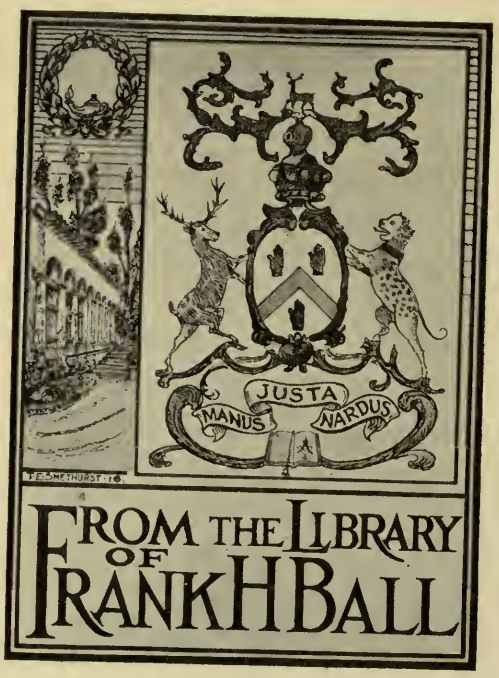
RADFORD'S ARCHITECTURAL DRAWING

Complete Guide to Work of Architect's Office

Drawing to Scale-Tracing
Detailing — Lettering
Rendering—Designing

Classic Orders of Architecture



Frank H. Ball

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A COMPLETE AND THOROUGH COURSE, CLEARLY WRITTEN AND BEAUTIFULLY ILLUSTRATED; SUITED ALIKE TO INDIVIDUAL STUDY AND CLASS INSTRUCTION

Prepared under the Supervision of

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A Companion Volume to
"RADFORD'S MECHANICAL DRAWING"

THE RADFORD ARCHITECTURAL COMPANY
Chicago, Ill.

Preface

All that stands between thousands of practical carpenters and builders in this country and a greater success is the lack of facility in architectural drafting. Ambitious men, both young and old, are turning to architecture—the drawing of plans—as their big opportunity for advancement.

"Radford's Architectural Drafting" has been specially written and illustrated to help these men to reach this goal. It is practical, clear, direct. It goes straight to the point, telling the learner what he wants and needs to know without fuss, flurry, or theoretical nonsense. It is complete. It is arranged in logical order for satisfactory individual study.

The importance of neat drafting and lettering on plans can not be overestimated. Architects rate their draftsmen according to the way they do their work; and the architects are themselves judged by the way their drawings go out. Careless drafting and amateurish lettering have more than once lost for an otherwise good man a desirable job or a nice commission.

This book, together with its companion volume, "Radford's Mechanical Drawing," has been prepared to furnish ambitious men—whether apprentices or experienced builders, students in school or young draftsmen in offices—a practical, thorough, and satisfactory course in draftsmanship, drawing, sketching, rendering, and designing. One who is already in the work can well begin with this Volume 2, the more advanced drafting and designing work as done in the best architects' offices. Others should start with Volume 1 and master the foundation principles of mechanical drafting, the use of the drafting instruments, etc., before proceeding with the architectural course.

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A FINE EXAMPLE OF PEN-AND-INK RENDERING.

Architectural Drafting

It would be a commonplace to insist on the advantage to all property owners and to all classes of workers engaged in building construction, of a knowledge of the principles of architectural design. It is equally important that they should know how to read and interpret intelligently the working drawings that are the guides to the details of actual construction, and, if need be, to make these drawings themselves.

GENERAL REQUIREMENTS

The first impression given by a set of drawings applies as well in Architecture as in any other line of work. So often we hear it said, "It certainly makes a good impression." Applying this same principle to architecture, let us consider a few general requirements in order to finish a set of plans in the best manner, and also have them appeal to a person not familiar with architectural work.

The drawings should be complete in every respect. They should be fully dimensioned with plain figures; all material plainly marked by arrows; each room named, for the sake of reference; and the various parts of the work

carefully explained by explanatory notes. Make these notes clear, concise, and with no mistaking the part to which they refer. While the title of each page may be lettered in a more elaborate letter, make all explanatory notes plainly lettered. Drawings in general have but few notes of explanation. Make it a rule to explain fully all the questionable portions of a building. This applies to the plans, as well as the elevations, sections, and details. In the arrangement of notes, if there are those that do not refer to any particular portion of the drawing, place these notes over the sheet, to make it well balanced. Do not try to crowd them into one corner of the sheet or along one edge. Place them where they will make the drawing as a whole look the best.

Architectural drawings should have some character to them; the lines should be firm and straight, making them a full, even thickness. Very often good drawings are spoiled by the lines being very poor and also too faint. Use a good, heavy line, and make it look as if it was there for a purpose.

One way in which a drawing can be made attractive and "snappy," as you will hear architects say, is to overrun all corners and intersections of lines, slightly. In mechanical drafting other than the work of the architects, it is always required to stop the lines at the corners, making the drawing exact and very mechanical in appearance. The architect, however, is

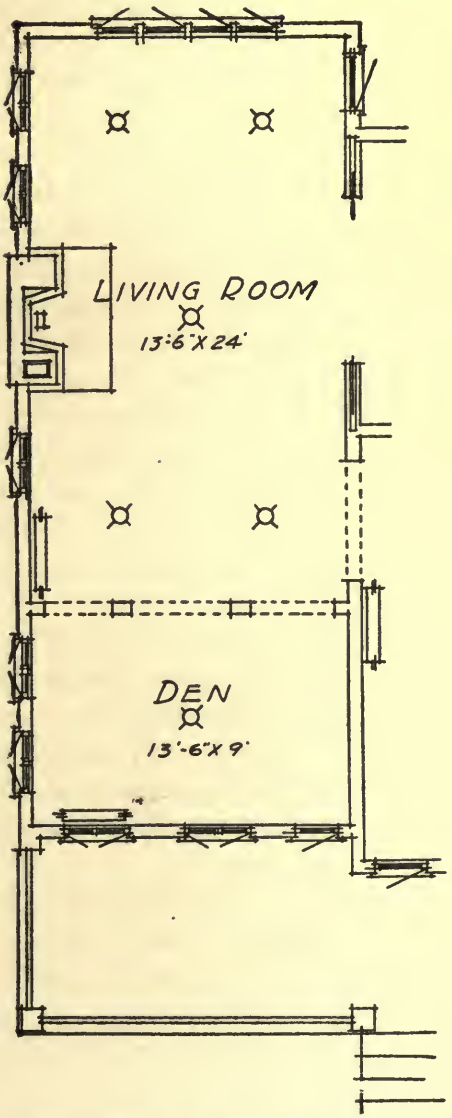


Fig. 1. Part Plan, Showing Method of Overrunning Corners.

allowed some liberties in his work. He will resort to methods, to improve the looks of his drawings, which would not be permissible in other work.

Referring to Fig. 1, it will be seen that the corners and intersections are emphasized by the overrunning of the lines. This does not mean long lines past the corners, but just enough to show a sharp intersection. A little practice will soon enable a draftsman to do this work skilfully, and once this method is adopted it will be used on all future work, as there is no comparison in the general attractive appearance of two drawings, in one of which this method is used, and in the other the strict mechanical method is adhered to. The actual time consumed in getting out a drawing is less with the method described than with the true mechanical drawing, in which it is necessary to start and stop at exactly a certain point. In mechanical drawing, it is frequently necessary, after two lines at an angle have been drawn, to go over the first line in order to continue it a short distance to the exact corner.

Very often, a few minutes spent on careful lettering, indicating materials, and an additional explanatory note, will be the winning feature of a set of drawings.

Too much emphasis cannot be placed upon always being on time, whether in office work or in getting out drawings. When a time is set for the completion of any drawing, or a time

of meeting arranged, have your work ready at that time, and keep your appointment exactly as arranged. Before setting a time of completion, be sure you are giving yourself time to do the work completely, and then see to it that your work is ready at that time.

The architect's services usually consist in preparing the necessary studies or preliminary sketches, working drawings, specifications, and large-scale and full-size details, together with a general supervision of the work. For this service, there is usually a price based upon a minimum percentage of the completed work. This percentage varies in different States and localities, from 3½ to 7 per cent. As the work progresses, or different sets of drawings are completed, payments are made. If we consider the architect receiving five per cent commission, one-fifth the entire fee is due upon the completion of the preliminary sketches, two-fifths upon the completion of the working drawings and specifications, the balance being paid as the work progresses. This percentage is based on the total cost of the buildings. These prices are those adopted by the Chicago Architects' Business Association. Should work on the drawings be abandoned, a charge should be made for services for the amount of work done.

This will give an idea as to the general prices charged, and the usual times of payment. It does not pay to do work at a small percentage, for the work on the drawings and specifi-

cations will necessarily have to be inferior and incomplete.

The scales at which drawings are usually made are ⅛ in., ¼ in., ½ in., ⅜ in., ¾ in., 1½ in., and 3 in., to the foot. These are convenient for all parties concerned. We see that by using the first three scales we can use the regular divisions on a rule, without having an architect's scale. The last scales are also convenient for the same reason. Take, for instance, a detail drawn at 3-inch scale; then we see that ¼ inch equals one inch, and an ordinary rule can be used to advantage. On the actual construction work, the foreman always uses his two-foot rule for scaling the drawings; and if the above scales are used, they are easily read from an ordinary rule.

A complete set of drawings should include a survey, or City Engineer's plan, of the lot, on which the outline of the building is marked; a foundation plan; a plan for each floor; a roof plan; an elevation of each side of the house; all necessary ¾-inch scale detail sections; all necessary elevations of interior finish; large-scale details of the window-frames and sash and interior trim; and any other details of unusual construction. After the contract is let, then get out full-sized details.

Should any changes be necessary after the drawings are completed, secure the owner's written order for such changes. If everything

is in writing, there can be no cause for dispute, especially in the matter of changes.

METHOD OF GETTING OUT DRAWINGS

The prospective client, by appointment or otherwise, meets the architect in his office. The general scheme is talked over, and the various subjects are discussed, such as the lot, location, size, etc.; the amount to be put into the building, or the cost; the time of beginning and completion; the owner's general idea of the requirements; and the architect's fee. A time is set for the getting-out of the preliminary sketches. All of this information is arranged, and entered in a book for future reference.

At the appointed time, the client appears again, and the preliminary sketches are talked over, changed, and revised, and any new information is noted. After another visit or two by the client, the sketches are accepted. The working drawings are begun, usually made at $\frac{1}{8}$-inch or $\frac{1}{4}$-inch scale. These drawings are carefully inspected by the head draftsman, numbered, dated, and signed.

These drawings are then reproduced by some method—usually blue-printed—bound, and sent to the contractors for bids or proposals on the work. After the contract has been let, the full-sized drawings are made.

ARCHITECTURAL DRAWINGS

Architectural drawings may be classified as follows:

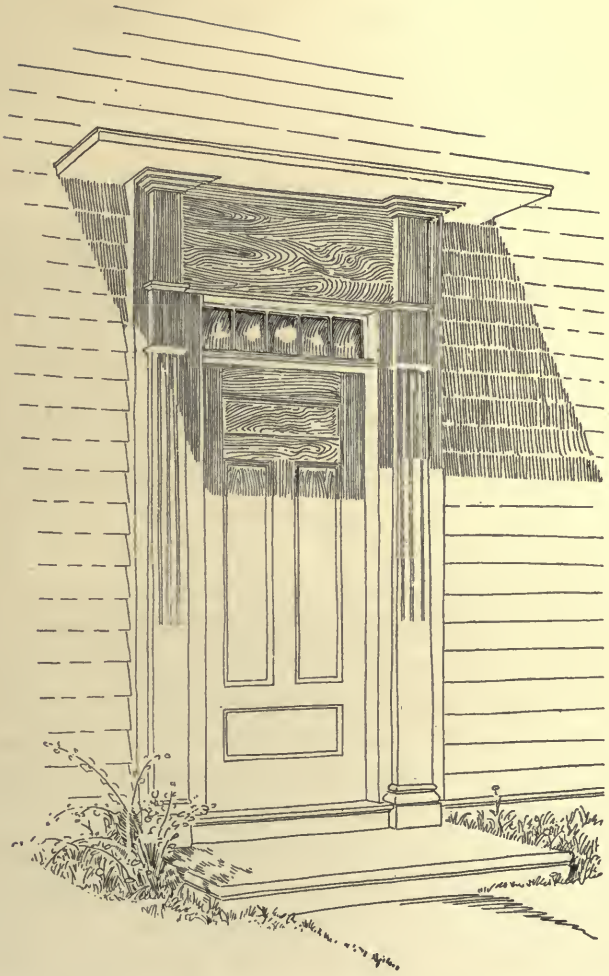
- Preliminary Drawings
  - Sketches
  - Perspective Sketches
  - Competition Drawings
- Working Drawings
  - General
  - Detail
    - Scale Details
    - Full-Size Details

Preliminary Drawings

Preliminary drawings are small studies of the proposed new work, freehand or otherwise, at a small scale, finished in an attractive manner. There are three classes of preliminary drawings—namely, Sketches, Perspectives, and Competitive Sketches.

Preliminary Sketches. In architectural work, no matter whether you are an architect dealing with an owner or client, or a draftsman getting out working drawings, it is always better to make a preliminary sketch of the arrangement, detail, etc., as it saves time and much erasing and changing on the scale drawings. By preliminary sketches we mean the sketching freehand on paper to show exactly just how you will draw it with the T-square and triangles.

Let us consider the architect dealing with a client. The first thing is an arrangement of the



COLONIAL ENTRANCE TO HOUSE AT HOPKINTON, MASS.

rooms, or the plan is first studied. For this work, tracing paper will be found very easy to work with and very convenient. The use of a sheet of co-ordinate paper under the tracing paper will be found very convenient. The squares on the co-ordinate paper will serve as a guide in drawing straight lines; and also the squares as ruled on this paper can be used as a scale—one square representing one unit, as a foot or an inch.

Very often the owner of the proposed new building will have some scheme or arrangement of rooms that he would like; therefore, try to have him give you a rough sketch of such arrangement; even a drawing with single lines for walls, and cross-lines indicating windows, will be very helpful. A drawing as shown in Fig. 2 is just what you want from your client.

Having received either this sketch or a list of the requirements, you are ready to start your preliminary sketches. Spread down the co-ordinate paper, and over this lay a sheet of tracing paper. These may be held down with thumb-tacks or weights of some sort placed on opposite ends. Assume each square of the paper to represent some unit, as one inch, or one foot, or ten feet; and lay out first the property lines. Then commence on the building proper. Make no attempt at trying to make exact lines; let these sketches be more of freehand drawing. Mark off the approximate sizes of rooms by rectangles, and try the various arrangements,

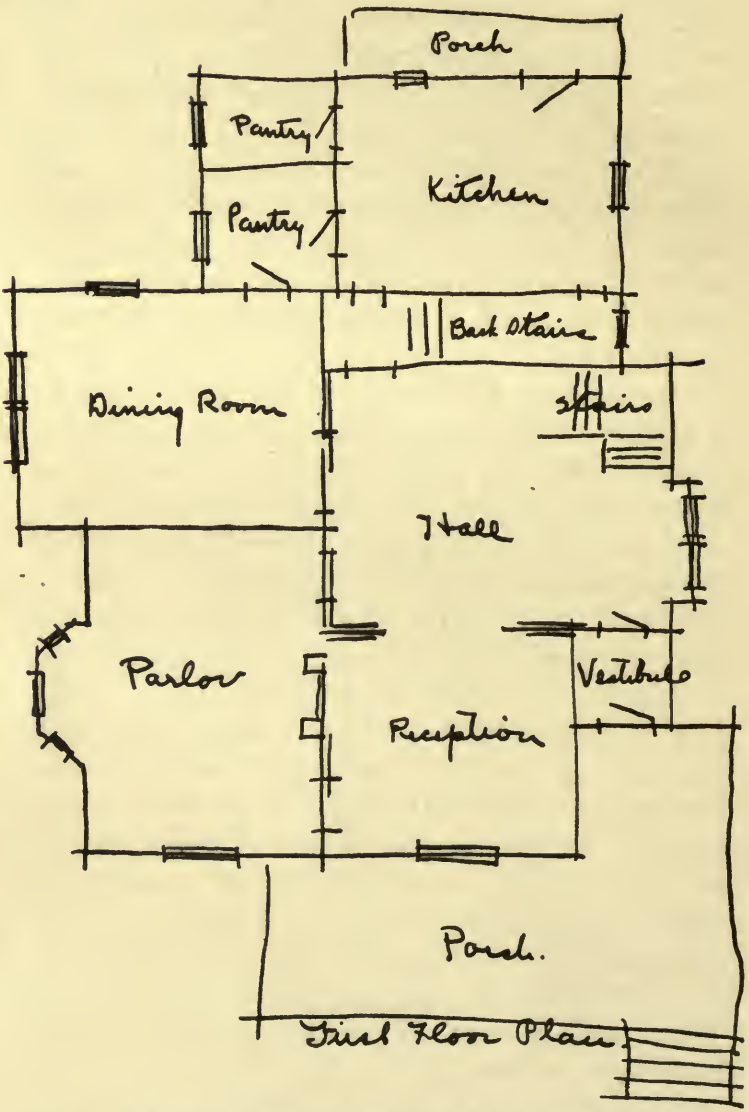


Fig. 2. A Single-Line Sketch Submitted, from which the Architect Gets an Idea of the Arrangement.

endeavoring to secure an ideal arrangement. Make no attempt at trying to show double lines for wall lines; let it be a free and easy sketch of single lines.

Don't be satisfied with one arrangement of the given requirements. Over this first sketch lay another sheet of tracing paper. Perhaps you can use some parts of the first sketch, and revise other parts. Study your problem, and be fully acquainted with the requirements. After completing this second arrangement, try to imagine difficulties that this arrangement would present, and how they might be remedied. Make another sketch; don't be satisfied until you have made half a dozen different sketches. After having considered all the possible arrangements of the requirements, then take the sketches, spread them all out before you, and see if you have solved the problem.

Now commence with a clean sheet of tracing paper over the co-ordinate paper, and make finished sketches; that is, lay out the wall lines carefully, put in the windows and doors, letter the rooms, and get these drawings into shape to submit them to the client. Make them so that he will understand clearly the arrangement you have sketched.

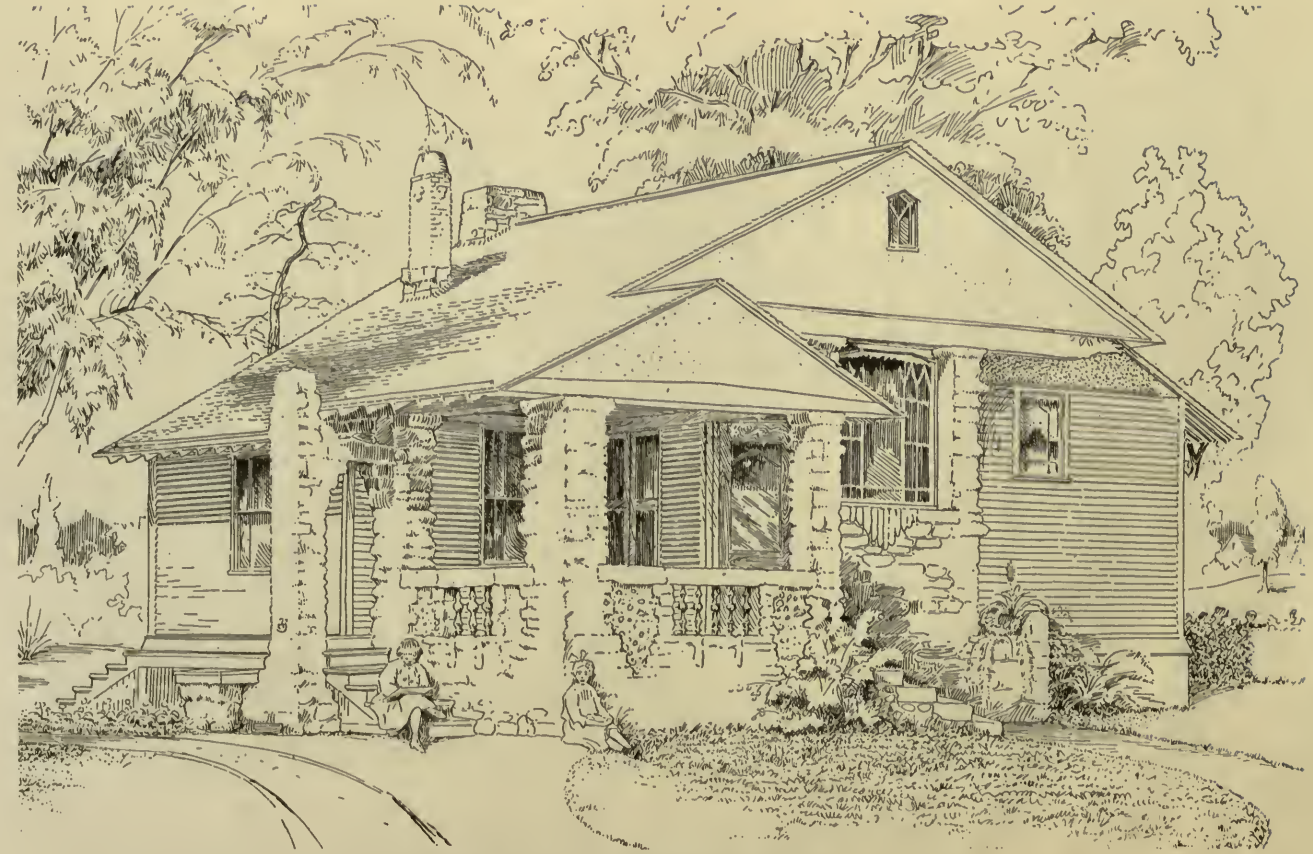
For filling in the walls to indicate the walls and the windows, it will help the appearance to color the walls on the back side of the paper with the pencil. This gives a subdued color to

the walls, and increases the clearness of the plan or drawing.

Prepare small sketches of possible treatment of the elevations, and submit these also with the plan. These will now do for you to submit to your client (see Fig. 3). Be very sure that you have studied the problem thoroughly, and be prepared to answer all questions your client will probably ask. The client will very soon form an opinion of your ability by the way you handle his work.

When these first preliminary sketches are ready, notify your client, unless you have had a previous time of meeting set. If this be the case, then be sure to have your work ready for him at the appointed time. Remember, your client is a busy business man, a man who is always used to keeping his appointments, and expects everyone to keep theirs.

After these first sketches have been submitted, and carefully gone over, make an appointment for the next meeting, at which time you will have the final preliminary sketches ready. There will always be changes and additions on these sketches; and the fewer times the client has to be consulted, the better impression you will make. Therefore, after this first meeting, understand thoroughly your client's objections and changes, ask questions to make sure you do understand, and go back to your office determined to make the revisions



BUNGALOW DESIGN RENDERED IN PEN AND INK.

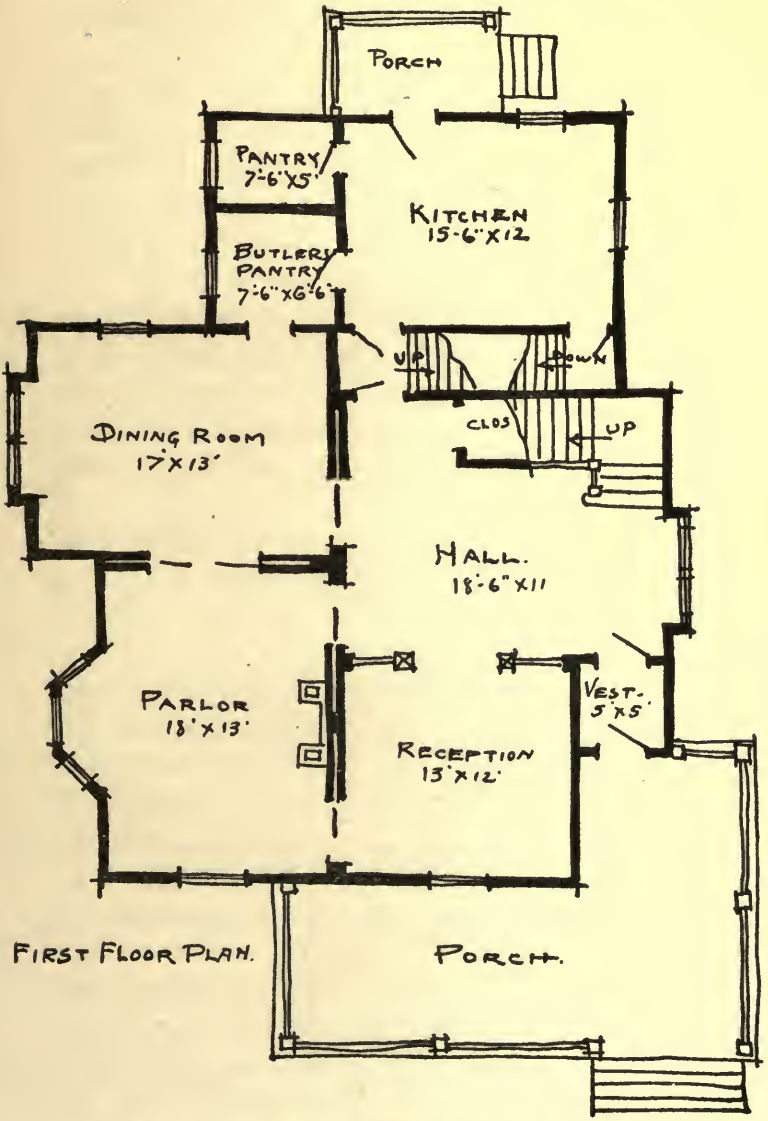


Fig. 3. First Sketch Ready to Submit to Owner.
Original drawn at scale of ⅛″ = 1′-0″, all freehand and drawn on co-ordinate paper.

and that the next sketches submitted will be approved.

For the next sketches, it is very often more satisfactory to use the T-square and triangles, and a scale, and make small, sketchy drawings. Tack down your tracing paper, and lay out to a small scale the general arrangement (Fig. 4). Every little detail need not be attempted on these sketches; but make them straight-line drawings, using more care in the finishing of such drawings. Make all plans necessary, showing the arrangement on all floors; also an elevation. Make them attractive, and letter completely.

The next meeting with your client should be the last one so far as the sketches are concerned. Have him look over all your sketches closely; go over them with him, pointing out the changes, telling him the advantages to be gained by this or that arrangement, and convince him that you know your business. He will finally see things your way, and he will tell you to go ahead with the work. If you see he is satisfied with the arrangement as shown him on the sketches, secure if possible his initials of approval (in ink) on each sheet. Don't ask him to "sign these sketches," as if you were an owner and he a lease-holder. If there is anything a business man hesitates to do, it is to sign his name to a paper of any kind. Use a little tact, tell him that you want him to be perfectly satisfied; and in order for him to be sure he is going to

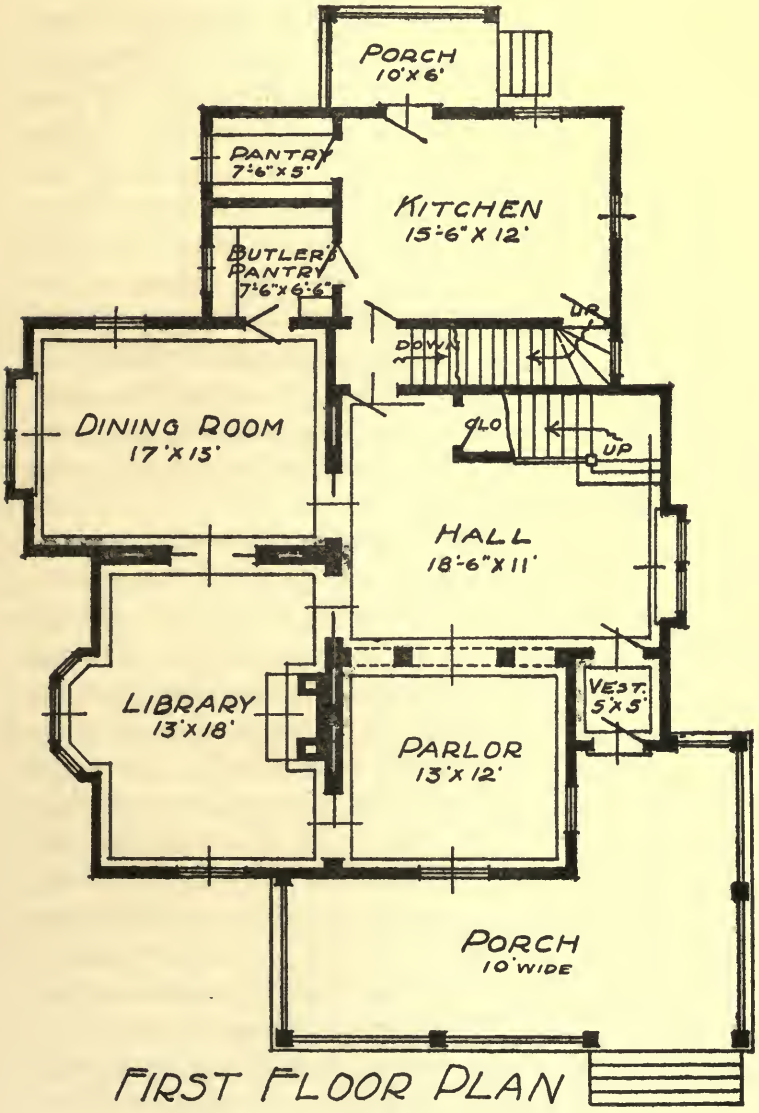


Fig. 4. Final Preliminary Drawing.
Drawn with T-square and triangles to scale.

get the arrangement that suited him, he can O. K. the sketches that he approves, and thereby have a check on the working drawings so that they will be sure to be what he wants. On the other hand, you are protecting yourself by this signature. Very often your client may forget that he ordered this or that change in your sketches; he might in some cases refuse to pay you your agreed commission, because you did not do this or that thing which he ordered. If you have his signature on the sketches, and you have followed these sketches exactly, you will not fear the outcome should the case go to law for settlement.

The same general method of procedure will apply if you are a draftsman getting out scale details. Get out freehand sketches on tracing paper, several of them; decide which is the best method before making the regular scale details. If you are a new man in an office, submit your best sketch for the construction to the head draftsman, and let him see that you are studying your work, endeavoring to get the best method. Learn to make your sketches clear and well executed. This comes only by practice in sketching.

Much time and money can be saved on the cost of getting out the drawings if only you learn to make these sketches well and complete, so that when you are ready to make the final drawings, you can start and know definitely just what they will include.

It will be found very convenient to use a soft pencil. Never use a hard pencil on your drawings, no matter whether they are the sketches or scale drawings.

It is very necessary for a draftsman to know how to make preliminary sketches. Very often a new draftsman's ability along architectural lines is tested by these preliminary sketches, their make-up, the method of getting them out, and the time taken to get them ready. If a firm finds out that you can make attractive and yet practical preliminary sketches, you will soon find out that you will not be required to serve your time at tracing drawings or details, as most draftsmen have to do upon entering a new office.

Perspective Sketches. A **perspective** is a representation of a building or object as it appears from a fixed point. These sketches are usually drawn at a small scale, either freehand or mechanically. The lines should be lightly drawn or sketched, as strong lines will be objectionable in the **rendering** or **coloring** of the drawing. The rendering may be in pencil, ink, water-color, or sometimes in crayon, and prepared upon almost any kind of paper (see Fig. 5).

Competition Drawings. These are more or less preliminary sketches. As a general thing it is only occasionally that a firm enters a competition; but if it should, let the draftsman show that he knows how to prepare such drawings. By **competition drawings,** we mean drawings that are submitted in a competition. The firms

may be invited to submit competition designs, in which case it is called a **closed competition**; or the requirements may be published in some

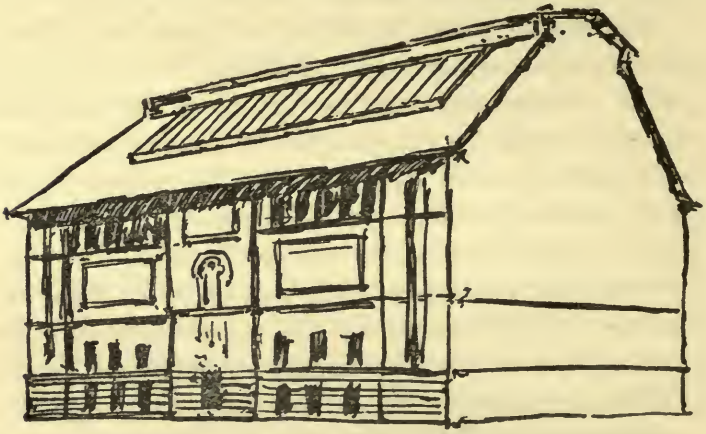


Fig. 5. A Freehand Perspective Sketch.

architectural paper, and anyone may submit drawings, in which case it is called an **open competition.** The drawings submitted for the open competition are more of the nature of sketches than in the closed competition. Usually, in the closed competition, each firm invited to submit drawings will be paid for their work even though unsuccessful in being the winner. There is generally a sum paid for such drawings. Thus, in a closed competition, an architect is paid for his time and can afford to get out a better class of drawings. These are usually drawn on regular drawing paper, carefully laid out to scale, and all inked in. The sheet is then water-colored and made as attractive as possible

in this manner. In other words, these drawings are laid out as carefully, except at a much smaller scale, as working drawings; only the important dimensions are put on.

In the open competition, the work is usually done on tracing paper. The plans are laid out at a small scale, made very sketchy, and the pencil is allowed much freedom in the lines. With this sort of drawing, it is necessary to study the requirements, make sketches, and decide for yourself which answers the requirements the best. There will be no client to criticise your work, but you will have to do this for yourself and submit your sketches as final sketches to the client. The first-floor plan is laid out, and the surrounding premises are also laid out. Trees and shrubbery also are put on; and walks, drives, and gardens are shown. Since this is on tracing paper, very little water-color is used. Use the pencil to show everything, and upon your ability to use your pencil—and a soft one, too—will depend much of the success of your drawings. After these sketches have been made, they are lettered and titled attractively, and then mounted on cardboard. This mounting is usually done by pasting the corners only, and not attempting to paste the whole drawing. Ordinarily, a border of some sort is placed around the card, and any other finishing touches that will make the drawing attract attention are added. Thus we see that competi-

tion drawings are only preliminary sketches finished a little better than for the ordinary class of work.

Should you be successful in the competition, the method of getting out the working drawings, scale details, and other drawings, is the same as for any other work.

The chances are that you will rarely have a chance to get out competition drawings; but should the opportunity come, grasp it, and do your best.

Working Drawings

By **working drawings** we mean drawings complete in every respect, with dimensions, sizes of rooms, etc. In other words, they are the drawings giving all the necessary information to completely build the structure as drawn. This division of drawings may be divided into **general** and **detail drawings**, the latter being subdivided into **scale** and **full-size.**

The architect who is mindful of his client's welfare will furnish a complete set of drawings. The clearest, simplest, and most exact working drawing is the best. Some architects feel that working drawings do not require the best work. The making of good, clear, complete drawings cannot be emphasized too strongly.

The Plan. In the plan we see an arrangement of the rooms for the different floors that approaches the ideal as nearly as possible. The plan should present the conveniences of arrange-

ment. In the following description we shall consider the plan of a residence, as it will clearly set forth the logical arrangement of parts. The description, as noted, will be limited to residence work, since this class of building is likely to afford a student his first opportunity for independent, original work.

The same reasoning could be extended and applied to any class of building. Usually the first-floor plan is worked out first, as it is the most important, since the greater part of the day is spent in this portion of the house. The upper floors, being used almost entirely for bedrooms or minor rooms, can be worked out to conform to the outline of the first-floor plan. The basement usually is devoted to the heating apparatus and its accessories, the laundry, storerooms, and such. Therefore, the first-floor plan will govern the outline of the basement walls; and the basement rooms will be arranged inside the basement walls, as determined by the first-floor plan.

In residence work we see two classifications—the **city house** and the **country house.** The city house gets its sunlight from the front and rear, being usually built in between adjacent houses where there is no chance of sunlight from the sides. A country house gets its light from all four sides; that is, it is built in a part of town where the lots are of sufficient width to give plenty of light and air. The city house

usually has a lot 20 to 30 feet wide, and it is a question of the best arrangement for light as well as comfort. The country house usually has a lot 50 to 60 feet wide; and it is not uncommon to see a house built on two lots, giving all the more room.

Let us, therefore, consider the first-floor plan. Upon entering a residence, we usually step into a **vestibule.** This room, while small and inferior, yet is one of the most important rooms in the house. The vestibule should be **well lighted,** which can be done by means of glass in the front door, by side lights along the sides of the door, by a transom, and by glass in the door leading into the living room. The vestibule should be provided if possible with a closet (it need not be large), in which a person's everyday hats and wraps may be kept, also all rubbers and umbrellas. It is very evident that this will be the first need upon entering a home—a place to dispose of one's coat, hat, etc., before entering the home proper. It is all the more urgent in a mild, rainy climate. In case a closet cannot be provided, there should be a seat with a hinged cover, and a stand for umbrellas, with the usual furniture for holding the coats and hats. This room, as already said, need not be large, as usually not more than two people are ever in the room at the same time. In some residences there is no vestibule, but it is almost a necessity in the best class of work.

From the vestibule, we now come to the **reception room.** This room is usually large, with but little furniture. The main stairway leads up from one side of this room and is made quite ornamental. The other side is usually open, or separated by columns or grill-work from the living room. At one end of the reception room, one frequently sees a fireplace, more or less elaborate.

Turning now to the **living room,** let us study the requirements of this room. Here is the room the family will spend most of the time in. Often one end is set apart for a nook or library. There should be a large open room with a fireplace of brick or stone or tile or other suitable material, ornamental or plain, or the mantel may be of wood.

Provide plenty of windows, especially on the sunny side of the house. Nothing will dispel gloomy feelings or worry quicker than plenty of sunlight and fresh air. For the nook, if there is one, build in shelves for books, put in a seat with a hinged cover, also a fireplace. In this room, the quiet hours of the day are spent; therefore make it comfortable and convenient. A very convenient arrangement is to place a seat on one side, with bookshelves on the other; also a few shelves at one end or above the seat, for current books or periodicals. Provide a plate-rail around this nook, for the placing of china, ornaments, or bric-a-brac.

Opening from the living room we usually

find the **dining room,** separated by sliding doors. This room should be more or less private, but by means of double doors it may be thrown open when desired. In the dining room, build in a sideboard, and provide a small shelf or two for pretty china, vases, or ornaments. Back of these shelves a mirror is usually set. A French beveled-plate mirror is used in the best work. There should be the "counter," or the main shelf, projecting from two to six inches beyond the shelves and drawers below. Below the counter, provide a long drawer that will take a table-cloth as folded when laundered. A drawer for silver is also directly under the counter. Below this, there may be either drawers for other table linen, or shelves enclosed by glass doors for displaying china or cut glass. This sideboard should be made an attractive feature of the room. There might also be another case of shelves and drawers for additional table linen and dishes. There should be a plate-rail around the room, on which to hang cups or to place china or ornaments. This room should have, if possible, an east exposure, since the first meal of the day should be served in a bright, cheery atmosphere.

It will be necessary to have a **serving pantry** between the dining room and kitchen. There should be double-acting doors. This greatly facilitates the carrying of dishes from one room to another. In this pantry should be a wide shelf or counter which will be used in the prep-

aration of the meal. Above are shelves with sliding doors, and below are drawers for different articles of food. Provide always plenty of drawers and shelf room. In a small room, sliding doors will be found much more convenient than swing doors, as they are much more easily handled and take up much less room in opening and closing. If possible, there should be built in this room a refrigerator. If not here, place it in the kitchen. This refrigerator should be provided with an outside door through which the ice may be replenished from the outside, thereby doing away with the ice man coming in at all hours and in bad weather tracking mud into the house.

The **kitchen,** while in the rear of the house, requires careful thought. The housekeeper usually spends the greater part of the morning here; therefore give this room, if possible, an east exposure. Make the windows low enough so that a person sitting can see out. For the kitchen table and sink, have a window near. This will not only be an aid to better light, but will give the housekeeper a chance to see out through the window. Place a sink as near the pantry and dining room as possible; also, as mentioned above, so as to be near outside light. In the kitchen will be found a cooking range or gas stove, or both. Place these, if possible, where they will get a cross-draft; in other words, place them between a door and a window, or between windows, so that the odor during

the preparation of a meal will be carried away. Of course there is necessary a flue for the range, and there should also be one for the gas stove to carry off the odors of the gas and the ovens. The kitchen table should be convenient to the stoves. There should be built-in shelves and cupboards for the kitchen-ware and the pots and kettles. Either in the serving pantry or somewhere in the kitchen, provide a tilting bin for the flour. This can be very easily done by making the bin pivoted at the outside corners, to allow the bin to tilt out. Hooks or pivots for swinging a barrel of sugar would also be a great convenience. Do not make the kitchen large; make it small, compact, and convenient, to save the housekeeper all unnecessary steps. There will also be necessary rear stairs, one to the basement and one to the attic. These stairs should be about 3 feet 6 inches wide, as boxes, furniture, etc., are all taken up or down these stairs; so do not make them too small.

Having decided upon a satisfactory arrangement of the lower floor, we now consider the upper floors. These are devoted to the **bedrooms** and other rooms where more privacy is desired, such as the **sewing room**, the **study**, or the **nursery**. As has been said, the first-floor plan determines the outline of the second-floor plan. The number of bedrooms is determined by the size of the family. There will be required also a guest room and a servant's room.

As to the requirements of a bedroom, make

ample-sized rooms. The usual articles of furniture will be the bed, a dresser, a chiffonier, a small table, and sometimes a writing desk or an additional table of some sort. Provide plenty of closet room, with a window, if possible, in it. In the closet should be a number of shelves, a hook strip around the three sides. The closet should be finished, so far as plaster and inside finish are concerned, as well as the other rooms. The question of closets is important; therefore, consider them an essential part of every house.

On the second floor provide a **bathroom** convenient to all rooms, yet far enough away from the main hall to be private. The bathroom is usually crowded into any remaining space that may be left after bedrooms have been consid-

Fig. 6. Layout of a Very Small Bathroom.

ered. This, however, is not a satisfactory way of doing, since the bathroom should be as convenient in arrangement as any other room. In the bathroom the usual necessary fixtures are a bathtub, a lavatory or wash-bowl, and a water-closet. In more expensive homes a foot-bath and a sitz bath are provided; sometimes a shower bath also. There should be ample room for the placing of these fixtures, with plenty of

room around them. In Fig. 6 is shown the smallest room that can accommodate the necessary fixtures. While this will serve in the cheapest houses, yet the arrangements shown in Figs. 7 and 8 are much better.

Should more fixtures be added, the room

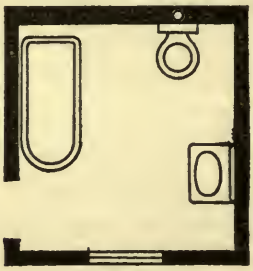


Fig. 7.

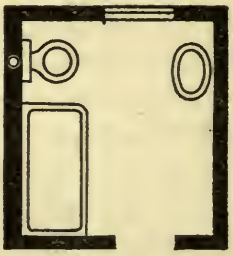


Fig. 8.

Two Plans of Commodious Bathrooms.

should also be made larger to accommodate them. There will also be required a medicine chest, usually built into the wall directly above the lavatory, or these can be bought at furniture stores, ready to hang on the wall. There should always be a mirror in the door of this chest. Provide a built-in closet with swing doors for the upper half and drawers for the lower half. The finish of this room, as well as the shape of the mouldings, should be such that the dust will not easily settle on them, and that they may be frequently washed to remove any accumulation of dust.

In most homes, the two main floors are all that are required for living rooms. The attic is usually low, and can be fitted up with store-

ILLUSTRATING EVIL EFFECT OF DISREGARDING BUILDING LINE.

rooms. The construction of the roof should be such that soot and dirt cannot come through. This is ordinarily accomplished by using building paper under the shingles or roof covering. There should be an attic stairs, convenient and easy of ascent.

For the **basement,** the **furnace** will require a part of the space, together with a **coal room.** This coal room should be built dust-tight, and have a window convenient to a driveway for the unloading of coal. The size of coal room for different classes of coal, is indicated below under the heading "Dimensions." There should be a **laundry** with laundry tubs, or a room where the family washing may be done. The remaining space in the basement may be divided to suit the owner's wishes; sometimes a work-room, a store-room, a drying room, a shop, may be placed here.

It is very essential to have a **concrete floor** over the entire basement. This will do away with a great deal of dirt and dust that otherwise would be carried from the basement all over the house. There should be an outside entrance, as well as an entrance from the kitchen or serving room.

Thus we see the usual requirements for the different rooms of the house. The essential rooms have been considered. In addition to these, if the price will warrant it, there may be other rooms and conveniences, such as a den or study, additional store-rooms, an extra guest

room, a nursery, a pantry off the kitchen for storing the supplies of the kitchen. A clothes-chute would be very convenient also. This chute is a vertical shaft connecting the bathroom with the laundry in the basement. There is a door into this chute at the bathroom, and one on the first floor. It should be lined with wood, with the pieces placed vertically to offer no obstructions to the passage of clothes. The purpose is evident, being a means of conveying the soiled linen from the second and first floors to the basement, and thereby saving carrying them from all over the house in a basket to the basement.

In summing up this portion of the work, let the draftsman put in all conveniences in the way of cupboards, shelves, and drawers wherever there is a space, corner, or portion of a wall. In this way you make a favorable impression upon the housekeeper, and if this is done, the "battle is more than half won."

Fig. 9 is a first-floor plan, showing the arrangement, the dimensions, and all necessary information to give the builder a complete understanding of the work.

The Elevation. Having considered briefly the general methods used in the drawing of architectural **plans,** we shall now consider the **elevations.** By elevations we mean the different "views" of the building. These should show exactly the appearance of the building when completed.

Use of the Orders. It will be assumed that

the reader is familiar with the Orders of Architecture (see below under heading "Orders of Architecture"), and that he knows the names of the various parts of an Order.

From a study of the Orders, we see that each one has three main divisions, the **entablature,** the **column,** and the **pedestal.** These are in turn divided into parts, the entablature consisting of the **cornice,** the **frieze,** and the **architrave;** the column has a **capital,** a **shaft,** and a **base** or **plinth;** and the pedestal, a **cap,** a **die,** and a **base.** Generally speaking, an elevation—especially the principal one—shows these component parts of an Order. They may not be classically correct in proportions, but the parts are more or less prominent, and should be used as a basis for design of all classes of work.

Let us take a **residence** for an example. Study an elevation of a good type of this class of building. We see that the **basement wall** up to the first-floor line corresponds to the pedestal of the column, a strong, massive part to support the building above. This pedestal is usually capped by a projecting course we call a **water-table**—that is, a board or strip projecting from the face of a wall to turn the water from the side of the building away from the foundation. This corresponds to the base or plinth of the column. Above the water-table, the part of the house extending to above the top story windows corresponds to the shaft of the column. Very often this column effect is emphasized by means

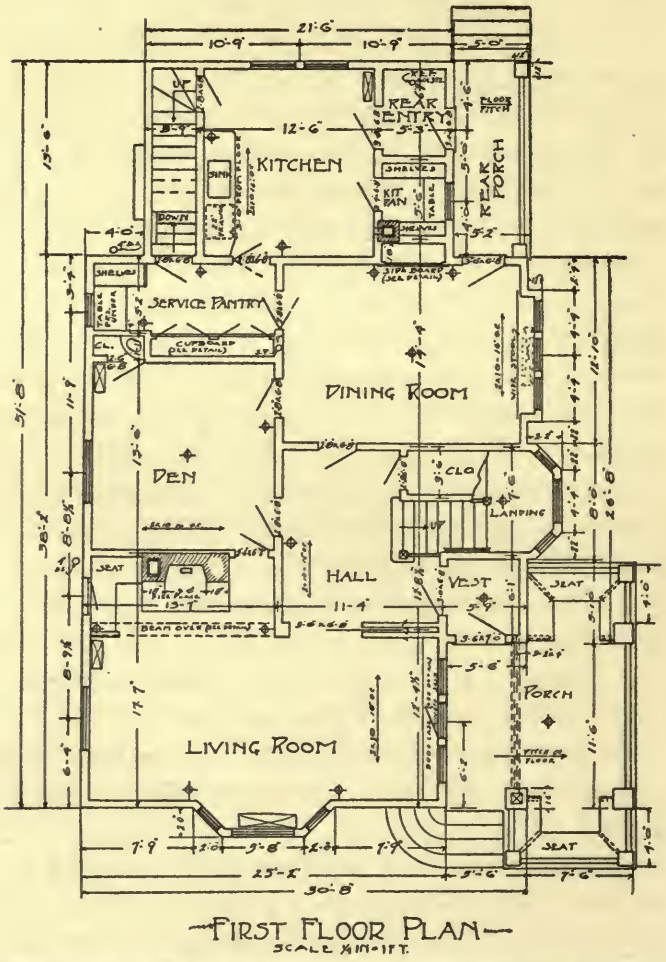


Fig. 9. First-Floor Plan of a Residence at Champaign, Ill. The scale reproduced is valid only as referring to the original-sized drawing.

of corner boards at the corners of the building. At the head of the top windows, or in that vicinity, we see a horizontal board or moulding, marking the division between the column and the entablature. Sometimes this entablature is divided by another moulded course, indicating the frieze and the architrave. There is always a **cornice** of some sort, very often corresponding to the cornice of the Order; this may vary from the true profile to a small projection, such as a few projecting courses of brick.

In the modern **office building** we see the lower stories marked by a projecting stone course; below this, the walls are of stone, and usually present a solid, substantial base upon which rests the upper part of the building. The column is indicated either by pilasters or column-like projections from the main face of the building, or by a three-quarter column fastened to the building. The upper stories, depending upon the height of the building, are placed in the entablature.

It is worth while to study this feature in all classes of building, in order to design intelligently.

Thus we see that the Orders of Architecture are really the basis for all our designs. This same applies to any type of building, being more marked in some classes of buildings than others. The **Colonial residence** or **Colonial Architecture** adheres strictly to this basis of ornament. If detached or free columns are used for porch construction, then we see the component parts of

the Order carried out exactly. Therefore, in any building, use the Order to start the general elevations, and elaborate or suit the elevation to the class of building.

Characteristics of Types of Buildings

Let us now consider the general types of buildings for different purposes. The **residence,** for instance, usually has the appearance of a quiet, restful place. The types of doors, windows, and roof lines are in general similar, there being large windows and plenty of them. Residences thus constitute a class marked by well-known and easily distinguishable general characteristics.

Consider a **library.** We see here a closer adherence to the Orders than in many other types of structure. Usually there is a pillared entrance of some form or other; the windows are all large and dignified. The roof is covered with tile or some other more expensive covering. In general, libraries are a dignified class of buildings, easily distinguished as such, and usually quite costly.

In **schoolhouses** we see a class of buildings with large areas devoted to windows, not usually of very great height, and with a tower of some outline. There may be large, blank walls, which make this class of buildings all the more distinct.

The **office building** generally has numerous windows, not usually grouped but placed one above the other, and is rather plain in treatment except at the cornice.

The **warehouse** forms another excellent example of the exterior indicating the purpose of the building. In this type, we see small windows, some barred, with heavy doors, showing it to be a building of great strength and fire-resistance.

Thus endeavor, in designing any building, to make it indicative of the purpose for which it is designed. Study carefully from examples or from pictures these characteristics, and apply these principles to designs you may submit.

General Composition of a Building or Treatment of Elevations. A few words about the general composition or elevation of a building might be said. There are a few principles involved that will be an aid in deciding upon the character of the elevation.

Fig. 10. Illustrating Method of Treating Elevations. In A, vertical lines are emphasized, adding to the appearance of height; in B, emphasis is laid on the horizontal lines, adding to breadth and length of structure.

The adjoining buildings will sometimes have a certain influence upon the treatment of the elevation. Should the new building be placed between two buildings taller and larger in every way, then some means to increase the general height must be used. Should there be plenty of room and the buildings on either side be far

enough away so that they will not be seen or included in the general view of the new building, then the design may be anything in keeping with good design. If the present buildings are large and massive, covering a good deal of ground, then we shall treat the new elevation correspondingly. In Fig. 10 are shown the results, on the same building, of different treatments of elevation. In **A** we see vertical lines emphasized, as they tend to increase the height. Such a treatment of the elevation should be used if the location were between two taller buildings. In **B** on the other hand, the horizontal lines are emphasized. There is the sill course or water-table at

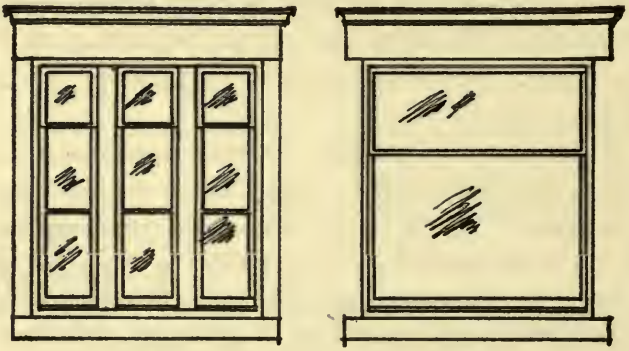


Fig. 11. Two Typical Methods of Treating Windows.

the first-floor line; then a belt course about the second-floor line, and a course at the attic line. These tend to lengthen the general appearance, and would be in keeping as mentioned above for the third condition. In **A**, we see that the cornice is made smaller; while in **B**, the eaves are

given a greater projection, thereby giving another horizontal line. **A** and **B** are exactly the same size in plan and also in height to the eave line; yet there is no mistaking which appears the taller.

This is the fundamental principle in the design of an elevation. Having then this start for the elevation, carry out the same principle in the windows, either grouping them and keeping them low, for the design **B**; or else use single windows with a pier or wall space between. Very often, if the ceilings are high enough, windows may have a transom bar and transom, thereby increasing the height. In the treatment around the windows, for **B**, we shall use merely a cap of some kind with no vertical lines; while for **A** we shall make use of an outside trim with a cap. See Fig. 11.

In all our designs, it has been attempted to emphasize either the vertical lines or the horizontal lines. This is but one—the most important one, however—of the points to consider as to the general character of the elevation. The purpose of the elevation is to give an effect that will be pleasing to the eye, and at the same time fulfil the requirements of the plan as to the arrangement of windows and story heights; and very often it will make the property more valuable. For, consider two residences offered for sale at the same price, with the same surroundings. One has been built with no idea as to design or relation to the surrounding buildings; the

other has been treated to correspond with the existing conditions, has been made attractive by the arrangement and style of windows, and the cornice has been designed to give a certain effect to the other parts of the design. There is no question which would be the best investment. Work, then, with this end in view, as if it were your own builidng, and you wanted it to be the very best for the money.

In drawing the elevations, usually each side of the house is shown on the drawings. The **front elevation** is made the most complete. The owner wants to see how his building will look when completed; therefore show the materials. If the walls are shingled, indicate by lines that there are to be shingles—not by covering the entire front with perfectly regular, mechanical lines representing the shingles, but with patches here and there over the entire front. Indicate by arrows and lines, similar to dimension lines, where the shingles are to be used. Indicate the brick of the foundation above grade the same way. Show the type of windows you expect to use; show the correct profile or outline of the cornice; the general design of the front door and the porch and steps; indicate the glass in the door, whether double strength, plate, or beveled-plate glass. In short, make this front elevation complete, so that an owner can see just the materials used, where used, and just how the building will look from the front. Very often the stairs are dotted on this elevation to show just how they go

up to the next floor above; but this is not to be recommended, as it detracts from the general appearance of the elevation, and there are other and better methods of indicating stairs, as explained later.

Very often there will be a small section of the house on the same sheet with the front elevation.

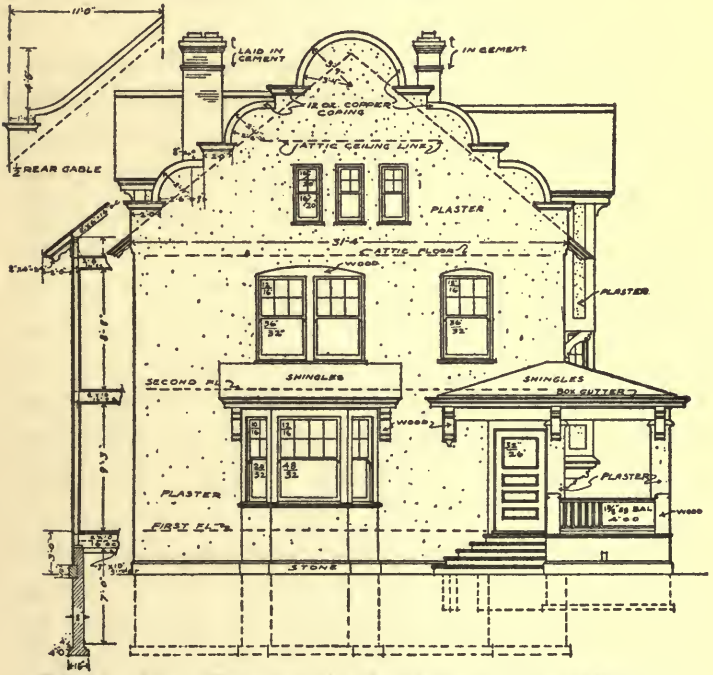


Fig. 12. Front Elevation of a Residence at Champaign, Ill. Outline emphasized.

This is used to give the heights of the floor-lines, the window lines, and the cornice lines, and not for showing of details. This is not objectionable, as the section is a separate drawing entirely from the elevation, and will give a means of showing

the above data without marking them directly on the elevation.

Too much emphasis cannot be laid upon the method of finishing the front elevation. A little time and careful work spent on this drawing will very often confirm a favorable impression on the owner. The style of letter used and the arrangement on the sheet should all tend to make the drawing attractive.

As a final touch, it will be found very desirable, after the elevation is complete, to outline the building with a heavy line, thus emphasizing the general outline of the building, while the other lines are all uniform but lighter (see Fig. 12).

The **side and rear elevations** should also be complete in that they should show the exact materials used and the exact size and spacing of the openings; but they need not be so carefully drawn nor so carefully lettered as the front elevation, since they are more or less a secondary consideration.

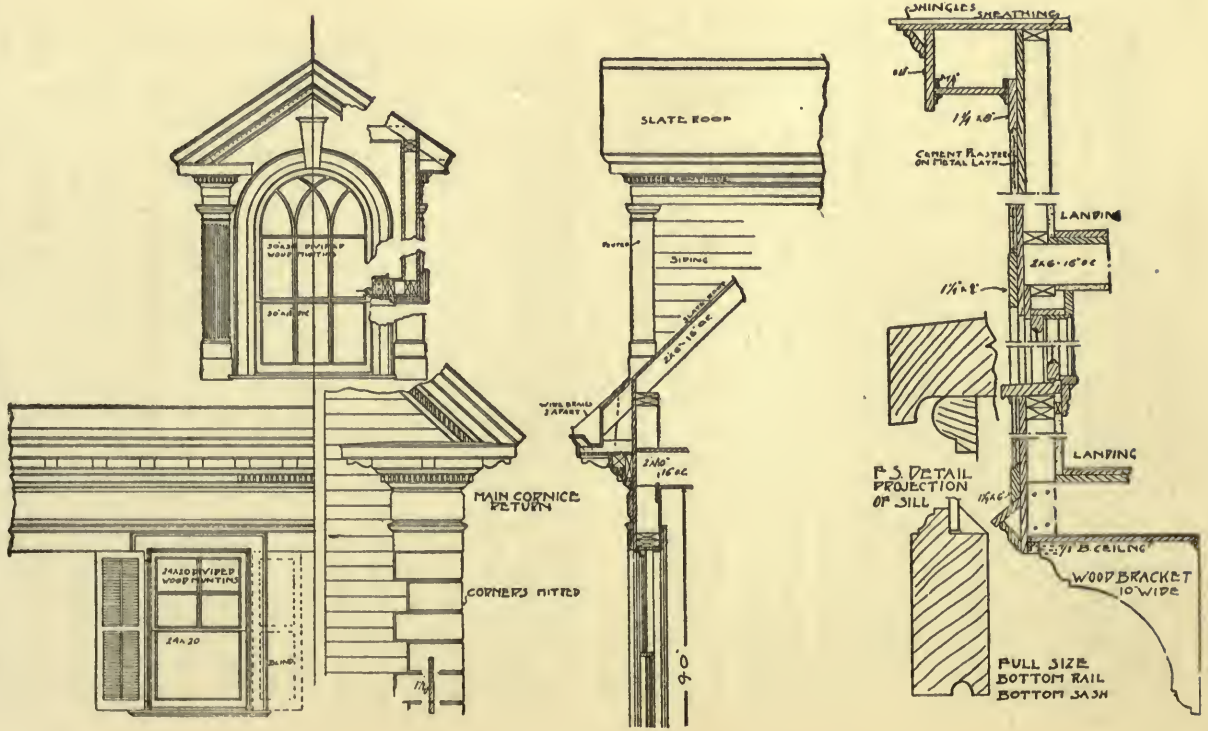
The **location of openings** should be studied with the idea of the general effect on the elevation, as well as on the necessary arrangement for the rooms. In other words, do not locate all openings on the plans definitely without studying the elevations also. Be sure that the openings are correctly located on the elevations so that the plans and elevations will agree, and not merely put on the elevations where they look the best without any reference to the plans.

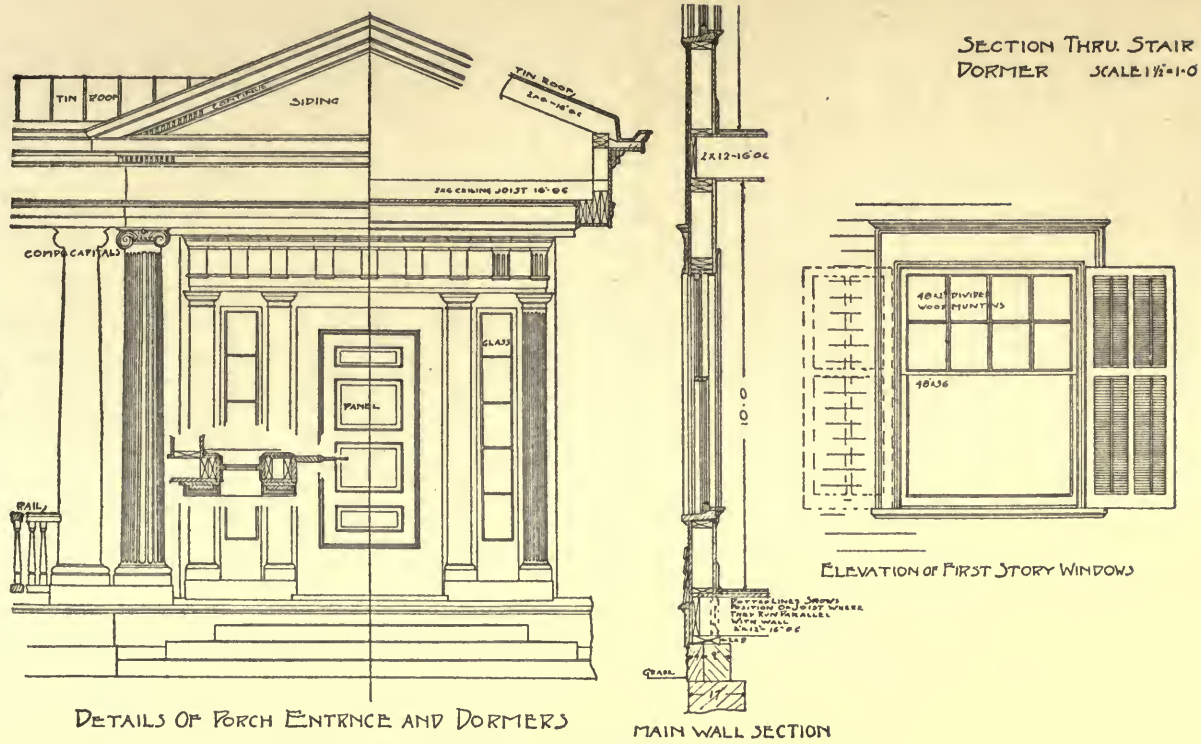
To sum up, make the elevations true pictures of the building when completed; indicate the extent of all materials; study the design, making it typical of the class of building in hand, and make it complete in every respect.

Scale Details

The Section. Having completed the plans and elevations, it will be necessary to make large-scale sections through different parts of the building. A section should be shown through every portion of the building that is of different construction from others. These sections are usually of a larger scale than the plans and elevations.

In Fig. 13 we see the method of drawing and finishing these details. A scale very convenient for use is three-quarters of an inch equals one foot (or, as it is often called, a "three-quarter-inch" scale). The purpose of these sections is to show exactly how the building is to be put up—the method of supporting the cornice on the plate; the roof sheathing and covering; the construction of the gutter, with all materials named; the ceiling joists and method of support on the outside wall; the lath and plaster; the wall sheathing and siding or shingles; the picture mould; the detail of the inside window trim; the base around the room; the second-floor construction, showing size of joists and method of support on the wall; the composition of the floor, whether double or single, or any paper between


SLATE ROOF
SIDING
MAIN CORNICE RETURN
CORNERS MITRED
SHINGLES
SHEATHING
CEMENT PLASTER ON METAL LATH
LANDING
LANDING
F.S. DETAIL PROJECTION OF SILL
WOOD BRACKET 10" WIDE
FULL SIZE
BOTTOM RAIL
BOTTOM SASH



DETAILS OF PORCH ENTRNCE AND DORMERS

MAIN WALL SECTION

ELEVATION OF FIRST STORY WINDOWS

Fig. 13. Scale Details of a Residence at Albany, N. Y.

the floors; the lath and plaster of the ceiling below; the details of the window construction, trim and stool or inside sill; the base around the room; the method of supporting the frame wall upon the basement wall; the water-table; the thickness of the basement wall; the level of the ground on the outside; the basement floor inside; and the footing.

Use plenty of dimension lines and explanatory notes. In dimensioning story heights, always give from finished floor-line to finished floor-line, or from floor to ceiling; never dimension the thickness of the floor construction. In other words, referring to Fig. 13, we shall get into trouble by trying to specify exactly the thickness over all. This should be left without a dimension, by showing the plaster, noting the size of joists, and showing the floor, whether one or two thicknesses, let it come what it will. The thickness of the plaster will vary slightly; a 2-inch by 10-inch joist is not 10 inches deep; neither is a floor of two thicknesses 2 inches thick. Thus we see it is rather an uncertain dimension.

A sheet is usually devoted to these details. Sometimes as many as half a dozen different sections are drawn for a residence, each showing differences in construction.

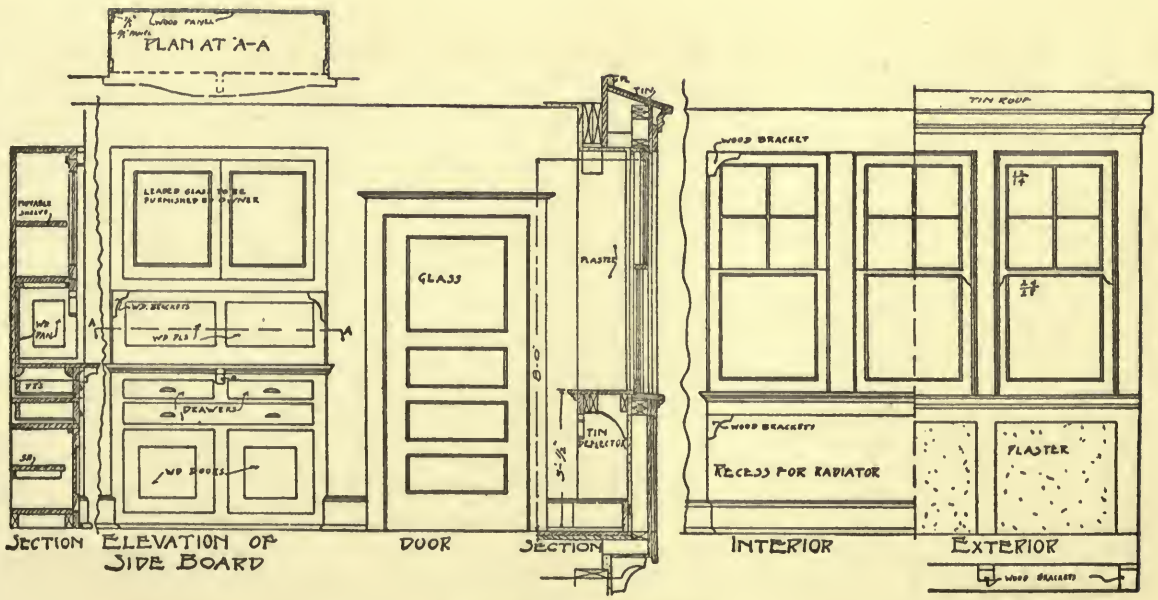
Be very careful to note on the plans just where each section is taken, and put corresponding letters on the title for the section. The use of notes and plenty of them cannot be urged too

DESIGN FOR AN ARCH, FROM SAXON-NORMAN DETAILS.

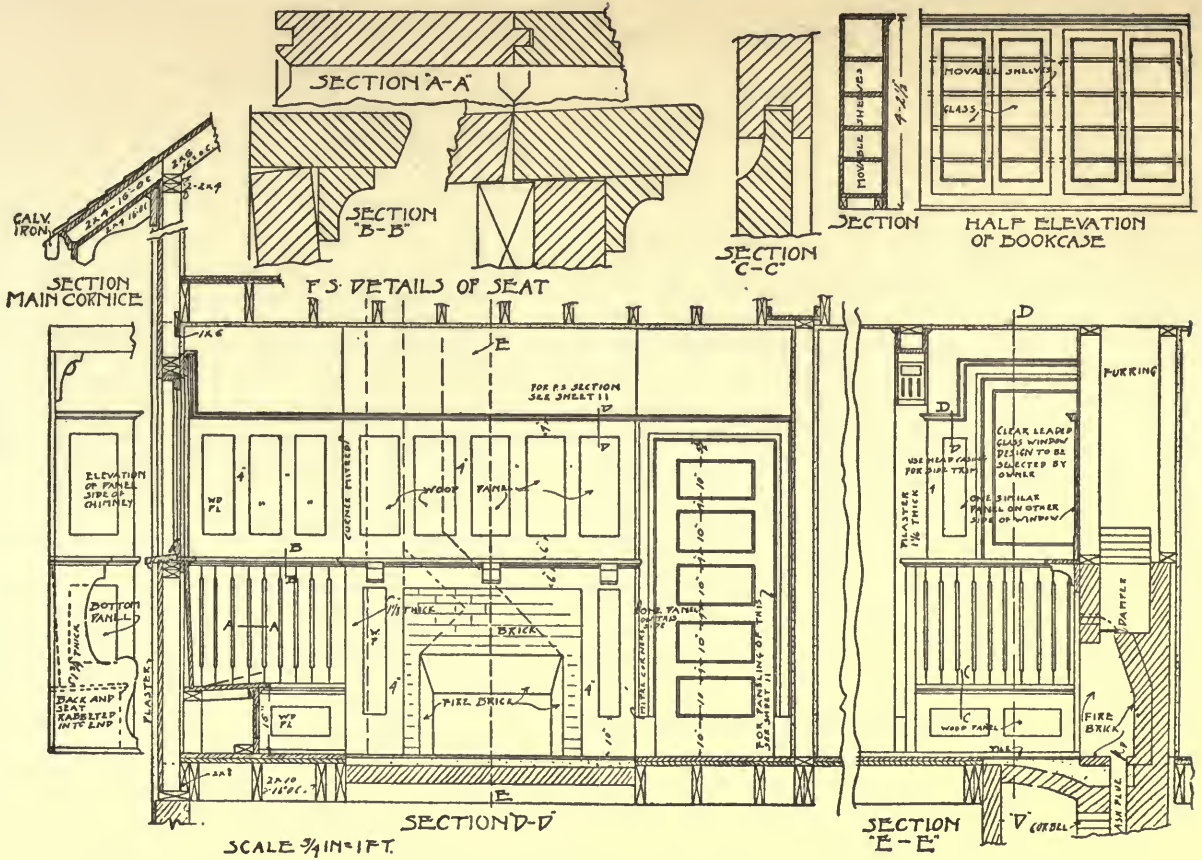
strongly. The small working drawings are very unreliable as to details; and consequently the more details, the better the contractor will understand just exactly what he is to furnish, and will therefore be able to figure the more closely. These details, well executed, will prevent many disputes between contractor and architect, and between architect and owner, as well as save the "extra" bills from the contractor which are sure to arise from incomplete drawings.

Cross-hatch or cross-section all sections or materials that are cut in two, using some standard symbol, as elsewhere indicated, on the drawings. This makes a much better looking drawing, and makes it much easier to interpret.

To indicate further the general treatment of the interior finish, the rooms having anything in the way of a paneled wainscot, beamed ceiling, or finish around a fireplace, also the sideboard, cupboards, and pantry fittings, should all be shown. The best and perhaps the most common method is to draw at one-quarter-inch scale the different elevations of the rooms, showing exactly the height, width, and any features of unusual arrangement. Should opposite sides of a room or any sides be similar, after putting the title on one drawing, note under it: "Opposite, north, south, etc., sides similar." There is usually one sheet of just such drawings as this to accompany the regular set of drawings. Since plans are usually submitted to competitive contractors, there is not the chance of one pro-



Details of Dining Room.



Details of Living Room.

Fig. 14. Part Details of a Residence at Champaign, Ill. Originals drawn at scale of ¾" = 1'-0".

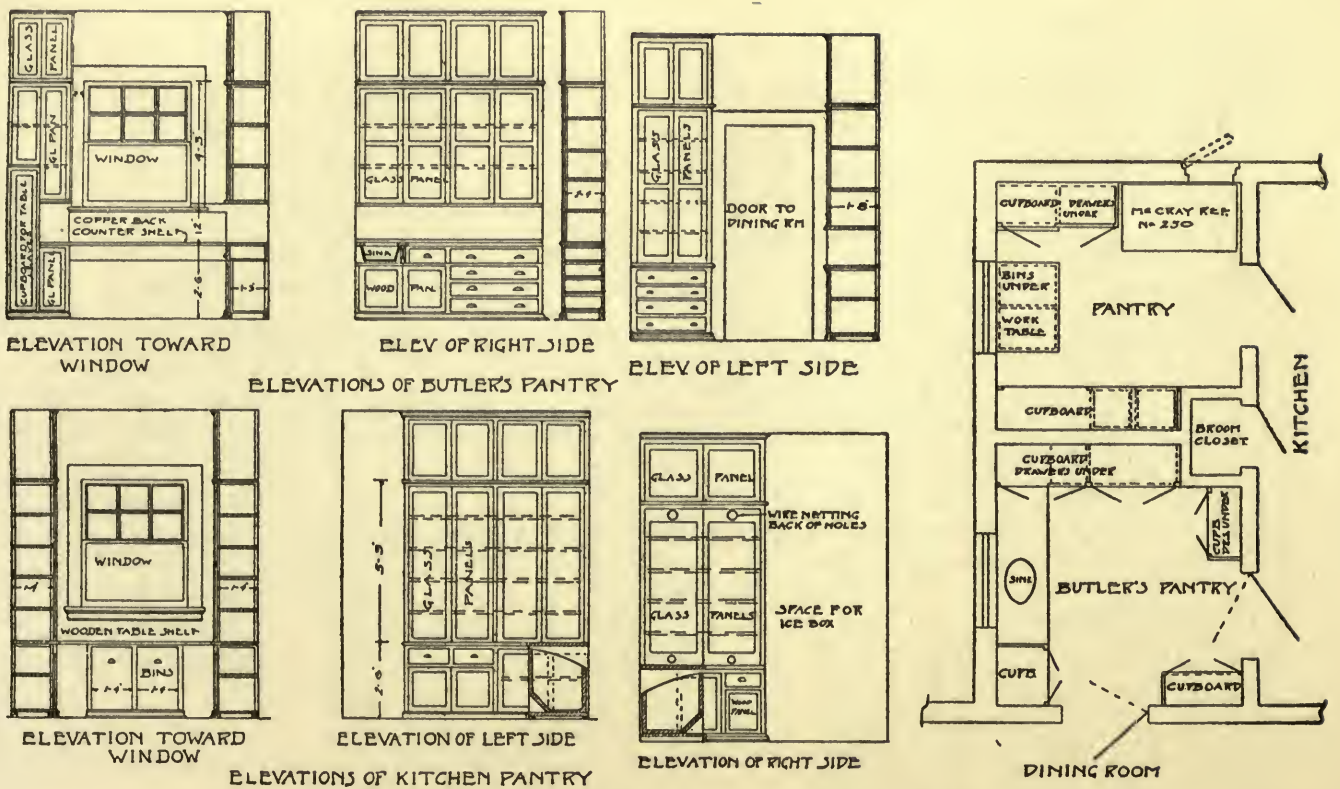


Fig. 15. Cupboard Details of a Residence at Albany, N. Y.

posal or bid being lower than another because certain things were overlooked or purposely omitted.

In Fig. 14 we see drawings of elevations and sections of various portions of a living room and dining room, giving all necessary information.

Fig. 15 illustrates completely the drawings necessary to show a pantry and butler's pantry.

Full-Sizing. After the contract has been awarded, the general working drawings will have to be supplemented by drawings of different portions of the work at a large scale. Usually these are drawn at actual or **full size.** In order to have your profiles and outlines made just as you intended, this method of drawing all parts of construction at the actual size is imperative.

Take an example. You wish the plate-rail in the dining room made just so. Then you will have to draw this part of the work the actual size. If you do not do this, the contractor will put in a plate-rail of a stock pattern; that is, he will select some pattern that he can buy from a planing mill, and will use this. It is the cheapest way to do, for him; therefore you cannot blame him for saving anything he can, if the exact style is not definitely shown.

In full-sizing, it will be well for the draftsman to be familiar with the usual method of doing things, making his details practical as well as indicating the profile. The cornice should be shown; the interior finish; the method of mak-

ing the window-frames; all unusual woodwork; the construction of the beams for a beamed ceiling; all sheet-metal work, such as gutters, cornices, etc.; all stonework, such as water-tables, window-sills, and door-step; all plaster work, such as ornamental cornices, and method of supporting under unusual conditions. You will hear it asked: "Why is it necessary to spend all this time detailing, when the contractor or the planing mill have their own way of doing these things?" There is just the point. They certainly have a way of doing things; but naturally their way is the cheapest way; therefore, give them details of how you want this work done, and see that it is done your way. Dimensions on full-size details are unnecessary.

Fig. 16 is a reproduction of a sheet of full-size details.

A word might be said as to the method of getting out these details. The drawing is first made on **detail paper,** a heavy yellow paper. A soft pencil should be used, as it makes the lines more distinct and is easily changed or erased. After the drawing is completed on this paper, then use a cheap, thin paper, and trace through, using a broad, heavy line and colored crayon for cross-sectioning the sections of the work. Yellow is generally used for wood, red for brick, green for stone, blue for iron or steel, and brown for terra-cotta. A second tracing is also made. Thus we have three copies of each detail—one for filing in the office for future reference, and

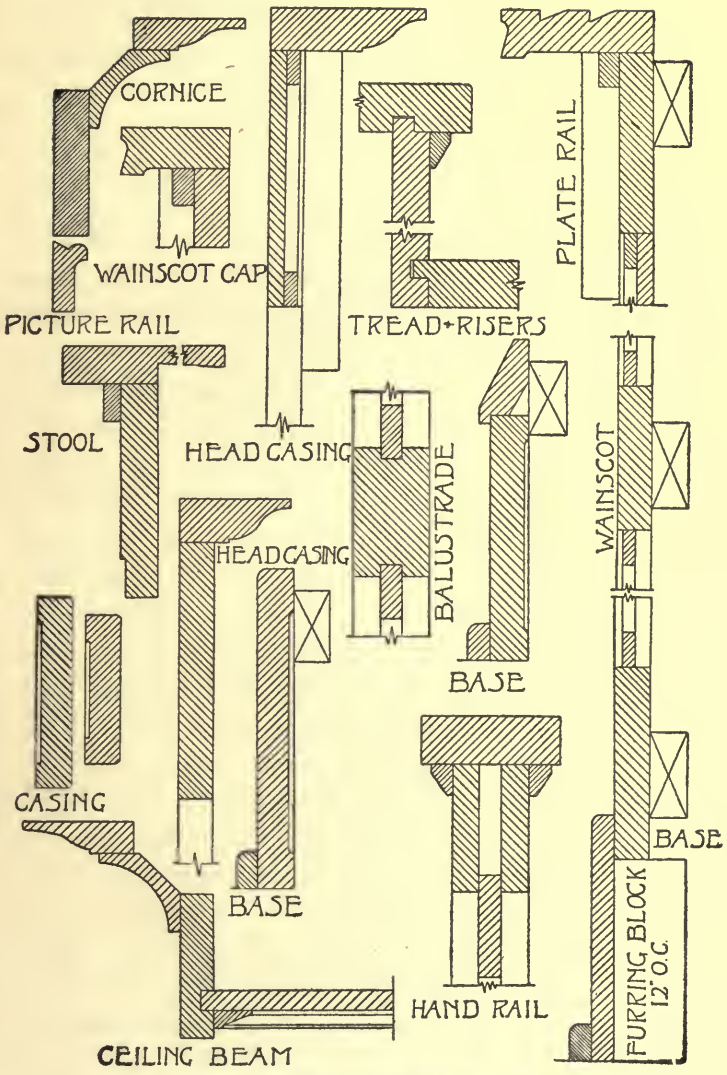


Fig. 16. A Sheet of Full-Sized Details

two for the contractor. One of the copies made on tracing paper is usually kept in the office, since it can be folded up to a convenient size and filed, the original and one copy on thin paper going to the contractor.

REPRODUCING DRAWINGS

The question of the method of reproducing drawings is an important one as to cost and time consumed. New methods are being advertised on the market every day.

Blue-Printing. The blue-print process is the commonest, and generally speaking the cheapest. There is a chemically prepared paper which is sensitive to the light. The paper is treated with a solution of citrate of iron, ammonia, and red prussiate of potash, and is placed in a dark room to dry. The drawing has previously been prepared on tracing cloth or paper. When the blue-print paper is dry, place the drawing, face down, on a sheet of glass, usually held in a wooden frame; over this, lay the blue-print paper, with the sensitive side down; over this, place a layer or two of soft cloth similar to Canton flannel, and over this place a board backing.

Turn the frame over now, and expose to the sunlight for a few minutes, depending upon the intensity of the sunlight. After exposure, remove the blue-print paper, which has turned to a dark bronze color, and place it in a tank of water. Gradually the print comes out in white

lines, leaving the background blue. These white lines were directly under the ink lines of your drawing, and the sun therefore could not attack that portion of the paper. Hence the water washed off the blue-print solution, leaving the white paper.

A little experience will soon teach how long to expose in different kinds of weather. Prints may be made on cloudy days, and have sometimes been made even during a mist. The exposure, of course, must be much longer on such days. The prints from such exposures are not so clear, distinct, and "sharp-cut" as those made on bright days. When possible, avoid making blue-prints on dark days, if you expect the best results.

Paper for blue-printing can be procured ready to use, from dealers all over the country, at a nominal cost. This is machine-prepared, and is more satisfactory than home-made.

Blue-prints are hard on the eyes, and, having a blue background, cannot be dimensioned, noted, or to any great extent changed. Should small alterations be necessary on the blue-print, use a solution of common soda and water with a pen. This is not very satisfactory, but in cases where changes are necessary it will do.

White-Printing. From working drawings, **white prints** can be made. This kind of print is just the reverse of the blue-print. Here we have blue lines on a white background. In order to make white prints, a **negative** first has to be

made from the drawing. The paper used for the negatives is specially prepared and exposed and washed in the same way as blue-prints. When washed and dry, it is a real negative, on which all pencil lines are white and the background is black so as to exclude the sun—all the reverse of the drawing. This negative is then used by placing it over regular blue-print paper. The sun passes through the white lines, and is excluded from the rest by the black background. Upon washing the blue-print paper, the lines having been exposed to the sun are changed to blue; and the background, not having the sun on it, is washed off, leaving the white paper.

This process makes a much better looking drawing than a blue-print, and is not so hard on the eyes. The cost is a little higher, on account of the negative; but after the negative is made, the cost is the same as for blue-prints.

Aligraphy. Another process, known as **Aligraphy,** has been patented. By it, drawings can be reproduced on linen or paper, and the lines are practically as black as the original. They closely resemble etchings. For very fine work, this process makes splendid reproductions; but it is more expensive than any of the processes above mentioned.

Hectograph Process. Another common method of reproducing drawings is the **hectograph process.** This consists in making the drawings with suitable aniline inks, and then placing them face-down on a gelatine pad. After

being in contact for about two minutes, they are removed, and blank paper is brought in contact with the pad, being in turn removed. It will be found to give a complete drawing similar to the original in scale, color, etc. Upwards of thirty-five copies may be taken off, depending upon the intensity of the original.

The pad may be made as follows: 1 part of white glue to 5 parts by weight of glycerine. Soak the glue over night, in just enough water to cover it. Bring to the boiling point slowly, without burning; then add the glycerine, and thoroughly mix. Pour into a shallow pan; remove all air-bubbles from the surface with a stiff card; and allow to cool. Before using each time, wash thoroughly with a sponge and allow to dry partially before applying the drawing; also wash well immediately after using, to remove all traces of ink.

The proportions may be varied slightly for different climates. A cold climate will require more glycerine, and a warm climate more glue. The pad should be stiff enough to resist pressure from the fingers when firmly pressed upon it.

Other additional ingredients are sometimes used. Perhaps they have their advantages; but the mixture as described has been used very successfully. Often, in very hot weather, after a pad is made, it may seem too soft to work well. In such a case, placing the pan on a cake of ice will harden the mixture and make it satisfactory.

A cheaper pad may be made by using a mixture of a special clay and glycerine. While not giving so many prints as the glue pad, it can be used more economically for large drawings. Hectograph pencils may be had in many colors, which are used for making full-size details. These drawings are copied in the same way as the regular pen-and-ink drawings.

The hectograph process is gradually gaining in favor, and in some localities it is used extensively. It has several features to commend it:

(1) All materials can be represented in appropriate colors.

(2) Copies are very cheap, and can be made on paper or prepared cloth.

(3) The draftsman finds it convenient when making revisions, as parts of the drawing can be cut out and a correct portion inserted. No matter how badly the drawing is cut and patched, the prints are perfect.

(4) In assembling different drawings on a sheet, they may be shifted at will, and a better arrangement secured.

(5) When a sheet is composed of small drawings, the draftsman may work over the small drawings more comfortably than if compelled to work on a large sheet.

The hectograph process, however, has some drawbacks, which may be indicated as follows:

(1) Small details cannot be shown so clearly, as the lines must be quite heavy if a number of prints are required.

(2) The drawings fade more or less if exposed to a bright light, but they are permanent enough for most work.

(3) Some draftsmen do not like to use the inks, as

they are sticky and soil the fingers. This, however, should apply only to the inexperienced.

Hectograph inks may be purchased of dealers everywhere, in all colors. Below are suggested colors for various sections of materials:

Purple—For lines in general, outlines, profiles, etc.; also for sections of plaster, and concrete.

Red—For dimension lines, and for sections of brick-work.

Blue—For iron, steel, flashing, etc., in section.

Brown—For sections of terra-cotta.

Green—For sections of stone or marble.

Yellow—For wood.

For the blue-print process, the drawing to be reproduced is preferably done on tracing cloth, on the rough side, in black ink. Erasures may be made on this, and the work corrected; but the finished drawing has to be complete in every respect, as every line is reproduced just as drawn.

For the hectograph process, we shall need to make the lines much heavier, and may use colored inks. Mistakes cannot be erased, but are cut out, and a new piece of paper placed over the hole, and the drawing continued.

Tracing cloth makes the most satisfactory material all around for the original drawing. It is translucent or semi-transparent, will make good prints by almost any process, and is much more desirable than paper for filing away and for constant use in the drafting room.

The use of colored inks is not to be recom-

mended. They make the tracing look very pretty, but they print very poorly, some shades of green being hardly visible on the blue-print. Red reproduces very faintly, and when this color is used for dimension lines they should be heavy. Black is the most serviceable color to use. In steel detailing, the entire drawing is done in black—even dimension lines.

ARCHITECTURAL FORMS

Having considered the general method in the drawing of architectural plans, we shall now consider some of the general forms employed to represent different parts of the work.

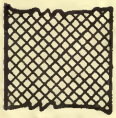
Conventional Forms and Symbols. First there must be some adopted form for representing materials. It will be found throughout the country, that each architectural firm has its own architectural forms and symbols. This is rather confusing, since it requires a draftsman changing offices, or Building Departments checking plans, to become familiar with the symbols as used by each office.

In Plate A are given some general forms for representing materials.

Fig. 1 represents brick. A section of a brick wall should be sectioned as shown, by parallel lines at 45 degrees, slanting down to the left. It might be well to repeat here what has been said about the use of colored inks for drawing. Except for dimension lines, avoid the use of colors. The materials may be indicated as shown


BRICK
FIG. 1.


RUBBLE STONE
FIG. 2.


CUT STONE
FIG. 3.


CONCRETE
FIG. 4.


TERRA COTTA
FIG. 5


WOODEN PARTITION - LATHED AND PLASTERED.
FIG. 6.


TILE PARTITION - PLASTERED.
FIG. 7.


BRICK WALL - FURRED, LATHED AND PLASTERED.
FIG. 8.


SOLID PLASTER PARTITION - PLASTERED.
FIG. 9.

Plate A. Conventional Symbols for Representing Materials on Architectural Drawings.

by varying the texture of the line and also by different forms of dotting.

Fig. 2—We use alternating lines—solid and dashes—at 45 degrees to represent rubble stone such as is found in most basements.

Fig. 3—We use solid lines running at 45 degrees to each other and in opposite directions, to represent cut-stone work such as sills for windows and doors, chimney caps, and any kind of finished or dressed stone.

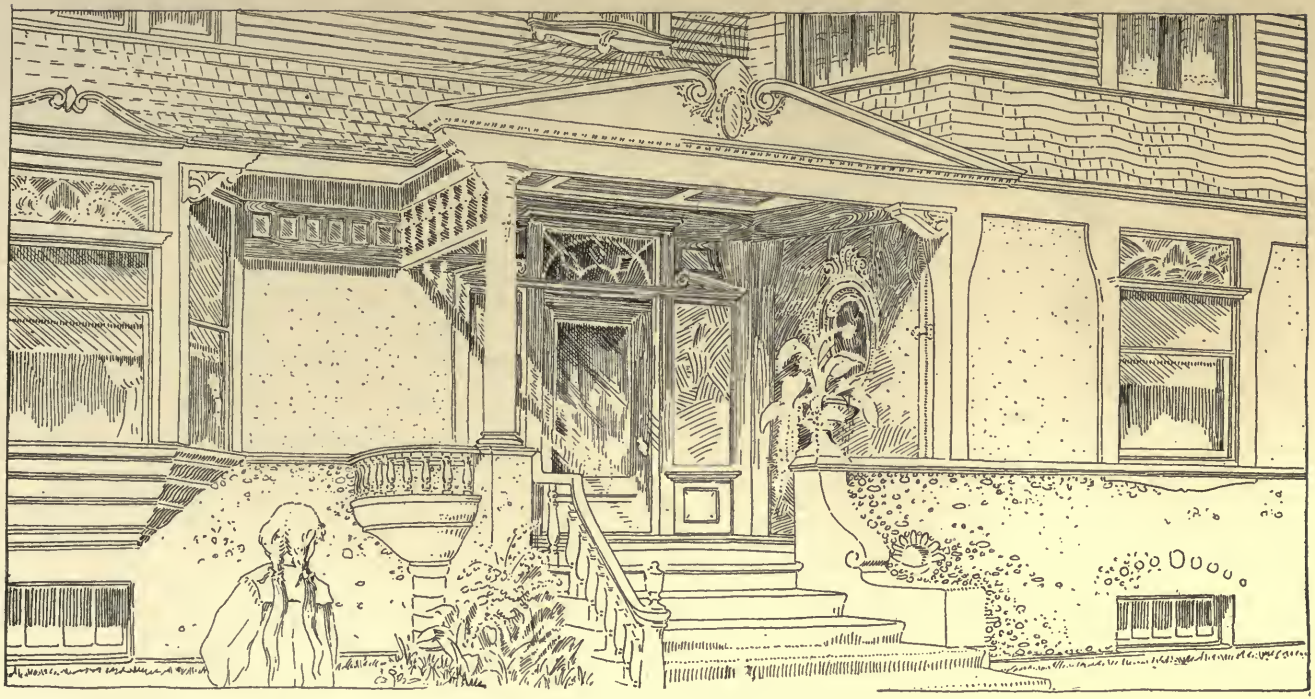
Fig. 4 represents concrete. This symbol is composed of small, wavy lines, with occasional triangular shapes to represent the stone. This symbol may be used to represent the concrete such as would be used in a solid wall or reinforced concrete for floors and other similar constructions.

Fig. 5 illustrates the method of showing terra-cotta. This is the same as for brick, with the lines running in the opposite direction.

For representing an interior partition of a frame building, the method shown in Fig. 6 is perhaps the most satisfactory. Plaster is represented by parallel lines to opposite sides of the wall.

Very often, in fireproof buildings, partitions are built of hollow tile and plastered on both sides. Fig. 7 illustrates the method of indicating such a partition.

Where a brick wall is furred on the inside and then plastered, we use the ordinary symbol for



WELL-RENDERED DESIGN FOR AN ENTRANCE, SHOWING HARMONIOUS ADAPTATION OF A GREAT VARIETY OF ELEMENTS.

the brick wall, and show the plaster away from the wall, as in Fig. 8.

Very often, instead of using the partition as shown in Fig. 7, it will be built up solid of plaster 2 inches thick with a layer of expanded metal imbedded. This partition is shown in Fig. 9. It will be found a very satisfactory partition, requiring less floor space, and equal in every way to any other fireproof partition.

On the basement plan, various **lines of pipe** should be shown. There should be a porous tile drain, in damp soils, all around the outside of the basement walls, at the footing line. Such drains are constructed of porous farm tile, laid with butt joints and no cementing of any kind. The tile being porous, the water in the soil percolates through the walls of the tile, and is carried away. These drains are indicated as shown in Plate B.

For the sewer connections inside the building, and extending at least six feet outside the basement wall, the pipe should be cast-iron and have calked joints. Such pipes are shown on the basement plan as in Plate B. Connected to this cast-iron pipe outside the basement wall, a vitrified tile drain should be used, with cemented joints. Such pipe is also shown in Plate B. All these pipe lines should be shown in black on the drawing.

There are certain lines used in a drawing for reference, such as **axis lines**—that is, when a room or building is symmetrically arranged

POROUS TILE DRAINS.

IRON PIPE DRAINS.

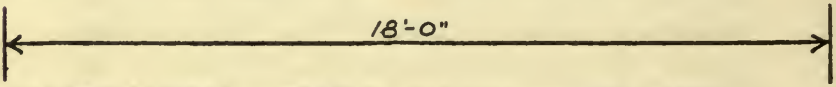
VITRIFIED SEWER PIPE.

THE ABOVE SHOULD BE SHOWN WITH BLACK LINES.

AXIS LINES (RED).

BUILDING LINES (RED).

DOTTED LINES FOR GENERAL USE.



DIMENSION LINES (USUALLY RED WITH BLACK ARROWS).

Plate B. Conventional Methods of Representing Drain and Sewer Pipe, Axis Lines, Building Lines, Dimension Lines, etc.

around a center line. In order to make such axis lines distinct from general lines, they are usually made as shown in Plate B.

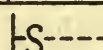
When there are offsets or projections on a wall, such work is measured from certain lines established as **building lines** (see Plate B). Usually the outside wall line of the first story is taken as this reference line; and the basement wall line, the second-story line, the eave line, etc., are all measured as projecting from this line.

All **dimension lines** are to be noted as shown on this same plate, in which the arrow-heads are black, the connecting line is red, and the figures are in black, always above this line. This is the best practice, though sometimes dimensions are placed in the center of the line, the line being stopped to allow the figures to be inserted. This method takes more time and is not so practical, since the dimension line is broken and in some cases there might be a dispute as to just how much the dimension is intended to include.

For **lighting**, there are standard symbols adopted by the National Electrical Contractors' Association of the United States. These are published on a card convenient for reference, and copies may be had by applying to the Secretary. Another form of symbols has been adopted by the Boston Society of Architects, copies of which may also be had on application. The latter symbols are shown on Plate C. These are given for convenience in laying out plans, and are not

This Specification is based upon the use of the following symbols and of such others as may be used and explained on the Plans.

	ELECTRIC	GAS	COMBINATION
CEILING OUTLET 4 Lights			
WALL OUTLET 2 Lights			
FLOOR OUTLET 1 Light			
BASE OUTLET			

SWITCH  Dotted Line shows Switch Control.

PUSH BUTTON 

BANK OF BUTTONS 

BELL 

ANNUNCIATOR 

CABINET 

SPEAKING TUBE 

HOUSE TELEPHONE 

PUBLIC TELEPHONE 

HEIGHTS OF STORIES - TOP TO TOP

1ST	FT	IN.	2ND.	FT.	IN.	3RD	FT.	IN.	4TH	FT.	IN.
5TH	FT.	IN.	6TH	FT.	IN	7TH	FT.	IN.	8TH	FT.	IN.
9TH	FT.	IN.	10TH	FT.	IN.	11TH	FT.	IN.	12TH	FT.	IN.

HEIGHTS OF CENTER OF WALL OUTLETS. Unless otherwise specified.

LIVING ROOMS - 5'-6" OFFICES - 6'-0"

CHAMBERS - 5'-0" CORRIDORS - 6'-3"

HEIGHT OF SWITCHES - Unless otherwise specified - 4'-0"

Plate C. Standard Symbols for Representing Fixtures, Electric Outlets, etc.
Adopted by the Boston Society of Architects.

intended to be complete in every respect. It is essential to show the location of the light outlets in all rooms; also whether they are to be gas, or electric, or a combination of both. Push-buttons, bells, and telephones are also indicated. If these locations are not shown, the contractor for this work will naturally place them in a posi-

Fig. 17. Conventional Symbols for Heating Apparatus. A—Steam or Hot-Water Radiator; B—Hot-Air Register.

tion requiring the least amount of pipe, wire, etc. Therefore show all of these fixtures, and there can then be no dispute as to the true intent of the plans and specifications.

For the **heating**, about all that is necessary is to show the location of the registers or radiators, marking the number of square feet of radiation on each radiator. The usual method is shown in Fig. 17 (**A**) for steam or hot water, and in Fig. 17 (**B**) for hot air. The specifications should

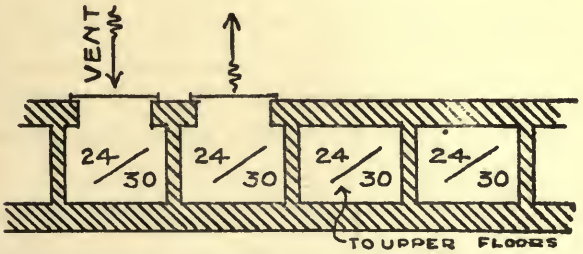


Fig. 18. Conventional Representation of Flues for Air Supply and Ventilation.

describe the kind of heat, and go into detail about pipe, fittings, etc.

In hospitals, public buildings, and schoolhouses, where there are a number of occupants in each room, it will be necessary to furnish a **fresh-air supply,** also a **vent flue.** These are all figured, and should be located conveniently.

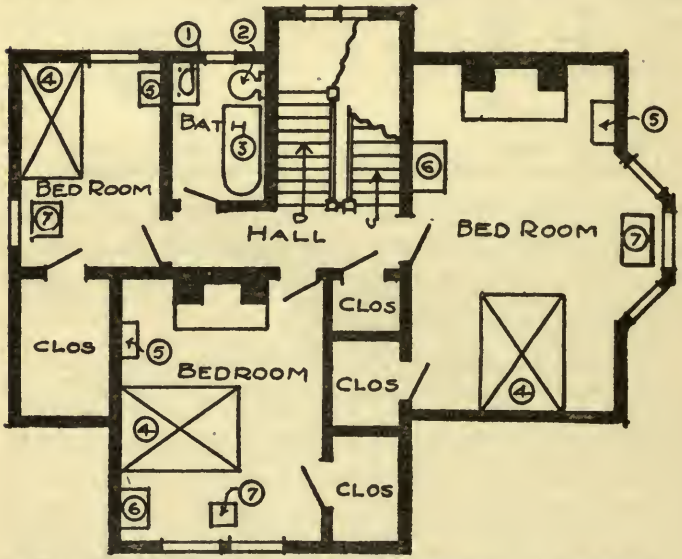


Fig. 19. Sketch Plan Showing Arrangement of Furniture.

The method of figuring the correct location for such work will be considered under "Heating and Ventilating." The conventional method of showing flues for air supply and ventilation is shown in Fig. 18.

For **furniture,** certain conventional forms are used, and shown on all plans. The furniture of the bedrooms and bathrooms is usually laid out on the plans, since these are usually made as

small as practicable; therefore the furniture and fittings are laid out to make sure that there will be room to get them all in. This applies to the cheaper classes of houses, for in the larger and more expensive residences the rooms are always amply large to accommodate all the furniture and fittings desirable. In Fig. 19, a bathroom and bedrooms are laid out, the furniture being indicated by numbers, (1) representing the lavatory or wash-bowl, (2) the closet, (3) the bathtub, (4) the bed, (5) the chiffonier, (6) the dresser, and (7) a table or writing desk. See also Fig. 20.

Sometimes a client has furniture he wishes to put into a new home. It will be found very convenient to get the dimensions of such furniture, and cut out pieces of cardboard the exact sizes of this furniture according to the scale of the plan. Then lay them on the plan as drawn, and see how they will fit wall spaces, nooks, etc. By this method, pieces can be arranged, and it will very soon be shown whether or not the rooms will accommodate the furniture. This will be found very convenient in all classes of work (see Fig. 20).

Below are given the dimensions of some of the common pieces of furniture. These sizes will vary somewhat, but in general they will be accurate enough in laying out work.

Dining Tables—3 ft. 6 in. to 4 ft. wide, and to extend to 10 ft. to 12 ft. by extra leaves, and 2 ft. 5 in. high.

Writing Tables—2 ft. 6 in. high.

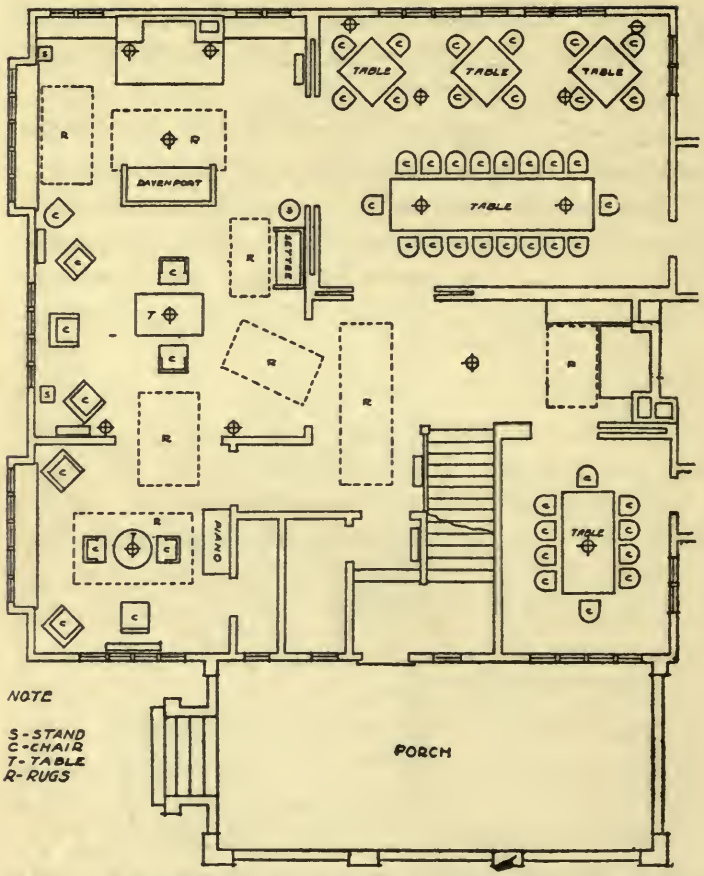


Fig. 20. Plan Showing Method of Laying Out Furniture and Rugs.

Carving Tables—3 ft. high.
Ordinary Tables—2 ft. 6 in. high.
Beds, Single—3 ft. 6 in. wide;
Beds, Three-quarter—4 ft. to 4 ft. 6 in. wide;
Beds, Double—4 ft. 6 in. to 5 ft. wide.
All beds should be 6 ft. 8 in. long inside.
Dressers—1 ft. 6 in. to 2 ft. by 3 ft. 5 in.
Couches—2 ft. 6 in. by 6 ft. 8 in.

Chiffoniers—2 ft. by 3 ft., and 4 ft. 6 in. high.

Sideboards vary according to design, 4 ft. to 6 ft. long, and from 2 ft. to 2 ft. 2 in. deep.

Pianos, Upright, vary, being usually 3 ft. 3 in. by 6 ft. 6 in. long, and 4 ft. to 4 ft. 9 in. high.

Bookcases—10 in. to 16 in. deep, any length and height.

Chairs and Seats—Usually 17 in. high at front, 16 in. at back, and the seat is usually 17 in. high by 16 in. inside; the back, from 1 ft. 6 in. to 1 ft. 8 in. high, slightly inclined at the top.

For plumbing fixtures, consult any plumbing catalogue. The washstand varies, 18 in. deep by 2 ft. long being about the minimum. The bathtub varies from 3 ft. 6 in. to 4 ft. 6 in. long, about 1 ft. 11 in. high above the floor, and 2 ft. wide across the rim. Closets are about 1 ft. 4 in. wide, and about 2 ft. from the wall.

Ranges—26 in. to 30 in. by 36 in. by 42 in.

Ranges, Gas—26 in. by 34 in.

Lunch Counters—Height, 3 ft. 3 in.
Stool, 2 ft. 2 in.
Counter projects 9 in. and is 2 ft. 2 in. wide.
Foot-rest, 7 in. high and 9 in. from counter.

Urinals—26 in. to 30 in., center to center.

Rugs—4 ft. 6 in. by 7 ft. 6 in. up to 11 ft. 3 in. by 15 ft.

The above dimensions are only general, but will be of assistance in laying out the furniture of a house.

MATERIALS OF CONSTRUCTION

There will be found a great variety of materials for the construction of buildings, nowadays. In some localities, one material will be used more than others; for instance, in the vicinity

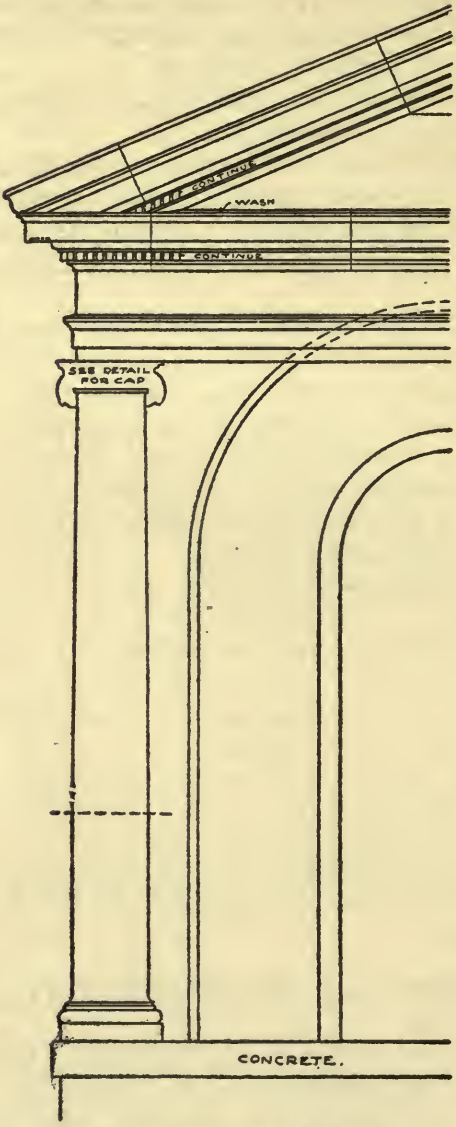


Fig. 21. Elevation of a Porch.
See also Figs. 22 and 23.

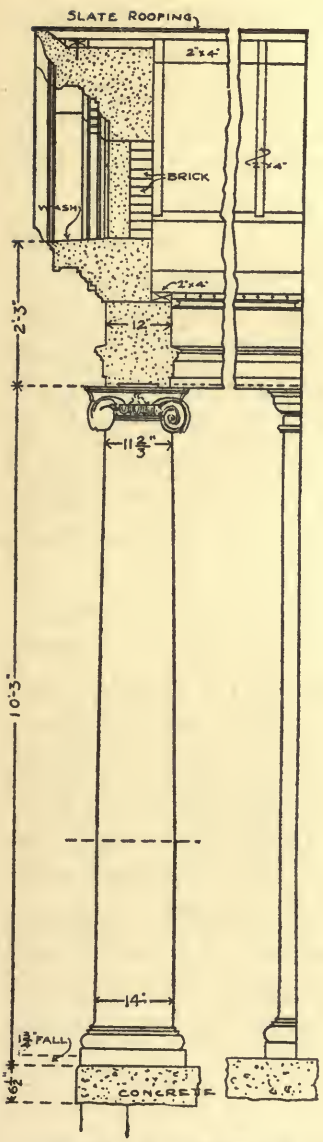


Fig. 22. Porch of Fig. 21 Detailed for Stone Construction.

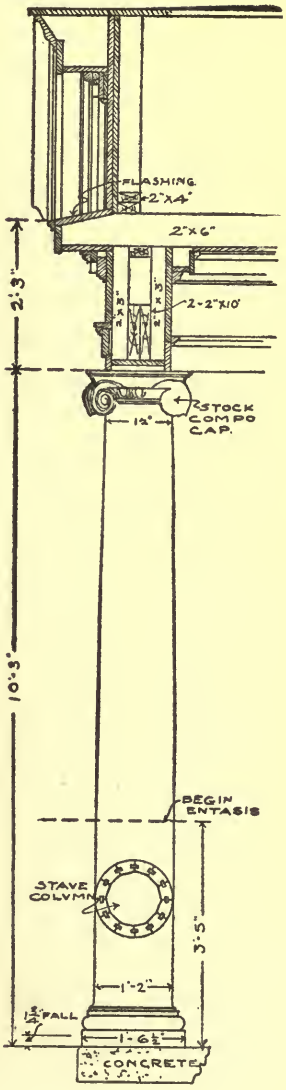


Fig. 23. Porch of Fig. 21 Detailed for Wood Construction.

of a stone quarry, stone will usually be cheaper than anything else—even in some cases cheaper than wood. Should your client be interested in a brick concern, brick would undoubtedly be used. In a locality where timber is cheap, that material would be largely employed.

For the cheaper class of work, we find wood to be the cheapest material, although, within the past ten years or so, wood has advanced in price at a great rate. The kind of wood used will vary with each locality. In some sections—especially the South—yellow pine will be used; in our Western States, fir and local varieties will be selected. An architect in a new locality, therefore, should become familiar with the local woods used, and should govern his work, such as spans of beams, interior finish, etc., by these conditions. The use of terra-cotta for the facing of masonry walls, for ornamental courses, cornices, and window-sills, is quite common. Since this is a product made of clay, properly mixed, moulded, and burned, it can be treated as plainly or as elaborately as the design of the building warrants. Terra-cotta, of course, is used only with masonry, such as brick, stone, or concrete.

Fig. 21 shows the elevation of a porch, and Fig. 22 shows this porch detailed for stone construction; while Fig. 23 shows the same porch detailed for wood.

SHADES AND SHADOWS

In order to prepare sketches and make them attractive, a brief treatment of **Shades and Shadows** will be taken up, the main general rules and principles being explained, which may be applied to ordinary architectural drawing.

By the use of shades and shadows, very important effects are produced. The general proportions of the cornice, for example, are emphasized by using shadows. The relative amount of window area to wall area is clearly shown by the use of shadows.

The light is always assumed as coming over the left shoulder of the person looking at the drawing, and at an angle as explained later. This assumption is always made, being merely a conventional or customary way of considering

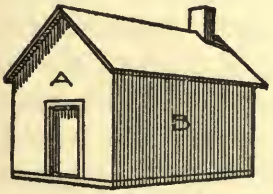


Fig. 24.

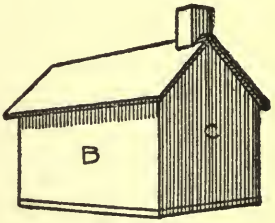


Fig. 25.

Illustrating Conventional Method of Considering Rays of Light in Architectural Drafting.

the light. The idea intended is to produce the same effect on a drawing that the sun in this one position would produce on the building. While the sun would actually produce a shadow on one side of the building at one time, and on another side at another time, in architectural

drawing this variation is not shown. No matter what elevation or side of the building is being considered, the light is always from the same direction.

Thus we see that in Figs. 24 and 25 the sun really would make one side always in shadow, but we do not so consider it. In Fig. 24 we see the side **A** is in sunlight, and the side **B** is in shade. Looking now at Fig. 25, we see side **B** in sunlight, and **C**, which was the rear end, now in shade. This is the conventional method of considering the rays of light for architectural drawings. No matter what elevations or drawings are considered, or how many of the same building on the same sheet, the direction of the rays of light is fixed.

Perhaps it will make the understanding of this subject clearer if we define the terms **shade** and **shadow**. That portion of a building or drawing is said to be in "shade" which is turned away from the assumed rays of light; or, it receives no rays of light, in contrast to the sides which are in light or upon which the light falls.

If a body is placed between the light and a plane upon which the rays might fall, such a body will prevent a portion of the rays from striking the plane, thereby causing a shadow upon the plane.

All rays of light are assumed as parallel and considered as straight lines.

The rays of light are assumed as coming over the left shoulder, or sloping downward and

backward. This is the diagonal of a cube. The projections of this diagonal in the vertical plane and in a horizontal plane are at 45 degrees, while the true angle of the diagonal with the plane is slightly less than 35 degrees 16 minutes. If we assume the side of the cube as 1, then the true length of this diagonal is nearly one and three-quarters. In Fig. 26, we see the cube and the diagonal drawn as a heavy line with an arrow-

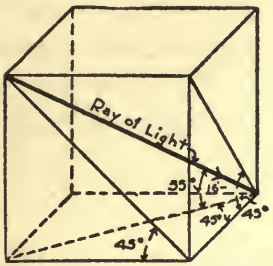
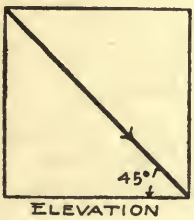


Fig. 26. Drawing Showing Assumed Direction of Light.



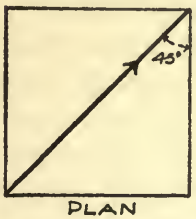


Fig. 27. Elevation and Plan of Cube of Fig. 26.

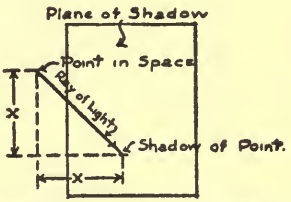


Fig. 28. Elevation of Point and Shadow.

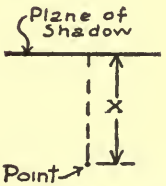


Fig. 29. Plan of Point in Space and Plane.

Shadow of a Point in Space.

head indicating the direction of the light. Fig. 27 shows the elevation and plan of the same cube.

The **shadow of a point** is where the ray of light surrounding the point intersects the plane upon which the shadow falls. In Fig. 28, we see the light surrounding the point, and intersecting the plane, giving the shadow of the point upon the plane. The shadow is located as far down and as far to the right of the point in space as the point is from the surface or plane upon which its shadow falls. Fig. 29 shows the plan of the point, its distance from the plane, and the plane.

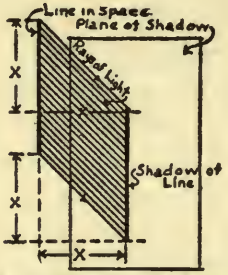


Fig. 30. Elevation of Line and Shadow.

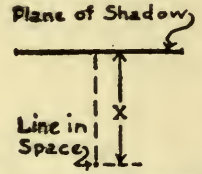


Fig. 31. Plan of Line in Space and Plane.

Shadow of a Line Parallel to Plane of Shadow.

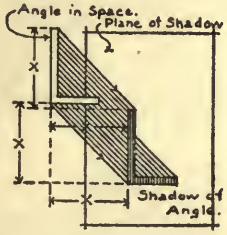
The **shadow of a straight line** in space is the intersection of the light surrounding this line with the plane of shadow. By casting the shadows of the extremities of the line and connecting these points of shadows, we have the shadow of the line. All points of the line in space will cast shadows upon the plane as far down and as far to the right as the point is from the plane.

DORMER WITH DECORATIVE FEATURES FROM ANCIENT AMERICAN INDIAN DESIGNS.

OLD ENGLISH INN WITH LATTICED DORMER.

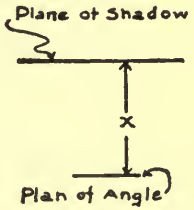
If the line is parallel to the plane, the shadow will be equal in length and parallel to the line itself. See Fig. 30 for an elevation, and Fig. 31 for the plan of the line and plane.

If the line in space is not a straight line, then the shadow of the line may be found by casting the shadows of any number of points on the line, and connecting these. The greater the number of points of shadows cast, the greater will be the accuracy of the work. In Fig. 32



ELEVATION

Fig. 32.



PLAN

Fig. 33.

Shadow of an Irregular Shape which is Parallel to Plane of Shadow.

we see the shadow of an angle or L-shape cast on the plane of projection; Fig. 33 shows the plan of the angle.

The shadow of a straight line perpendicular to the plane upon which the shadow falls, is a straight line at 45 degrees, no matter what the outline of the surface is upon which the shadow falls (see Figs. 34, 35, and 36).

The shadow of a straight line parallel to the plane upon which the shadow falls, is an irregu-

lar line giving the true outline of the surface (see Fig. 37).

The shadow of a perpendicular line on a roof is therefore a line which gives the true slope of the roof, since the line is parallel to the plane, and therefore casts a shadow the true shape of the surface upon which it falls.

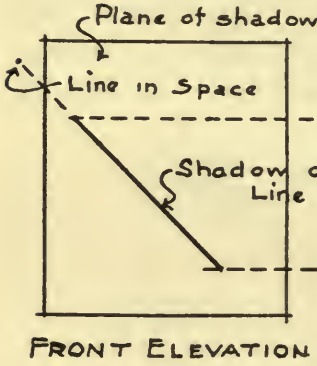


Fig. 34.

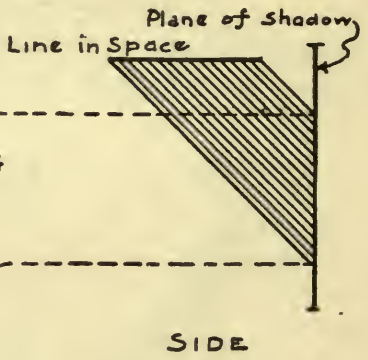


Fig. 35.

Shadow of a Line which is Perpendicular to lane of Shadow.

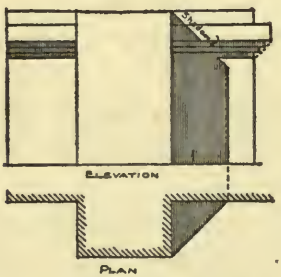


Fig. 36. Showing Shadow of a Line Perpendicular to Plane of Shadow.

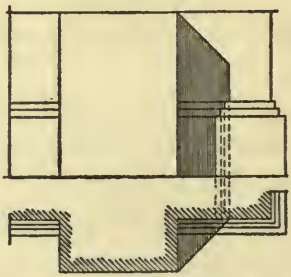


Fig. 37. Showing Shadow of a Line Parallel to Plane of Shadow on a Moulded Surface.

The shadow of a straight line inclined to the plane upon which the shadow falls, is a straight

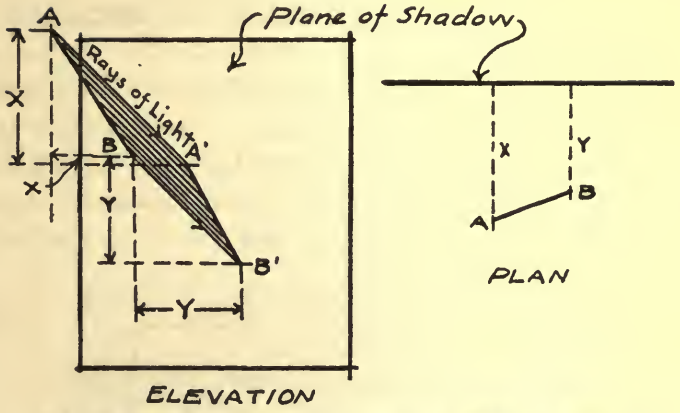


Fig. 38 Shadow of a Line Inclined to Plane of Shadow.

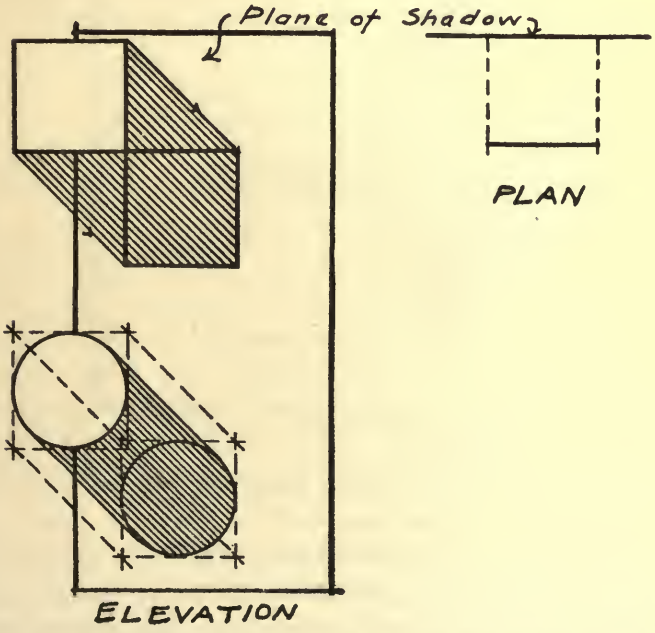


Fig. 39. Shadows of a Square and a Circle Parallel to Plane of Shadow.

line connecting the shadows of the ends of the line (see Fig. 38).

As in the case of a line parallel to the plane upon which the shadow falls, the shadow is equal in length and parallel to the line, so it is with surfaces—the square, rectangle, octagon, etc. If parallel to the plane of shadows, the shadow

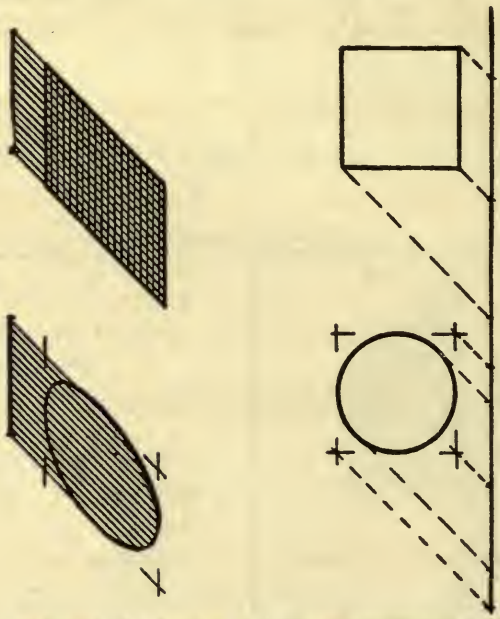


Fig. 40. Shadows of a Square and Circle Perpendicular to Plane of Shadow.

will be equal in size and shape to the figure (see Fig. 39).

A square perpendicular to the plane of shadow will cast a diamond-shaped shadow, for two of the lines are parallel to the plane, and two are perpendicular to the plane (see Fig. 40).

Having stated a few principles of casting shadows, these will be applied to a few common examples.

Take an example of a brick projecting from a wall (Fig. 41). We apply the principles as

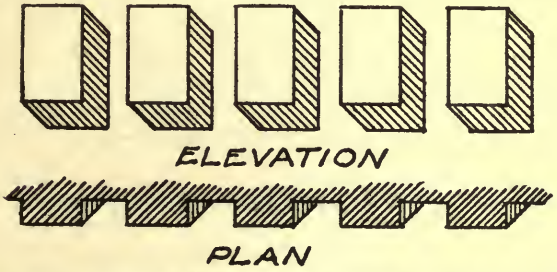


Fig. 41. Shadows of Projections from Plane of Shadow.

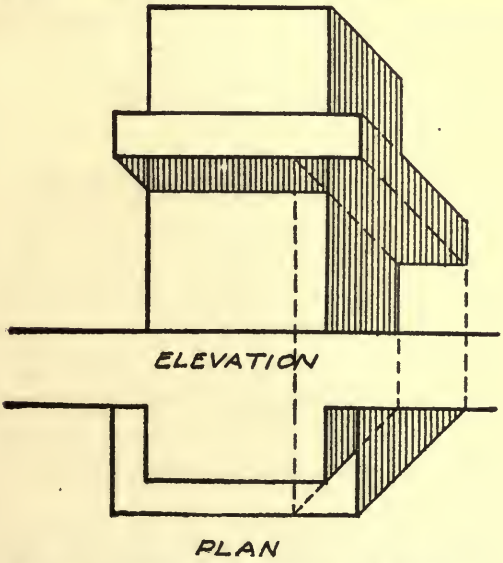


Fig. 42. Illustrating Principles of Shadows.

stated, to each edge of the brick. The top, bottom, and side faces of the brick are perpendicu-

lar to the plane, therefore the shadows will be rectangular in shape.

Figs. 42 and 43 show a further application of the foregoing principles.

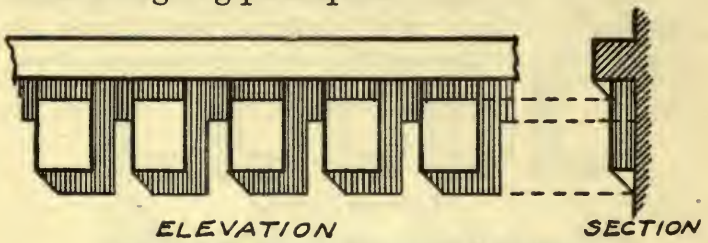


Fig. 43. Illustrating Principles of Shadows.

Plate D shows the shadows as cast upon an Order of architecture, illustrating also how much clearer the drawing is when it has the shadows worked out on it.

The above principles will give a general understanding of the subject.

DETAILS OF CONSTRUCTION

It is essential to know the usual method of detailing different portions of the building. For the clear understanding of some of the important parts of a building, there have been prepared some typical details. The reader, having become familiar with the details shown, can adapt them to any sort of building.

Cornice. The cornice is the projection at the top of the building, made more or less elaborate. There are several kinds of cornices—the **box cornice,** as shown in Fig. 44, and the **open cornice,** as shown in Fig. 45 (**a** and **b**). Referring

to Fig. 44, there is the **crown-mould A**, the **fascia B**; the **planceer** or **soffit C**; the **lookout D**; the

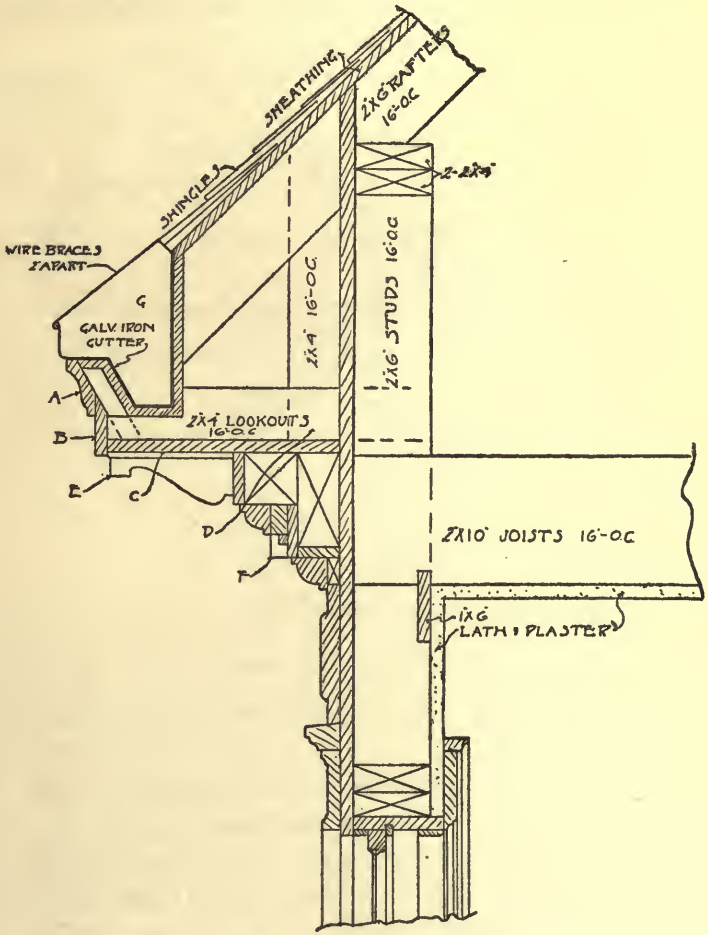


Fig. 44. Box Cornice.

brackets E; the **dentil course F.** Not all cornices have all these parts. The plainer ones may be without the brackets **E** and the dentils **F**; or

more elaborate cornices may have more members. The closed cornice always has the gutter built into the upper members; the open cornice

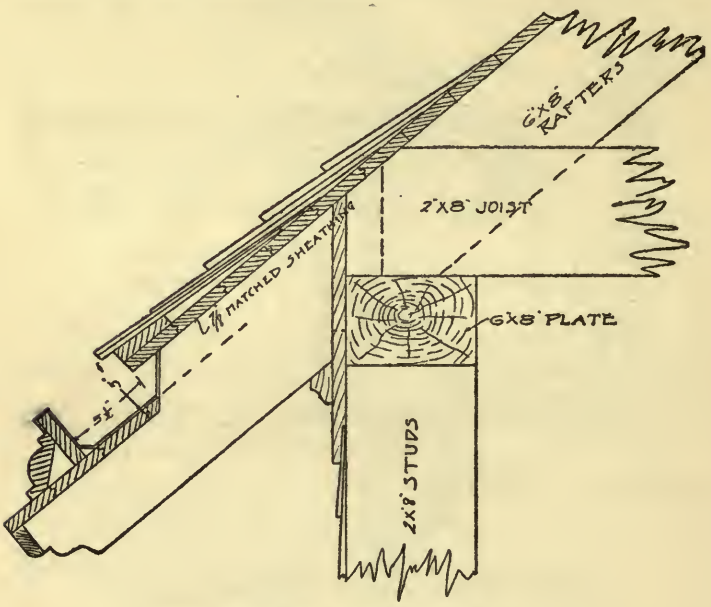


Fig. 45a. Open Cornice.

has a hanging gutter, as shown in Fig. 45 (a or b).

The **gutter,** in the best work, is made of copper; in ordinary work, of galvanized iron; and in the cheapest class of work, tin is used. The durability of these materials is in the order named, the copper wearing usually the life of the building. Galvanized and tin gutters have to be kept well painted; but even with good care, the life of these two materials is limited.

One important feature of a good gutter is

to have the metal run well up under the roofing material, and out over the crown-mould. This keeps any water from overflowing up under the roof if the gutter becomes choked with ice or leaves. The gutter should be well pitched or graded to the outlets. The gutter outlets are in turn connected to leaders or down-spouts. These down-spouts are made, usually, of the

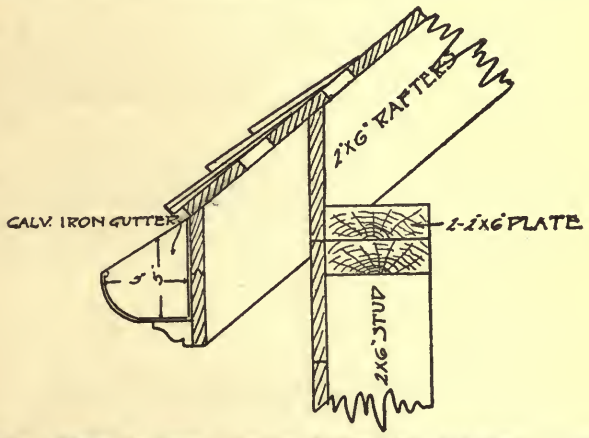


Fig. 45b. Type of Open Cornice Known as Close-Eave Cornice.

same material as the gutter. The shape of the down-spouts may be either round or rectangular; a very common form is made of corrugated iron, either round or rectangular. The gutter, especially if a hanging gutter, must be securely fastened to the roof at intervals of two or three feet, by means of some sort of hanger. The down-spouts must be securely fastened to the wall by some approved method.

Floor Construction. The floor construction does not vary much (see Fig. 46). In this figure

we have the usual construction and method of support at the second or upper floor line. The **joists** must be of ample size, not only to carry

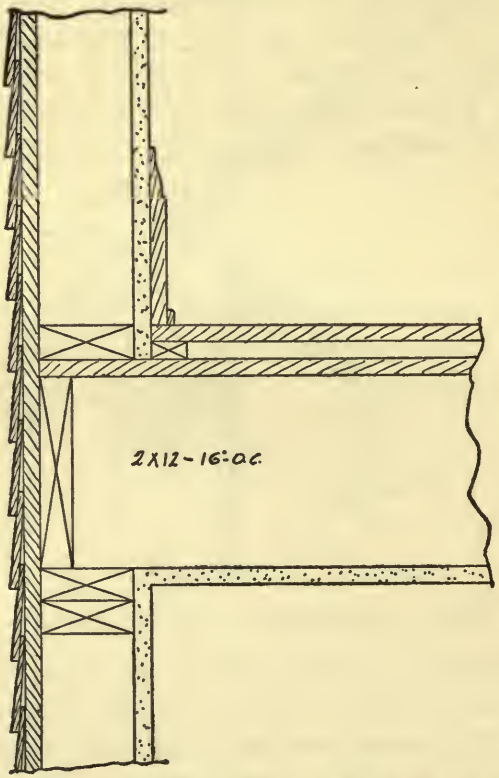


Fig. 46. Common Floor Construction at Second-Floor Line.

the load safely, but to be stiff enough not to sag or vibrate under a load, since this would crack the plastering or the ceiling below. On the joists is laid an **under-floor**, usually of boards $\frac{7}{8}$ inch thick, laid diagonally at 45 degrees with the joists, and spiked with two nails on every

joist. The flooring laid in this manner braces the building, and resists any tendency to twist.

In the best construction, we use some sort of **deafening material** between the upper and under floor, to deaden sound. The upper floor is of maple, oak, or yellow pine of matched or tongued-and-grooved boards, with the boards parallel to one side of the room. This floor is **blind-nailed;** that is, the nails are driven in at the intersection of the tongue and the vertical edge, as shown in Fig. 47. This keeps all nail-

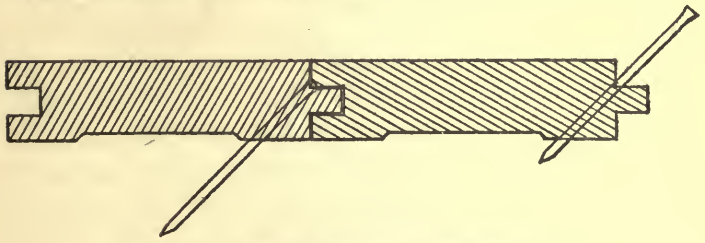


Fig. 47. Section Showing Blind-Nailing.

heads hidden from view. The upper floor should be thoroughly kiln-dried—that is, dried artificially to drive out the greater part of the moisture, so that when it is finally laid, it will not dry out in the building and open up ugly cracks. For this reason the finished floor should not be laid until the plastering is thoroughly dry. The under side of the joists is lathed and plastered.

Around openings, chimneys, or stair-wells, the joists are supported at the ends by means of a **header,** or a joist running at right angles to them, to which they are securely

spiked; or they may rest on top of a ribbon or ⅞-inch board let into the studding, the construction being similar to the support for the ceiling joists as shown in Fig. 44.

At the first-floor line, we have to build a **sill** upon the basement wall; this sill forms a support for the joist, and also gives a nailing for the studding. The method is clearly shown in Fig. 48.

Lath and Plaster. The interior finish of almost all residence work is lath and plaster. The walls, if of wood, and the ceiling, are lathed with good, sound lath, free from blue sap or bark, and of white pine or spruce. They should be spaced at least ¼ inch apart, and the plaster pressed firmly onto them so as to make sure that there will be a good key for holding the plaster. All lath on vertical walls should be put on horizontally, and there should not be a vertical joint of more than 18 inches between any series of laths. Under no consideration should lath be put on a vertical wall other than horizontally. In hot weather, it will be well to wet the lath before applying the plaster, as then they will not absorb so much water from the plaster.

Plaster is usually put on in three coats for woodwork, and in two coats for brickwork. The first coat consists of slaked lime, sand, and long, clean cattle hair or fiber, this hair or fiber being used to make the plaster hold together better.

The first or **scratch coat** is applied and

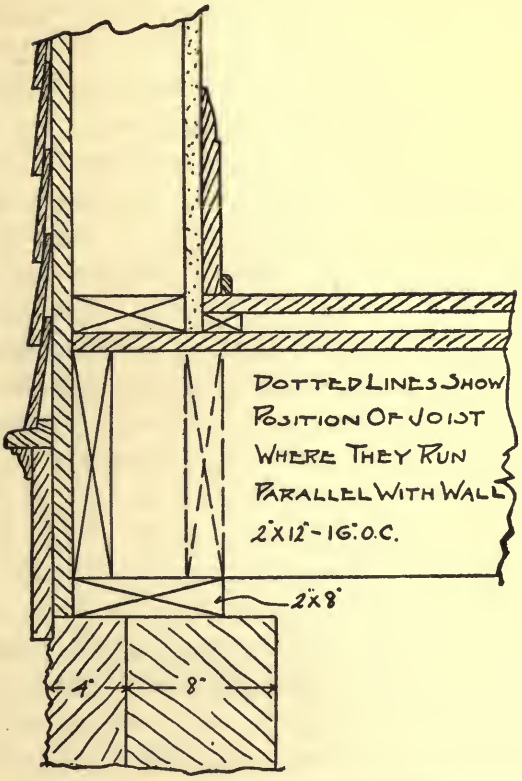


Fig. 48. Floor Construction at First-Floor Line.

pressed well into the spaces between the lath. It is this plaster getting in between the lath and falling over onto the lath, which forms the key or clinch for the plaster. This coat is then scratched with the trowel all over, in all directions. This scratching roughens up the surface, and makes a better surface for the second coat to adhere to.

The second or **brown coat** is a mixture of lime

putty, sand, and a little hair or fiber, and is applied after the scratch coat has partially dried. This brown coat is brought out to a true line for all walls and ceilings, and corners are made true and sharp. There are placed around all openings and back of all chair rails, base-boards, etc., small strips $\frac{7}{8}$ inch thick for three-coat work, and $\frac{3}{4}$ inch thick for two-coat work, by $1\frac{1}{2}$ inches wide. These are called **grounds,** and serve as a guide for the plaster (see Figs. 71 and 72). The third coat, sometimes called the **white** or **skim coat,** is a mixture of lime putty and white sand, with a little plaster of Paris. This is a thin, white coat, put on and rubbed down until hard, giving a hard white surface. Sometimes marble dust is added, which makes it harder and gives a little more polish to the surface. If a sand finish is desired, instead of the white coat as above described, the third coat is mixed with lime putty and coarse sand.

Flashing and Counter-Flashing. By flashing and counter-flashing is meant metal protection for the intersection of surfaces, to keep out the weather. Take an example of a chimney going through a roof. Some means must be provided to prevent snow and water from coming in through the space between the vertical side of the chimney and the roof. This is accomplished by using sheet metal—either copper, galvanized iron, or tin—and fastening it under the roof covering, turning it up against the chimney, as shown in Figs. 49 and 50, the piece marked **A.**

To prevent the water running down the side of the chimney, a cover-piece, called the **counter-flashing,** is fastened into a mortar joint of the brickwork, and turned down over the flashing. The counter-flashing should extend to within two inches of the bottom of the flashing. This same method of protection applies to joining a roof to a vertical wall, the protection at the outside of a window-frame, or any other place needing similar protection.

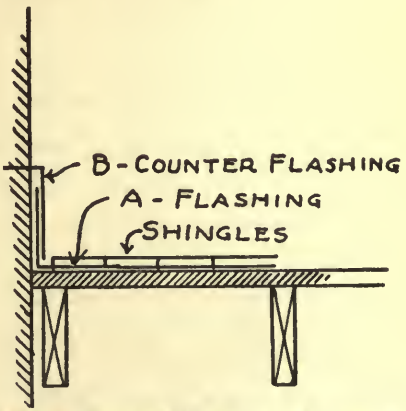


Fig. 49. Section Showing Flashing and Counter-Flashing.

Shrinkage. A word might be said about shrinkage. All lumber, when exposed to heat, will shrink, owing to the moisture drying out. In all wooden construction, all parts should be carefully framed together to reduce the shrinkage to a minimum. One common error in framing is shown in Fig. 51. The girder rests upon the post below, and the post from above rests upon the girder. We can see at a glance

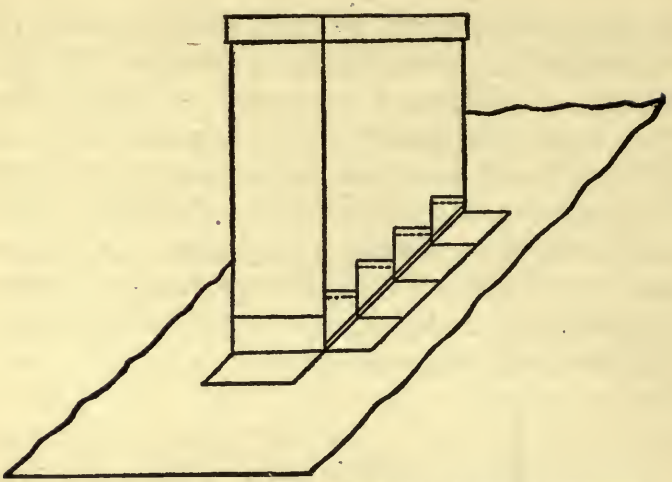
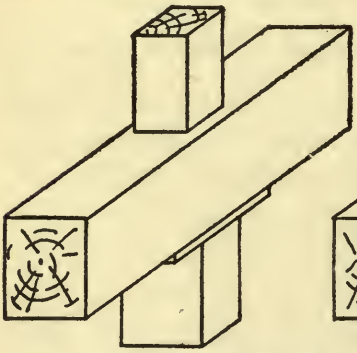


Fig. 50. Flashing and Counter-Flashing around a Chimney.

what happens when the girder commences to dry out. It will shrink, causing the post above to settle, which will affect the part of the building carried in this way. Fig. 52 shows a much better way of framing these posts. The post above rests directly on the post below; and the



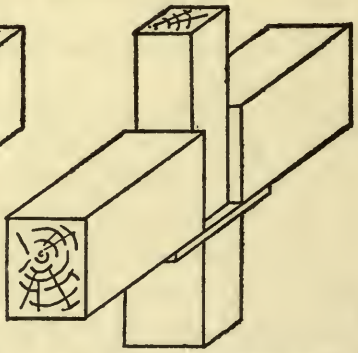


Fig. 51. Erroneous Method. Fig. 52. Correct Method.
Framing of Posts and Girders to Counteract Effects of Shrinkage.

DESIGN FOR A CARRIAGE SHELTER.

girder is carried by the steel plate as shown, or by means of a cast-iron post-cap. By this means the shrinkage in the girder does not affect the

Fig. 53. Section of Solid Door.

construction above. Carry out this same idea in all framing. When one partition comes over another, carry it on the cap of the partition below, and not on top of the floor construction.

Doors. Doors are of two kinds—the **stock door** and the **built-up door.** The stock door is made solid, with a simple bevel called an **O. G.** (or **Ogee**). The stock doors are usually $1\frac{1}{8}$ inches, $1\frac{3}{8}$ inches, and $1\frac{3}{4}$ inches thick (see Fig. 53). The built-up door has a core of $\frac{7}{8}$-inch pieces of pine glued together; this is covered with thin sheets of wood $\frac{1}{8}$ inch thick, called

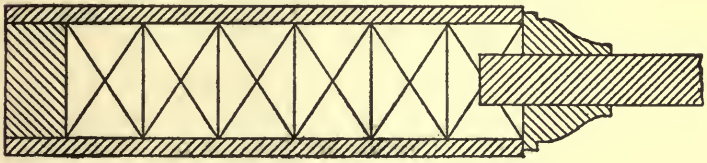


Fig. 54. Typical Section of a Built-Up Door.

veneer, which is firmly glued to the core. The veneer is made of wood to match the interior finish of a residence.

Fig. 54 shows a typical section of a built-up door; and Fig. 55 shows elevations of different

doors, with the names of the various parts of a door.

All openings, either door or window, should have the rough framing doubled around them.

At the bottom of the door we have the **threshold,** which is a raised piece, usually of oak or some other hard wood. This gives a chance for the door to swing clear of the carpet or rugs. For different details of door trim, etc., see Fig. 56.

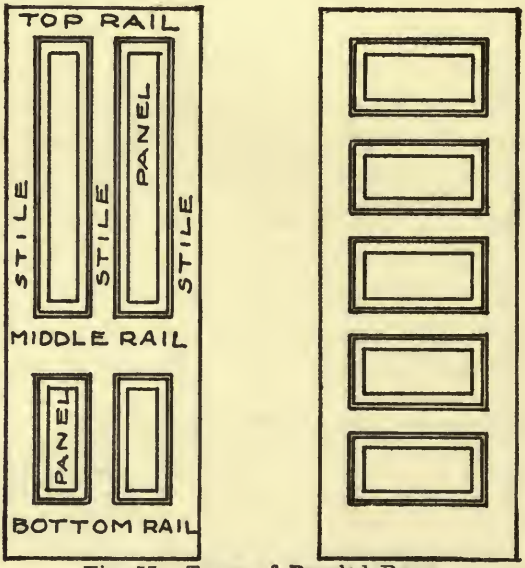


Fig. 55. Types of Paneled Doors.

The door is hung in a wooden frame which is securely fastened to the framing of the house. The inside and outside casing covers the space between the door frame and the rough framing. See Fig. 56 for a section through a door.

Porch Construction. In Fig. 57 (also Fig.

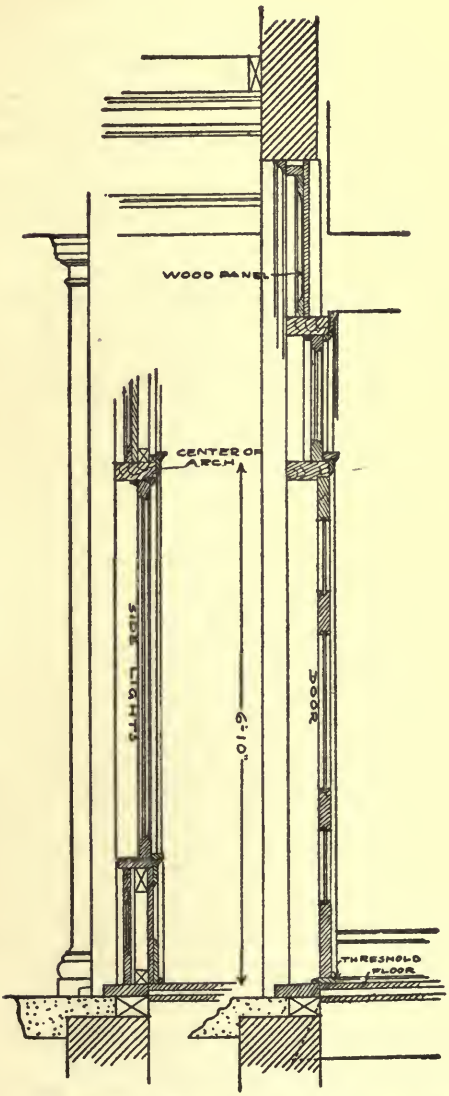


Fig. 56. Sections of Front Door and Side Lights.

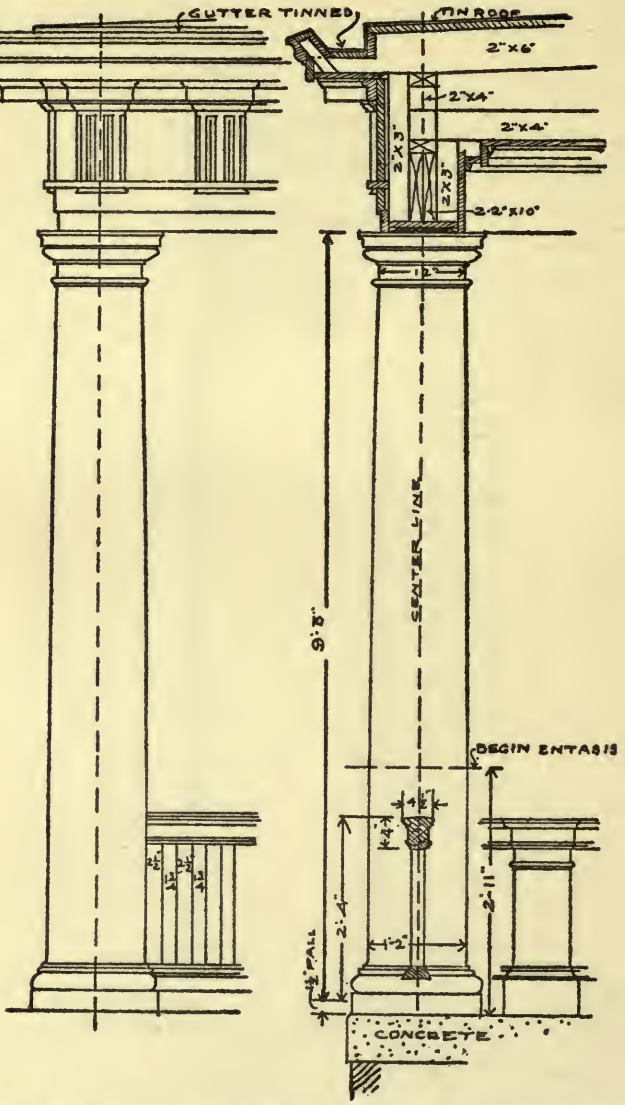


Fig. 57. Part Elevation and Section Showing Method of Porch Construction.

ILLUSTRATING VANISHING POINT AND NECESSITY OF DRAWING OBJECTS IN PROPORTION.

Two men of same actual height, but one in background appears much the taller.

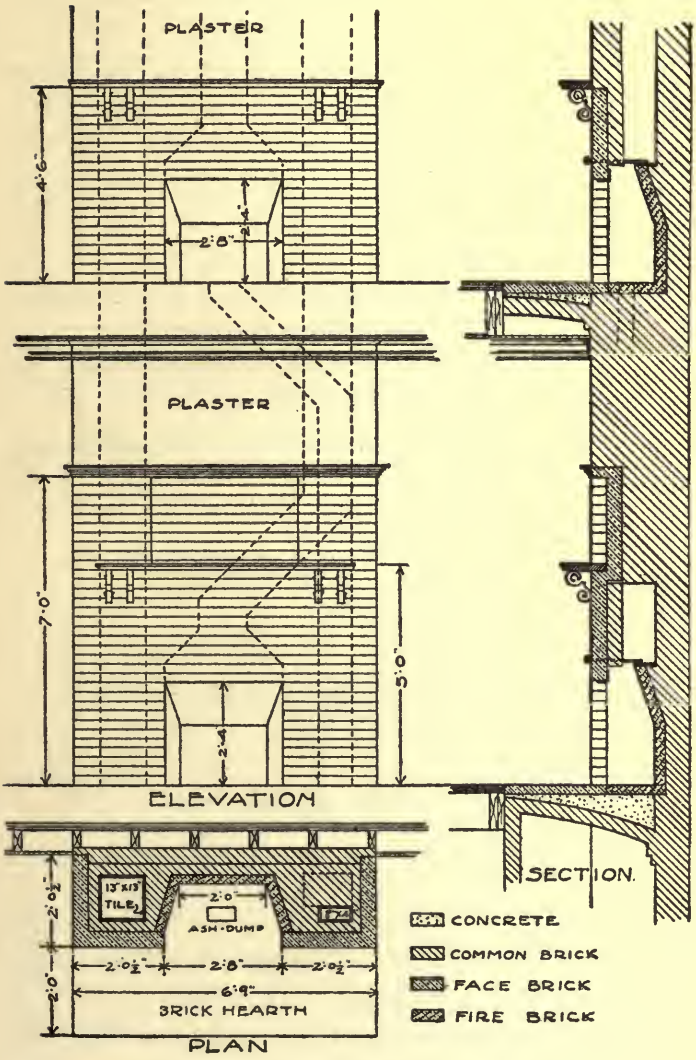


Fig. 58. A Typical Fireplace Construction.

23), we see a part elevation and a section showing the method of porch construction. The floor construction will be the same as for ordinary floor construction, except that only one thickness of flooring is used, and the boards must run at right angles to the house, and have a slight pitch away from the building. This allows the water to drain away from the building. In the best construction, the flooring is put together with white lead, thus insuring a perfectly tight joint to keep the water from soaking in at the joints, and thus causing the floor to rot.

Fireplaces. Fig. 58 shows a typical fireplace construction. The flues are all dotted on the

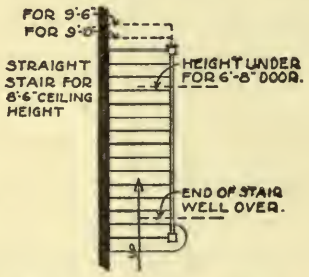


Fig. 59. A Simple, Straight Stair.

elevation. There should be an **ash-chute** from each fireplace connected to an **ash-pit** in the basement. There should be a damper in the throat of the fireplace to regulate the draft. All fireplaces should be lined with firebrick.

Stairs. For stair construction, see Figs. 59 to 65 inclusive. The simplest stairway is the one that has no turns in it, or the one shown in Fig. 59. As laid out, this stair is for an 8 ft. 6

in. ceiling. Should the ceiling be higher, other risers may be added.

In Fig. 65 are shown the customary details. The **riser** is known as the vertical portion, and the **tread** as the horizontal portion. The main supports are usually 2 by 10-inch or 2 by 12-inch, notched to fit the treads and risers, and are

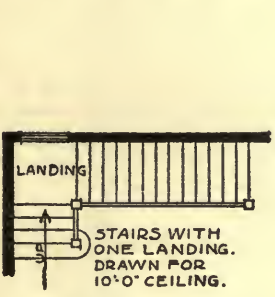


Fig. 60.

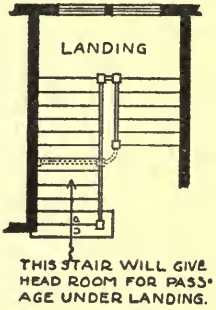


Fig. 61.

Types of Stairs with One Landing.

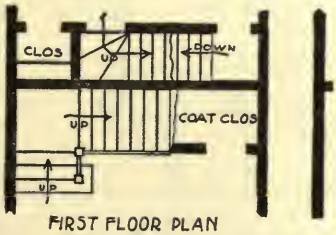


Fig. 62.

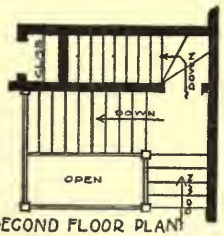


Fig. 63.

Combination Front and Back Stairs.

called **carriages.** The **balusters** are the upright spindles or ornamental pieces supporting the hand-rail.

Various heights of riser to tread have been tried, but the one found most satisfactory is to make the riser from 7 inches to 7½ inches. The usual rule for figuring the treads and risers is

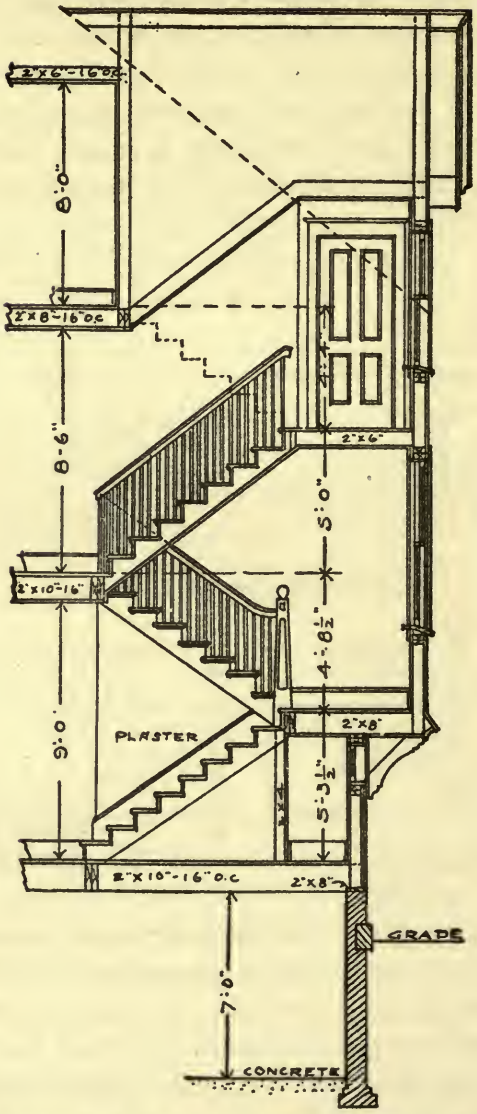


Fig. 64. Elevation of Stairway, Giving Necessary Information.

to make the sum of a tread and riser equal to 17 inches or 17½ inches. From this we see that the higher the riser, the narrower will be the tread. If we make the riser 7½ inches, then the tread should not exceed 10 inches. The width of tread is exclusive of the **nosing,** which is usually 1½ inches.

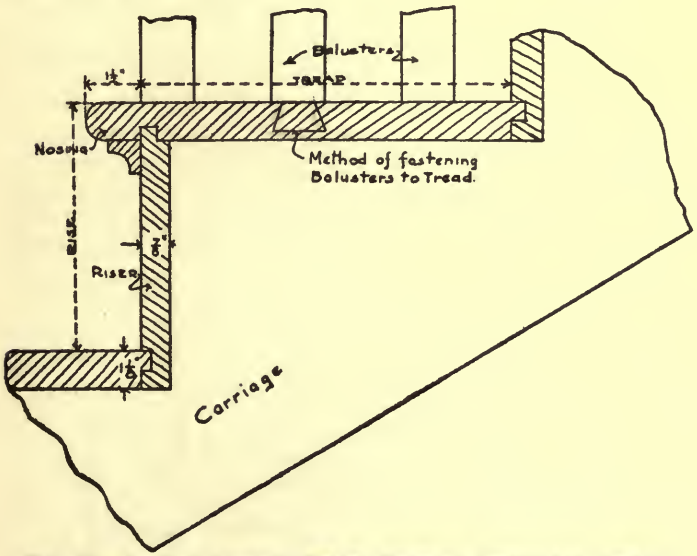


Fig. 65. Section through Stairs, Showing Customary Details.

Stone stairs, or stairs without a nosing, will have to be wider.

For figuring the number of risers, divide the height from floor line to floor line (in inches), by the height of one riser; the result will be the number of risers.

Fig. 60 shows a stairway with a landing. Fig. 61 is another form of stair with a landing.

Fig. 62 is a combination front and back

stairs. There are separate stairs up to the landing; then the back stair joins the main stair. Fig. 62 is the first-floor plan, and Fig. 63 the second-floor plan, of the same stairs.

Fig. 66. Single-Light Window.

Fig. 67. Two-Light Window.

Where possible, put a coat closet under the stairs. This space cannot be utilized for anything but a basement stair or a closet. Usually there is a basement stair in the rear of the house.

Fig. 64 shows an element of the stairway, giving all necessary information.

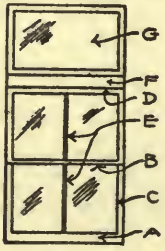


Fig. 68.

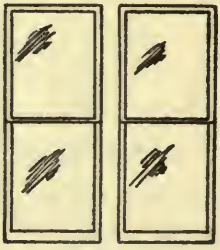


Fig. 69.

Types of Window Construction.

Windows. There are various types of windows used in the construction of buildings. The plainest is the **single-light window** shown in Fig. 66. This is either pivoted, hinged, or fixed to slide.

The windows are usually designated according to the number of panes of glass they contain, Fig. 67, for example, being a two-light window. Very often a large glass space is divided into smaller areas by means of horizontal and vertical strips called **muntins,** as shown in Fig. 68. The lower sash slides up, while the upper one is usually fixed in place; this upper sash is called a **transom.**

When windows are grouped in twos or threes, they are separated by means of vertical divisions. These divisions are called **mullions.** The weights of the sash usually travel in these (see Fig. 69).

The **sash** is usually the movable frame that contains the glass. A **double-hung window** is one in which the sash are counterbalanced by iron weights so that the sash will slide easily up and down in grooves in the frame. The sash of a window may be hinged to open like doors, in which case the window is called a **casement window.** If the sash are hung on pivots, either vertically or horizontally, we speak of the window as a **pivoted window.**

Referring to Fig. 68, **A** is the **lower rail** of the sash, usually from 2½ to 3 inches wide; **B** is the **meeting rail,** from 1 to 2 inches wide; **C** is the **stile,** usually 2 inches wide; **D** is the **upper rail,** of the same width as the stile; **E** indicates the **muntins,** which divide the sash into small areas; **F** is the **transom bar,** or the

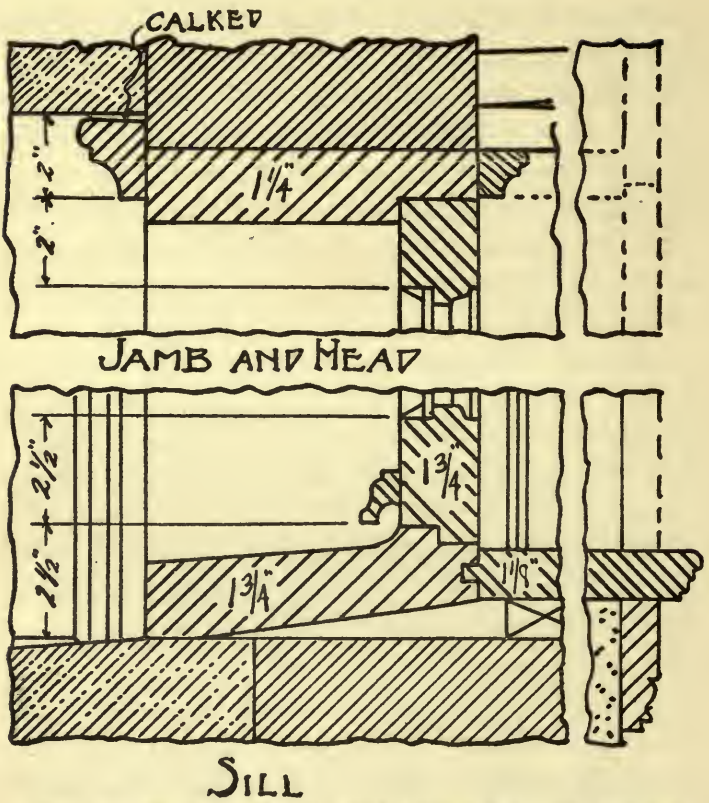
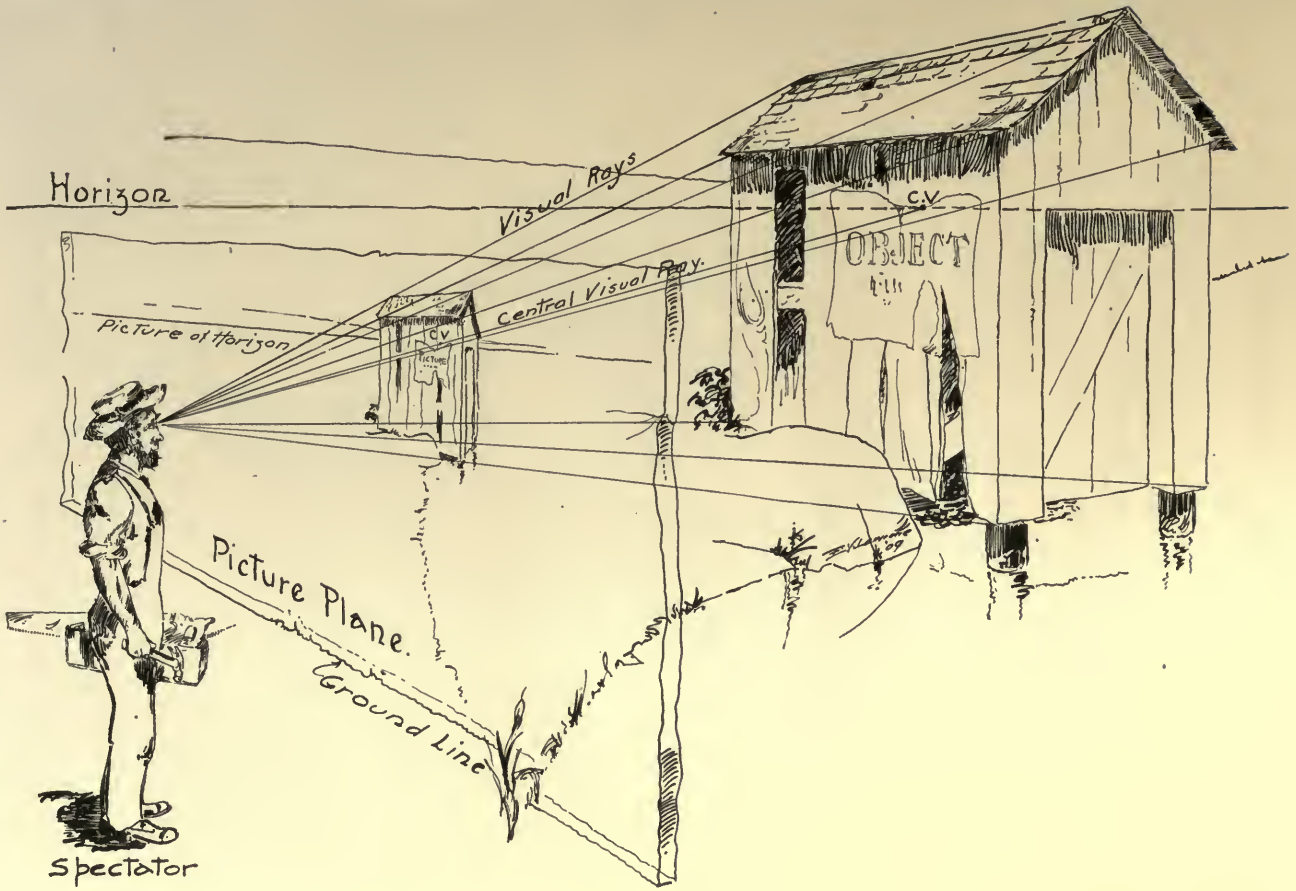


Fig. 70. Typical Detail of Plank-Framed Basement Window.

fixed bar between the transom **G** and the double-hung sash below.

The usual thicknesses of sash are 1⅛ inches for small windows, to 1⅜, 1¾, and sometimes 2¼ inches, depending upon the size of sash. The larger the window, the heavier the sash must necessarily be.

In Fig. 70 we have a **plank-framed window.** This is the same kind of frame required for the



ILLUSTRATING THE ELEMENTS OF PERSPECTIVE.

casement window as shown in Fig. 76. Fig. 70 is the typical detail for cellar window construction. The windows usually have a single sash which may be divided by muntins into smaller

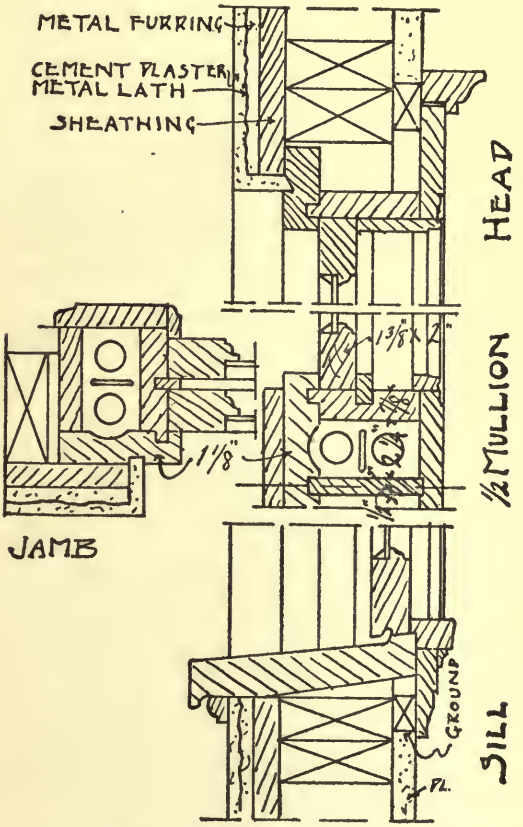


Fig. 71. Double-Hung Window, Outside of Building Plastered.

lights. Notice the projection on the bottom rail, which serves as a drip for all water coming from the glass. Such windows are usually hung at the side or top. Fig. 70 is detailed for a

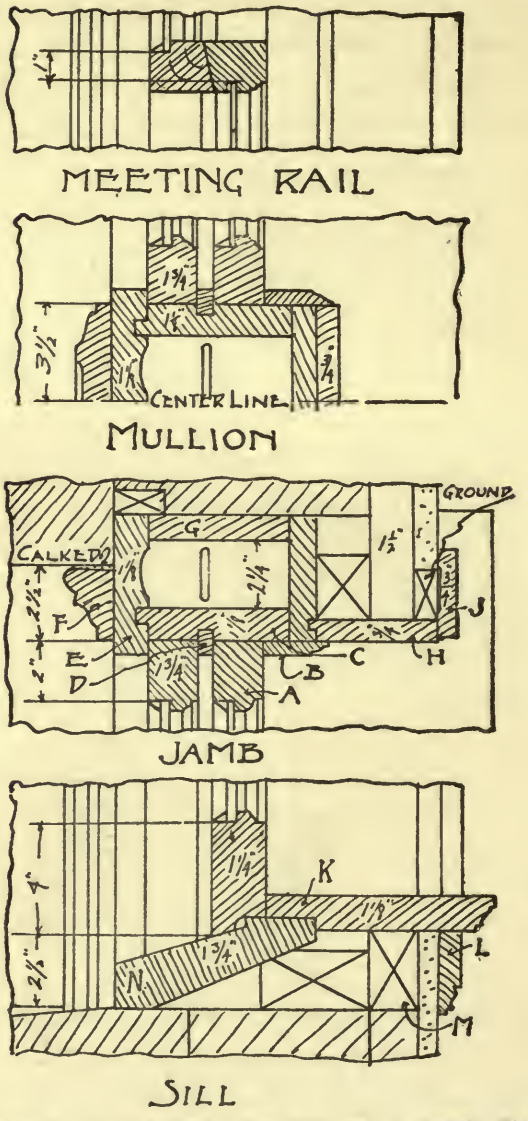


Fig. 72. Double-Hung Window for a Brick Wall.

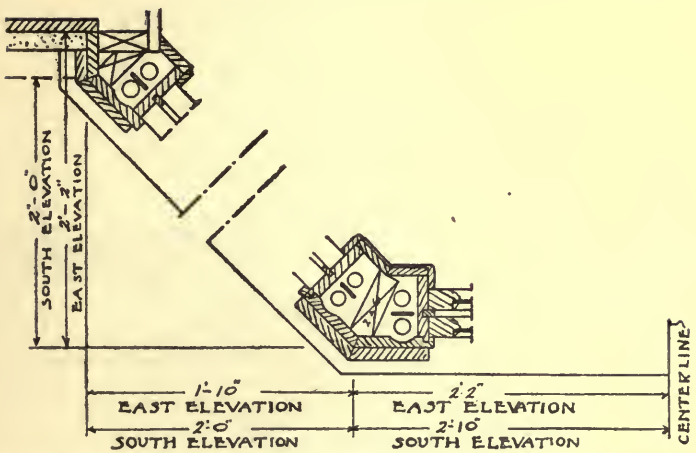


Fig. 73. Part Section Showing Details of Bay Window Construction.

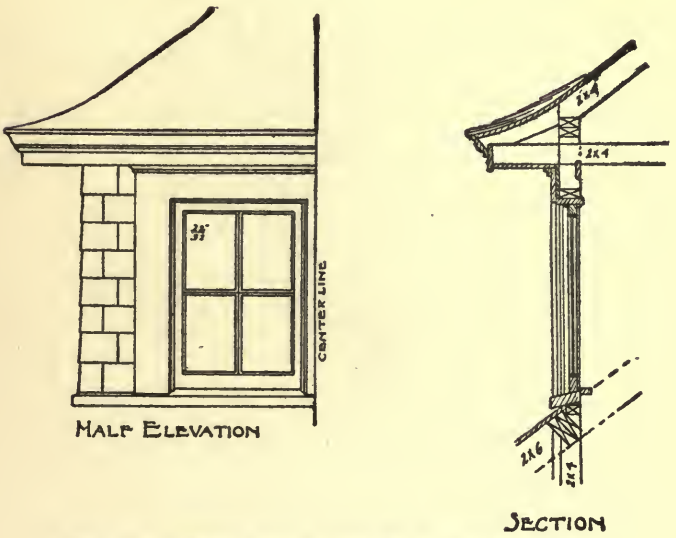


Fig. 74. Details for a Dormer or Roof Window.

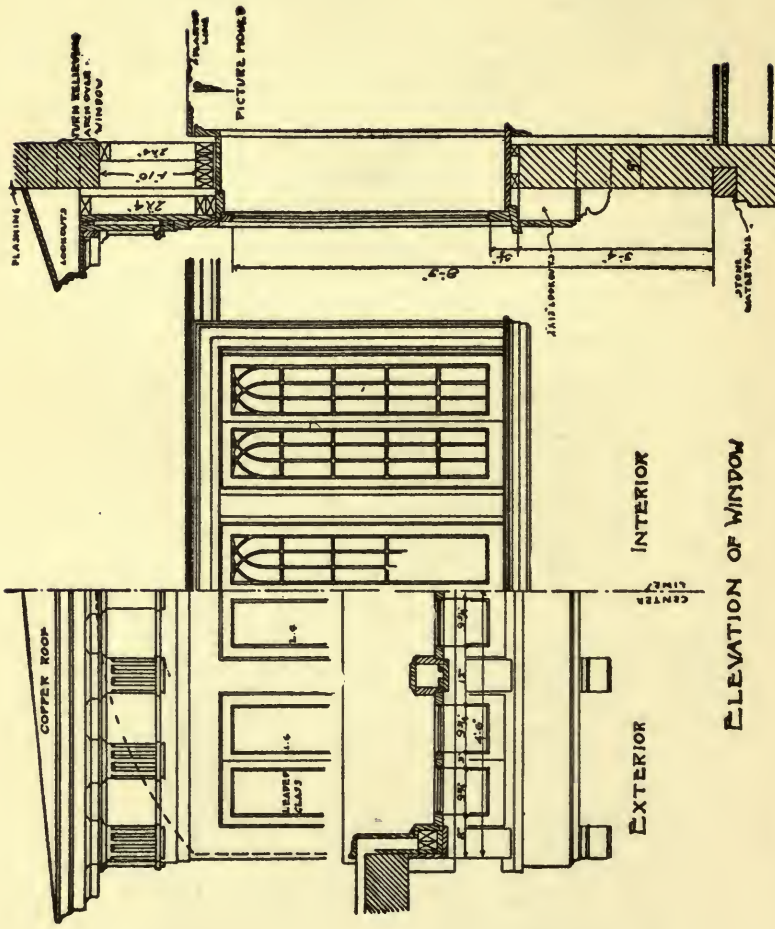


Fig. 75. Showing Details of Construction for Projecting Bay Window.

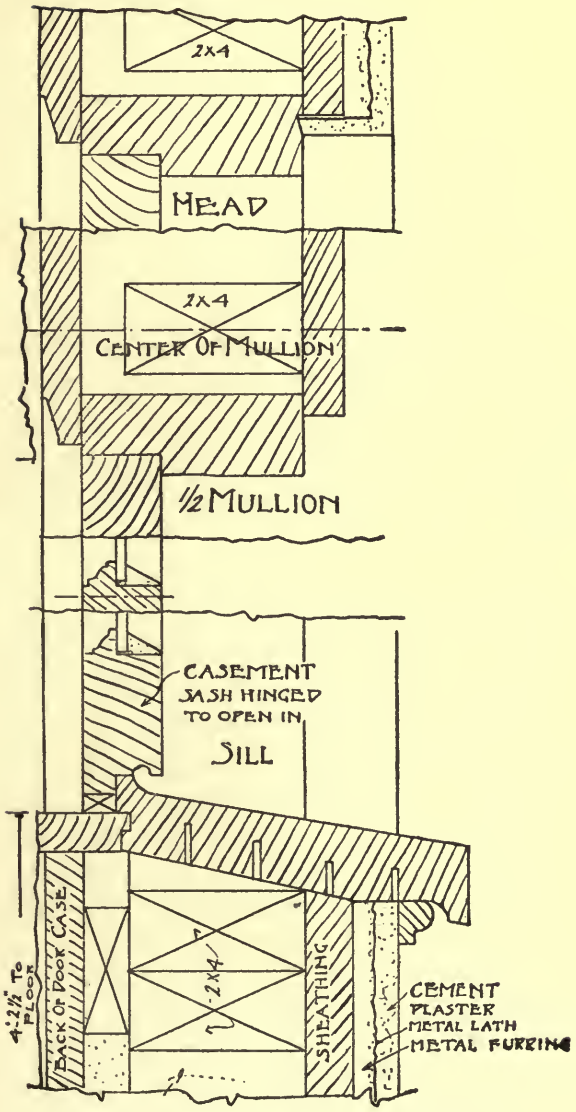


Fig. 76. Details of Casement Window.

brick wall, although the same detail will apply to a frame wall.

In Fig. 71 we have the details and dimensions for a double-hung window in a frame wall, the exterior of the wall being plastered. In Fig. 72 we have the details for a double-hung window in a brick wall. Notice that there is very little difference in construction. The parts of the construction are named for the sake of clearness, **A** being the **sash**, **B** the **inside stop**, **C** the **pulley stile**, **D** the **parting strip**, **E** the **outside casing**, **F** the **brick mould** or **staff-head**, **G** the **back lining**, **H** the **sub-jamb**, **J** the **inside casing**, **K** the **stool**, **L** the **apron**, **M** the **ground**, and **N** the **sill**.

In Fig. 73 we have the construction for a **bay window**, showing the boxes, sash, etc.

Fig. 74 shows the details for a **dormer** or **roof window**.

Fig. 75 shows the construction for a projecting bay window, the sash being hung to swing out. We have shown a half exterior view, a half interior view, and a section.

Fig. 76 shows the details of a **casement window** in which the head, mullion, and sill, with all adjoining construction, are shown. Notice the grounds or guide for the plaster work, as spoken of under "Lath and Plaster."

Fig. 77 shows the interior elevation of the door and window trim, with a large-scale drawing of the exact profiles of this trim. The trim, and in fact all interior woodwork, are fastened

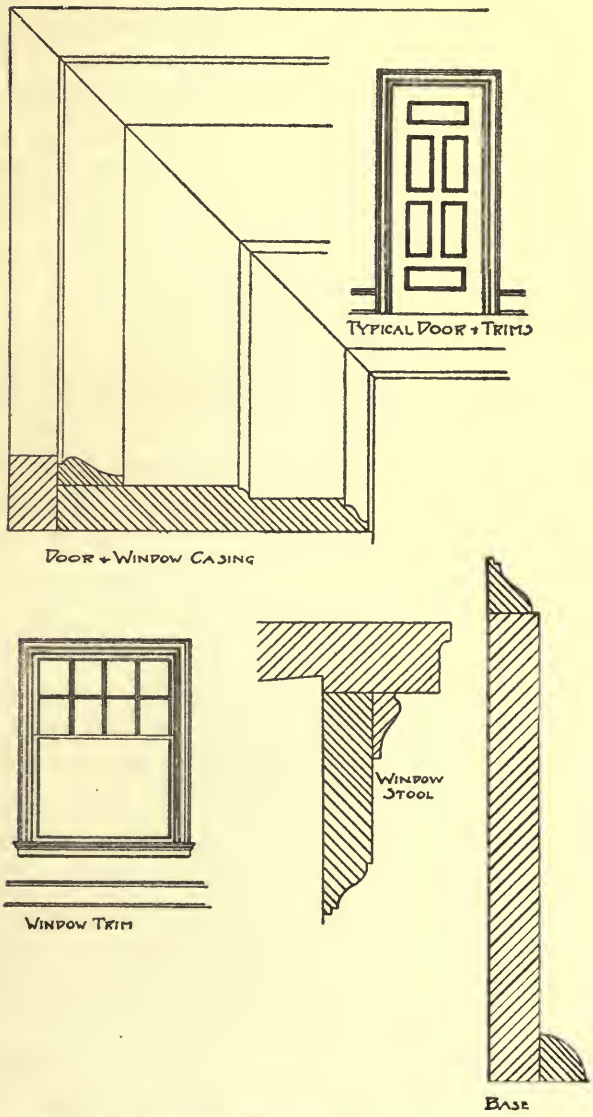


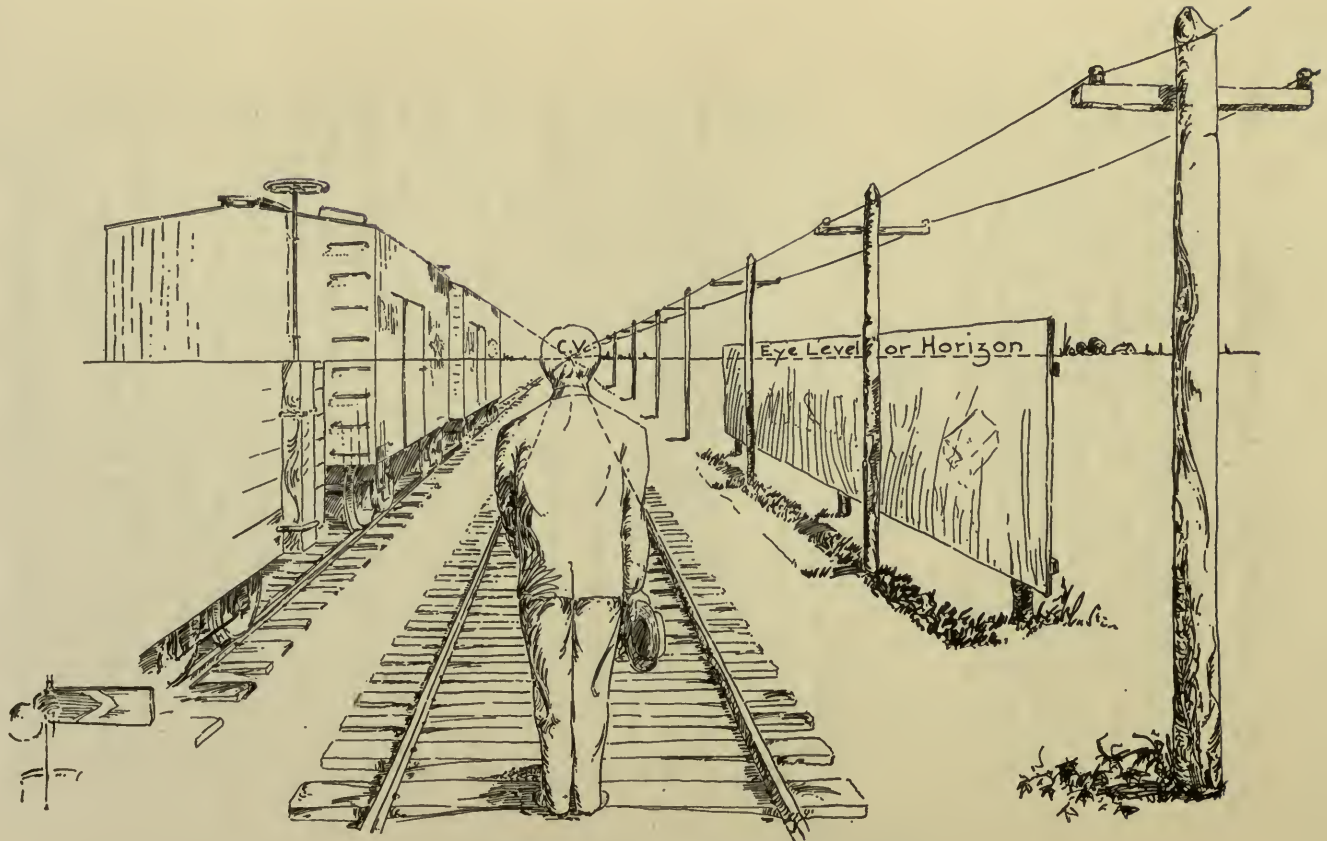
Fig. 77. Details of Window and Door Trim.

to the grounds, which are set to serve as guides for the plasterer, and which should be placed back of all interior finish. The base shown is the finish at the floor-line. The base is nailed to grounds; and the quarter-round mould at the floor is nailed to the floor, to cover the crack at the joining of the base and floor-line.

SKETCHING

In all architectural work, the art of **sketching** is important. To be able to show one's ideas clearly and artistically, or to reproduce some form or object in a pleasing manner, is indeed an essential qualification for the draftsman as well as the architect. Some have a natural ability to sketch, which lacks but the pencil and paper to give a true expression of the idea of the mind; while others acquire the art of sketching only by diligent study and persistent practice. Many instances have proven the fact that one may have ability, but that it needs developing, just as in the case of the mathematician, who becomes an expert in the higher mathematics by a gradual training from the simpler problems on up through more complex ones. Because one has not ability that is apparent at the outset, is no criterion whereby we may judge of his ability along any particular line. Learn to sketch, as it is a valuable asset for the architect.

Fundamental Principle. To the beginner,



AN EXAMPLE OF PARALLEL PERSPECTIVE.

the object usually presents itself as made up of small portions, and ordinarily he will make an attempt to show all the small details, overlooking the main mass or body of the object. The first thing is to be able to see the object as it really is, as it would really appear to the best advantage when sketched roughly and quickly. Learn to look at the general grouping of the different portions, and their relation to one another. The beginner attempts to draw the object as he sees it at close range, while the experienced person draws it as it appears at a distance. The tendency of the beginner is to represent everything with hard, sharp, and exact lines which are known from actual knowledge of the object to exist, although they do not really appear so. Learn to study the general proportions as expressed by the shadows, rather than by the exact outlines bounding each surface. Studying an object for sketching is really a study of the shadows. In all sketching, the proportion is the fundamental principle. Having correctly represented the proportions, then represent the object by means of the shadows as cast upon the object, and let the details be merely an after consideration. Learn to see the object correctly, and the representation by lines will come by practice.

Pencils and Paper. The pencil is present on all occasions; therefore it is used a great deal in sketching. Pencils may be obtained in all degrees of **hardness** and **softness.** Drawing

pencils are usually denoted by **H**, **HH**, etc., for hard pencils, up to **8H**, which is a very hard lead; the soft pencils are denoted by **B**, **BB**, etc., up to **4B** for very soft pencils. An intermediate grade known as an **HB** is between the hard leads commencing with **H** and the soft leads commencing with **B**. This is a very convenient grade to use for all kinds of work. A good drawing pencil should contain no grit.

As a general rule, the larger the drawing, the softer the pencil, since the lead in the soft pencils is larger than that in the hard pencils. Therefore, it is rather difficult to make a small drawing with a really soft pencil. As stated above, the most satisfactory pencil for all-around work is the medium grade or the **HB** pencil.

The pencil should never be sharpened to a point. Cut away the wood, leaving the lead its full size; and by a few strokes on a piece of scratch paper, wear off the sharp edge, until you have a line the full thickness of the lead.

Hold the pencil comfortably between the fingers, not in a cramped position, but free and easy. The length of line, the position on the paper, and the width and intensity of the lines will determine just which movements of the fingers, wrist, or arm are the best suited to the work. In all work, avoid bending over the drawing; sit upright so that the drawing may be all seen at a glance. The paper should

always be at right angles to the line of sight, to insure the best work.

The paper should have a somewhat rough texture for the best work, although some very pleasing sketches have been made upon smooth paper. Never use a glazed paper. The smooth paper requires greater care in its use, it being harder to erase anything successfully. A good grade of tracing paper makes a very good paper for sketches with a medium-soft pencil.

Method. Begin sketching by drawing parallel lines horizontally; then make them vertical; then slanting lines—endeavoring all the time to make them all of the same width and intensity. After exercises in the drawing of straight lines, try circles and ellipses. Then sketch familiar household articles. From these, let the student take up more difficult work, learning to see objects as they actually appear to the eye, and not as they are really known to exist.

Referring to Plates E and F, notice the method used for indicating surfaces. Instead of covering the side of the building with long, mechanical, parallel lines, the lines are made short, and broad, and break joint so as to give an uneven surface. The eaves are all represented by the shadow they produce, there being no definite line for the edge of the roof. For the corners of the building, there is not a hard, sharp line, but a broken, irregular line. The

doors and windows are all represented by the shadows they cast.

It will be noticed that the shadow is the thing to reproduce. If the shadows are shown in their true relative proportions, in intensity and size, we are reasonably sure of a satisfactory sketch. For such work, the object is

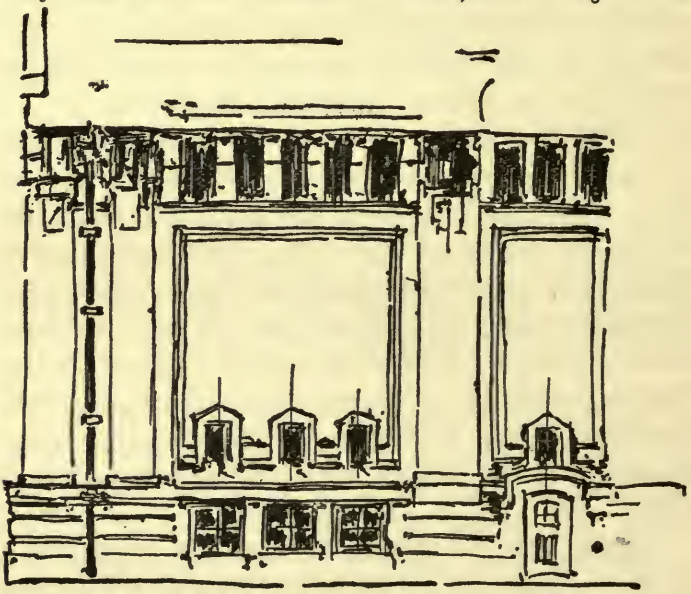


Fig. 78. A Quickly-Made Preliminary Sketch.

usually outlined with a light line, to get the proper lines and proportions; in other words, just enough lines are given to show the proper relation of dimensions.

Having outlined the object, then commence with the soft, broad pencil, and indicate the texture and shadows by varying intensities of lines.

Practice will give you the best training for developing the art of sketching. It is not enough to study work already done, analyzing lines and surfaces. Actual work and practice in drawing and sketching will do more for you than any mere study of sketches.

Learn to make preliminary sketches quickly, and yet indicate general proportions and outlines (see Fig. 78). This sketch was made in about five minutes' time, while the architect was talking to his client. Some of the finer points of the original pencil sketch are necessarily lost in the pen-and-ink reproduction from which the cut was engraved. The figure represents a possible treatment for a boiler house. This is a good example of a preliminary sketch, there being no particular time spent in the drawing and very few straight lines used, yet, when the sketch is studied, we can see the general effect that such a building would produce in sunlight.

Make your sketches have some "snap" to them. Let each line be firm, starting and stopping in a way that shows it to be there for a definite purpose. Use plenty of free and easy lines, and also black lines. Do away with sharp lines, and never use hard pencils for this work.

For the purpose of **laying out drawing**, either for pencil, pen and ink, or pen-and-ink rendering, a sketch will be shown to illustrate clearly the quickest and most satisfactory method. See Fig. 79, where the sketches are all rather

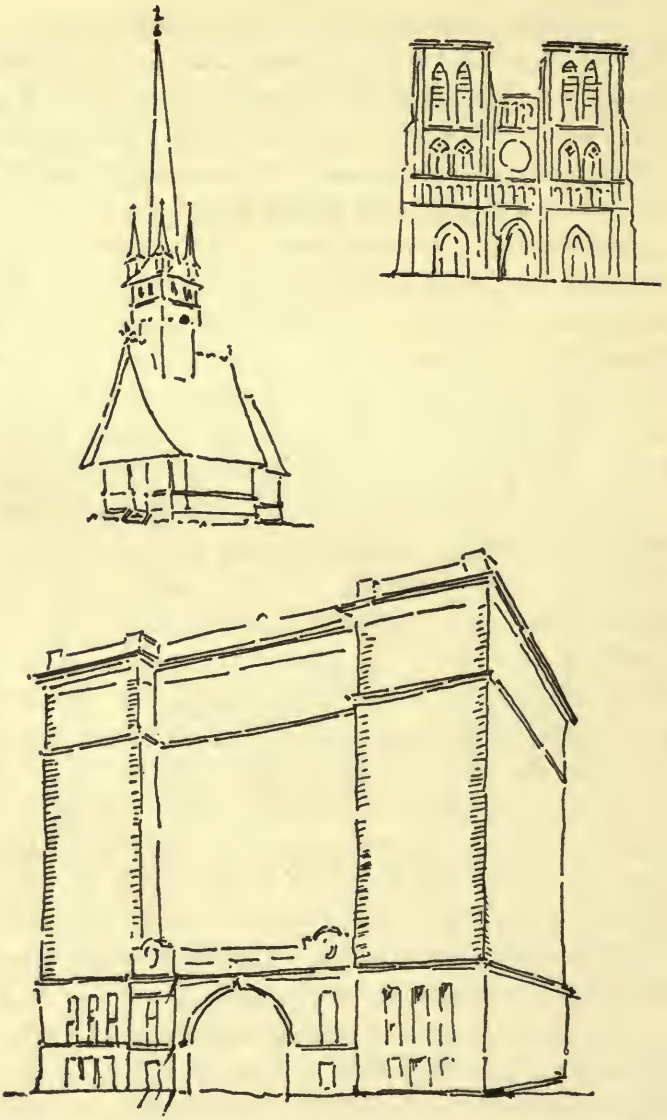


Fig. 79. Sheet of Drawings Laid Out with a Sense of Proportion.

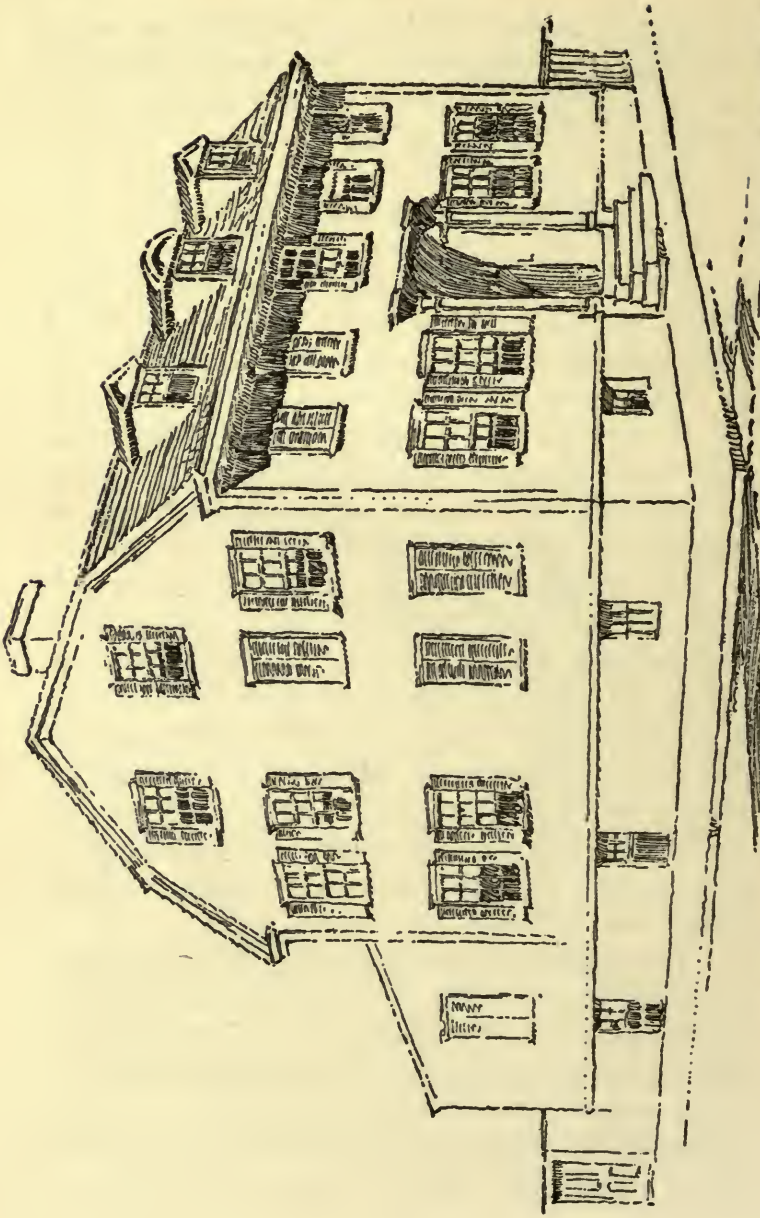
rough or uneven, but the general drawing shows the effect of proportions. The lines, instead of being long and continuous, are made up of short lines almost joining.

PEN-AND-INK RENDERING

Finished drawings may be **colored** or **rendered** in a number of ways. The method of **pen-and-ink rendering** is very often used. It is indeed an accomplishment to be able to render in pen and ink successfully. This usually comes only from long and patient work in practicing. A drawing may also be rendered in **pencil,** or colored by means of **water-colors.**

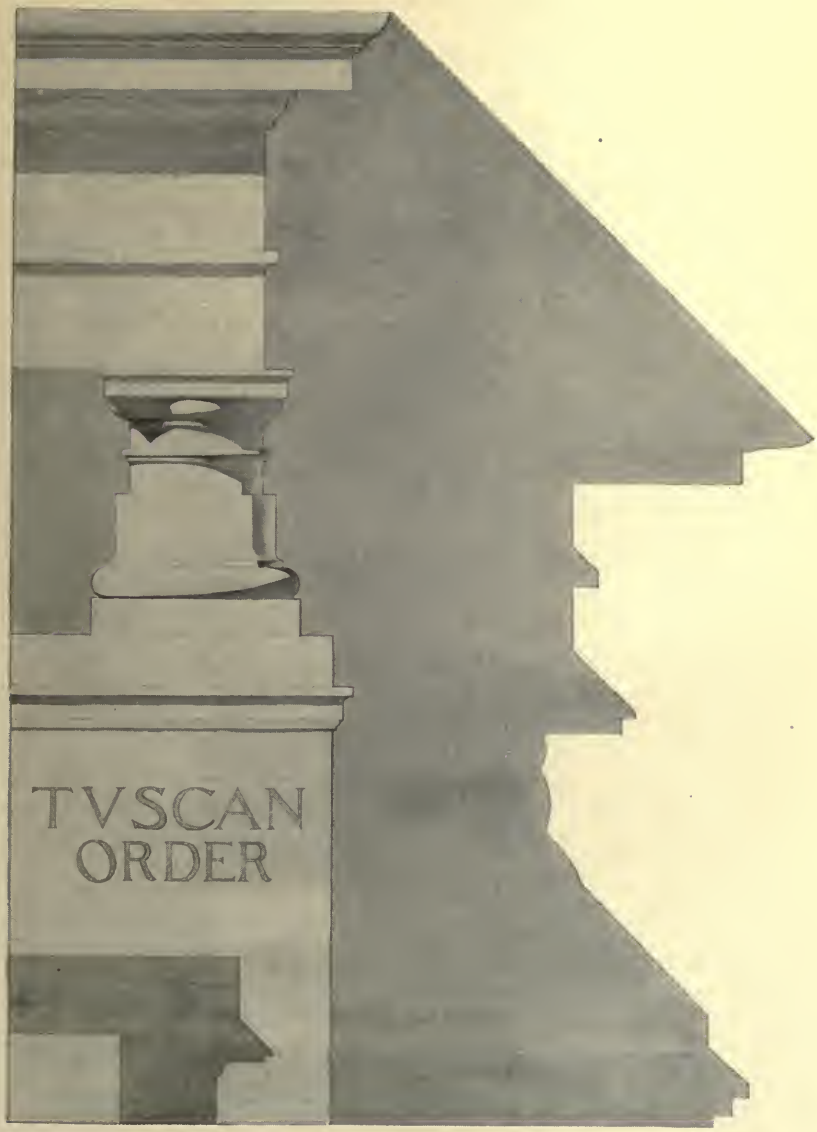
For pen-and-ink rendering, any black ink will do. A good grade of India ink is very satisfactory and convenient. There was a time when all drawing inks were made by grinding a stick of India ink in water on a stone bed; but now prepared inks are used almost entirely. The pens should be fairly large, and have a medium point; the tendency of beginners is to use too fine a point. Any good-quality tracing paper may be used.

The outline of the work may be made upon scratch paper; and, by placing the tracing paper over it, the ink rendering can be made directly over the outline. Papers with soft surfaces should be avoided, since the ink will have a tendency to spread, the points of the pen will often catch and spatter ink, and erasing is



Courtesy of "American Architect and Building News."

Fig. 80. Illustrating General Method of Rendering a Building in Pen and Ink.



SHADOWS CAST UPON AN ORDER OF ARCHITECTURE.

PLATE D—Architectural Drafting.

almost impossible. Good bristol board makes a satisfactory surface to work upon.

All lines should be firm and uniform, and series of parallel lines should give an even texture or appearance to a surface. Avoid the stiff, hair lines, which are too fine to give any character to the work. In making ink lines, while the general direction of the line may be straight, yet a line slightly wavy, or a line such as would be made by the trembling of the hand, is not objectionable.

Use care in drawing lines to make them as uniform as possible, and exercise care in the starting and stopping of lines. Lines should naturally be a little heavier at the ending than at the beginning.

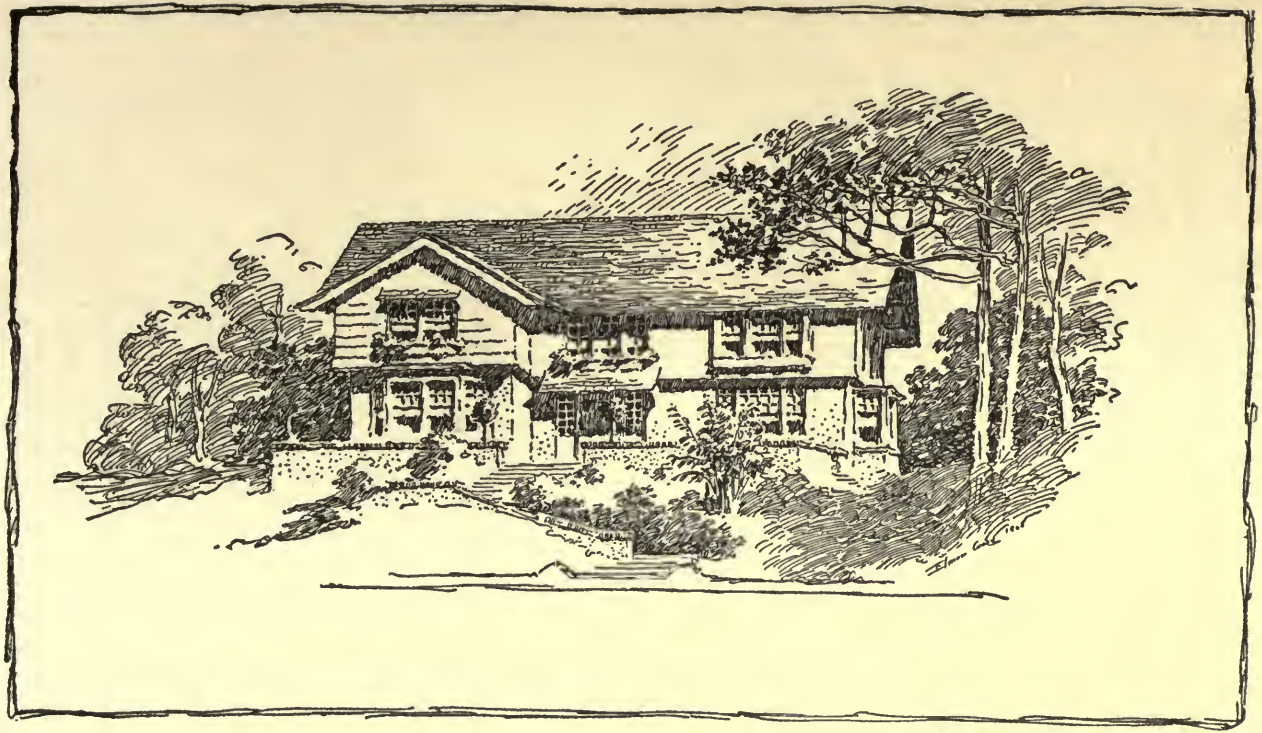
Referring to Fig. 80, we see in this drawing, the general method of rendering a building in pen and ink. The window-panes, instead of being hard, sharp lines, are made by a series of parallel lines representing the shadow. Notice the treatment of the roof, the shadow of the cornice, and the general lines of the building.

Fig. 81 shows the use of parallel lines entirely for the texture of the wall, and also for the shadows.

Fig. 82 shows a very attractive drawing. Study the foliage around the house; see how it has been represented by lines, sometimes straight and sometimes curved. The distance to the background is obtained by the quality

Courtesy of "American Architect and Building News."

Fig. 81. Illustrating Use of Parallel Lines in Pen-and-Ink Rendering.



Courtesy of "Inland Architect and News Record."

Fig. 82. A Well-Executed Example of Pen-and-Ink Rendering.

of the line; the further away the background, the lighter the line. Study the lines representing the wall and roof surfaces. Notice that the lines in general are not straight, but are more or less irregular. The shadows in Figs. 81 and 82 are composed of entirely different kinds of lines. Probably the best and easiest method is by the use of vertical lines. Notice, generally speaking, that there are no long lines. If it is necessary to make such a line, let it be represented by a series of short lines, with their ends almost touching. The tendency of the beginner is to make the rendering all too light. Put in some black, somewhere, as it makes the drawing more in contrast, and emphasizes other portions of the work.

Plate G is a good example of a sketch rendered in pen and ink.

WASH DRAWINGS

Water-colors or **India ink** for coloring drawings, are used for the best work, almost entirely. By means of color or by the use of India ink for a monotone, the shades and shadows can be emphasized and the drawing made much more attractive. The usual method of procedure is to have the paper upon which the drawing is to be made, stretched tight upon a board; then cast the shadows, marking the outlines faintly with a hard pencil; then clean the drawing with a soft eraser; finally, have all

ILLUSTRATING METHOD OF SKETCHING.

Notice the absence of hard, mechanical lines and sharp corners, and the use made of the shadows for indicating surfaces.

materials ready for applying the washes, and then start the color work.

Materials. The usual materials for wash drawings are: the colors or the India ink; a number of brushes (one a bristle brush and the others soft camel-hair or Japanese brushes); plenty of receptacles for holding the color in its various shades, also one large receptacle for clean water. Porcelain or china dishes made especially for this work may be purchased from any dealer in artists' materials. In addition to the above, a soft sponge and a number of blotters will be necessary. The paper should have a rough finish, as this takes the color or wash much better than paper with a smooth or glazed surface. Hot-pressed and cold-pressed papers of good quality are largely used for this work. The cold-pressed is a little rougher than the hot-pressed and is perhaps more frequently used. A good tracing paper may be used if the color is applied thick and in spots, or where no attempt at a true wash drawing is made. Care will have to be exercised in the use of tracing paper, as too much water will spoil the work.

As mentioned above, the paper upon which the drawing is made has to be **stretched tight** on the drawing board. This may be done after the drawing has been made, although it will be found much more convenient to stretch the paper first, and then make the drawing. To stretch the paper, it should be thoroughly wetted all over, and kept wet until it is firmly

fastened in place; this wetting causes the paper to expand. On the four edges of the paper, for about an inch back from the edge all around, place glue or drawing-board paste. The paper, being expanded by the water, should now be fastened or pressed down onto the board, working opposite edges at the same time. Do not attempt to stretch the paper perfectly tight. Be careful to see that the edges of the paper are in contact with the board, and run the back edge of a pocket-knife all around, to insure the glue or paste on the edge of the paper coming into contact with the board.

After the paper is thus stretched, take all surplus water off by means of a sponge, and dry the paper as much as possible with the sponge. Allow the paper to stand until thoroughly dry, when it will be found that the paper has shrunken tight and smooth, giving a good surface for the drawing, and the rendering will be much easier because the paper is held firmly in place. Be very careful to see that the paper is stuck to the board all along each of the four edges, before allowing the paper to dry.

After the drawing has been made, the shadows are cast with light pencil lines. Clean the drawing with a soft eraser, either of kneaded rubber or of "sponge" rubber. These erasers remove the general surface dirt without affecting the lines materially.

The use of an India ink wash will be described, although the same treatment will be

true of colors. The drawing should, of course, be inked very carefully before any tinting is started. The erasing of lines should be done very carefully as the surface of the paper, if rubbed too hard, will be abraded—so that when colors are applied they will soak in instead of remaining on the surface. The drawing may be very carefully washed after the inking is completed, with a soft sponge; this removes surplus ink and leaves the lines more subdued.

Method of Applying Wash. Having the drawing all ready to render, a few principles must be followed to insure the best results. Have your water, color, brushes, blotters, and sponge, all handy; have plenty of clean water convenient; for heavy or dark shades, apply several washes of a lighter value, instead of putting the heavy color on all at once.

Having once started the wash, carry it on continuously, without allowing it to dry; any mistakes can be remedied after the wash is completed, but the wash should never be interrupted to rectify mistakes. Lighten the wash by the gradual addition of clean water; be careful to take the color from the top of the dish, to avoid getting the sediment. Always take about the same amount on the brush, and do not allow the brush to become too dry before adding more, as this will dry much quicker on the paper, and the addition of more will cause a streaked or mottled effect.

Having reached the bottom of the drawing,

take up any standing water or color with a blotter, as it will make a bad appearance if this is all allowed to stand and dry. The board should be tilted slightly, so that the wash will have a tendency to move downward; and it should be left in this position until the color is dry. Do not attempt to patch or add color to any portion of the drawing that has commenced to dry.

Having put into a saucer enough of the ink for the drawing, apply the brush to the surface of the ink, soaking up a brushful. If the drawing is of any considerable size, a wide, flat brush of camel's hair can be used to better advantage than a pointed brush. The pointed brush, however, will be the one most used on ordinary-sized drawings.

With the brush filled with the ink, apply to the upper edge of the drawing, carrying it across the top and gradually working it downward, adding more ink as the brush becomes drier. Since all work is darker at the top and gradually shades lighter, as the wash is carried down the sheet, add a little clean water each time, until, at the bottom or last application of the brush, it should contain almost clear water. This shading from darker at the top to lighter at the bottom is a conventional way of rendering plans.

Plate H (lower figure), shows a plan rendered in this way, the darker effect being

obtained by a series of light washes and not by a single wash.

The brush is held in much the same way as a pencil, the hand being entirely free from the paper, or perhaps at times resting on the little finger.

In case of any blotches or other objectionable portions, these can be remedied with a little care. Take the sponge and dip it into clear water. Sop the portion thoroughly, allowing enough time for the water to soak into the color; then apply a clean blotter, and soak up the water. Be very careful not to rub the blotter over the surface. If very carefully done, the trouble can be remedied, and the drawing will scarcely show the spot.

Be careful, in all work, not to allow dust or hairs from the brushes to remain on the drawing. These may be removed with a toothpick, by slightly moistening the end of the toothpick in the mouth and carefully lifting the objects off the drawing. For lines that have overrun after the wash has become dry, take the bristle brush, moisten it in clean water, and rub gently over the color outside the line. When the water has soaked into the color, use the blotter. The trouble can be remedied by one or two such treatments.

The methods of procedure described above concern the application of flat washes.

It will take considerable practice to render well. The beginner is advised to make several

sheets of such work as described above, before attempting a plan or elevation. Use the washes on the elevations to show shadows, or the portions in shade. See Plate H (upper figure), which shows an elevation rendered in the conventional way.

Water-colors are applied or "floated on" in the same manner as the India ink washes. Remember that in the use of colors you will have to be very careful to have a dish and a brush for each color, as the least particle of color in the clear water will sometimes change the color of some other dish if the two are used. Clean color boxes, brushes, and water are the first requisites of good rendering in color.

Colors may be obtained either in tubes, similar to oil paints, or in pans, which are small dishes of color. These should all be kept in a water-color box. There are usually two palettes or lids to this box, on which the colors may be mixed. If there is to be any quantity of color used, these palettes will not be large enough, and the dishes should be used.

In the use of either color or India ink, apply enough color to give the drawing some character; make it "snap;" do not commit the oft-repeated offense of having your drawing look "sickly" or have a washed-out appearance. Attack the problem of rendering, with determination; put on the colors as colors, and not as if you were afraid of spoiling something.

Red, blue, and yellow are commonly called

the three **primary colors,** and in combination will give the intervening tints or colors of the prism. Thus blue and yellow will give green; red and yellow will give orange, and red and blue will give violet or purple, the tints varying according as one or the other color predominates in the combination.

ORDERS OF ARCHITECTURE

In the study of architectural history, we turn to the Greeks and Romans for a great many fundamental principles of design. We see that they had proportions for everything. Adopting some unit, the building was designed and erected with this as a unit. They had certain arrangements of a cornice, a column, and a base which have been handed down for ages. All of the parts had certain relations to one another in size. This combination we have called an **Order.**

We have four Orders which are used in architecture—the **Tuscan, Doric, Ionic,** and **Corinthian.** (See Figs. 83 to 86.) A fifth Order—the so-called **Composite Order**—combines features of the others.

It will be noticed that all the ornamentation on the mouldings has been omitted for the sake of clearness in revealing the important proportions. Each Order has the three main divisions —the **entablature, column,** and **pedestal.** In our architectural design, the base or pedestal is

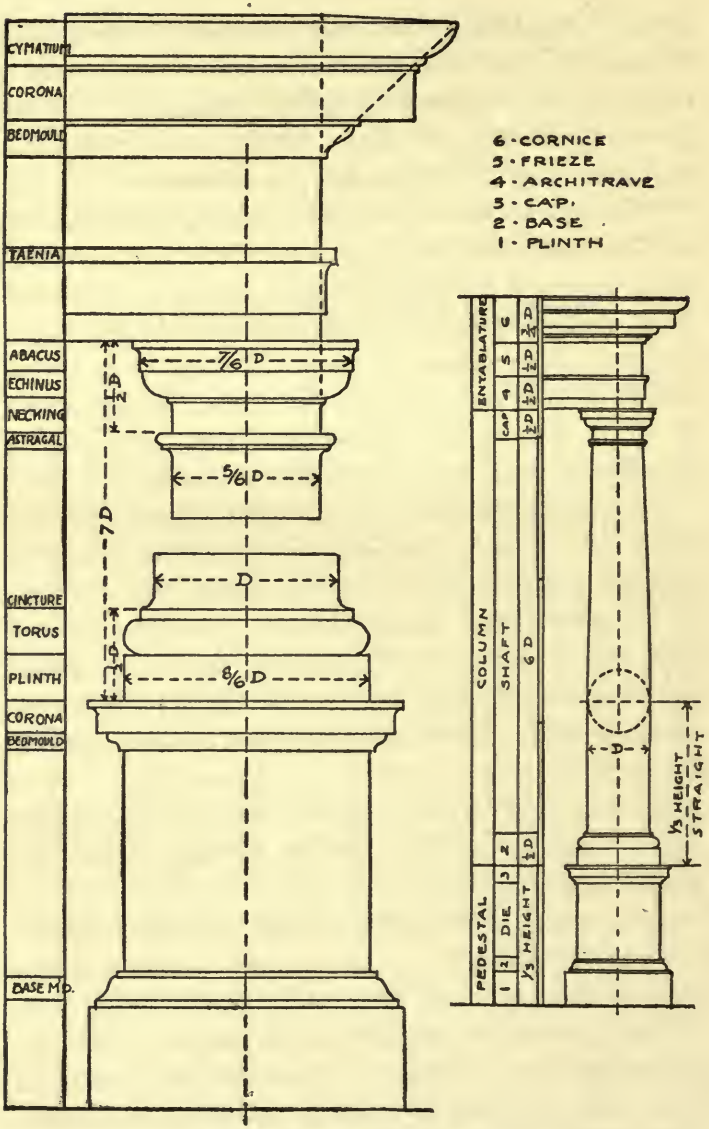


Fig. 83. The Tuscan Order.

usually omitted. As will be seen from the drawings, the entablature has three divisions—the **cornice, frieze,** and **architrave;** the column is divided into the **cap, shaft,** and **base;** the pedestal, into the **cap, die,** and **base.**

The entablature varies from 1¾ to 2½ times the diameter of the column. The cornice projects from the face of the column a distance equal to the height of the cornice in all cases except in the Doric Order. The frieze is a flat band or surface, sometimes ornamented. The architrave may be made of a single band, or it may be divided into a number of bands.

The column has a **capital** or top, varying from a plain cushion to the elaborate cap of the Corinthian and Composite Orders. The shaft, in some Orders, is perfectly plain, while in others it is fluted. All columns have a taper at the top. The shaft is carried up straight for one-third the height; and from this point it tapers. This tapering is called **entasis.** The shaft rests on a base which consists of a **torus** and a **plinth,** or a series of toruses called an **Attic base.**

The **diameter of the column** at the straight portion is used as the **unit of measurement** for all other parts.

Fig. 83 shows the **Tuscan Order,** with the principal proportions. This is the simplest Order, being perfectly plain. It is used a great deal for porches, or for lower stories where there are a series of Orders above.

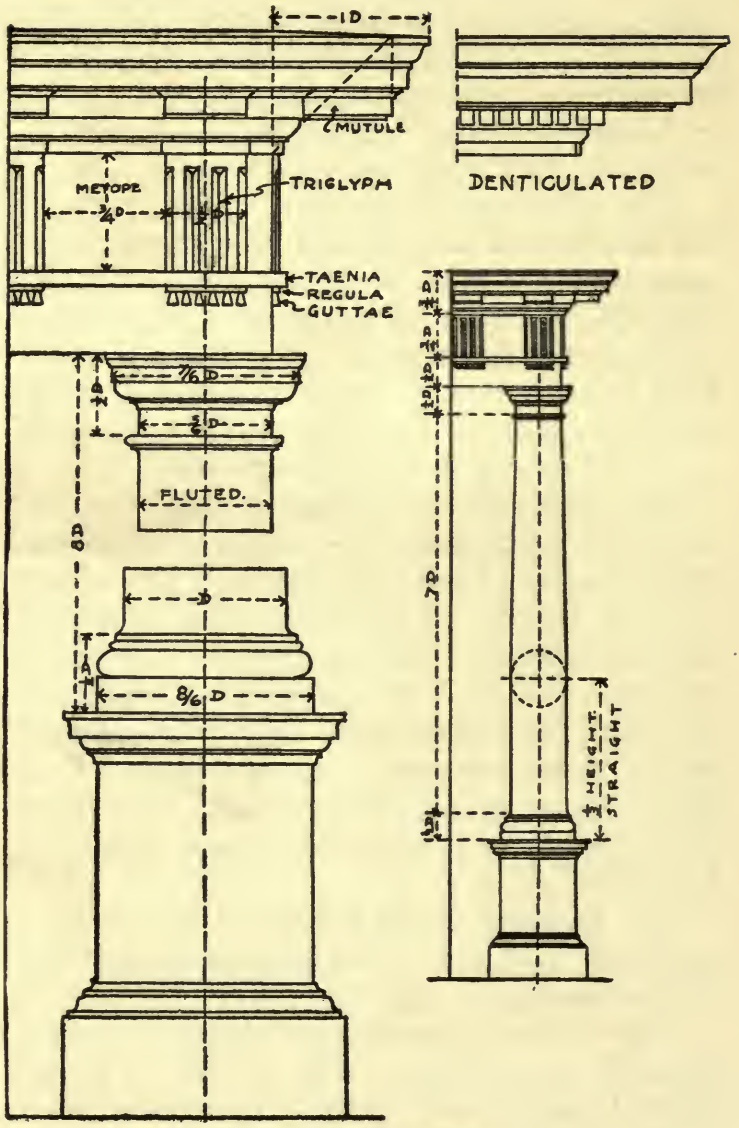


Fig. 84. The Doric Order.

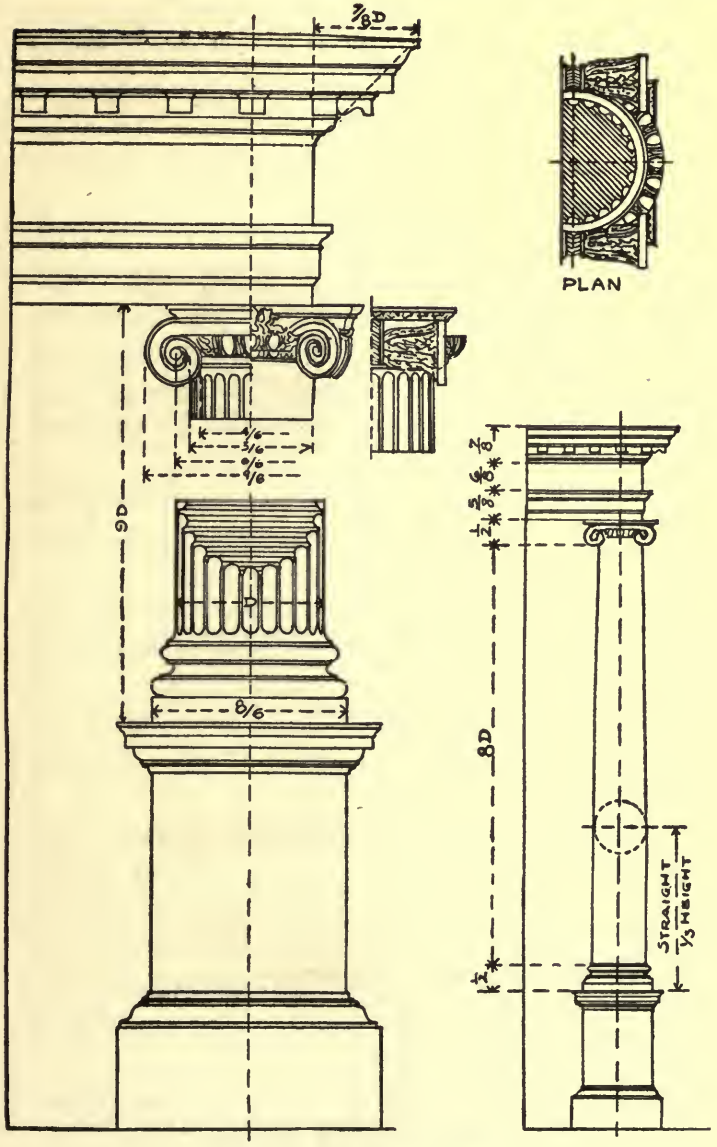


Fig. 85. The Ionic Order.

Fig. 84 shows the **Doric Order.** This has a great deal of ornament, both on the soffit of the **corona** (the projecting, crowning member of the cornice), and on the mouldings. In most modern designs, we see this Order modified more or less.

There are two types of cornices used with the Doric Order—one with the **mutules** (projecting flat blocks ornamented on the under surface); and the other with the **dentils** (a course of small cubes in the bed-moulding). The general profile of the cornice is different in the two types. The shaft is very often fluted.

Fig. 85 shows the **Ionic Order,** with the principal proportions. The cornice may have brackets called **modillions,** or it may have the dentils. The capital for the column varies, the left-hand half showing the **cushion capital,** and the right half shows the **volute** turned at 45 degrees, thus giving all faces alike. The shaft is fluted, and the mouldings are usually ornamented.

Fig. 86 shows the **Corinthian Order.** The main difference from the other Orders is the capital, which is highly ornamented by means of **acanthus leaves.** This Order is probably the most dignified, and is also the most expensive. Sometimes the shaft is fluted. The mouldings are all greatly ornamented.

There is a variation of the Corinthian Order, called the **Composite Order,** already referred to. The chief difference is in the volutes

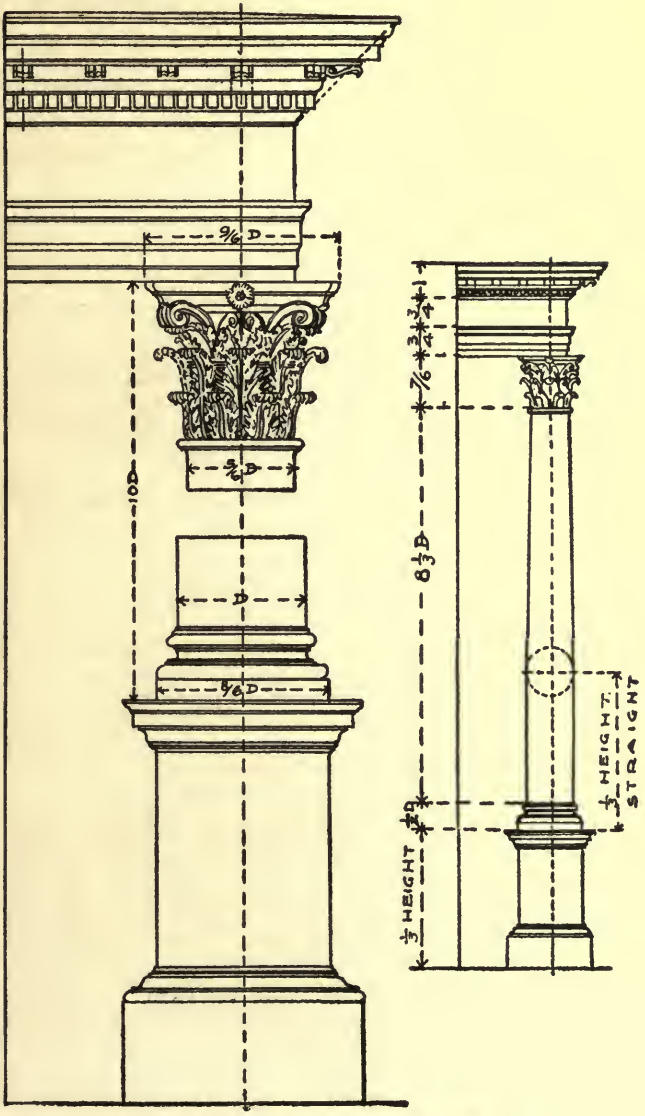


Fig. 86. The Corinthian Order.

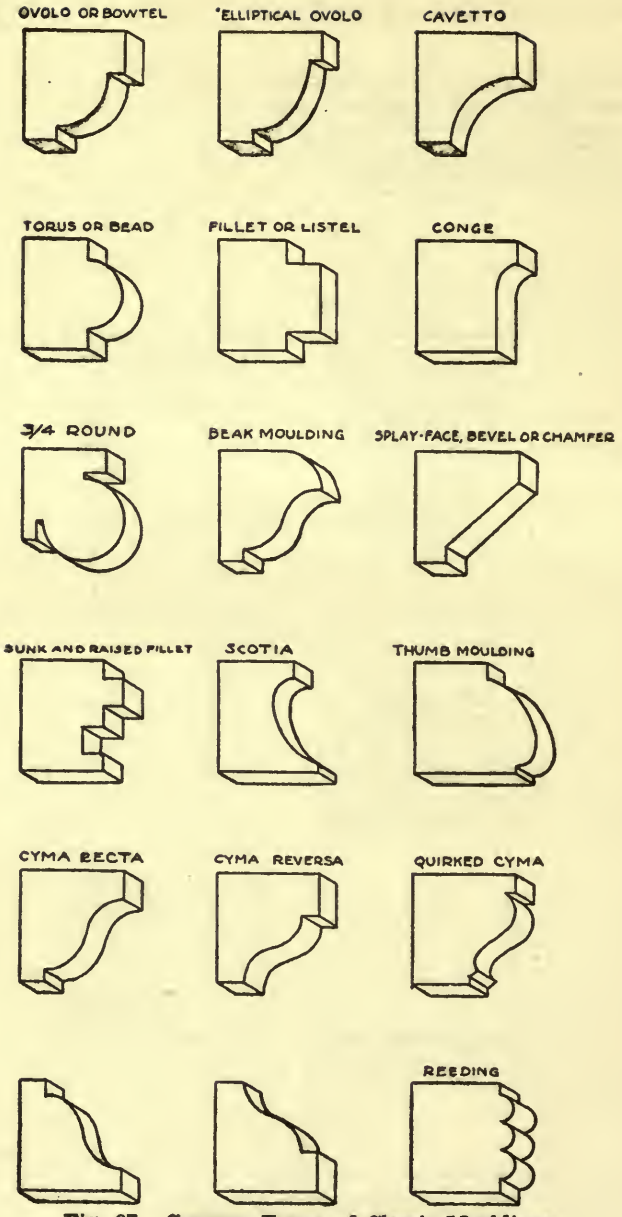


Fig. 87. Common Forms of Classic Mouldings.

of the capital, they being much larger and turned out the same way as in the true Corinthian.

All of these Orders are modified to a greater or less degree in all applications of them, each architect making changes to conform to general styles he is using on the building. The proportions, however, cannot be varied much without spoiling the general effect of the Order.

Fig. 87 gives some of the common forms of **mouldings,** with the corresponding names.

ARCHITECTURAL LETTERING

Good lettering is an essential requisite of a good set of plans. A drawing poorly executed but lettered attractively and well, will look a great deal better than one which is well drawn but which is poorly lettered. Therefore, at the start, let it be said that a draftsman needs to be a good letterer as well as a good draftsman.

We find lettering used with the earliest art of the Egyptians. These ancient people expressed their thoughts by means of symbols, more or less geometrical in outline. These inscriptions we find in the oldest of our Biblical writings; they were worked in stone and written on their papyrus. The forms used are called **hieroglyphics,** and students of ancient languages have been able to translate these strange characters.

The Greeks and Romans had characters very

similar to ours. We have copied their forms, and use them to-day for our letters. Some of the inscriptions on the ancient Greek and Roman temples are splendid examples of lettering, as to both form and spacing.

The first principle to remember is that good lettering comes from **freehand** work, and not a mechanical product. The tendency of the beginner, especially, is to make all letters by means of straight edges and drawing instruments. The difference in the two methods is evident when we compare work of the two kinds. The printed letter such as is used for newspaper headlines, and the title as executed on a set of drawings, show very clearly that the former is too mechanical and stiff, while the latter, if well executed, is much the more attractive. Then again, freehand lettering can be adjusted to the general type of the drawing.

After the graceful ease and ready adaptability of freehand work, the next requisite in good achitectural lettering is **simplicity.** The simpler the letter, the easier made, and the better the general effect. Examples illustrating this can be seen in the effect of highly ornamental letters in newspaper advertising.

Learn to make the titles the same as a freehand sketch. Make plenty of strokes of the pencil; get the general shape of the letters, and the spacing. Do not attempt to make each letter with one stroke of the pencil.

After having made the title with several out-

ILLUSTRATING METHOD OF SKETCHING.

Notice the free and easy movement of the lines, and the prominence given to the use of shadows.

lines, then go over this, and the final lettering can be done from this sketch of the letters. Get the general proportions and shapes first, together with the spacing, before trying to get a finished title. Develop the title as a whole, and let the small details of each letter be the last thing attempted.

The effect of the **spacing** of letters upon the general appearance of the title, will be seen from the accompanying illustrations of examples. Study the available space for the title;

Fig. 88. Forms and Proportions of Letters.

and make the size, style, and spacing of the letters to suit the conditions. The guide lines, with perhaps a few lines limiting the edges of the letters, are the only mechanical lines that should be used.

It will be well to consider some of the letter forms, in order to understand just how they are made to look the best. See Fig. 88. The A is made wide enough at the bottom to give the appearance of stability. The cross-line should always be below the center, for, if exactly on the center, the upper portion appears too small for the base. The B should have the upper half

smaller than the lower, both as to the width and the cross-line. It appears over-balanced if the upper half is made exactly like the lower half. The C should have the upper projection of the curve a little less than the lower. E should be smaller above the center line than below. The cross-line of F, H, and R should be the same. G should be similar to C in the greater projection of the lower part of the curve. P, because it has no lower portion, should be made a little larger than one-half the height. S should have the upper half the smaller. X and Y usually have their intersection on the center line.

By keeping these facts in mind, the appearance of the letters will be much improved.

For different styles of titles, where certain types of letters are used, the above rules will be modified; but for general work they should be followed.

Single-line letters are used almost entirely in lettering plans and drawings.

Spacing of Letters. As to the spacing, there is no set rule for standard dimensions; but a few rules may be given as a guide. Letters which have vertical and parallel sides coming together, are spaced the greatest distance apart. Take H and B, for example; these require the largest space. In case of a curve, as an O or a C, with an N or an H, the spacing will be about two-thirds of that for the H and the N. This same rule will hold for the curve of a D with an N or M or any letter with a vertical line.

If two curves come together—as, for example, a C and a G, or a B and a C—the space is slightly less than for N and O.

If A and V come together, make the lower point of the A come directly under the upper point of the V; there should be no vertical space between these letters. A or V, with O or B, will have about the same spacing as two curves, such as B and C or C and O.

While the above rules are only general, yet they will serve as a guide.

When **marks of punctuation** are used, the spacing will have to be increased over that of the regular arrangement. The spacing between words depends upon the style of letter used and the available space. Increasing the spacing will make the words more prominent.

In doing all letter work, it should first be penciled completely, before any inking is done. It is much easier to erase and make changes while the title is still in pencil than after it is inked. The ink will emphasize all irregularities.

The tendency of the beginner is to use too fine a pen. A new pen is always hard to work with, since it makes a thin hair line. Sometimes a new pen can be made to work more easily, by heating the point with a match. This will render it more flexible, although the pen will not last so long. Be very careful to make the same thickness of line for all parts of the letters, and for all letters of the title. It will require practice to be able to use the pen satisfactorily.

The inks can be any of the ready-mixed India inks. These are very satisfactory, and are much more convenient than grinding the ink from an India ink stick. Since the prepared inks evaporate and therefore thicken when exposed to the air, the cork of the bottle should always be at once replaced after filling the pen. Some grades of black writing ink may be used, although the India ink is much more satisfactory.

Almost all of the drawing papers will take ink. Tracing paper and tracing cloth are used a great deal. Bristol board is used where lettering is employed, as for an inscription, or where it is not a part of a drawing.

In lettering, first rule the guide-lines in pencil; then pencil the letters, and then ink. There is no rule for holding the pen; be sure to learn to have a free and easy stroke. By practice, learn to have a uniform line; and have confidence in your ability before you start. Usually the beginner is a little backward when starting the lettering on a sheet. By practicing vertical lines, inclined lines, and curves, one gradually learns the use of the pen. It should be noted that the strokes are all downward; and a curve, as for O, is made up of a series of strokes. There will be difficulty in getting straight lines and curves of the same size.

In penciling, always use a soft pencil, one free from grit. Make the lines as light as possible, so that they can be erased with as little

Courtesy of the University of Illinois.

SKETCH RENDERED IN PEN AND INK.

PLATE G—Architectural Drafting.

pressure as possible. Keep the paper as free from erased lines as possible, as the erasing tends to destroy the general surface of the paper, and makes it much more difficult to ink properly upon it. Should a mistake be made, after the ink has become thoroughly dry, use an ordinary pencil eraser, and rub gently in all directions. Stop at short intervals to allow the eraser to cool, as it will smear the ink if it becomes too hot from rubbing. After the erasing, take some smooth, hard surface—be sure it is clean—and rub gently over the erased surface to give a smooth finish to the paper. Some think that a regular ink eraser is necessary to remove the ink; but the pencil eraser will do the work better and leave the surface of the paper in much better condition. The work of erasing will be slow and tedious, but it should be carefully done.

The **size of letter** will depend upon the space, if the space is limited. Otherwise the letter should be made to correspond to the size of the drawing, a large, full-size drawing requiring a large letter, while a quarter-inch scale drawing will require a small letter. By a careful study of proportions, one can make a drawing look the best. Poor judgment in this respect will often spoil a well-drawn plan.

Titles are put on every sheet of a set of drawings. Each drawing on the sheet must have a single-line title; and each sheet must have a title complete, giving the name of the work, the

client's name, the location, the scale, and sometimes the date. For the convenience of the architect, he usually places in one corner his name, the number of the sheet, the job number, the initials of the different men who made the drawing, and the date. This gives him his record for filing the set of drawings.

Choose a style of letter that will be clear and simple. While the architect has more liberty in the choice and spacing of letters than the engineer, yet the fundamental principle is clearness. Capitals are used almost entirely for titles, and small letters for notes of all kinds.

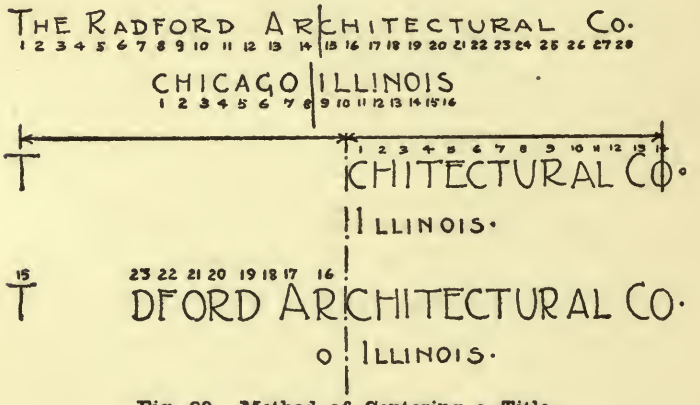


Fig. 89. Method of Centering a Title.

In laying out a title, there is usually a certain space it will have to occupy; therefore the title must be centered about a vertical center line through this space. The method of centering a title is shown in Fig. 89. Decide upon the wording, and write out each line as it is to be copied. Upon a piece of scratch-paper, spell out

the letters in each line, numbering each letter in order, and also the spaces between the letters. The center of each line is then evident.

Lay out the center line of the space to be occupied on the drawing, and, after drawing the guide-lines, start at the center line, and commence sketching in the letters, first to the right, as shown in the third line, Fig. 89. Thus the right half of the title is sketched first. Now take a piece of paper, and lay off to the left the same distance as the right half extends to the right. This gives us a starting point for the left half. This part may be worked either from the left to the right, or, as shown in the fifth line, the letters may be placed in the order as

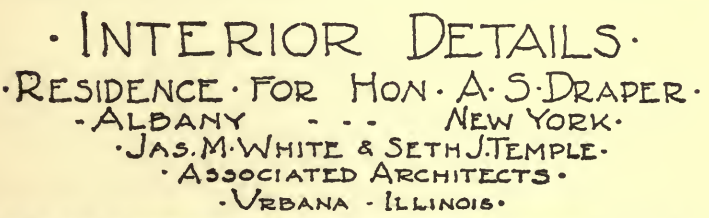


Fig. 90. Arrangement of a Title Showing Symmetry but not Mechanical Stiffness.

numbered. A little experience will enable one to lay out a title quickly and accurately in this manner.

Having the general arrangement in pencil, go over it carefully, and make the letters, properly spaced and in good outline. The title is then ready for inking. In all titles, let the composition or spacing be such that while the title as a whole shall be symmetrical, its general

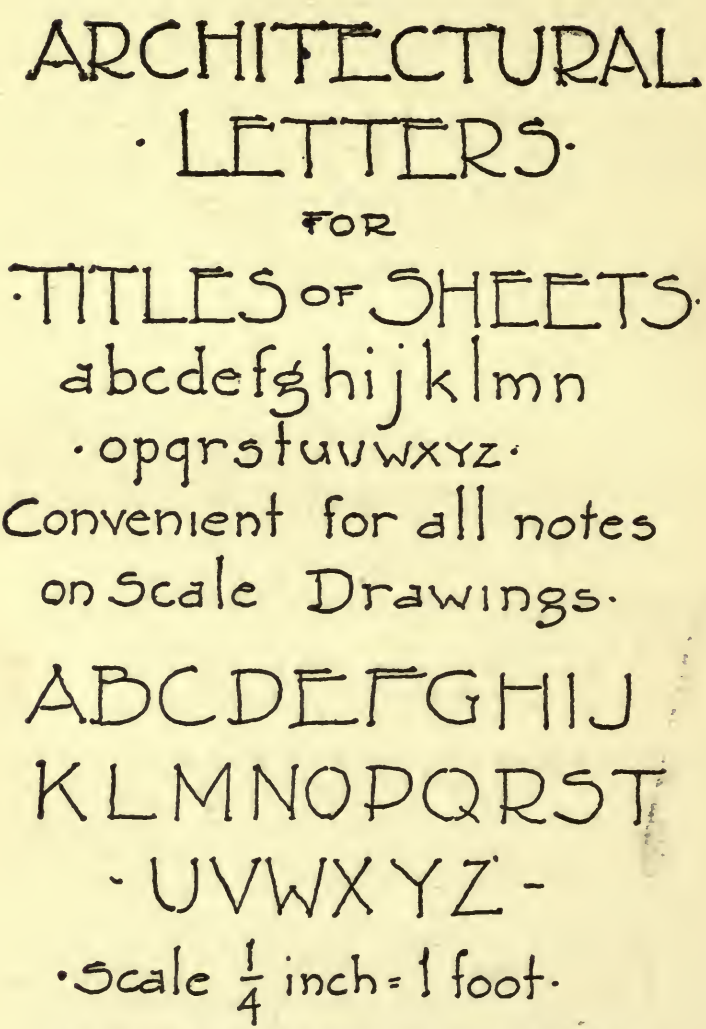


Fig. 91. Easily-Made Letters for General Drawings.

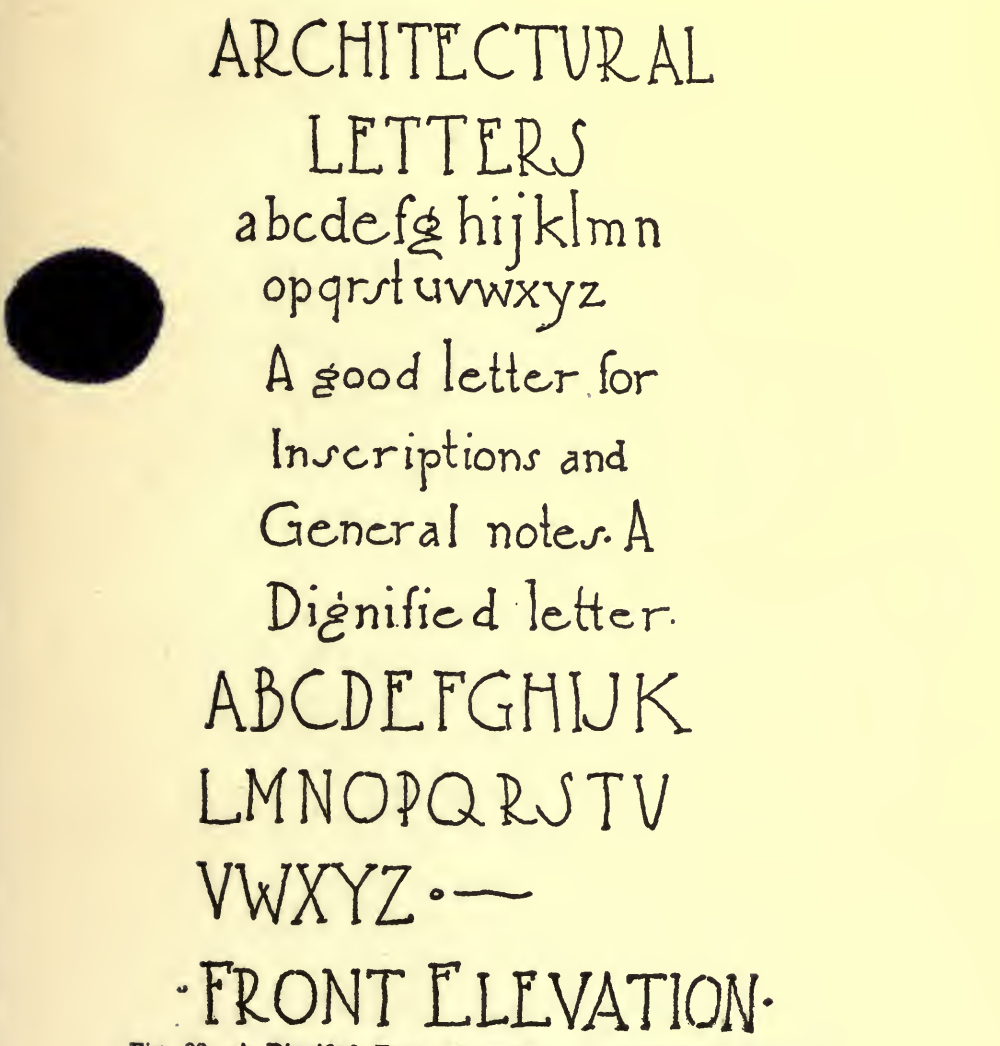


Fig. 92. A Dignified Type of Letter for Inscriptions, General Notes, etc.

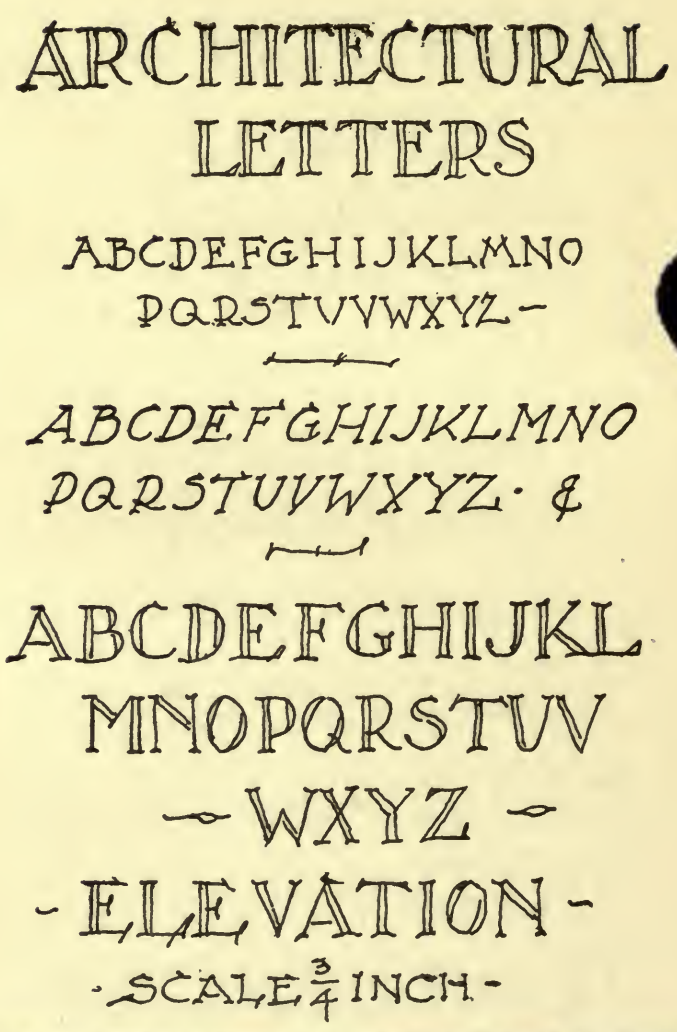


Fig. 93. Showing Double-Line Letters Used Largely for General Titles.

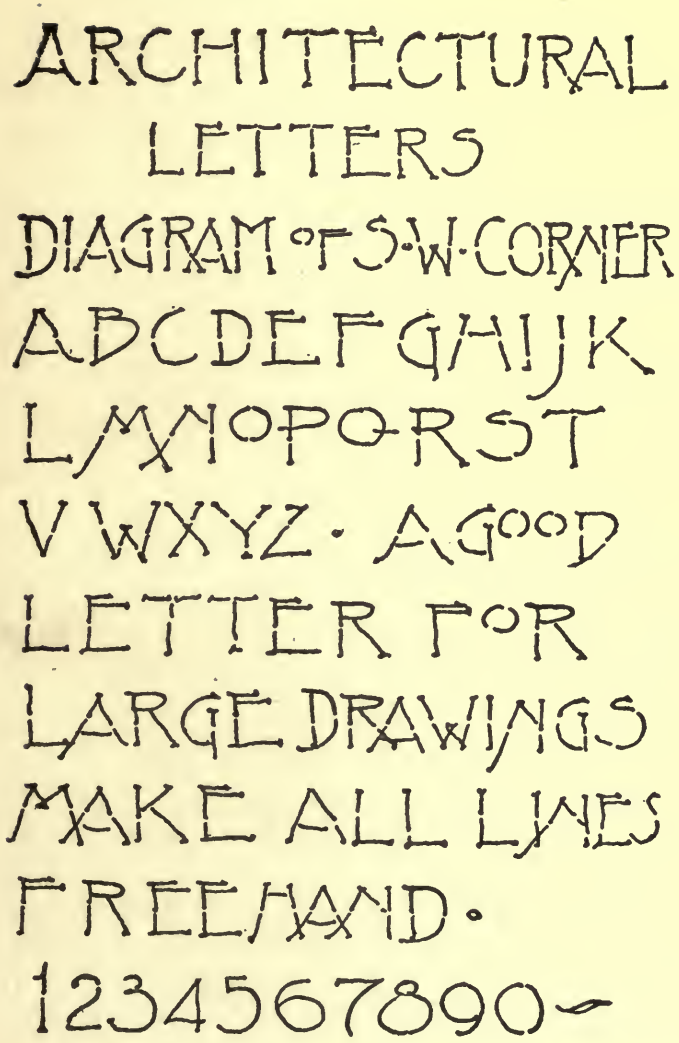


Fig. 94. Letters Suitable for Large-Scale and Full-Sized Details.

·RELATIVE·SIZE·OF·LETTERING·FOR·DRAWINGS·

(1) THUS·FOR · TITLES·OF·SHEETS·

(2) " ·PRINCIPAL·ROOMS·

(3) " ·CLOSETS·ETC·

(4) " ·Notes and explanations·

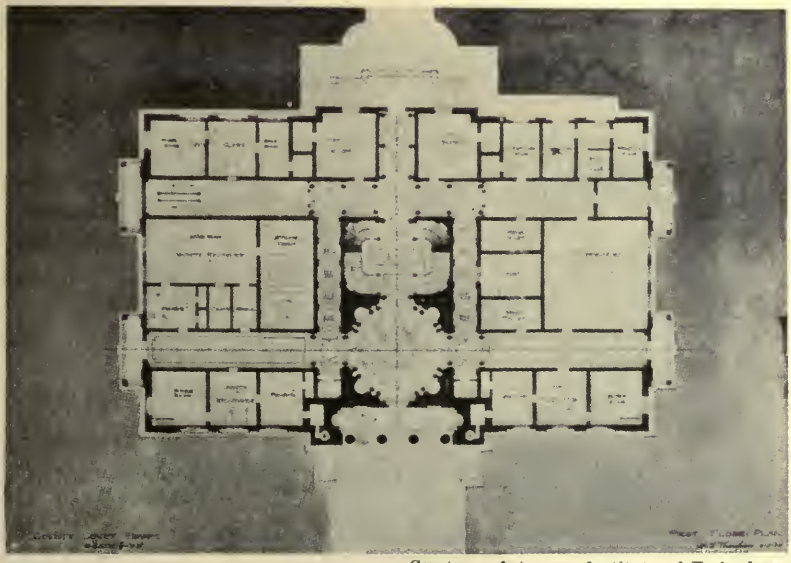
(5) N.B.

The size of lettering may vary somewhat with the size of the sheets, but keep all lettering in proportion to the importance of the subject.

All lettering on the job with the exception of notes and figures to be done by one man.

Fig. 95. Sheet Showing Relative Sizes of Letters to Use on a Drawing.

DESIGN OF A COURT HOUSE FOR A SMALL CITY.



Courtesy of Armour Institute of Technology.

ELEVATION AND PLAN RENDERED IN WASH.

Fig. 96. A Good Form of Slanting Letter for Large Work and Full-Sized Details.

outline shall not be inclosed by straight lines. A line, for example, connecting the ends of the different lines of a title should not be straight, but irregular, as shown in Fig. 90. Try to avoid making the lines exactly the same length. Where the same general title is to be used on a number of drawings of a set, it is very convenient to make the title in pencil on a piece of paper, and trace it through the tracing cloth for the finished drawing. This saves a great deal of time. and gives a uniform title for every sheet.

The styles of letters mostly in use by architects are shown in Figs. 91 to 96.

Fig. 91 presents an easy substantial title, quickly made, and very clear. This form of letter will be found very satisfactory for general drawings.

Fig. 92 shows a type of letter largely used. It has a dignified appearance, is suitable especially for inscriptions on tablets or buildings, and is quickly and easily made.

Fig. 93 shows a form of double-line letter, very quickly made; this letter is used largely for general titles.

Fig. 94 shows a good style of letter to use on full-sized details and large-scale details. It is made by several strokes of the pen. Long lines are hard to make; therefore the long lines are made up of a series of short lines. When well done, it makes a very attractive form of letter to use. The figure is small, and the true values

of the broken lines do not show up as they do on large work.

Fig. 95 is a sheet showing the relative sizes of letters to use on a drawing. The small letters may be made either slanting or vertical.

It is much easier to make a slanting line than a vertical line. Irregularities show less in slanting letters than in vertical letters, and for this reason some architects use a slanting letter entirely. The vertical letter, however, is much more dignified, and, when well done, is more satisfactory.

Fig. 96 is a good form of slanting letter for full-size detailing and large work.

It is as true of drafting as it is of every other branch of worthy human endeavor. Experience is the one great and indispensable teacher. Just as we learn to sing by singing, and to build houses by building them, so we learn to draw by drawing; and it is only by persistent practice on the part of the draftsman that the highest proficiency can be acquired.

INDEX

Architectural Drafting

W

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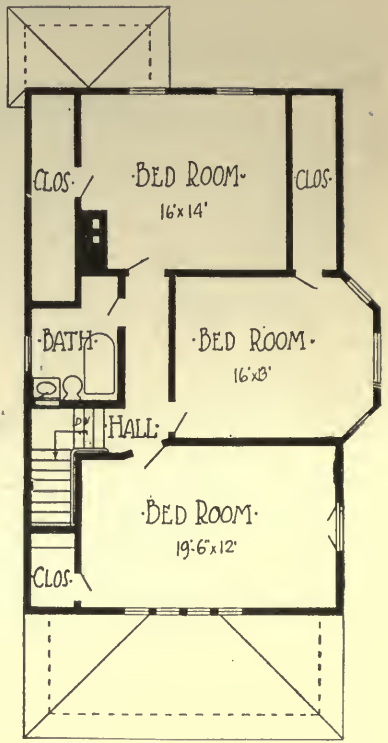

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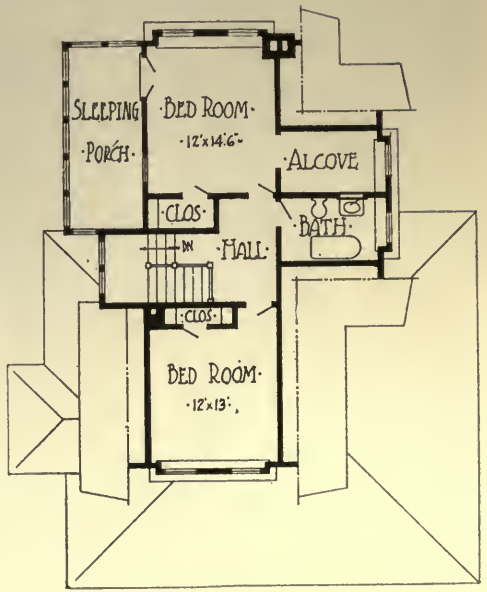

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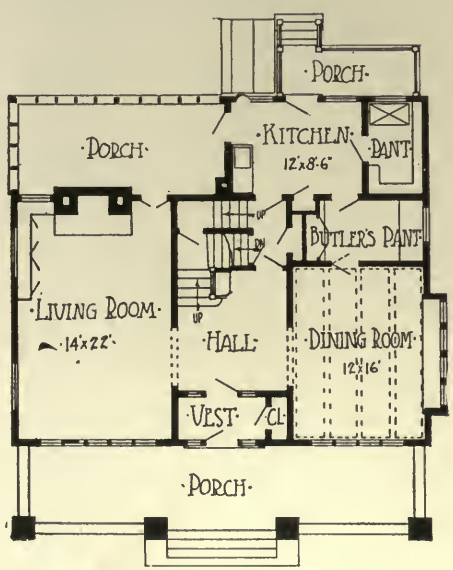

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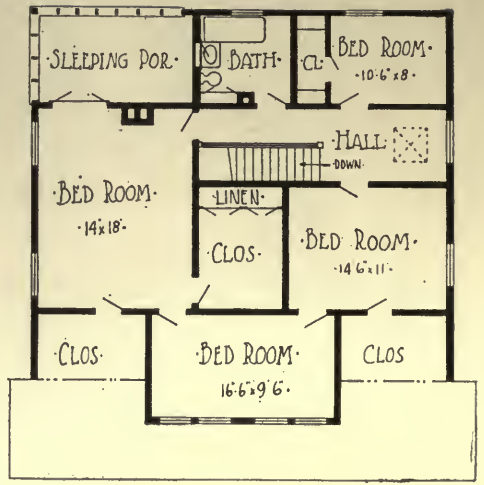

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Design No. 6517

Size: Width, 28 feet; Length, 35 feet, exclusive of porch

First Floor Plan.

Blue Prints consist of foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about fifteen pages of typewritten matter.

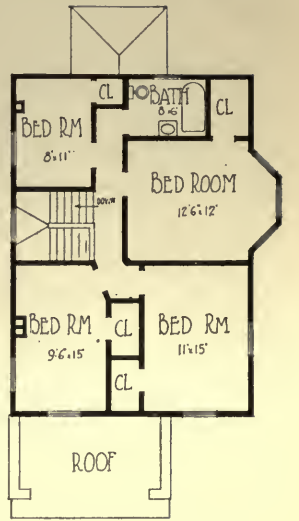
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$26.00

We mail Plans and Specifications the same day order is received.



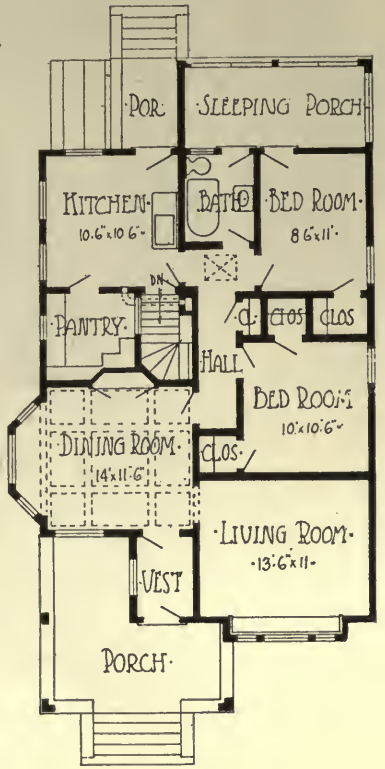
Second Floor Plan.

Very Attractive, Well-Arranged Five-Room Cottage (Design No. 6509)

Design No. 6509

Size: Width, 29 feet; Length, 45 feet

Blue Prints consist of basement plan; roof plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.



Floor Plan.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

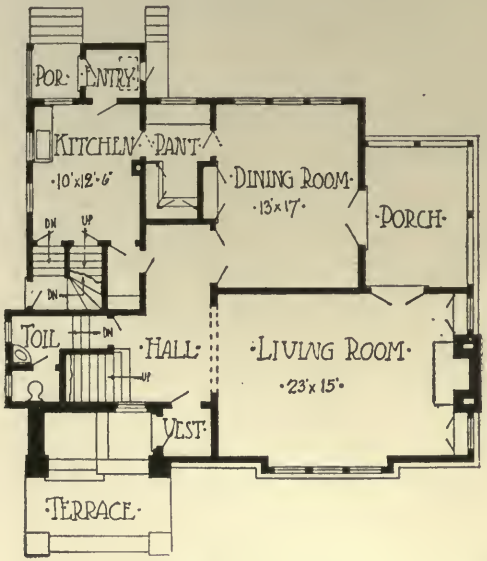
$16.00

We mail Plans and Specifications the same day order is received.

Pretentious Eight-Room Stucco and Brick Veneer Residence (Design No. 6534)

Design No. 6534

Size: Width, 43 feet; Length, 34 feet 6 inches



First Floor Plan.

Blue Prints consist of foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

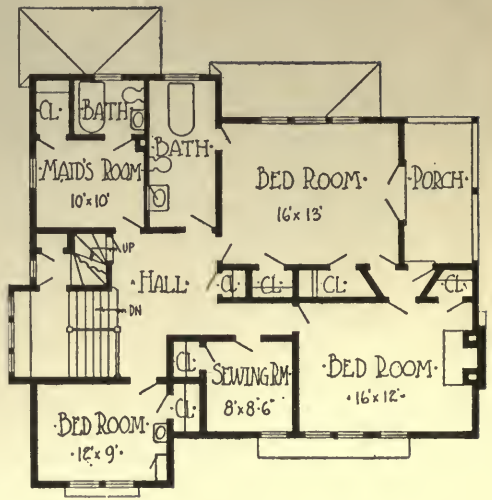
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$30.00

We mail Plans and Specifications the same day order is received.

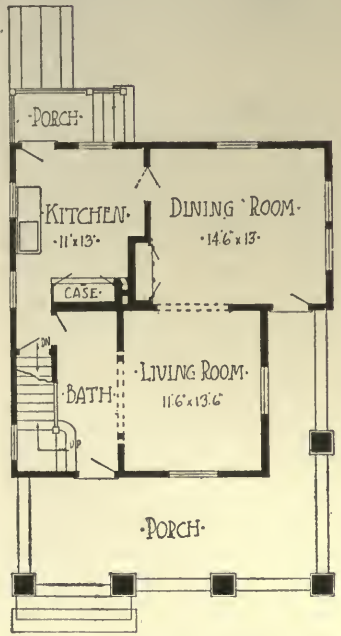


Second Floor Plan.

Unique Story and a Half Six-Room Cottage (Design No. 6526)

Design No. 6526

Size: Width, 27 feet; Length, 28 feet, exclusive of porches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

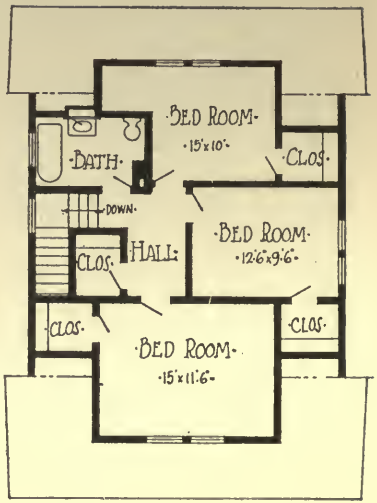
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$18.00

We mail Plans and Specifications the same day order is received.

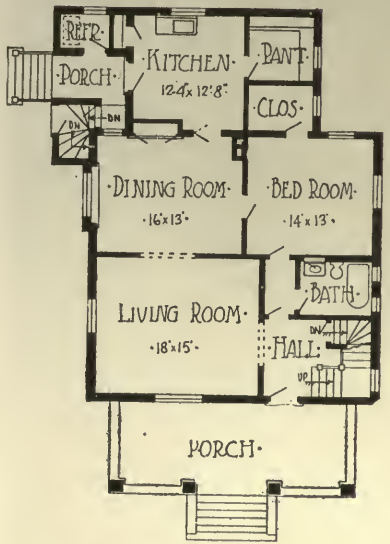


Second Floor Plan.

Substantial, Well-Designed Eight-Room Concrete Block Residence (Design No. 6507)

Design No. 6507

Size: Width, 36 feet; Length, 43 feet, 4 inches, exclusive of porches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

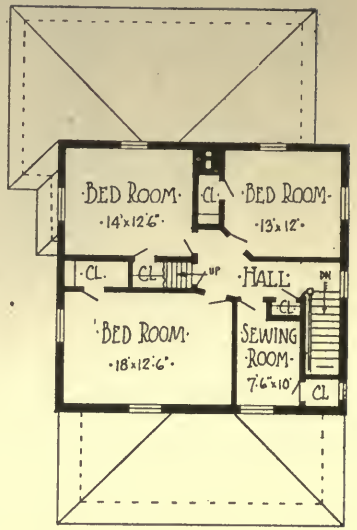
PRICE

of Blue Prints, together with a complete set of typewritten specifications.

ONLY

$28.00

We mail Plans and Specifications the same day order is received.

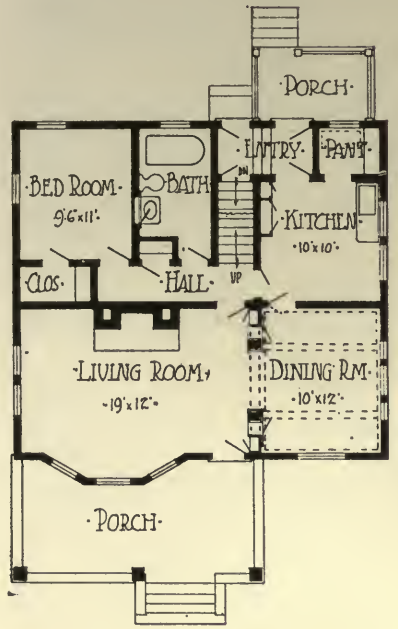


Second Floor Plan.

Very Attractive Shingled Bungalow Cottage of Seven Rooms (Design No. 6501)

Design No. 6501

Size: Width, 31 feet; Length, 28 feet



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about fifteen pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$18.00

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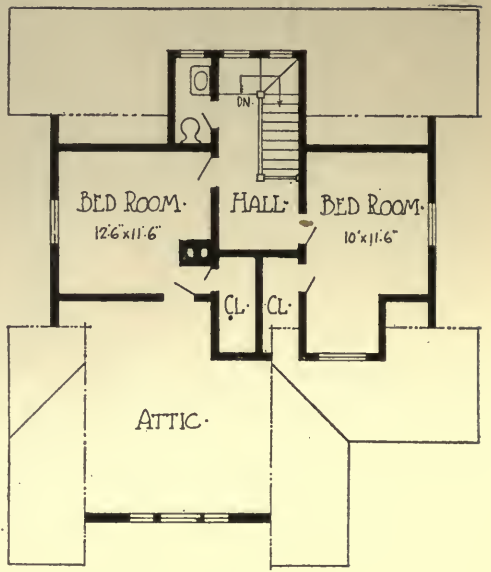
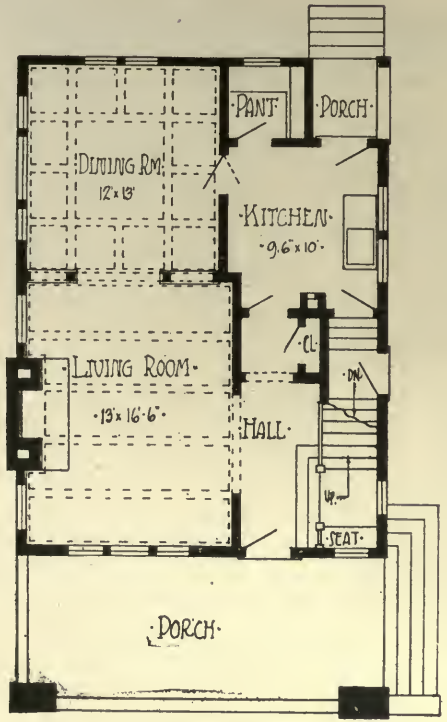


Second Floor Plan.

Six-Room Stucco House Trimmed with Brick (Design No. 6521)

Design No. 6521

Size: Width, 23 feet; Length, 31 feet, exclusivc of porches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about fifteen pages of typewritten matter.

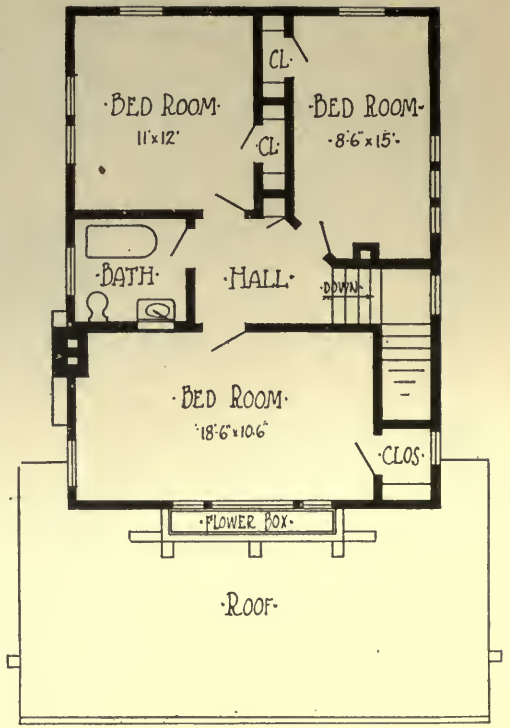
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$24.00

We mail Plans and Specifications the same day order is received.

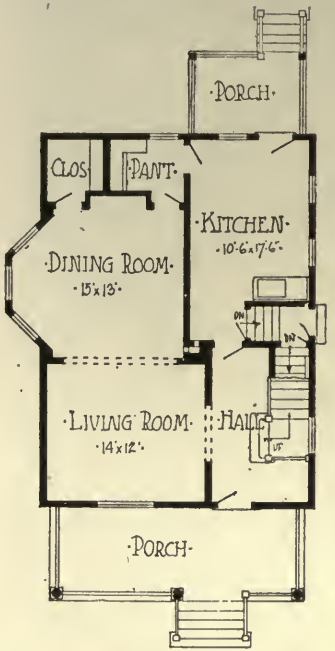


Second Floor Plan.

Neat Five-Room Cottage (Design No. 6513)

Design No. 6513

Size: Width, 27 feet; Length, 32 feet 6 inches



First Floor Plan.

Blue Prints consist of foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about fifteen pages of typewritten matter.

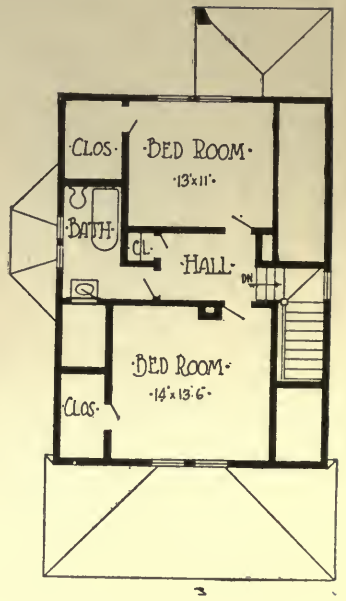
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$16.00

We mail Plans and Specifications same day order is received.

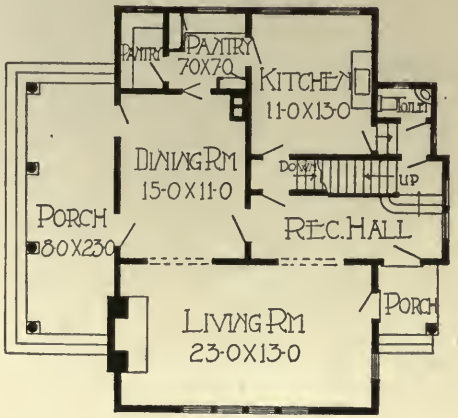


Second Floor Plan.

Unusual Design for Six-Room Cement Stucco Residence (Design No. 6529)

Design No. 6529

Size: Width, 26 feet; Length, 37 feet, exclusive of porches



First Floor Plan.

Blue Prints consist of foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

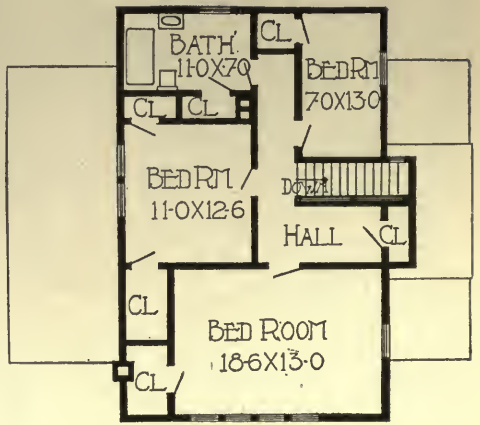
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$26.00

We mail Plans and Specifications the same day order is received.



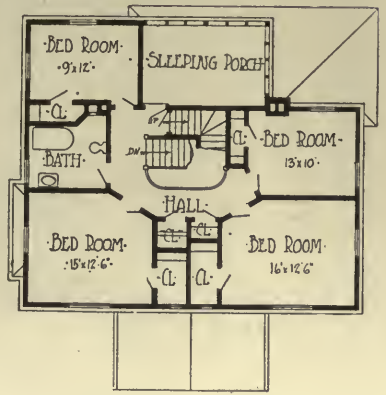
Second Floor Plan.

Artistic Residence of Nine Rooms: First Story Wide Board Siding, Second Story "Half Timber" (Design No. 6524)

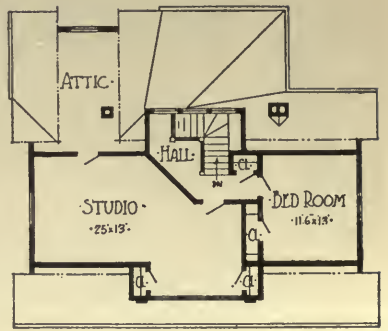
Design No. 6524

Size: Width, 41 feet 6 inches; Length, 34 feet

First Floor Plan.



Second Floor Plan.



Third Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

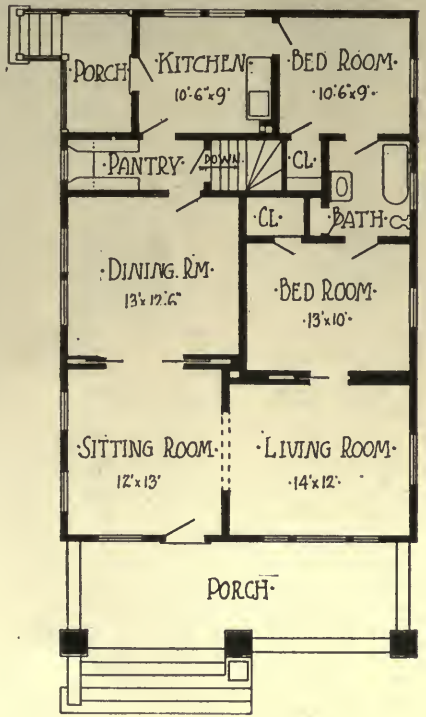
ONLY $28.00

We mail Plans and Specifications the same day order is received.

Six-Room Frame Cottage with Stucco Porch; Shingle Roof Has Raised Courses (Design No. 6519)

Design No. 6519

Size: Width, 27 feet 4 inches; Length, 40 feet 4 inches, exclusive of porches



Main Floor Plan.

Blue Prints consist of basement plan; roof plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

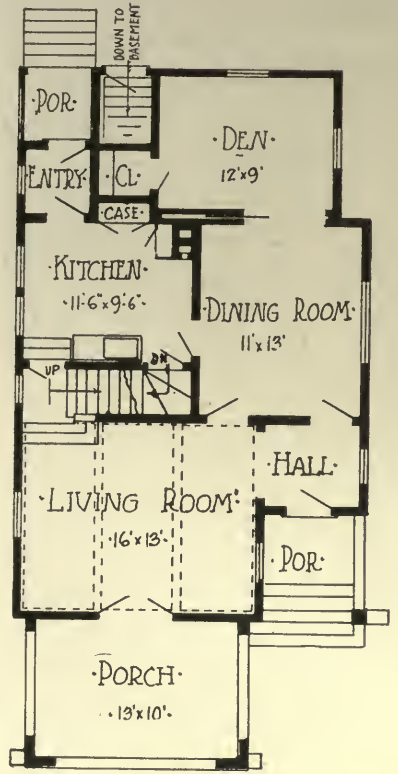
$16.00

We mail Plans and Specifications the same day order is received.

Modern Style Cement Plaster Residence of Seven Rooms (Design No. 6520)

Design No. 6520

Size: Width, 24 feet; Length, 37 feet 6 inches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

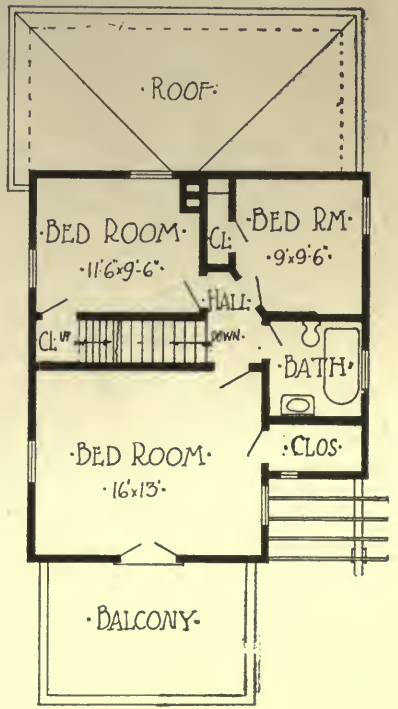
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$24.00

We mail Plans and Specifications the same day order is received.



Second Floor Plan.

Five-Room Bungalow with Wide Board Siding and Shingled Gables (Design No. 6512)

Design No. 6512

Size: Width, 29 feet 6 inches; Length, 45 feet, exclusive of porch

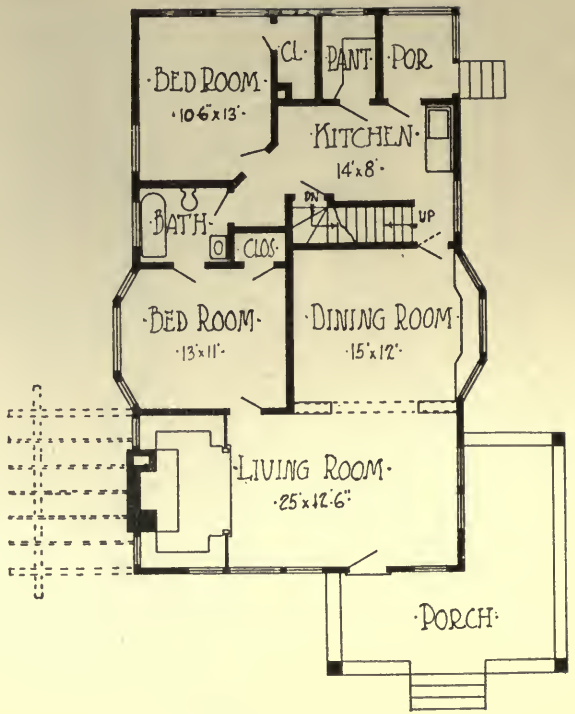
Blue Prints consist of basement plan; roof plan; floor plan; front, rear and two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY $16.00

We mail Plans and Specifications the same day order is received.



Main Floor Plan.

Six-Room House; Modern Design with Large Living Room, Pergola Entrance and Comfortable Side Porch; a Homelike, Dignified Residence of Colonial Lines (Design No. 6514)

Design No. 6514

Size: Width, 42 feet; Length, 25 feet 6 inches, exclusive of porches

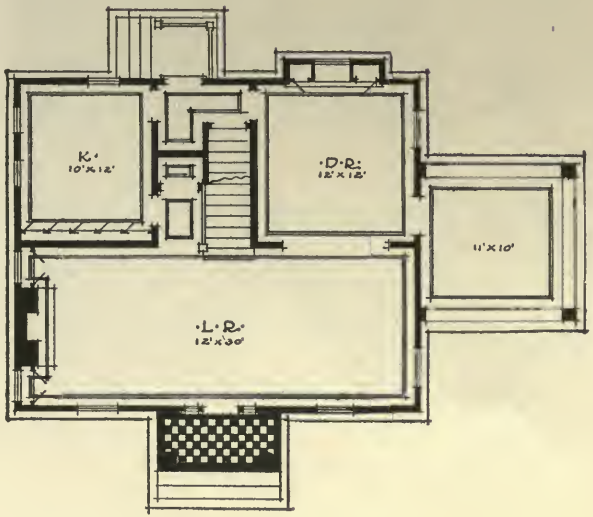
Blue Prints consist of cellar and foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

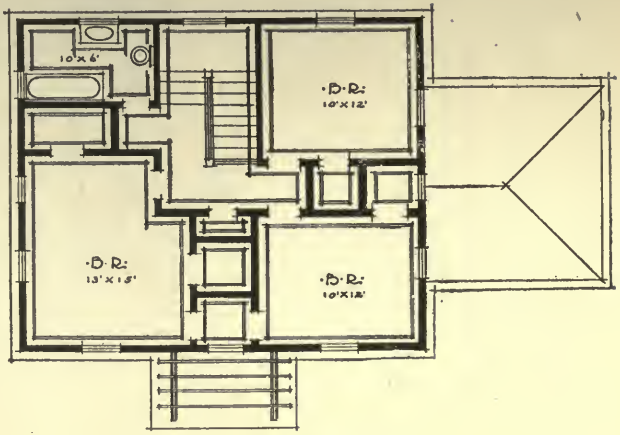
of Blue Prints, together with a complete set of typewritten specifications

ONLY $28.00

We mail Plans and Specifications the same day order is received.



FIRST FLOOR.

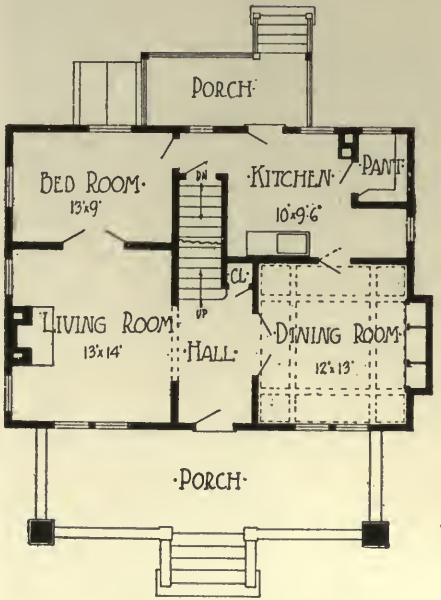


SECOND FLOOR.

Very Attractive Seven-Room Cement Plaster House with Ornamental Paneling (Design No. 6516)

Design No. 6516

Size: Width, 34 feet 6 inches; Length, 24 feet 6 inches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

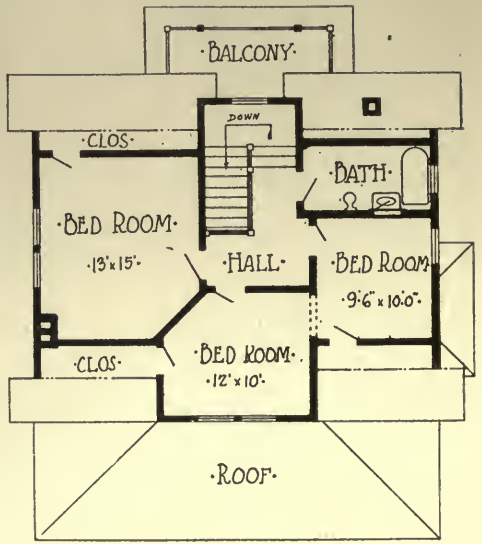
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$20.00

We mail Plans and Specifications the same day order is received.



Second Floor Plan.

Five-Room Bungalow of Pleasing Appearance; Foundation Courses Wide Boards, Cement Plaster Above (Design No. 6523)

Design No. 6523

Size: Width, 27 feet 10 inches; Length, 46 feet, exclusive of porches

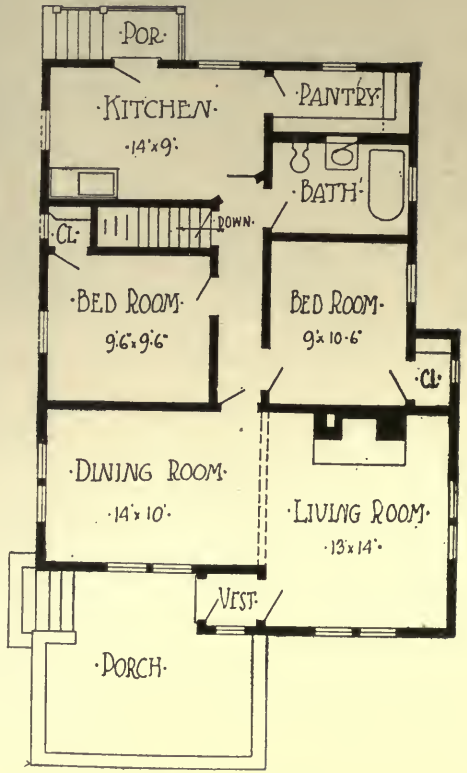
Blue Prints consist of basement plan; roof plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY $16.00

We mail Plans and Specifications the same day order is received.

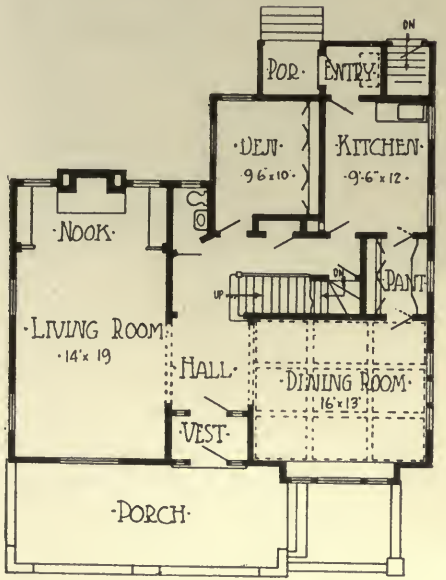


Main Floor Plan.

Dignified Cement Plaster House of Nine Rooms (Design No. 6525)

Design No. 6525

Size: Width, 39 feet; Length, 39 feet



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

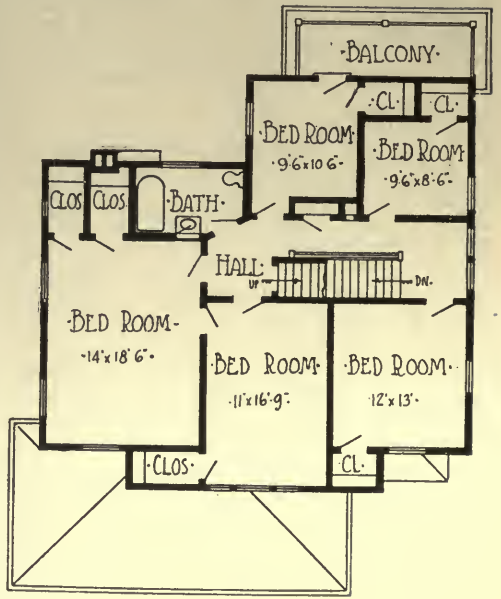
PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$30.00

We mail Plans and Specifications the same day order is received.

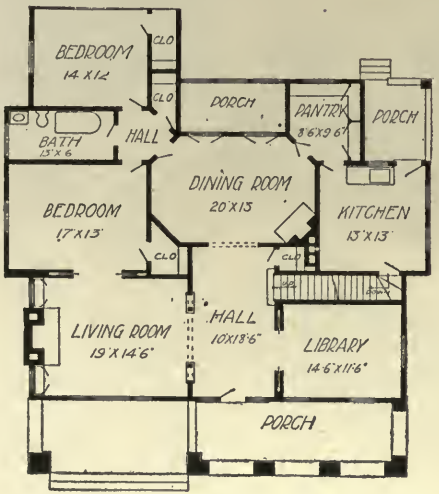


Second Floor Plan.

Up-to-Date Design for a Seven-Room Bungalow of Cement Stucco Construction
(Design No. 6530)

Design No. 6530

Size: Width, 52 feet; Length, 48 feet 6 inches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$20.00

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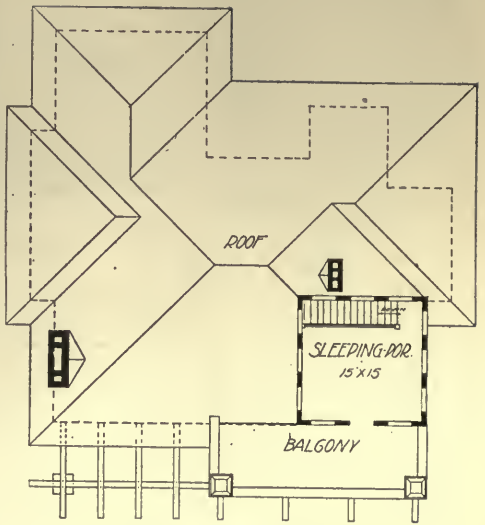
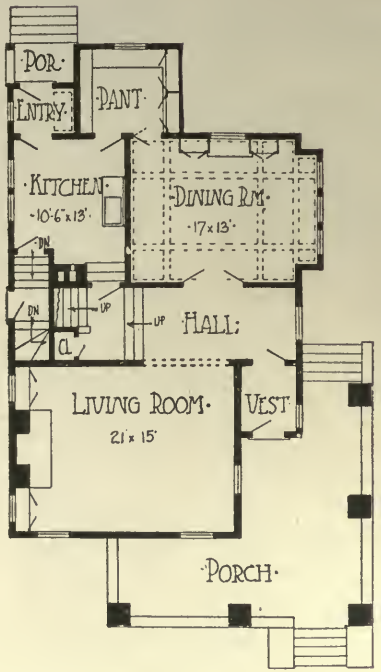


Second Floor Plan.

Dignified Hip-Roof Cement Stucco House of Seven Rooms. (Design No. 6511)

Design No. 6511

Size: Width, 28 feet 6 inches; Length, 44 feet 6 inches, exclusive of porches



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$26.00

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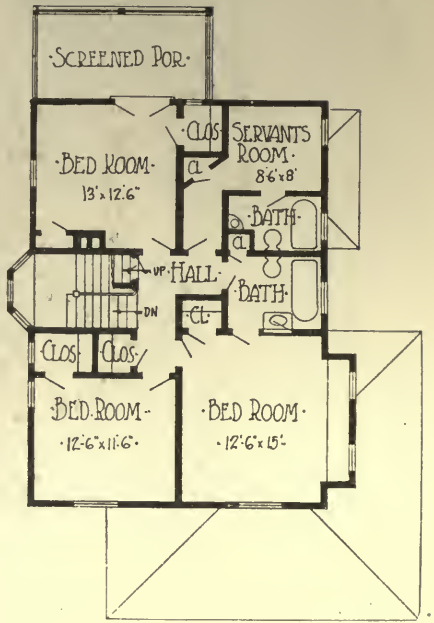

Second Floor Plan.

Very Pleasing Six-Room Cement Stucco House (Design No. 6506)

Design No. 6506

Size: Width, 32 feet; Length, 24 feet 6 inches, exclusive of porches

First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, and two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$20.00

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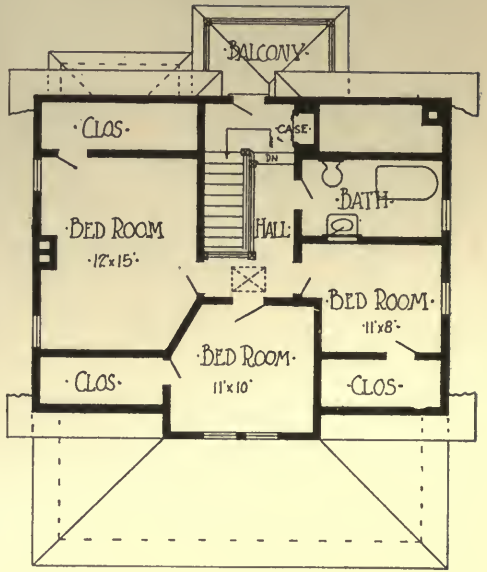
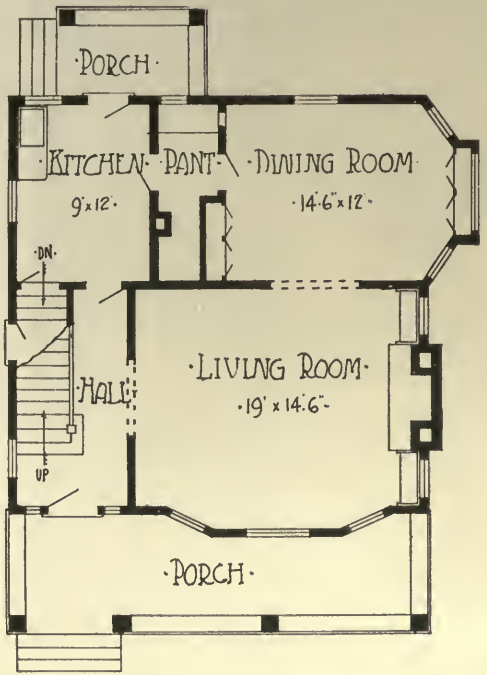


Second Floor Plan.

Attractive Square Hip Roof House of Six Very Large Rooms (Design No. 6502)

Design No. 6502

Size: Width, 28 feet; Length, 28 feet



First Floor Plan.

Blue Prints consist of basement plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary details. Specifications consist of about twenty pages of typewritten matter.

PRICE

of Blue Prints, together with a complete set of typewritten specifications

ONLY

$24.00

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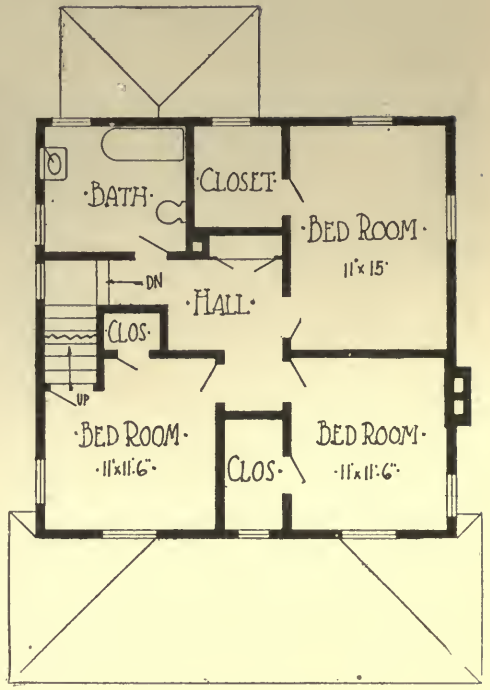


Second Floor Plan.

Modern Suburban House of Six Rooms and Screened Porch (Design No. 6528)

Design No. 6528

Size: Width, 34 feet; Length, 24 feet 6 inches

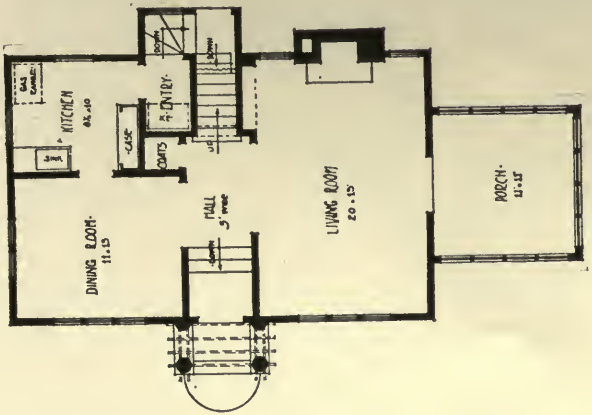
Blue Prints consist of foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

PRICE

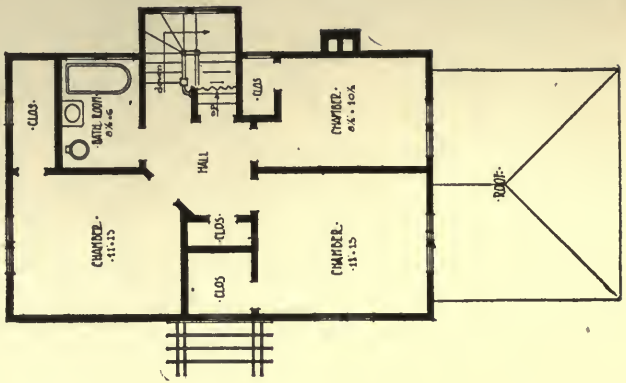
of Blue Prints, together with a complete set of typewritten specifications

ONLY $24.00

We mail Plans and Specifications the same day order is received.



First Floor Plan.

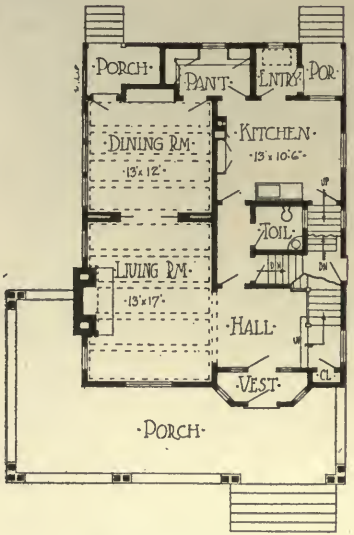


Second Floor Plan.

Model Seven-Room Dwelling of Cement, Stucco and Shingles, Embodying All Modern Features
(Design No. 6532)

Design No. 6532

Size: Width, 27 feet 6 inches; Length, 36 feet



First Floor Plan.

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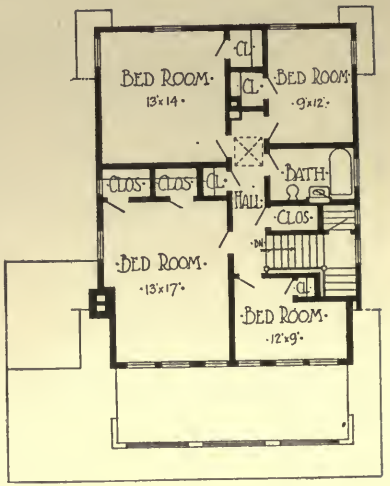
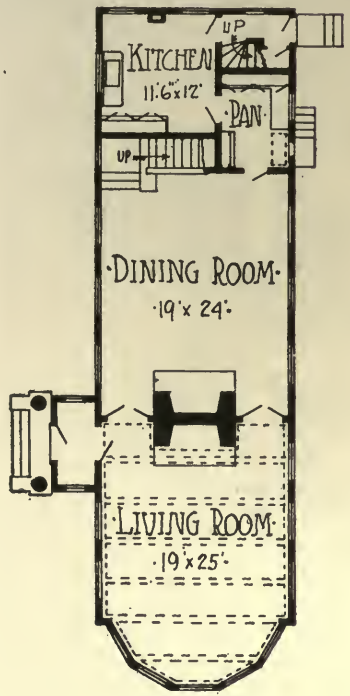


Second Floor Plan.

Striking Seven-Room Rresidence of Broad Frontage; Wide Board Siding (Design No. 6503)

Design No. 6503

Size: Width, 20 feet; Length, 62 feet



First Floor Plan.

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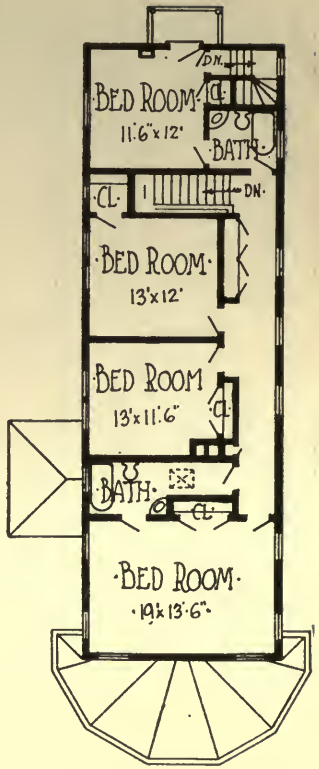
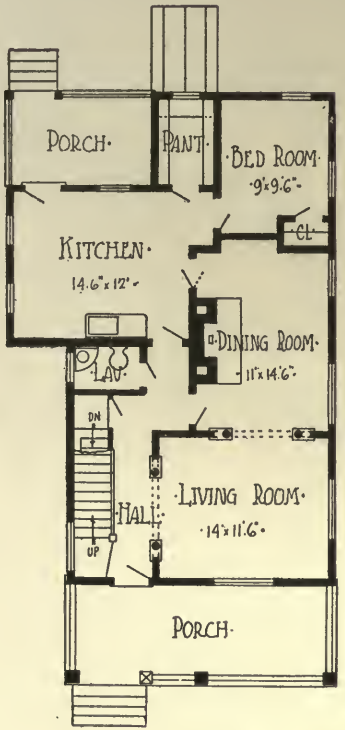


Second Floor Plan.

Seven-Roomed House of Distinctive Design, Combining Wide Board Siding and Stucco
(Design No. 6518)

Design No. 6518

Size: Width, 27 feet; Length, 40 feet



First Floor Plan.

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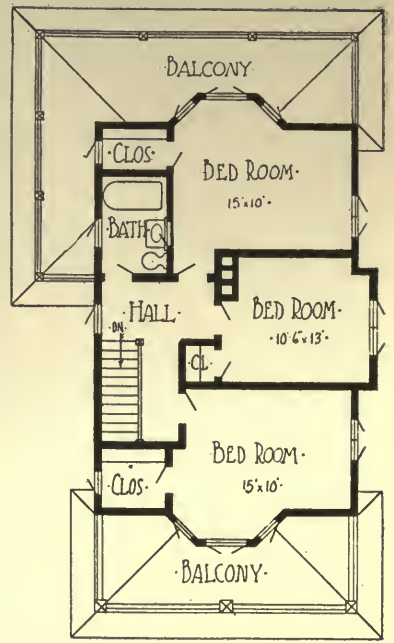
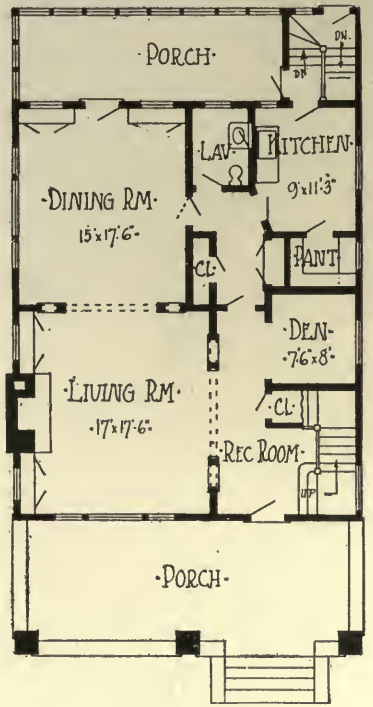


Second Floor Plan.

Eight-Room Cement Plaster House of Strictly Modern Design and Arrangement
(Design No. 6522)

Design No. 6522

Size: Width, 31 feet; Length, 45 feet, exclusive of porches



First Floor Plan.

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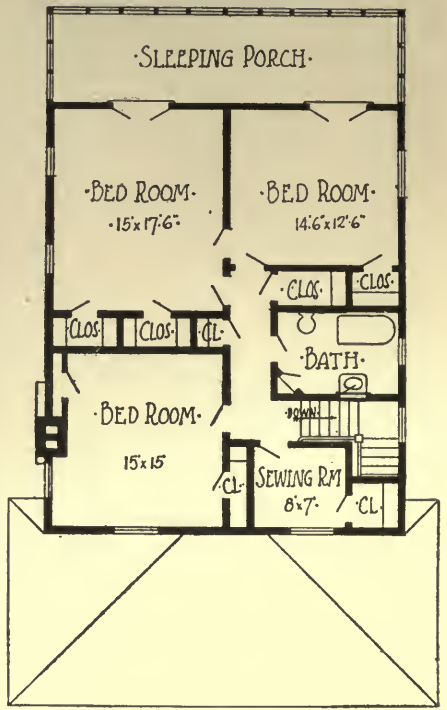
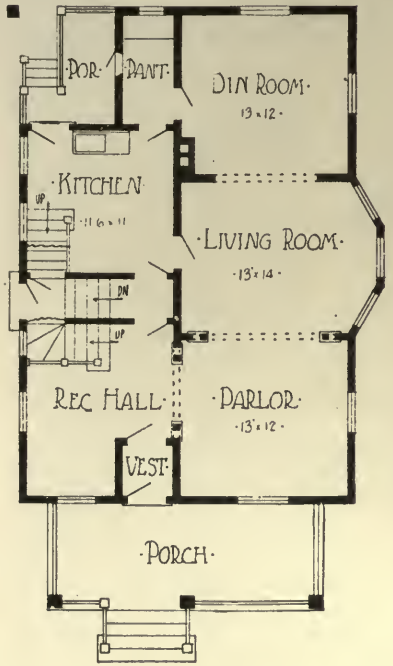


Second Floor Plan.

Sensible Square Type Hip Roof House of Eight Rooms Properly Arranged (Design No. 6505)

Design No. 6505

Size: Width, 28 feet; Length, 38 feet, exclusive of porches



First Floor Plan.

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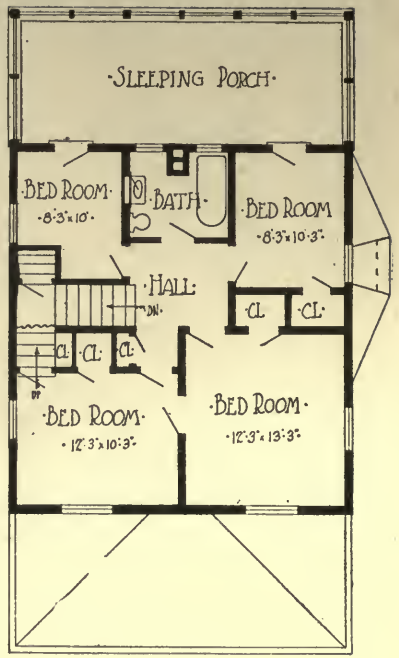
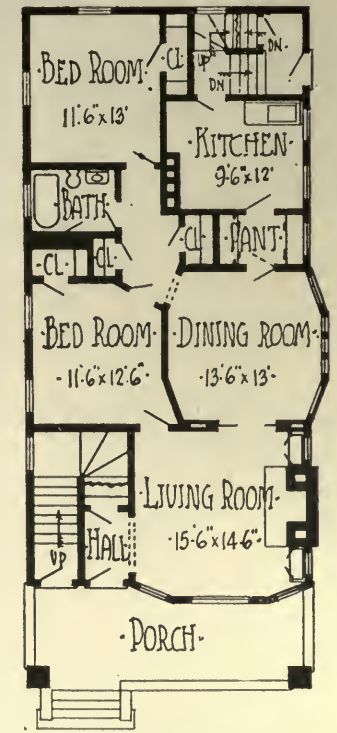


Second Floor Plan.

Two-Flat Building of a Design Suitable for Strictly Residence Sections; Five Fine Rooms on Each Floor (Design No. 6531)

Design No. 6531

Size: Width, 26 feet 6 inches; Length, 52 feet, exclusive of porches



First Floor Plan.

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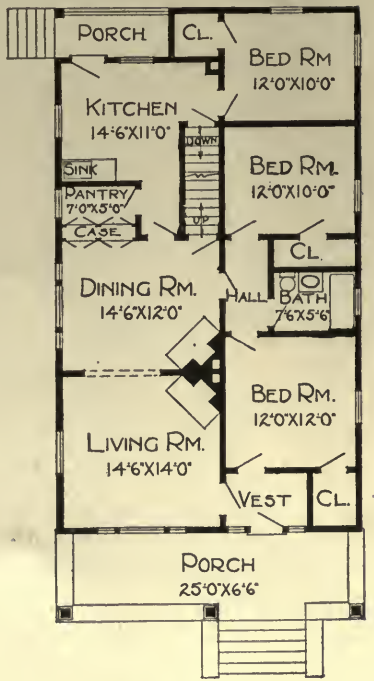
Second Floor Plan.

Six-Room Bungalow of Pleasing Lines (Design No. 5127)

Design No. 5127

Size: Width, 28 feet; Length, 48 feet 6 inches

Blue Prints consist of basement plan; roof plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter.



Floor Plan.

PRICE

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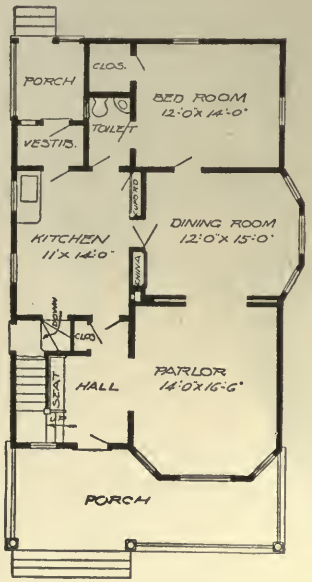
Homelike Dwelling of Eight Rooms (Design No. 2005-D)

Design No. 2005-D

Size: Width, 28 feet 6 inches; Length, 43 feet



First Floor Plan.

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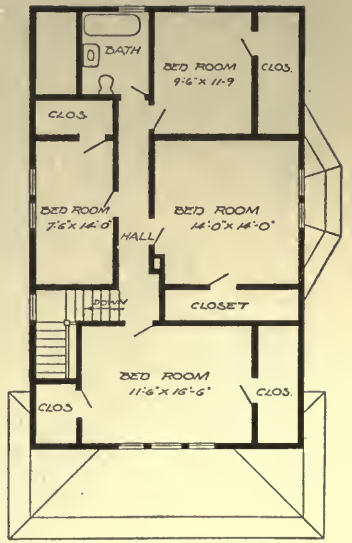
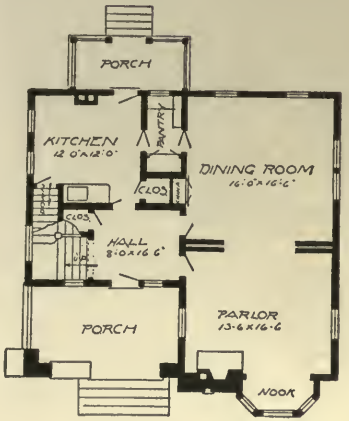


Second Floor Plan.

Distinguished Appearing Residence of Seven Rooms (Design No. 2544-D)

Design No. 2544-D

Size: Width, 34 feet 6 inches; Length, 35 feet 6 inches



First Floor Plan.

Blue Prints consist of cellar and foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter.

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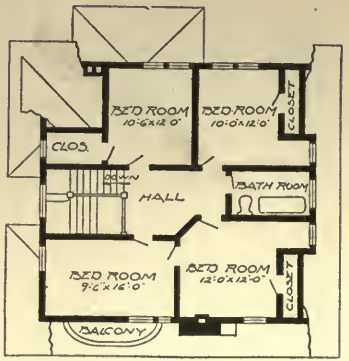
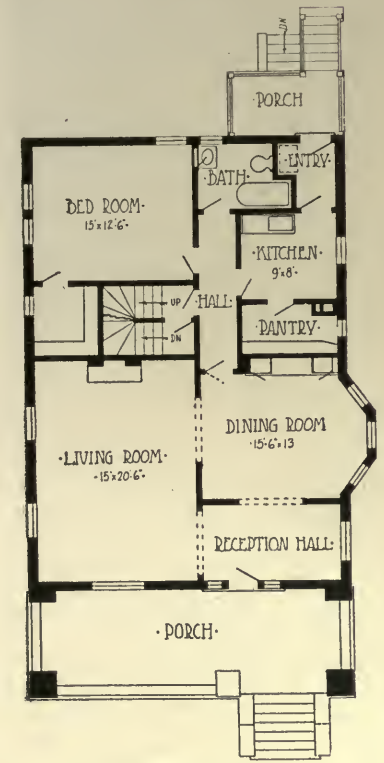


Second Floor Plan.

Brick Bungalow of Strong, Simple Lines, Containing Seven Rooms (Design No. 9520)

Design No. 9520

Size: Width, 32 feet 6 inches; Length, 42 feet, exclusive of porches



Second Floor Plan.

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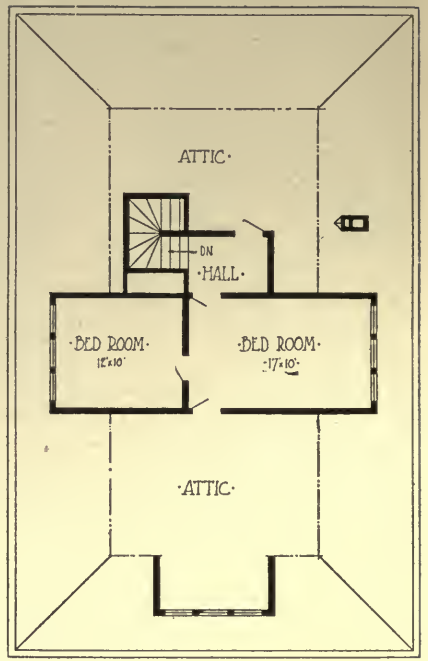
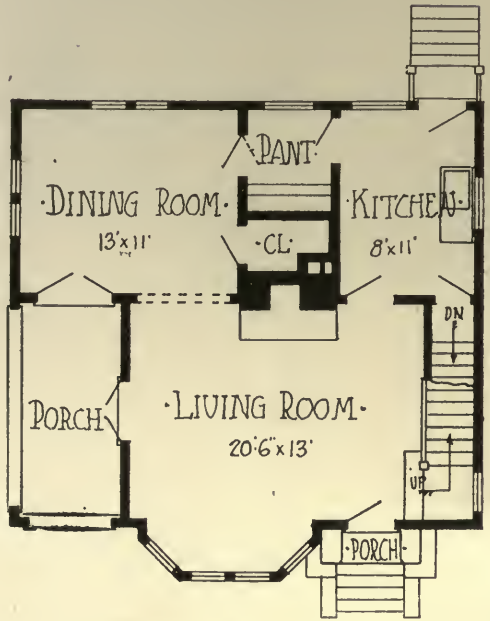


First Floor Plan.

Square Design, 7-Room Stucco and Clapboard House (Design No. 6508)

Design No. 6508

Size: Width, 28 feet; Length, 28 feet 6 inches, exclusive of porches



First Floor Plan

Blue Prints consist of cellar and foundation plan; roof plan; first and second floor plans; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

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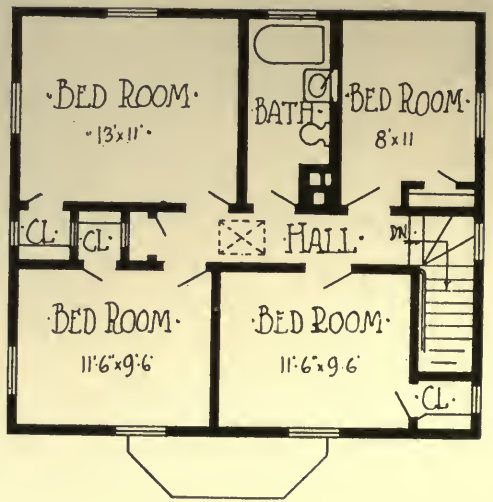

Second Floor Plan

Unique Bungalow of Southwestern Design—all Rooms Arranged Around Central Court (Design No. 6527)

Design No. 6527

Size: Width, 55 feet; Length, 54 feet 6 inches, exclusive of porches

Blue Prints consist of basement plan; roof plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of about twenty pages of typewritten matter.

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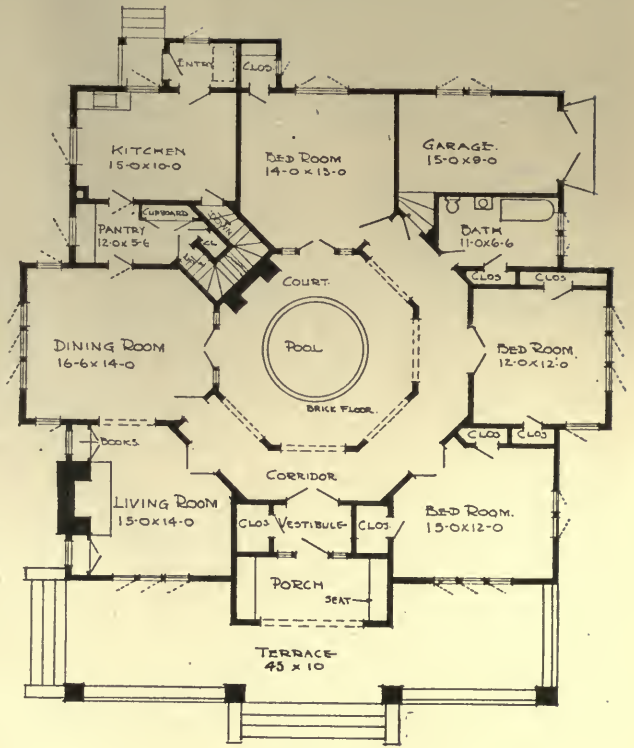
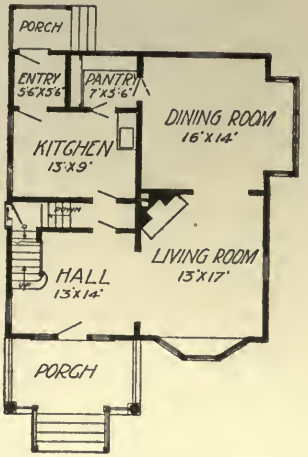


Main Floor Plan.

Correctly Proportioned Gambrel Roof House of Eight Rooms (Design No. 6533)

Design No. 6533

Size: Width, 30 feet 6 inches; Length, 34 feet 6 inches



First Floor Plan.

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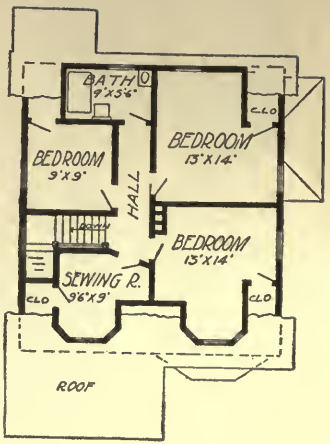

Second Floor Plan.

Very Attractive Five Room Brick Bungalow (Design No. 9510)

Design No. 9510

Size: Width, 30 feet; Length, 39 feet 6 inches exclusive of porches

Blue prints consist of basement plan; roof plan; floor plan; front, rear and two side elevations; wall sections and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter.

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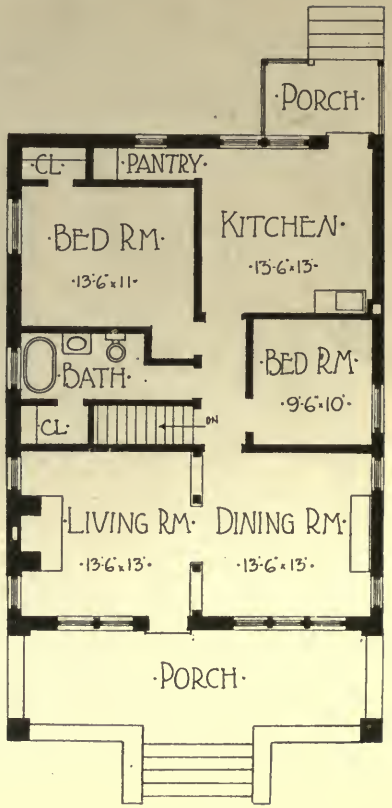

Floor Plan

Five Room Brick Cottage of Strong Lines (Design No. 9507

Design No. 9507

Size: Width, 29 feet; Length, 49 feet 6 inches exclusive of porches

Blue prints consist of basement plan; roof plan; floor plan; front, rear, and two side elevations; wall sections and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter.

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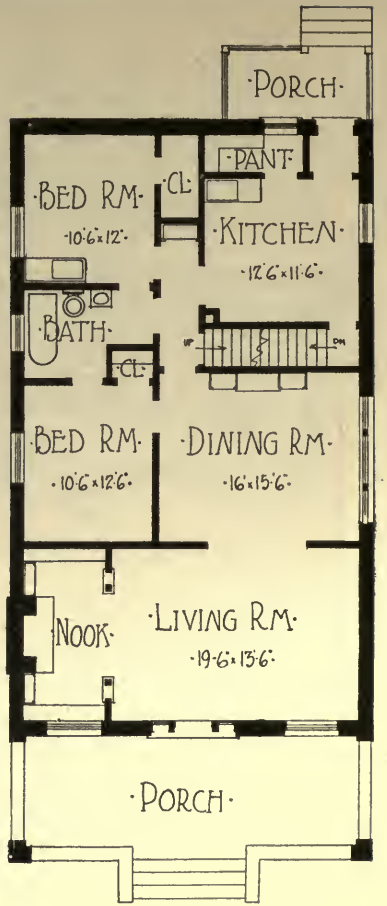

Floor Plan

Artistic Brick Dwelling of Best Design, Containing Five Rooms (Design No. 9509)

Design No. 9509

Size: Width, 52 feet 6 inches; Length, 28 feet

Floor Plan

Blue prints consist of basement plan; floor plan; front, rear, two side elevations; wall sections and all necessary interior details. Specifications consist of twenty-two pages of typewritten matter.

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Index to House Plan Supplement—Part II

Design.	Page.	—Estimated Cost— From About	To About	Price of Plans and Specifications.
2005-D	66	$2,500	$2,800	$12.00
2544-D	68	3,500	4,000	15.00
5127	64	2,275	2,425	10.00
6501	18	2,825	3,225	18.00
6502	48	3,800	4,200	24.00
6503	54	6,500	6,900	30.00
6504	2	3,000	3,400	22.00
6505	60	4,900	5,200	26.00
6506	46	2,800	3,200	20.00
6507	16	6,000	6,200	28.00
6508	72	3,125	3,325	22.00
6509	10	2,800	3,200	16.00
6510	4	3,800	4,200	18.00
6511	44	5,200	5,600	26.00
6512	32	3,150	3,550	16.00
6513	22	2,200	2,400	16.00
6514	34	5,600	5,800	28.00
6515	6	4,675	4,975	18.00
6516	36	2,875	3,275	20.00
6517	8	4,800	5,200	26.00
6518	56	3,800	4,200	22.00
6519	28	2,625	3,025	16.00
6520	30	4,100	4,500	24.00
6521	20	4,400	4,800	24.00
6522	58	6,000	6,200	28.00
6523	38	2,700	3,100	16.00
6524	26	6,000	6,400	28.00
6525	40	6,400	6,800	30.00
6526	14	2,475	2,875	18.00
6527	74	7,500	8,000	24.00
6528	50	4,200	4,600	24.00
6529	24	4,250	4,650	26.00
6530	42	5,000	5,500	20.00
6531	62	6,600	7,000	30.00
6532	52	3,200	3,600	20.00
6533	76	3,200	3,475	22.00
6534	12	6,200	6,600	30.00
9507	80	3,200	3,800	18.00
9509	82	3,200	3,800	18.00
9510	78	2,800	3,400	18.00
9520	70	3,075	3,475	22.00

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FLOOR PLANS—These plans show the shape and size of all rooms, halls and closets; the location and size of all doors and windows; the position of all plumbing fixtures, gas lights, registers, pantry work, etc., and all the measurements that are necessary are given.

ELEVATIONS—A front, right, left and rear elevation are furnished with all the plans. These drawings are complete and accurate in every respect. They show the shape, size and location of all doors, windows, porches, cornices, towers, bays, and the like; in fact, give you an exact scale picture of the house as it should be at completion. Full wall sections are given, showing the construction from foundation to roof, the height of stories between the joists, height of plates, pitch of roof, etc.

ROOF PLAN—This plan is furnished where the roof construction is at all intricate. It shows the location of all hips, valleys, ridges, decks, etc. All the above drawings are made to scale one-quarter inch to the foot.

DETAILS—All necessary details of the interior work, such as door and window casings and trim, base, stools, picture moulding, doors, newel posts, balusters, rails, etc., accompany each set of plans. Part is shown in full size, while some of the larger work, such as stair construction, is drawn to a scale of one and one-half inch to the foot.

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Every issue of the **AMERICAN CARPENTER AND BUILDER** contains perspective views, floor plans and details of modern and moderate-cost residences, schoolhouses, farm buildings, bungalows, cement houses, flats and other public and private structures. These house plans are all original, complete and absolutely correct. They are reproduced so clearly that they can be used to work from "on the job" if desired.

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DETAILS

of Building Construction

Radford's Portfolio of **"Details of Building Construction"** is a complete manual of building practice, as applied to carpentry, construction and the use of millwork. It is a remarkable collection of full-page plates, accurately drawn and reproduced to exact scale, showing clearly every detail of modern building construction and finish. These plates make plain the framing and construction of residences of every type. The drawings show both the arrangement of the room and all the interior trim, including built-in features, fully detailed.

General Synopsis of Contents

PART I. Details of Construction and Finish

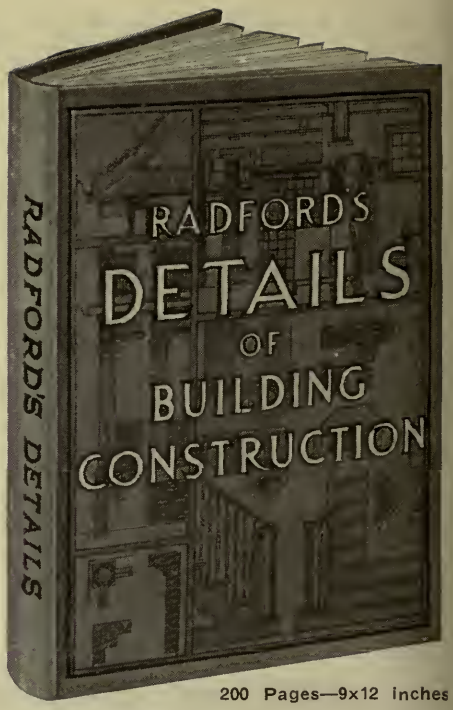
38 Full Page Plates, showing complete details of interior trim with special "built-in" features for every room and part of a modern residence.

PART II. Details of Frame and Masonry Construction

44 Full Page Plates, presenting a graded series of 197 figures detailing completely every point in frame, brick and stone construction.

PART III. Details of Miscellaneous Building

57 Full Page Plates—A veritable Treasure House of practical and reliable information for carpenters and builders—especially those working in the country—working drawings and details which solve completely every building problem.



200 Pages—9x12 Inches

PART IV. "The Handy Man's Friend"

How to Make a Thousand and One Useful Things

61 Pages, packed full of practical helps for doing all the various pieces of work that the carpenter and the "handy-man-about-the-house" is called upon to do. Details and working drawings with brief explanatory text.

A Big, Brand-New Up-to-the-Minute Book

Every part of a building and every kind of a building is shown in Radford's Portfolio of **"Details of Building Construction."** All dimensions, angles, curves, measurements and joints are made so plain and are so well illustrated that the "man on the job" will have no trouble or difficulty in doing the work. It has all been figured out for him by men who have made a lifelong study and success of architecture and building. This is the day of "built in" space- and labor-saving features in the home. Carpenters are called upon to plan and build buffets and sideboards for the dining room, kitchen cabinets, cases and cupboards for the kitchen and pantry, bookcases for the living room and library, wardrobes and linen closets for the chambers, fireplaces with wood mantels, window seats, etc. Radford's Portfolio of **"Details of Building Construction"** is a regular gold mine of new and attractive designs and practical ideas from which the carpenter or the architect or the builder can draw for all or any of these. In every case complete details are presented—all accurately drawn to scale—so that the work can be gotten out directly from the Portfolio, if need be, without redrawing.

Two Hundred Pages of Illustrations

Each plate and drawing is accompanied by descriptive text, pointing out the special features and making every part perfectly clear and easily understood.

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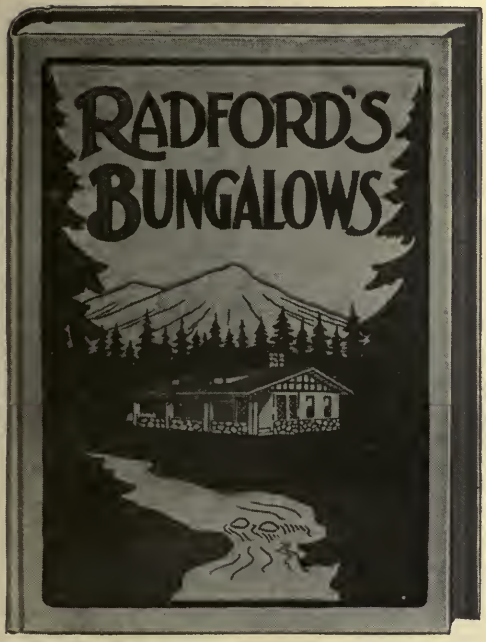
BUNGALOW BOOK

208 Brand-New Designs



This handsomely bound book, size 8x11 inches, 224 pages, contains perspective views and floor plans of 208 Bungalows suitable for any climate and for every material. The illustrations show the Bungalows exactly as they will appear when built and the floor plans show the size and arrangement of the rooms, windows, closets, plumbing and interior details. The estimated cost of construction of the Bungalows shown ranges from $500.00 to $5,000.00 each.

Best Ideas in Bungalow Architecture

In this big book is condensed the best thought on Bungalow construction. The home builder and contractor will find here every style of Bungalow that has proved itself worthy of being classed with that form of architecture. Freak ideas that serve no good purpose, but are an item of large expense, have been carefully excluded from this collection.

Largest Bungalow Book Ever Published

"Artistic Bungalows" is the largest and most complete work of its kind ever published. In its 208 Bungalow designs are many that will appeal to every taste. Economy of construction, as well as beauty and harmony of design, has been carefully kept in mind. Convenience of interior arrangement, light, and closet room have all been considered.

Plans Are Guaranteed to Be Correct

The plans for every Bungalow shown in this book were drawn by licensed architects, men who have made a life study of home construction and who know the economy of planning buildings that allow of the use of the standard sizes of lumber and material.

Wide Range of Style and Materials

Every floor plan shown in this large collection is guaranteed to be absolutely correct from an architectural standpoint. "Pet ideas" that involve needless expense, waste, or possibility of mistake have not been considered.

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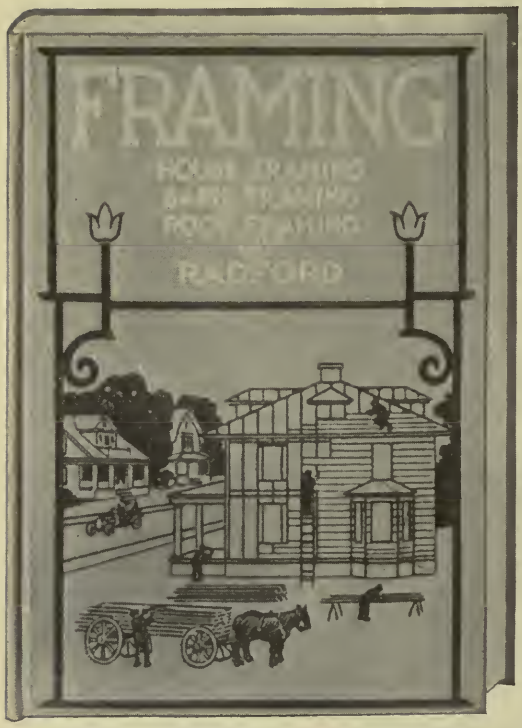
FRAMING



House Framing, Barn Framing, Roof Framing

"Framing" is the largest book of its kind ever published. It consists of 356 pages, size 6x9 inches, and printed from large, clear type on a high-grade book paper. More than 100 pages of illustrated details make it most valuable.

This large new book, "Framing," is written so that any reader can understand every page, every term used and every detail shown. It is entirely free from technicalities, and yet its pages are meaty with instructions to all classes of builders, from the youngest apprentice to the journeyman, as well as the practical builder and the largest contractor.

Practical information is the keynote of "Framing." By practical, we mean information that can be successfully applied to the everyday work of the average carpenter, builder and contractor, as well as the more intricate forms of framing that come less often, but about which it is necessary to be fully posted. The book presents problems as they have been worked out by well-known architects and the man on the job.

General Synopsis of Contents

Part I. Framing for all Types of Houses

Chapter 1. Ordinary Frame Houses—Framing complete, from foundation to roof
Chapter 2. Roof Framing Simplified
Chapter 3. Stair Building Simplified
Chapter 4. Cement Plastered and English Half-Timber Houses
Chapter 5. Wood Framing for brick veneer houses
Chapter 6. Wood Framing for stone and brick houses

Part II. Barn Framing Complete

Chapter 1. Heavy Timber Barns
Chapter 2. Plank Framing
Chapter 3. Balloon or Self-Supporting Construction

Part III. Framing of Factories, Stores and Public Buildings

Chapter 1. Mill Construction
Chapter 2. Wood Trusses of all kinds
Chapter 3. Architectural Framing as in churches, gymnasiums, halls, etc.

Part IV. Miscellaneous Framing

Chapter 1. Scaffolding and Shoring
Chapter 2. Wooden Bridges
Chapter 3. False Work for Concrete

Part V. Useful Tables and Data

Part VI. Dictionary of Terms and Index

All terms used in framing, building construction and architecture defined and explained, with cross reference to full discussion in body of book

A Big, Practical, Up-to-the-Minute Book for the Architect, Draftsman, Construction Man, Contractor, Builder and Carpenter

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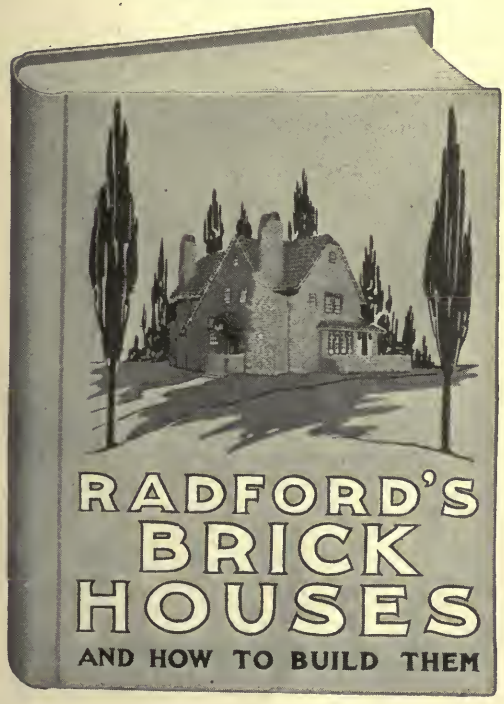
BRICK HOUSES

And How to Build Them

This book is a complete and clear manual of brick construction, designs and details. It tells what every builder should know of the classification and measurements of brickwork, together with architects' drawings of framing for brick houses and the use of brick veneer.



Up-to-Date and Approved Methods

This book also tells of the miscellaneous uses of brick, including ornamental brick and tile work, chimney and flue construction, brick fireplaces, brick sewers, cisterns and flush tanks, etc. It tells the carpenter and builder everything he should know to undertake brickwork and how to make a success of every job in which brick is used. It is so clearly illustrated by details that there can be no uncertainty in any builder's mind as to each successive step to be taken.

Money-Maker and Business-Getter for Builders

This book will be a money-maker and business-getter for builders. Brick houses are in demand. Many thousands of dollars are being spent by brick manufacturers in advertising so as to create a demand for their product. This has stimulated a desire on the part of those intending to build to insist upon brick instead of other materials. Every builder should learn all he can about the many varieties of brick and the multitude of ways it can be used in order to meet this demand. In addition to designs of many beautiful, attractive, medium priced houses this book also contains fully worked-out detail drawings, as well as prices and estimating data.

Beautiful Designs Shown

Over sixty designs of the very best modern architectural work are presented in this book. These designs are of attractive, substantial, homelike brick houses of many types—designs that will appeal to home lovers and the man or woman who is investing the savings of a lifetime in a home. This book will give any builder all the information he needs to figure on a job and then carry it out in the most approved manner. In all sections of the country the demand for brick houses is growing. Builders are finding out they must post up on brick construction. They are being asked its cost, durability, economy and hundreds of similar questions. They can find the answers by studying the pages of this book.

Size 8 x 11 inches, 236 pages. Bound in cloth with handsome art cover. Price, postpaid, $1.00.

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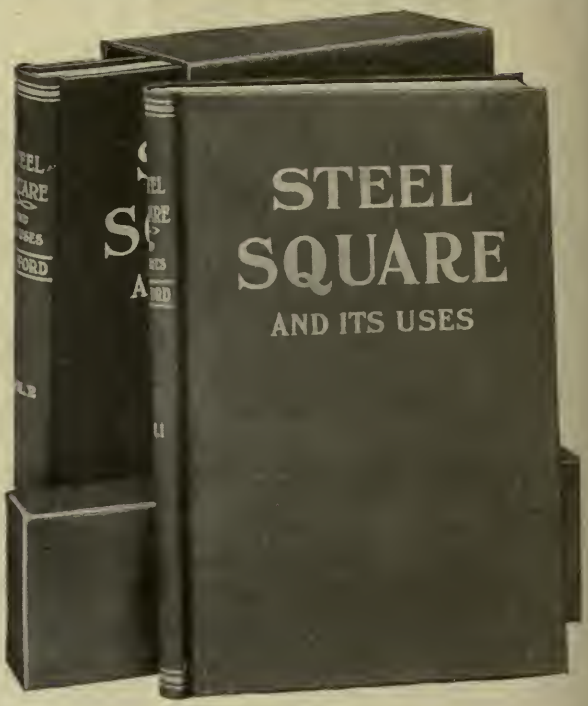
STEEL SQUARE And Its Uses

"Steel Square and Its Uses," by Wm. A. Radford, consists of two volumes and are brand new books. They are written in plain, everyday language and the text and illustrations can be easily understood and followed. Information of value that has appeared in former works appears in these books, together with a vast amount of absolutely new, practical, every-day information, such as is necessary for every progressive and successful carpenter to know.



Vast Amount of Practical Information

This up-to-date and practical work on the application of the steel square treats of the laying of the rafters, finding the length of jacks, securing bevels, laying out hopper bevels, showing how to use the steel square as a calculating machine, and how to measure solids, surfaces and distances. While the text and descriptive matter are so accurate and easy of comprehension that they could be understood without even the assistance of the illustrations, nevertheless the book has been thoroughly and profusely illustrated with diagrams and drawings.

Over 300 Illustrations

Practical and instructive illustrations to the number of more than 300 are shown in these books. The illustrations are not technical, mathematical designs nor geometrical problems, but are the thoroughly practical illustrations of a thoroughly practical text.

Special Chapters on Stair Building

Special chapters are devoted to that part of stair building to which the steel square can be applied. Other chapters discuss the adjustable fence, roof framing, hip roof framing, hoppers and hopper bevels, combination squares, key to the steel square, possibilities of the steel square, polygons and miters, pitches and roof framing and miscellaneous rules and examples.

A Department of Questions and Answers

Incorporated in Volume 2 is one of the most useful, interesting and instructive departments ever presented in a work of this character. It consists of numerous questions which have been sent the editors by practical carpenters all over the country, together with clear and easily understood answers. These questions come up in every carpenter's work frequently and the solutions of the problems given will prove a valuable aid to the readers of **"Steel Square and Its Uses."**

Books Are Absolutely Up-to-Date

These books are absolutely new and up-to-date. Each volume measures 6 x 9 inches and contains over 300 pages, being the largest books on the steel square ever published. They are bound in cloth, with attractive cover designs, handsomely stamped.

Price per volume, postage prepaid, $1.00.

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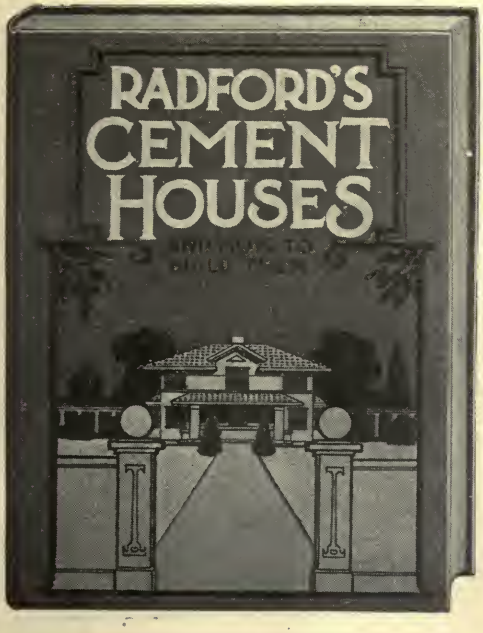
CEMENT HOUSES

And How to Build Them

In "Cement Houses and How to Build Them," a book of 160 pages, all types and designs of houses are shown, ranging in price from $750 to $4,000. The plans were all drawn by licensed architects and are guaranteed to be absolutely correct in every detail.



This Large Book Contains

Illustrated Details of Cement Construction; Standard Specifications for Cement; Standard Specifications for Concrete Blocks; Valuable Information Concerning Waterproofing, Coloring, Aggregates, Proportioning, Mixing, Paving, Reinforcing and Monolithic Work, Foundations, Walls, Partitions, Steps, Stairs, Floors, Sidewalks, Sewer Pipe, Tile, Cement Shingles, Chimneys, Porches, Tanks and Cisterns, Expanded Metal Meshing, Metal Lath, Establishing a Concrete Block Business, Cement, Plaster and Stucco Work; Concrete on the Farm; Cement Brick; How to Overcome Concrete Troubles; Causes of Cement Failures; Freezing; How to Select Proper Aggregates; Applying Stucco to Old Walls; Examples of Strength; Tension and Compression; Placing Reinforcing Rods; Adhesion; Dimensions for Beams; Vibrations; Miscellaneous Information of Every Kind.

176 pages, size 8x11. Over 200 illustrations, with perspective views and floor plans of eighty-seven cement plaster and concrete block houses, finest ever designed

All houses illustrated with fine half-tone cuts, printed on enameled paper. The illustrations show the houses exactly as they will look when built, and give a very clear idea of their appearance. All the floor plans are shown, giving the location and dimensions of all rooms, closets, porches, etc., with detailed information as to both interior and exterior. The houses illustrated range from the small to the medium large in size, such as will appeal to the average man or woman who intends to build a home.

Keep Posted on New Developments

In these days of timber and cement houses, brick and cement houses, and other combinations of materials, the builder and contractor who wants to be ready to do work on all kinds of residence construction should study the latest methods and most practical and economical ways of doing his work. He should be prepared to accept contracts on any type of construction, be able to estimate accurately and understand all details. New and odd ways of combining frame, stucco, concrete blocks and veneered brick are constantly being employed, and the builder who does not have the advantage of practical experience on this unusual work is under a serious handicap.

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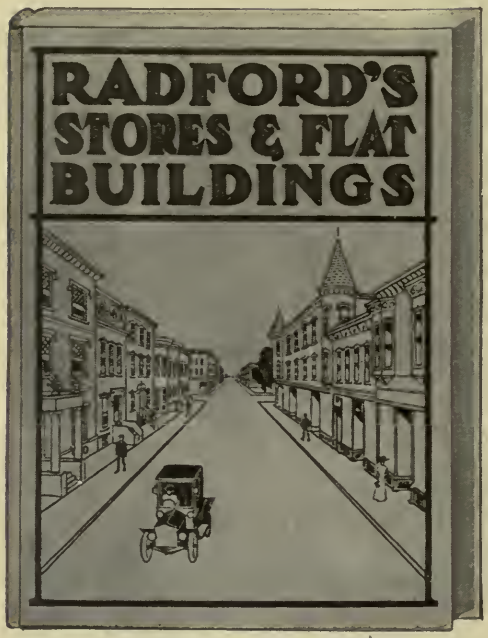
Stores and Flat Buildings



This book is entirely different from any book of Architectural Plans ever published, as it is composed of perspective views and plans designed both for city and country buildings. Nothing like it has ever before been within the reach of any one desiring to build for himself or others.

Only Book of Its Kind

"Stores and Flat Buildings" is actually the first and only book of its kind ever published. In other plan books designs are shown for single residences to be constructed on separate lots, but in this book are given ideas for the man who wants to have his store on the first floor and live above it, or rent the upper floor or floors. These designs combine business and residence structures, and also give the

Latest Ideas and Designs

in Flat Buildings of two, four, six and nine apartments. In nearly all good sized towns and villages small flat buildings, combined with stores or entirely for residence purposes, are becoming more and more popular, and are proving very popular. In the suburbs of large cities small flats or apartments are being built more than any other type of construction.

The owner usually lives in one of the apartments and rents the others, thus helping him to take care of his investment.

For Country and City

In addition to the designs for stores, combined stores and flat buildings and separate flat buildings, this book also illustrates small bank buildings, lodge halls and double houses suitable for the small towns and villages as well as the larger cities. In many small towns there is a demand for suitable places of gathering for societies and lodges, and in numerous cases the contractor and builder, having had no experience in this line of work, believes it necessary to apply to an architect in a larger place to get correct plans drawn especially to order. The contractor and builder, with this book on hand, can take care of this work himself and secure correct and guaranteed plans at a trifling cost, plans that have been built from and found satisfactory in every particular. The same is true of bank buildings, of which a good selection is shown.

An Up-to-Date Book for Builders

This book shows many popular designs of the kind of building shown by its title, suitable for different building materials, such as frame, brick, stone, cement, plaster and stucco, and cement block. An estimate of cost, based on favorable conditions, is shown under each design. An expert knowledge of the material that goes into buildings of this character is back of every design shown.

"Radford's Stores and Flat Buildings" is printed on high-grade super-calendered paper from artistic half-tones and etchings. It is bound in silk cloth, with an illuminated cover. Price, postpaid, $1.00 per copy.

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