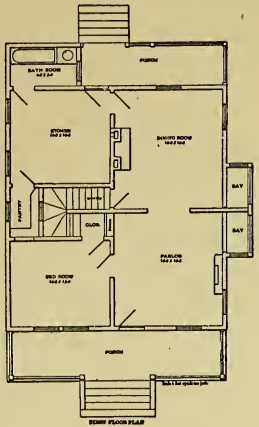


Price of Plans and Specifications

$6.00

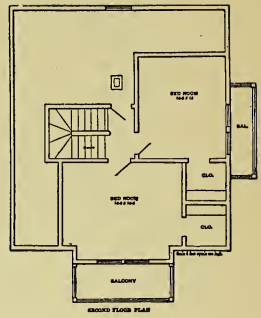
Full and complete working plans and specifications of this house will be furnished for $6.00. Cost of this house is from $3,100 to $3,200, according to the locality in which it is built. Special itemized estimate of cost furnished for $1.00 extra.

Floor Plans of "The Country Cottage"



SIZE

Width, 30 feet
Length, 40 feet
Exclusive of Porches



Blue prints consist of cellar and foundation plan; floor plans; roof plan; front and side elevations. Complete typewritten specifications with each set of plans.

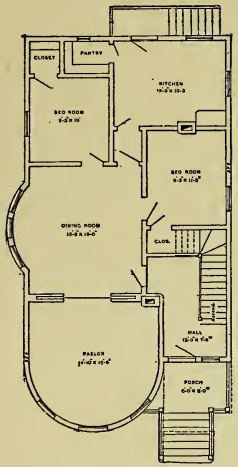
"The Crescent"

Price of Plans and Specifications

$5.00

Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $1,000 to $1,100, according to the locality in which it is built.

Floor Plans of "The Crescent"



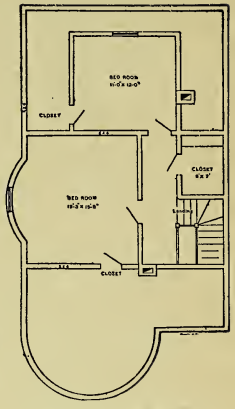
FIRST FLOOR PLAN

SIZE

Width, 25 feet
Length, 45 feet

Blue prints consist of cellar and foundation plan; first and second floor plans; roof plan; front and side elevations.

Complete typewritten specifications with each set of plans.

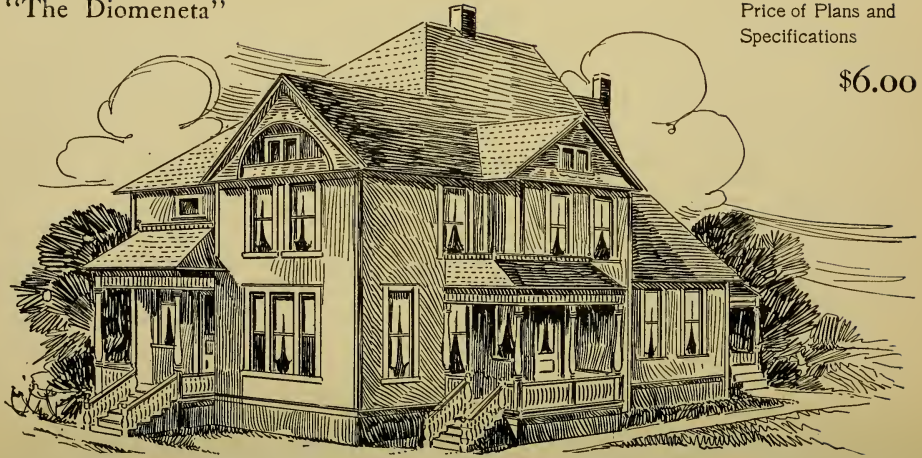


SECOND FLOOR PLAN

"The Diomeneta"

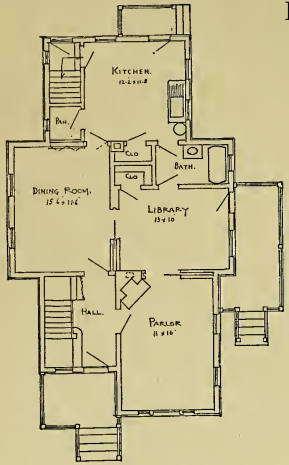
Price of Plans and Specifications

$6.00



Full and complete working plans and specifications of this house will be furnished for $6.00. Cost of this house is from $2,600 to $2,800, according to the locality in which it is built.

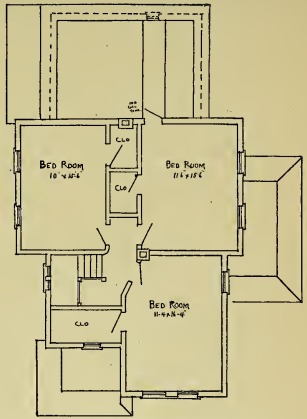
Floor Plans of "The Diomeneta"



FIRST FLOOR PLAN

SIZE

Width, 33 feet
Length, 52 feet
Exclusive of porch



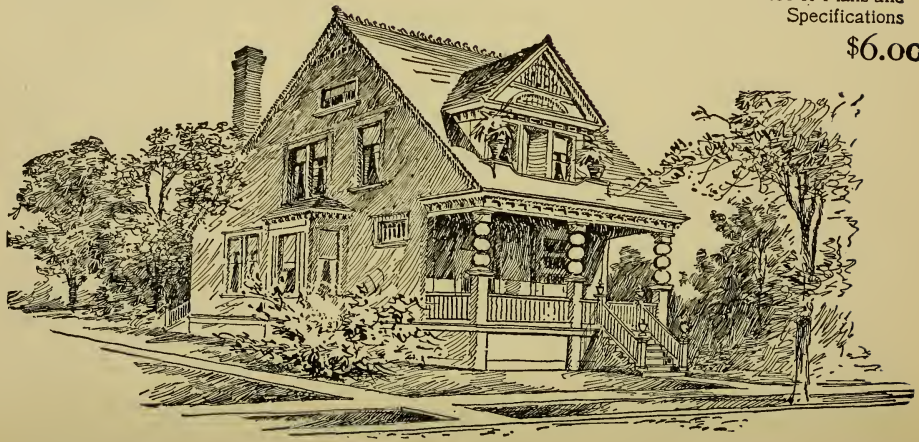
SECOND FLOOR PLAN

Blue prints consist of cellar and foundation plan; floor plans; roof plan; front and side elevations. Complete typewritten specifications with each set of plans.

"The Drake"

Price of Plans and Specifications

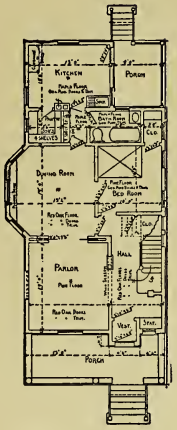
$6.00



Full and complete working plans and specifications of this house will be furnished for $6.00

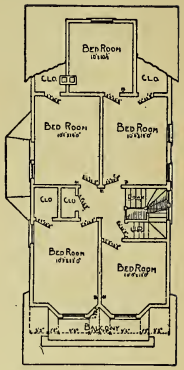
Cost of this house is from $2,900 to $3,000. according to the locality in which it is built.

Floor Plans of "The Drake"



FIRST FLOOR PLAN

SIZE
Width, 25 feet
Length, 53 feet



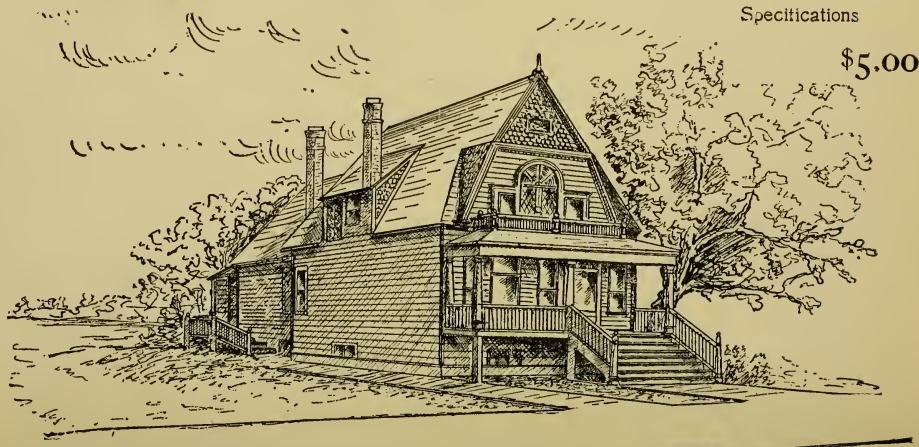
SECOND FLOOR PLAN

Blue prints consist of cellar and foundation plan; floor plans; roof plan; front and side elevations.
Complete typewritten specifications with each set of plans.

"The Drexel"

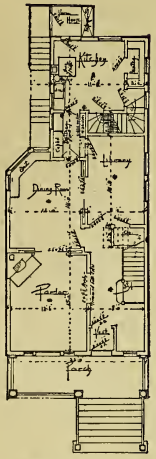
Price of Plans and Specifications

$5.00



Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $2,150 to $2,200, according to the locality in which it is built.

Floor Plans of "The Drexel"

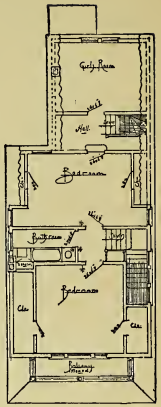


FIRST FLOOR PLAN

SIZE
Width, 22 feet
Length, 36 feet

Blue prints consist of cellar and foundation plan; floor plans; roof plan; front and side elevation.

Complete typewritten specifications with each set of plans.



SECOND FLOOR PLAN

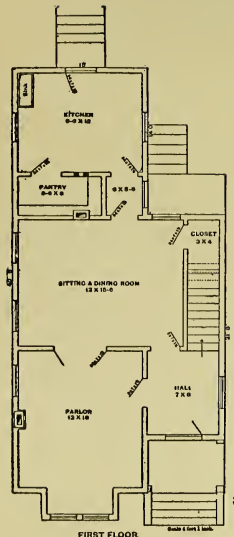
"The Durstin"

Price of Plans and Specifications

$5.00

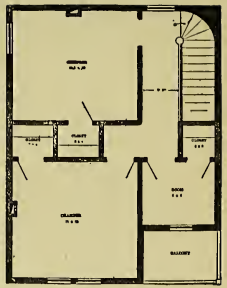
Full and complete plans and specifications of this house will be furnished for $5.00.
Cost of this house is from $1,600 to $1,700, according to the locality in which it is built.

Floor Plans of "The Durstin"



FIRST FLOOR

SIZE:
Length, 40 feet
Width, 20 feet



SECOND FLOOR

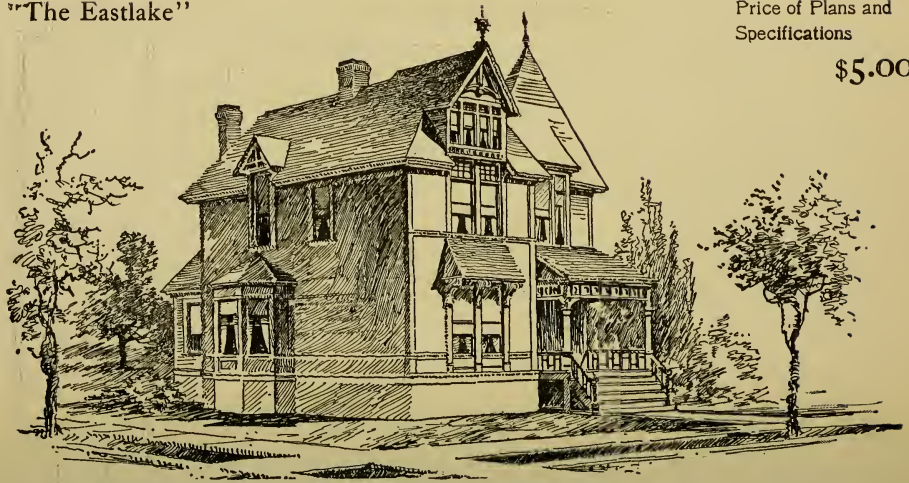
Blue prints consist of cellar and foundation plan; roof plan; floor plans; front and side elevations.

Complete typewritten specifications with each set of plans.

"The Eastlake"

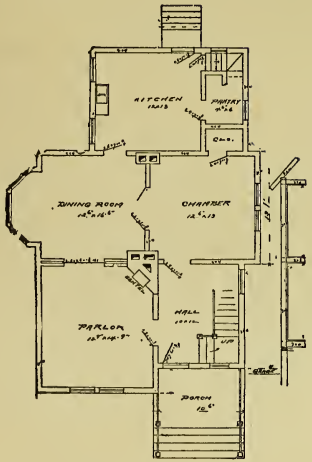
Price of Plans and Specifications

$5.00



Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $1,900 to $2,000, according to locality in which it is built.

Floor Plans of "The Eastlake"



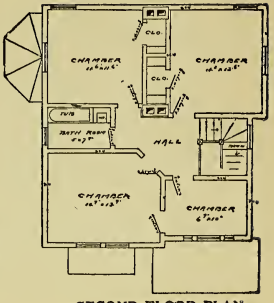
FIRST FLOOR PLAN

SIZE

Width, 32 feet
Length, 42 feet

Blue prints consist of cellar and foundation plan; floor plans; front and side elevations.

Complete typewritten specifications with each set of plans.

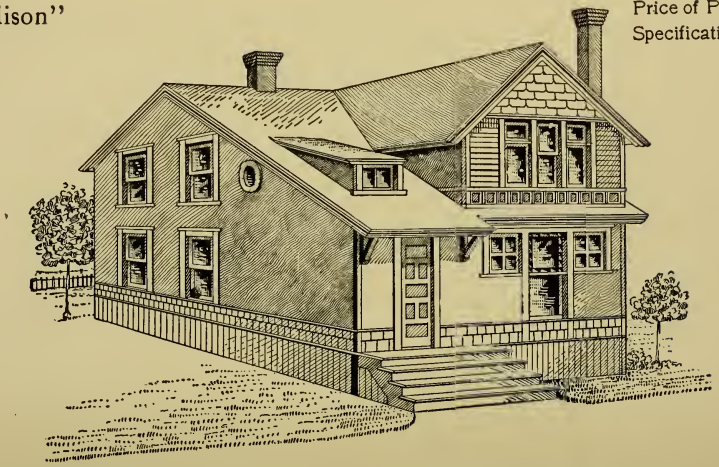


SECOND FLOOR PLAN

"The Edison"

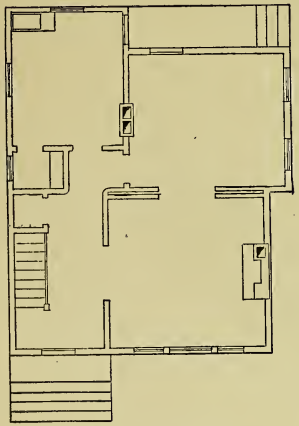
Price of Plans and Specifications

$5.00



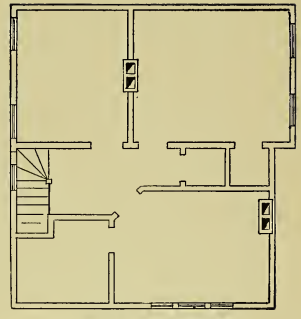
Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $1,100 to $1,200, according to the locality in which it is built.

Floor Plans of "The Edison"



FIRST FLOOR PLAN

SIZE
Width, 24 feet
Length, 32 feet



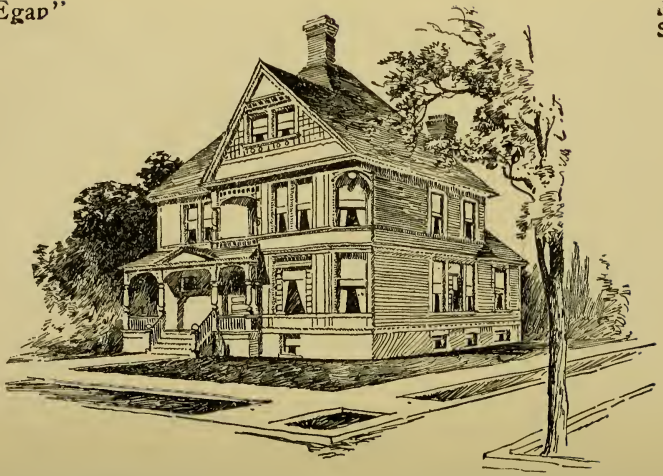
SECOND FLOOR PLAN

Blue prints consist of cellar and foundation plan; floor plans; roof plan; front and side elevations.
Complete typewritten specifications with each set of plans.

"The Egan"

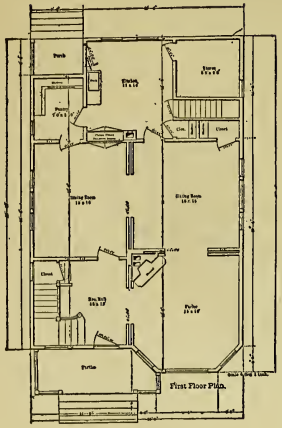
Price of Plans and Specifications

$5.00



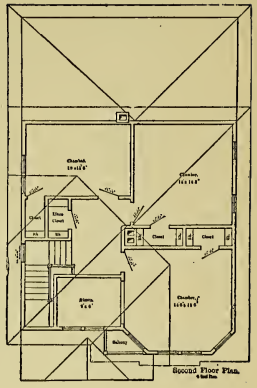
Full and complete working plans and specifications of this house will be furnished for $5.00.
Cost of this house is from $2,200 to $2,400, according to the locality in which it is built.

Floor Plans of "The Egan"



SIZE

Width, 30 feet
Length, 48 feet

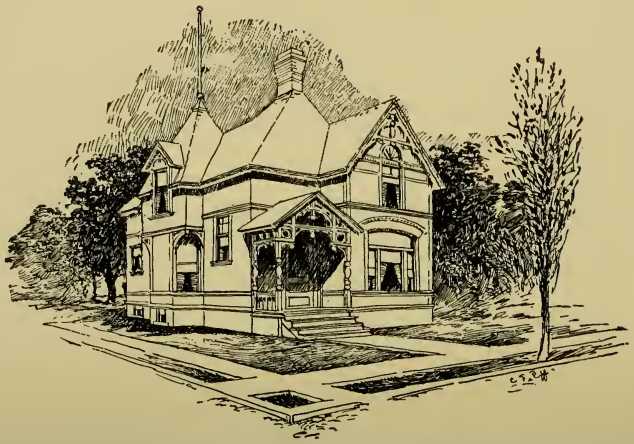


Blue prints consist of cellar and foundation plan; roof plan; floor plans; front and side elevations.
Complete typewritten specifications with each set of plans.

"The Evanston"

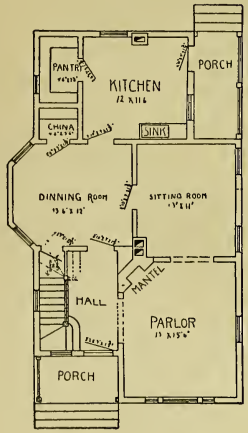
Price of Plans and Specifications

$5.00



Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $2,600 to $2,700, according to the locality in which it is built.

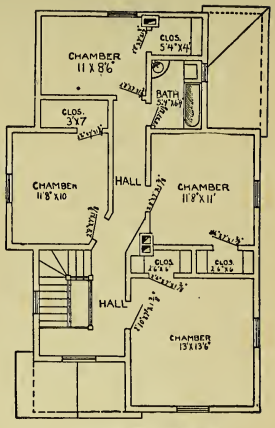
Floor Plans of "The Evanston"



FIRST FLOOR PLAN

SIZE

Width, 24 feet
Length, 43 feet



SECOND FLOOR PLAN

Blue prints consist of floor plans; roof plan; front and side elevations.
Complete typewritten specifications with each set of plans.

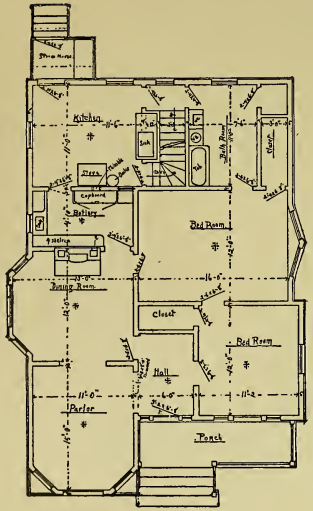
"The Essex"

Price of Plans and Specifications

$5.00

Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $2,100 to $2,200, according to the locality in which it is built.

Floor Plans of "The Essex"



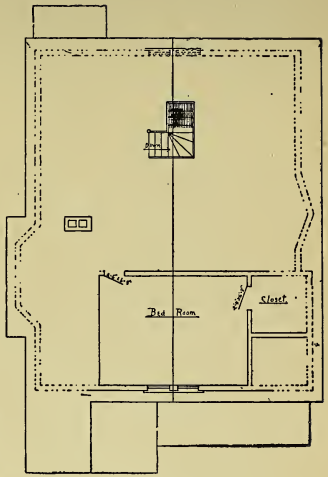
FIRST FLOOR PLAN

SIZE

Width, 32 feet
Length, 44 feet

Blue prints consist of cellar and foundation plans; first floor and attic plan; roof plan; front and side elevations.

Complete typewritten specifications with each set of plans.



ATTIC PLAN

"The Erie"

Price of Plans and Specifications

$6.00

Full and complete working plans of this house will be furnished for $6.00.
Cost of house is from $2,900 to $3,000, according to the locality in which it is built.

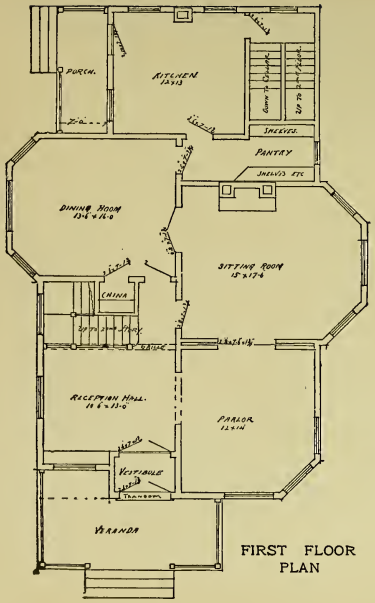
Floor Plans of "The Erie"

SIZE

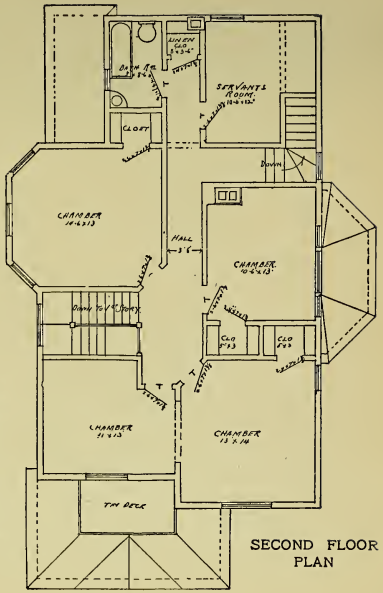
Width, 36 feet
Length, 48 feet

Blue prints consist of cellar and foundation plan, first and second floor plans; roof plan; front and side elevations.

Complete typewritten specifications with each set of plans.



FIRST FLOOR PLAN

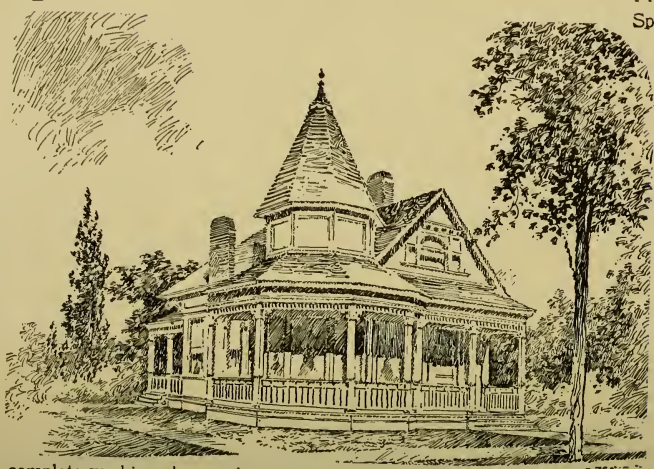


SECOND FLOOR PLAN

"The Evergreen"

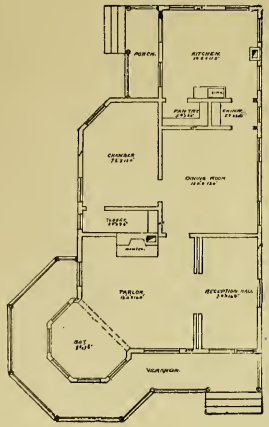
Price of Plans and Specifications

$5.00



Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $1,200 to $1,400, according to the locality in which it is built.

Floor Plan of "The Evergreen"



SIZE

Width, 28 feet
Length, 42 feet

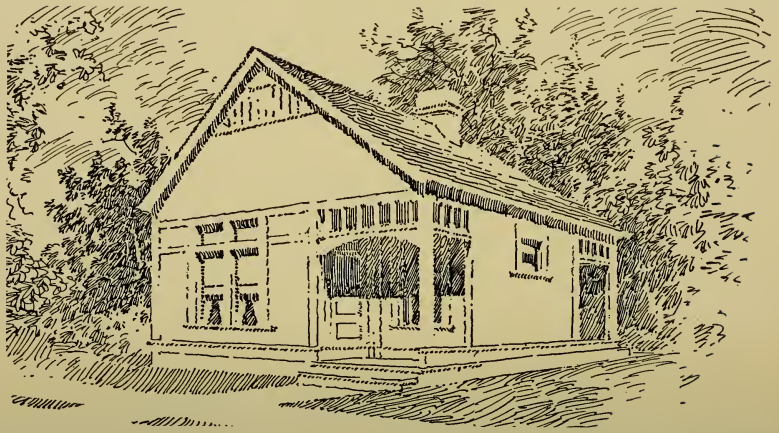
Blue prints consist of first floor plan; roof plan; front and side elevations.

Complete typewritten specifications with each set of plans.

"The Farmer"

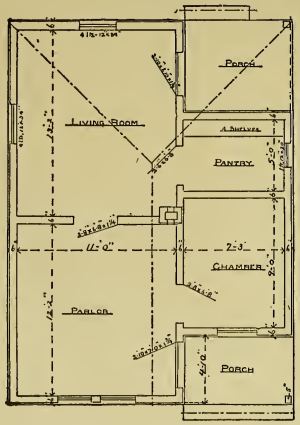
Price of Plans and Specifications

$5.00



Full and complete working plans and specifications of this house will be furnished for $5.00. Cost of this house is from $500 to $600, according to the locality in which it is built.

Floor Plan of "The Farmer"



SIZE
Width, 20 feet
Length, 28 feet

Blue prints consist of cellar and foundation plan; roof plan; floor plan; front and side elevations. Complete typewritten specifications with each set of plans.

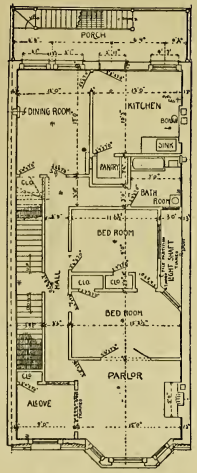
"Farmer Flats"

Price of Plans and Specifications

$8.00

Full and complete working plans of this store and flat building will be furnished for $8.00
This building has been erected at a cost of $6,500.

Floor Plans of the "Farmer Flats"

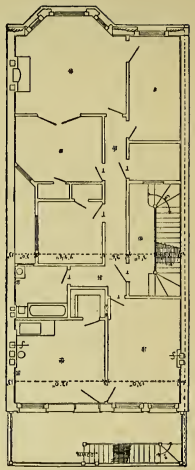


SECOND STORY PLAN

Store and Three Flats

Blue prints consist of floor plans; front and side elevations and foundation plan.

Complete typewritten specifications with each set of plans.



THIRD STORY PLAN

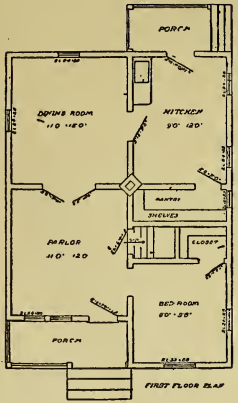
"The Feeney"

Price of Plans and Specifications

$5.00

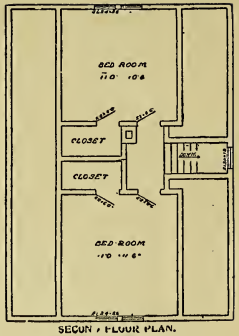
Full and complete plans and specifications of this house will be furnished for $5.00.
Cost of this house is from $1,000 to $1,100, according to the locality in which it is built.

Floor Plans of "The Feeney"



SIZE:

Length, 22 feet
Width, 32 feet



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