The Lightning Conductor

H. JAMES BRADT.

THE

Lightning Estimator

A SIMPLE, RELIABLE GUIDE FOR ESTIMATING
THE COST OF FRAME BUILDINGS

RAPID, PRACTICAL, COMPACT, COMPREHENSIVE

PREPARED BY

H. JAMES BRADT

SIXTH EDITION

PRICE ONE DOLLAR

BRADT PUBLISHING CO.

JACKSON, MICH.

AUTHOR'S REMARKS

There seems to be a popular demand for clear, simple and reliable methods of estimating, if the large sale of my five previous editions is any criterion.

In presenting this sixth edition to the builders of the country my aim will be to improve where I can on my previous efforts, making some subjects more easily understood, adding a little here and there, and a few more illustrations, which are always helpful to the builder in grasping the ideas and methods shown in the book. The many gratifying letters I have received would seem to indicate that my methods are fast becoming the standard for estimating housework. While I have had some objections to the size of the book from a few of that class who put quantity ahead of quality, and would rather have a long drawn out treatise which they could not understand readily, than a terse, compact, comprehensive article which would benefit them, nevertheless, it will ever be my policy to handle each subject in as brief and simple a manner as possible to give a clear understanding, for in these busy days the majority of builders wish to buy information that is presented in the most serviceable form.

The young estimator must bear in mind that there is no royal road to estimating, that above all, good judgment is paramount, because often two similar jobs will vary in cost because conditions are different. The careful estimator is the one who, with a fair knowledge of arithmetic, combined with sound judgment, will be ever alert to existing and various conditions. He must dissect and analyze each separate part of his work and not jump at the cost.

Much as I dislike to say it, I must admit that for special and irregular classes of work, a good estimator must be a good guesser. Now, I don't mean to jump at the total cost of a job, but, as I have said, by dissecting and analyzing each separate part of the work, the risk in greatly lessened. The material can nearly always be computed accurately, it being the labor which bothers the estimator. Here is where good judgment comes in, and it is the purpose of this book to give examples in analyzing work in order to enlighten and broaden the judgment of the estimator. While the tables and data which I show are accurate and are taken from actual construction experiences, and may be relied on for the class of work described, they also illustrate the principle for analyzing nearly every class of house work one would encounter. It is readily seen that by resolving a piece of work into several parts a more definite idea may be had and the labor more easily computed. Judge more as to the time required by an average workman. not some particularly good man you have, as you never can tell how long you will have any certain man. Sometimes you might lose a job when your estimate was correct and the fault would be with poor labor. One can generally tell if work progresses satisfactorily, and if it does not, and the workman cannot be replaced, don't condemn your estimate as being too low to take another job of the same kind, because with proper labor it might be just right, and if you figured higher you might lose the next job, as competition is very close nowadays. Of course the amount lost would have some bearing on the matter, if very large you have made a mistake, but what I have just mentioned applies to a small loss. I have mentioned this point more to instill the idea into the mind that work must be constantly watched so that the fault may be corrected whether it is the estimate or the workmen. Eternal vigilance is the price of success as well as liberty, and nowhere is it more true than in conducting building operations. I am sorry that I have to speak of guess work, as it is the greatest evil we have to compete against, but as in some cases it is a necessity, I know of no other way to emphasize that estimating is largely a matter of judgment, and I have tried to explain how the evils may be overcome, and how to proceed to get the correct result.

Builders have written me that my book was of no use as the prices in their town were so much different. Think of it. If I were to get up a book for every town or city, no two would be alike. Even in my own city material is sold at different prices, and one builder uses a better grade than another, so the idea of making a set of prices universal is preposterous. This book is intended to teach a method of combining figures to save time. I studied arithmetic at school, and had a good text-book, but every time I have a problem to solve, I do not turn to my book to find an example with the identical figures contained in my problem. Just so with this book. It aims to teach you to help yourself. The idea is to analyze each part of your work, separate it into tables and rules similar to mine to get a basis for rapid and general use. Keep a record of the different parts of your work, make your own tables, compare one job with another. For instance, instead of estimating base-boards each member separately, make a table of 100 lineal feet of base and moldings and labor, see how long it takes an average man to put down 100 feet. Divide the result by 100 and you have a price per lineal foot until some item changes in price. I give here a table of this kind:

100 ft. lineal of base	$3.35
200 ft. lineal of grounds	.80
100 ft. qr. round	.60
100 ft. base mold	1.20
Labor, per 100 ft. (70 ft. in 8 hours)	4.00
	100)$9.95(10c.

Notice, I say average man. Don't pick out the best man or what you can do yourself in a day, but keep a record of several men, and the average will be the price to use. After establishing a standard for this class of work, if a man does not do the average, get someone else in his place.

There are several methods of estimating, such as cubing the contents at so much per cubic foot, or so much per square foot for the floor surface. Of these, all that can be said is they are only approximate estimates, and intended only for architects or those who need a rough and rapid idea of the cost. The customary way of taking off each piece is too slow, and there is too much risk of omissions and mistakes. Even if the quantities have been taken off accurately, there are so many figures to handle that it is safe to say six in ten mistakes occur in extending figures.

The method of taking off the material and adding a percentage for labor is decidedly inaccurate, as the labor on some materials is more than on others. Therefore, if one job had more of one kind of work in it than another this percentage would have to vary, and would resolve itself into just plain guess work, unless very subtle and keen judgment were exercised as to percentage added.

This book aims to get the same results as detailed estimating, but in a more easy, simple and rapid manner, with less risk. I have touched upon omissions, for I have known builders to overlook entirely such items as plastering, painting, gutters, chimneys, cornice, etc. Many builders add a percentage for this very thing, but suppose he happens to get everything figured in, this percentage would be apt to lose him the job; or, on the other hand, if he added 5 per cent. and had left out 10 per cent., where would he be? Mr. Builder, get the items all in. Have a list of general items similar to the following, and look plans and specifications over carefully to find any special work not ordinarily encountered.

Excavating,
Cellar Walls,
Concrete Floors,
Cellar Partitions,
Brick Work,
Piers,
Chimneys,
Coal Bins,
Colonades,
Veneer,
Cut Stone,
Cistern,
Plastering.

Gutters,
Cornice,
Side Walls,
Roofs,
Corner Boards,
Watertable,
Overlays,
Floor Space,
Inside Partitions,
Porches,
Windows,
Cellar Windows,
Tinning,

Seats,
Doors,
Base,
Wainscot,
Stairs,
China Closets,
Cupboards,
Picture Moldings,
Plate Shelf,
Mantels,
Heating,
Plumbing,
Wiring,
Painting.

I don't mean to say that this list covers all the items of a house estimate, but it serves as a reminder of the general items, and a careful inspection of plans and specifications will enable the estimator to add to the list as his wants require. I have observed that it is more often the case that a large item, such as a cornice, a gable, a partition, etc., is left out and the special or smaller items put down. This is true, perhaps, because the special items are specially mentioned in the specifications, while work that is generally understood belongs to a job, not being mentioned, is liable to be overlooked in a hasty estimate.

The prices given in this book are all based on actual cost. Then you add whatever profit you wish. Bids ought not to vary more than 5 per cent. if all bidders are on the same basis as to purchasing material, etc. General bids will vary because of several reasons, namely: Difference in sub-bids, access to the work, omissions or mistakes in extensions or adding, different ideas as to the cost of the labor, and the amount added for profit.

Profit varies sometimes, according to the amount of work the builder may have on hand, and on the state of the weather or time of year. As men can not do as much in bad weather as at other times, the labor is, of course, higher; so if you figure the same percentage you do in a good season you make less profit. Therefore I think a builder should not cut his profit to get a job in a bad season, as the extra cost of the labor eats into the profit as it is.

Now take a job estimated with the profit added to each item as you go along. How are you to know what the total profit is on the whole job? While I do not approve of it, it is sometimes desirable to cut a bid, so how can you do this safely if the entire profit cannot be ascertained? This is a point to consider, at least. You may add whatever profit your judgment tells you will secure the job; or take several jobs you have built and estimate them at actual cost, the difference will give you a fairly good idea of the regular profit you have been making. Of course competition is the leading factor to consider in making a price on most work.

The better way is to take a year's business you have done, and a fair amount you should make for the year. Divide the profit by the business and get the percentage which you must have to pay you for your work. You see again that it is judgment of the situation that has a great deal to do with this item. I will add that many small builders who put in their own time on the work, do not, as a rule, add any profit. The way I look at this is that a man must be a poor stick, who, if he can earn a day's wages working by the day for another man, will assume the risk, care, responsibility and extra work that contracting entails for the same amount as he could get by the day working at his trade.

I give the prices per day that this book is computed upon, therefore it is an easy matter to adjust them to your scale. For instance, if I gave 8 cents per lineal foot for the labor on wainscoting and my scale was 32 cents per hour, it appears that four lineal feet is one hour's work, and if your scale is 40 cents per hour, this work would cost you 10 cents per lineal foot.

Wages in this book are computed upon the 8-hour day;
Carpenters and Painters, .35 per hour.
Plasterers and Stone Masons, $4.00, or .50 per hour.
Bricklayers, $4.40, or .55 per hour.
Team and man, $4.00 per day.
Common labor, $2.00, or .25 per hour.

The price given throughout this book, and time for each part of the work, are based upon records of a great many jobs for several years, and an average struck from these. Two jobs identically alike will often vary a trifle as to cost, but what better methods can we use than taking an average for a standard.

While I give tables and memoranda for masonry, etc., it is on the methods of estimating carpenter work that I claim to have all other methods excelled for accuracy and rapidity.

To illustrate the rapidity of some of my methods over the regular way, I give a rough sketch of both methods for several parts of the work:

REGULAR WAY.	MY WAY.
FLOOR SPACE. No. ft. 6x8 sills and girders No. ft. 2x8-10 joist No. ft. 2x8-12 joist No ft. 2x8-14 joist No. ft. 2x8-16 joist No. ft. flooring Nails No. pieces bridging Labor on pc. stuff Labor on flooring	Simply No. sq. ft of floor space at price given in table.
SIDE WALLS No. pc. 2x4-12 studs No. pc. 2x4-14 studs No. pc. 2x4-16 studs No. pc. 2x4-18 studs No. pc. plates, 12, 14, 16 ft. No. ft. sheathing No. ft. siding or shingles No. rolls paper Nails Labor on studs and plates Labor on sheathing Labor on siding	No. of ft. side walls at price per square.
ROOFS. No. pc. rafters No. ft. roofing No. shingles Nails No. ft., lineal, ridge boards Valleys and hip shingles Ridge roll	No. sq. ft. roof at price per square.
PLAIN CORNICE. No. ft. 1x12 No. ft. 1x4 No. ft. 1x8 No. ft. 1x6 No. ft. crown mold No. ft. bed mold Brackets Labor on above	No. lin. ft. cornice at price per foot.

INSIDE DOORS.

No. doors No. ft. casings No. ft. head casings No. ft. head moldings No. set jambs No. set knobs and locks No. prs. butts No. ft. door stops No. ft. grounds Labor on each	No. of doors cased up complete at price each.

Of course this refers to doors of the same price only, as pine doors would be a different item from oak doors.

Finally, let me say: Go over your figures several times and add your columns at least three times, as more builders are ruined by carelessness than by ignorance of the cost.

I will be pleased to receive a letter from any builder receiving this book, to whom some part may not be clear, and will gladly answer all such to the best of my ability.

Yours for success.

H. JAMES BRADT.

The houses shown on the following pages show the class of work upon which the estimates and information in this book are based. They range from $2,500 to $7,000 in price, on the ordinary class of work which the builder is called upon to erect.

In estimating double house only one side need be estimated if both are alike, then double the amount. To this amount there are a few things to add separately, such as plumbing, the centre wall (generally brick or concrete blocks), sometimes the gutters and conductors if they are not the same for both parts, in fact any work which can not be taken singly and doubled.

EXCAVATING

As this work is largely a matter of judgment, based on experience, I will not devote much space to the subject, as this work is usually let to some teaming contractor who is usually better posted as to conditions of soil, site, etc., than anyone else. He also knows just what to expect of a team or man on the different classes of work. He can give a price per yard or take the whole job in a lump. However, I give the method of getting the cubic contents of a cellar, the average price, and day's work in this locality.

Multiply floor space by depth of cellar from grade; divide result by 27 (27 cubic feet equal one cubic yard). Result—cubic yards.

The following is about the average day's work for one team and two men.

Sand—50 yards per day at $6.00 equals 12c. per yard.

Sand and Clay—40 yards per day at $6.00 equals 15c. per yard.

Hard Clay—20 to 30 yards per day at $6.00 equals 20c. to 30c. per yard.

Of course these prices are for cellars from 3 to 6 feet deep, where plow can be used. If cellar is small or very deep, it will cost more to excavate.

STONE WALLS.

What I have said of excavating is largely true of rubble stone work. Every locality has a generally established price for common and face work, different grades, classes, etc.

Walls are measured by the cubic foot, perch or cord. Both the cord and perch vary in different localities regarding the cubic feet in each. For instance, the standard perch in our arithmetic is 24¾ cubic feet. Thus a wall 1 ft. high, 18 inches thick and 16½ ft. long would be one perch. Now, in this locality 16½ cubic ft. is a perch, therefore the above mentioned wall would count as one and a half perch. The law rules that custom governs, and many interesting suits have resulted in favor of custom. A standard cord is 128 cubic feet, but in many sections masons charge 100 cubic feet as a cord. It matters not, as long as a general custom is understood, and in estimating stone work in strange localities, it is important that this matter be looked into before estimating. The table I give below is based on 16½ cubic feet to the perch. Similar tables may be made for any other measurement.

If the wall is 18 inches wide it is only necessary to multiply length by the height and divide by 11.

Corners are measured twice and no openings are deducted, as extra labor laying up the corners or jambs offsets the saving in material. Don't forget that you must add to your price if cement is used in the mortar.

The following table gives material and labor for 6 perch of wall laid. If it is customary to estimate by cord or yard in your locality, make a table accordingly.

6 Perch Stone	$6.00
1 Bbl. Lime	.75
1 Yd. Sand	.67
1 day Mason	4.00
1 day Tender	2.00
	6)13.42(2.24 per perch.

This includes pointing inside, and outside above the grade.

This table is based on common rubble work. Block or course work, or any kind of fancy ashlar work costs additional. We pay, in this city, about 20 cents per square foot extra for face work. One-half of this goes to the teamster for the better grade of stone required for this work.

CONCRETE BLOCK WALLS.

In making blocks the cost of labor depends on kind of blocks, also the size and style of machine or mold. In making plain 20-inch blocks two men will make from 130 to 150 blocks in eight hours if they have had a little experience. Some turn out more, but at a sacrifice of quality. In making face-blocks, on which nearly every block maker uses a richer facing, from 80 to 100 is a fair day's work, considering the corners and small pieces which go a little slower than regular blocks. These figures cover wetting down, removing from pallets, piling, etc., and are based on hand-mixed concrete. While it is policy for every block maker to keep a record of his daily output for his particular style of work and methods, a table is given below showing how this may be done. Four sacks of cement equals 3.8 cubic feet, so for ordinary calculation one foot to a sack is used. Hence, if a 6 to 1 block is required, four sacks of cement would take 24 cubic feet of sand and gravel. As there is always a little shortage and waste to sand we will allow 27 cubic feet or one yard of sand in this calculation, and 30 blocks to the batch:

4 sacks cement	$1.50
1 yard sand and gravel	.67
30)2.17(7¼c. per block for material	

Two men 8 hours, at 25c. per hour, is $4.00. Making 133 blocks on an average per day would be 3c. per block for labor. 7¼c+3c.=10¼c. per block complete.

It is of course cheaper if one can make blocks on the site where they are to be used, as hauling soon runs into quite a bill.

In making face blocks (face down) we will require an extra sack of cement, and the cost is about as follows:

5 sacks cement	$1.88
1 yard sand and gravel	.67
30)2.55(8½c.	

Two men at $4.00, averaging 80 blocks per day, is 5c. each for labor. 8½+5c.=13½c. complete.

In laying blocks something depends on experience of mason and the class of work. On ordinary foundations one mason and tender ought to lay 160 blocks in 8 hours. $4.40 for mason and $2.00 for tender is $6.40÷160 gives us 4c. per block for labor laying plain blocks up to grade.

In laying the face blocks 100 in 8 hours is a fair average. $6.40÷100 in 6 4/10c. for labor laying. Blocks ought to be laid in good mortar. One barrel lime, 75c.; 4 sacks cement, $1.50; 1½ yards sand, $1.00, will easily lay 325 blocks, or about 1c. per block. Some masons use more than others. Also, some block setters will set 250 blocks per day. Builder must adjust his tables to conditions as he finds them.

We will now try an example on an ordinary foundation nine blocks high, six courses high of plain blocks and three courses high of face blocks. It is readily seen that a wall of 600 blocks would require 400 plain and 200 face blocks, no allowance being made for plain blocks back of porches:

400 plain blocks at 10¼c.	$41.00
200 face blocks at 13½c.	27.00
Labor, 400 blocks at 4c.	16 00
Labor, 200 blocks at 6 4/10c.	12.80
Mortar	6.00

600)102.80(17⅛c. per block.

Now, one block (8x20 face) lays 1⅑ square feet in face of wall, hence 90 blocks will lay 100 square feet of surface. If one block laid costs 17⅛c., 90 blocks would cost $15.41, or about 15½c. per square foot for face of wall. It is readily seen that by multiplying the surface measure in a wall by the cost per square foot the cost is given without taking the trouble to reduce the surface to the number of blocks and pricing by the block. This scheme may be worked out for any size block, the example given is merely a guide for the builder to make his own calculations.

In building block houses or buildings where all face work is required, the work of laying is much slower. It is not safe to estimate that one mason will lay more than 100 in 8 hours for the first story. Ninety is a better average for good work, and 70 to 80 for second story.

Much depends on facilities for handling this work, such as adequate scaffolding and means for raising the blocks. Also great care is required in handling face blocks in order to keep the edges intact. Window and door openings are figured solid and nothing allowed for sills and lintels, or the cost of blocks only (not the labor for laying) may be deducted and the caps and sills figured separately. It is about an even thing, ordinarily, which ever rule is used, the first being quicker and the latter more accurate. I might add that in making blocks the cost is greatly reduced if yard can be located near a sand pit, buying cement in car lots, using automatic tamper, power mixer and suitable trucks for handling the blocks, but all these require a great deal of capital, such as the ordinary builder cannot tie up.

It is now an opportune time to say a word about how blocks should be laid:

First, draw a plan of wall and space off the lengths of blocks around same for first course. If a side wall does not space out evenly and a fractional block is required, try to keep this piece as long as possible by laying the corner block in the opposite direction, as it keeps the bond better. For instance, in laying 20 inch blocks, if side of wall 24 feet long is required, instead of laying 14 blocks 20 inches long and one 8 inches, make it 13 blocks 20 inches and one 18 inches and lay the corner the 10 inch way. This is not really necessary, but looks better as the fractional blocks are nearer the size of the regular blocks. Next draw the elevations, locating all the openings for doors and windows, marking size of each over all, for outside of frame. Then draw lines showing the courses from bottom to top of wall. Now start at one side and space off the blocks.

making the fractional blocks come at the openings. If there is a projection on one side of the wall as for a wing, space from outside corner to inside, making fractional block come next to the inside angle. Prove all spacings by adding the lengths of blocks and widths of openings to see if they tally with length of wall. In running blocks for height the windows should be regulated as near as possible to the blocks, and any small variation can be made in the sill. For instance, a frame 68 inches high would take 8 courses laying 8 inches and a four inch sill, while a frame 70 inches high would take a 6 inch sill, or we might use a 5 inch sill and make each joint a little heavier. This is a proposition where the frame need be considered for height before anything else is done, as the size can oftentimes be changed to great advantage in laying the blocks. After you decide on height of frame space same off on the casing, same as for siding, only use height of one block and one joint for a space.

This may seem like a lot of work to many, but nevertheless it is absolutely necessary to procure a first class piece of work properly bonded, also it allows you to get the exact number and kind of blocks required. It is by this method that stone is cut at quarry or stone yard for an entire building before any are laid, and if no mistake has been made never a stone need be touched again by the cutter. The mortar joint is taken out of the length and height of stone or block. In getting out a bill of cut stone every stone is marked for course and position. As concrete block setting is identical with cut stone, we can get no better method than that used by the boss stone cutter.

CONCRETE FOOTINGS.

Hollow block walls should be laid on a footing. For house work these footings require 2x4s staked around the bottom of cellar so as to make footing from 14 to 16 inches wide. These are put in level then the concrete put in place. Two carpenters will put down these forms for 35 lineal feet of footing in one hour, which makes the cost 2c. per lineal foot. Lumber for forms is not figured as same can be used in the building again after concrete has set. The concrete mixed, placed in forms and tamped level costs as follows for one cubic yard in place:

(7 parts gravel to one part cement.)

$1\frac{1}{4}$ yards gravel	.84
5 sacks cement	$1.87
6 hours common labor	1.50
	$4.21

Hence, if one yard costs $4.21, one cubic foot would cost—$4.21÷27, or $15\frac{5}{9}$c.

Example—To find number of cubic feet in 100 feet lineal, of footing 15 inches wide by 4 inches thick:

15 in. = $\frac{5}{4}$ foot. 4in. = $\frac{1}{3}$ foot.

($\frac{5}{4}$x$\frac{1}{3}$=$\frac{5}{12}$ cubic feet) x 100=$\frac{500}{12}$ or about 42 cubic ft.
42x$15\frac{5}{9}$ cents is $6.53
Labor on forms 2.00

$8.53 cost of 100 lineal feet of footing 4x15 in place, or about $8\frac{1}{2}$ cents per foot, lineal.

Builder should make a set of tables for the different widths and depths of footings he is called upon most to build, in order to be able to readily estimate them by the lineal foot. Footings may be estimated at so much per cubic foot or yard instead of lineal foot as I have shown and add labor setting forms if one so chooses, but the method given is handier; after he has made a table of the different sizes, all he needs do is to take the length of footing by the price per foot.

For monolithic wall the above table for mixing and placing the concrete by hand is a fair estimate, but the cost of forms is another proposition, as there are several different ways of doing this work and so many different classes of work. Usually the lumber used in forms is not figured in, and the labor will run from $\frac{1}{6}$ to $\frac{1}{4}$ cost of the concrete. This is a proposition where experience, method of doing the work, and style of work has so much to do that I will not attempt to give any prices, but be obliged to leave it to builder's judgment and experience.

CONCRETE FLOORS.

Concrete floors are estimated by the square foot of surface. While the carpenter-contractor usually sublets this work the following tables will be of use for ordinary work such as cellar floors and porch floors. One square (10x10) of cellar floor two inches thick made seven parts gravel to one part cement with 3-to-1 top dressing, requires as follows·

1 yard gravel	$ .67
5 sacks cement	1.88
2½ hours finisher	1.25
5 hours common labor	1.25
	$5.05

This is about 5c. per square foot. Contractors charge from 6c. to 7c. for this class of work in this locality.

One square of cellar floor 3 inches thick requires:

1½ yards gravel	$1.00
6½ sacks cement	2.44
3 hours finisher	1.50
6 hours common labor	1.50
	$6.44 or about 6½c. per square foot.

Contractors charge 7c. to 8c. per square foot for this class of work. Large floors would not cost quite as much as the labor would run along faster. Also, machine mixed concrete is a big saving.

PORCH FLOORS.

Porch floors should be at least 4 inches thick, with 3/4 in. face. One square costs as follows:

2 yards gravel	$1.33
8 sacks cement	3.00
2 yards cinders	1.00
6 hours finisher	3.00
12 hours common labor	3.00
	$11.33 or 11 1/3c per foot

Nothing has been added for forms. As they can generally be used for several jobs the contractor can add for them or not, as he wishes. 13c. to 15c. is the price at which this work is generally taken.

CONCRETE STEPS.

The cost of concrete steps varies on account of number in a flight, the size and location. The cost of ordinary porch steps built between two walls or plain end made with wood form, four steps to set, each 7 feet long, is given below:

1 yard sand and gravel	$ .67
5 sacks cement for concrete	1.88
2 sacks cement for facing	.75
8 hours cement finisher	4.00
8 hours common labor	2.00
Lumber for forms	1.44
	$10.74

Steps are usually priced per step one foot long, and as we had 28 feet of steps, this would be about 38 1/3c. per foot for one step. This class of work is usually figured at 50c. to 60c. per lineal foot.

BRICK WORK.

The following table for brick walls is based on plain work with common brick, such as basement walls and partitions and ordinary small brick buildings. A brick house where a particularly good job is required would run a little higher. Hollow walls as are used sometimes in house work are laid up at the rate of 800 brick a day for one mason. For pressed brick and veneering see index.

Four inch walls require 6 to 7 standard brick (according to mortar joint) to the square foot face. I have found 6½ the average, thus a 9-inch wall requires 13, and a 13-inch wall 19½.

Cost of 9-inch wall. Plain work:

1000 brick	$8.00
Mortar	2.00
Labor at 1200 per day at $6.40	5.33
Cost per 1000	$15.33

Cost of 13-inch wall:

1000 brick	$ 8.00
Mortar	2 00
Labor at 1600 per day at $6.40	4.00
Cost per 1000	$14.00

If openings are deducted, deduct brick and mortar only as the labor around an opening is equal to labor on brick deducted. Some builders never deduct for openings, but do not figure for mortar.

BRICK PIERS.

On good size brick, 13-inch pier will require 18 brick to the foot in height.

18 brick at $8.00	.14
½ hour labor (mason and tender at 80c)	.40
Mortar	.04
Cost per foot in height	.58

Piers 13x17, one-third more than this.

This table is based on two or three piers, such as residence work sometimes requires; a larger amount could be laid cheaper. This work goes much slower than ordinary brick work.

BRICK VENEER.

Box frames, or frames for veneered buildings cost more, the price varying in different mills.

Important—On brick veneered jobs every window or door requires an angle iron across top to carry brick above unless brick arches are used. These cost about 3c. per lb., or 1½c. per inch.

Buildings to be veneered with brick are usually sheathed with matched stuff or ship lap.

Estimate outside walls for frame and sheathing only. Then figure brick as follows:

A good brick layer and helper will lay 500 common or stock brick in eight hours, at a cost of $6.40, or $12.80 per thousand. 1000 brick cost $10.00, mortar $2.00, labor $12.80. Total, $24.80 per 1000 laid in wall.

A good brick layer and helper will lay 350 pressed brick in eight hours, at a cost of $6.40, or $18.29 per 1000 One thousand pressed brick cost $20 00, mortar $2.00, labor $18.29. Total, $40.29 per 1000 laid in wall. Colored mortar costs $1.00 per 1000 extra.

After estimating all the cost of brick work, deduct cost of the brick only, not required for windows and door openings.

Mortar is estimated at 1½ barrels of lime and 1 yard of sand to 1000 brick. 50 pounds color to 1000 brick.

This depends greatly on quality of lime and sand. If these are first class, mortar will cost less. Do not forget to increase this cost if cement is required also.

Pressed brick run from $18 00 per 1000 up according to quality and number used.

CUT STONE SILLS, CAPS AND WATERTABLE.

Cut stone is estimated by the cubic foot, usually $1.50 to $1.75 per foot, cut and rubbed. This applies to plain work, of course.

Example—4x6—4 ft. sill equals ⅔ of a cubic foot; ⅔ of $1.50 equals $1.00, cost of sill 4x6—4 ft.

A simple and surprisingly accurate method for estimating used by cut stone contractors a great deal, is to estimate 1c. per square inch for each inch of the end of the stone. Price to be for 1 ft. lineal.

Example—Sill 4x6. 4x6 equals 24, at 1c. equals 24c. per lineal foot. It will be seen that a sill 4 ft. long would cost 96c. or practically the same as the first method. Of course this rule only works when stone is about $1.50 per cubic foot.

If stone can be bought for that price, this rule is recommended for its rapidity. Estimate lineal length of all sills, etc., and multiply by the cost per lineal foot.

Note—Window sills are 16 inches longer than the width of the glass. Door sills 12 inches longer than the width of door.

It is the best plan to get a price on this work from a dealer in cut stone on account of the many kinds, shapes and various prices.

CHIMNEYS.

Chimneys are usually sub-let by the lineal foot in height. The general price is for one flue, 8x8, 75c.; double flue, $1.00; and fireplace, $2.25.

If builder wishes to handle this work himself, he can estimate a good brick layer and helper will lay 500 common brick a day on small or short chimneys, averaging from bottom to top, unless the greater part is above roof.

Number of standard size brick required for one foot of various sized chimneys;

1 flue (8x8)	24 brick
2 " " (2 brick x 3½)	40 "
2 " " (if lined with tile)	32 "
2 " (8x12) (2½ brick x 3½)	46 "
2 " " (lined)	36 "

Chimneys lined with tile are not so large as no centre partition between the flues is necessary, thus 2 to 2½ brick on a course is saved. Fireplace breasts averaging from from cellar bottom to five feet above first floor require the following number to one foot in height:

Five foot breast	80 brick
Six " "	100 "

Above figures are accurate except on breast, which allows about five brick to the foot for slightly different methods of construction. However the amounts given are enough to cover any reasonable construction.

Example—Single flue (8x8):

24 brick at $8.00	.19
Mortar at $2.00 per 1000	.05
Labor, 500, at $6.40 per day	.31
	.55

First class work requires the flues to be lined with square tile, which cost 15c. per foot for 8x8, and 20c. for 8x12.

FIREPLACE CHIMNEYS.

A brick layer will lay 600 to 700 brick in eight hours on two flue and fireplace breast chimneys. Under first class conditions a good mason will lay more than 600, but I have found that more than three-fourths of the bricklayers I have had would not lay more than this amount a day under ordinary conditions. In this locality we run the breast up to five feet apove first floor and stud up the balance. This makes about 13 feet of breast, allowing for seven foot cellar, joists and five feet above. From this point figure for the two flues only. I give table for cost of one foot of breast using 80 brick as an average for 13 feet. I always build the ash pit 2½ brick thick.

80 brick at $8.00	$0.64
Mortar at $2.00	.16
Labor, 600 per day, at $6.40	.85
	$1.65 per foot.

As a breast should have a good foundation and an iron ash pit door, we must consider these also. Saying nothing about the gravel, a sack of cement will cost 40c., the door (10x12) 70c., and half an hour for the mason and helper putting in the foundation 40c., makes $1.50, or about the price of another foot of breast. Therefore in measuring a breast from plan I add one foot to the height to cover the cost of door and concrete footing. For the two flue part above the breast we find that 40 brick are required, so we take just half of the breast price, or 83c. If chimney is to have 8x12 flues it requires about ten per cent more brick, therefore add ten per cent to cost of table given for 8x8 flues and breast. Ten cents expended in mortar color will save an hour's time at least in topping out a chimney.

CISTERNS.

Are priced by the barrel. Cisterns with sides plastered on the earth cost 35c. per barrel, and bricked up from bottom 50c. per barrel in this locality.

Table for 40-barrel cistern, plastered on earth:

300 brick for arch, at $8.00,	$2.40
Manhole and 2 tile	1.00
2 days com. labor, 1 day mason	8.40
Cement, 4 sacks	1.50
Lime and sand	.50
	40)$13.80(34½c

To brick up a 40-barrel cistern from bottom to arch requires 300 brick=$2.40, mortar, 30c., half day mason and tender, $3.20. Total $5.90, or 15c. per bbl. extra.

The following table gives the number of barrels to one foot in depth for various size cisterns:

6 feet wide	6.71 barrels
6 ft. 6 in. wide	7 88 "
7 ft. "	9.14 "
7 ft. 6 in. "	10 49 "
8 ft. "	11.93 "

These amounts are found by multiplying the square of the diameter by .7854 and dividing the result by 4.21 (number of cubic feet in barrel).

Filters are sometimes built in cisterns. As good a way as any is to build it dome shaped, about 30 inches in diameter and 3 feet high, on bottom of cistern. Build of porous brick laid in rich cement-mortar. Wet the brick. The inlet pipe goes to cistern proper and water is drawn from inside of filterer. Such a filterer requires about 100 brick, 80c; 2 hours' time, $1.60; and a sack of cement, 40c., or $2.80 total.

TINNER'S WORK.

I use a list of prices as follows for this class of work. Your tinsmith will give you the prices per foot.

Common 3-in. trough	8c. per foot.
" 5-in. "	10c. "
Square hanging gutter, 4 in	13c. "
Molded O. G. hanging gutter	15c. "
2-in. plain conductor	8c. "
3-in. " "	10c. "
Square corrugated conductor	12c. "
Polygon conductor	16 to 20c. "
Tin roofing, common	$6.50 per square.
Tin roofing, old style	8.00 "
Valley tin	7c. per lineal foot.
Cut-offs	50 to 80c. each.

Have the price on conductors include the elbows.

PAINTING.

If the builder does not wish to let this out to his painter, he can estimate from a table like the following. Every locality has an established scale of prices for the different kinds of work.

Outside wall, per yard, 2 coats	$0.16
Inside painting, per yard, 2 coats	.20
1 coat liquid filler and 2 coats varnish (inside)	.25
1 coat paste filler and 2 coats varnish (inside)	.40
1 " " " " " " (rubbed)	.60
4 coats paint, 2 coats enamel	.60

Note—Hard woods are filled with a paste filler.

In estimating inside finishing, estimate each foot of base at $\frac{1}{9}$ yard; each window at 2 yards; each door at 7 yards; box stairs at 12 to 15 yards; open stairs at 25 to 40 yards.

1000 shingles dipped 10 inches in stain and given one coat of stain after being laid requires 3 gals. stain at 50c. per gal., which is $1.50 plus 75c. for labor, equals $2.25 per 1000, or 16c. per yard, or about the same as two coats of paint brushed on the siding. 1000 shingles cover 14 yards.

Openings are not deducted in estimating painting outside walls.

LATHING.

100 yards lathing, not counting out the openings, requires 26 to 30 bunches of lath 4 feet long, the difference being in the number and size of the openings and width of lath. Lath run from 1¼ to 1⅝ inches wide according to the mill where they are made and whether dry or green. 28 bunches is a fair average, so we will consider this amount in our calculation. In this locality lathing is done by the yard for labor on ordinary work. Difficult work and patching is done by the day. Lathers on new work put on from 100 to 150 yards in eight hours.

Table for 100 yards:

28 bunches lath at 28¾c	$8.05
Labor, at 3c. per yard	3.00
8 pounds nails at 3c	.24
	$11.29 or about 11¼c. per yard.

PLASTERING.

Patent hard wall gypsum plasters have crowded lime mortar out of the market so we will consider only the former. Plastering is always estimated by the yard, and is generally let out on this basis. Openings are not deducted unless very large, and this depends on custom in the various parts of the country. The table below showing cost of 250 yards, is based on one plasterer and one tender browning 125 yards in 8 hours, and two plasterers and one helper doing 200 yards of finishing in 8 hours. Granulated or sand finish, sometimes called carpet or felt-float work, costs same as white putty finish. For finishing, hydrated lime is now used instead of slacking lime at the job. This is lime that has been slacked, dried, ground and passed through a bolter. It is ready to use by merely soaking with water over night. Calcined plaster or plaster of Paris is used with each batch for guaging, same as with the old fashioned lime putty.

Table for 250 yards:

1 ton patent gypsum plaster	$8.00
2½ yards sand	1 67
20 sacks lime finish, at 20c	4.00
1½ sacks stucco	.60
2 days at browning, at $6.00	12 00
2½ days at finishing	12.50
	250)38.77(15½c.

15½c.+11¼c =26¾c. complete for lath and plaster.

Plastering contractors get from 2c. to 4c. a yard more than this.

CEMENT WAINSCOTING.

Cement wainscoting is done with Keene's cement, manufactured by the Hunkins-Willis Lime & Cement Co., St. Louis, Mo. It retails for $1.50 per 100 pounds. It is applied like plaster and generally marked off into 6-inch squares to resemble tiling. After it is marked off it is usually enameled.

The following table is for 35 yards:

1 sack cement for first coat	$ 1.50
1 bu. hair	.20
2 pails putty	.15
10 pails sand	.10
1 sack cement for second coat	1.50
2 pails putty	.15
15 pails sand	.15
1 sack cement for finish	1.50
1 pail putty	.08
1 day plasterer	4.00
1 day helper	2.00
	35)$11.33(32 per yd.
Add cost of lath and labor	11
	43c. per yd. complete.

For marking off add 5 hours' work for plasterer and helper, or $3.75, which is about 10c. per yard. If wainscot is to be laid off into rectangles with the joints broken, the labor is double that for marking the squares, or 20c. per yard.

Above figures do not include enamel.

Expanded metal lath costs 20c. per yard, and 5c. for putting up, total 25c. As wood lath, put up, costs 11c. per yard, the metal would cost 14c. more. (See lath table for wood lath.) It is not necessary to have metal lath for Keene's cement. Estimate ⅓ more material for metal lath.

A good substitute for this work is to plaster wainscoting with regular hard mortar and finish with Keene's cement. One sack cement and one pail of putty will do any ordinary bathroom in this manner, so the extra cost is only $1.50 for the cement, and 10c. or 20c. per yard for marking.

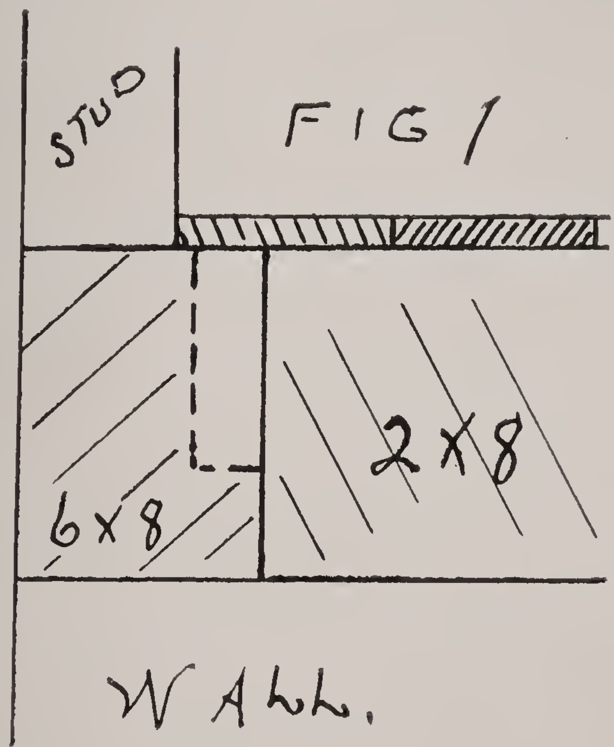
Full particulars of this cement can be had of the firm mentioned, also information as to the tool for marking off.

Where the last coat only is of Keene's cement applied over common plaster, builder estimates room along with the other plastering, at same price, then adds $1 50 for sack of Keene's cement, and 10c. or 20c. per yard for marking.

FLOORS.

In estimating sills, girders, joists, flooring, etc., the common methods in use in the past, and to some extent today, consist of taking off each piece of sill, girder and joist separately, then the flooring, bridging, nails, and finally the labor for each item. This method is very slow, so many figures are handled that mistakes are apt to creep in, and one must be very careful or something may be left out.

There are several styles of constructing framing for floors for houses, one of which is to use the 6x8 sill on the wall, 6x8 cross girder and 2x8 joists. While this style has been superceded almost entirely in most parts of the country by the box sill or bond plate style, for the benefit of those builders who still use this style we will analyze a square to see what material is required. Taking ordinary housework each 10x10 square of floor requires on an average 15 lineal feet of sill, 5 lineal feet of girder and seven 2x8–10 joists. For example, take a floor 24 ft. x 30 ft., which is 720 square feet surface, or 7.2 squares. 7.2x15 lineal feet of sill gives 108 feet or just what is required on wall. 7.2x5 lineal feet of girder gives 36 lineal feet for girder or 6 feet more than is required. A floor 20x30, being 6 squares, would allow 90 feet of sill where 100 feet would be required, but 6 square would allow 30 feet of girder where 20 feet is all that is required, so you see that in allowing 20 feet lineal of 6x8 for sills and girders, we have enough. Sometimes we lack a little on the sill and make it up on the girder, and again it is the other way. As jobs get larger we save on sills and use it up on the girders A floor 20x40, or 8 squares, would run out just right, as according to my average 8x20 lineal feet equals 160 lineal feet. This floor would require 120 lineal feet of sill and 2 girders 20 feet each or 160 lineal feet total, or just the same as my average. If a builder will take the trouble to try out a few plans on this basis, and then estimate the actual feet required, he will be convinced that the average is right. Large floor plans do not require quite as much sills and girders as this sometimes, but usually use up the saving in extra joist used under partitions, trimming, etc. Seven 2x8 10 joist to a square allows a little waste or enough for doubling under the partitions not setting upon girders. For example the 20x30 floor would require fourteen 2x8–14 joist and fourteen 2x8-16 joist, or a total of 560 board feet. 20x30 is 6 squares, and seven 2x8–10 joist equals $93\frac{1}{3}$ board feet, 6x$93\frac{1}{3}$ feet equals 560 feet or just what is actually required. In spacing these joists off on this floor two of them would come only two inches apart and would go under a partition, so it is readily seen that for ordinary conditions we have enough allowed at $93\frac{1}{3}$ feet to a square. If a builder thinks this too close he might add a little in his table for waste, bad joists, etc., but it is not needed once in a dozen times unless joists run bad, and if he pays for first class stuff, he should insist upon getting it. In comparing a great many jobs, actual requirements against this average, the difference has never exceeded $1.00 either way, and how many times in taking off joists piece by piece do you get as close as this, unless you draw out the floor plan showing every joist? Stairway openings do not save anything as the pieces saved are needed for trimming the opening. In estimating flooring add one-fourth for 4-inch flooring and one-fifth for 6-inch. So much for explanation. Now we will put all these items of sills, joist, flooring, etc., in one table in order to get a price per square, covering the entire floor. For example—a floor 20x30, or 6 squares at $11.14 per square is $66.84, only one calculation, which includes the whole floor, all material and labor. Which way do you elect to use; this simple, easy way, practically avoiding omissions, or the old, slower method, which, if no mistakes are made, only gives the same result? The builder should make tables covering the different styles of framing used in his particular business, then when called upon to estimate he only needs get the square measure by the cost per square.



(See Fig. 1.)

Table A—First Floor	Material	Labor
20 ft. lin. 6x8=80 ft. at $26.00	$2.08	$1.40 (4 hours)
Seven 2x8x10=93 1/3 ft. at $24.00	2.24	.47 (1 1/3 hours)
16 pieces bridging 1x3=16 in.	.15	----
Nails	.10	
125 ft. yellow pine fl'g. at $32.00	4.00	.70 (2 hours)
Cost of 1 sq. 10x10	$8.57	$2.57
		Total, $11.14

Second Floor.	Material	Labor
Eight 2x8x10=107 ft. at $24.00	$2.57	$ .53 (1 1/2 hours)
16 pieces of bridging	.15	
Nails	.10	
125 ft. yellow pine flooring	4.00	.70
Cost of 1 sq. 10x10	$6.82	$1.23
		Total, $8.05

Notice that sills are omitted on second floor and one joist added.

If second floor is the same size as first, average the two thus:

Cost of first	$11.14
Cost of second	8.05
Total	$19.19

Average cost per floor, $9.60.

FLOOR LINING LAID DIAGONALLY.

Use this with table A if desired:

Requires 110 feet of hemlock boards, at $23.00	$2 53
Labor 1 1/3 hours, at 35c	.47
Nails	.05
Cost per square, extra	$3.05

BOX SILL STYLE, (Fig. 2 and 3.)

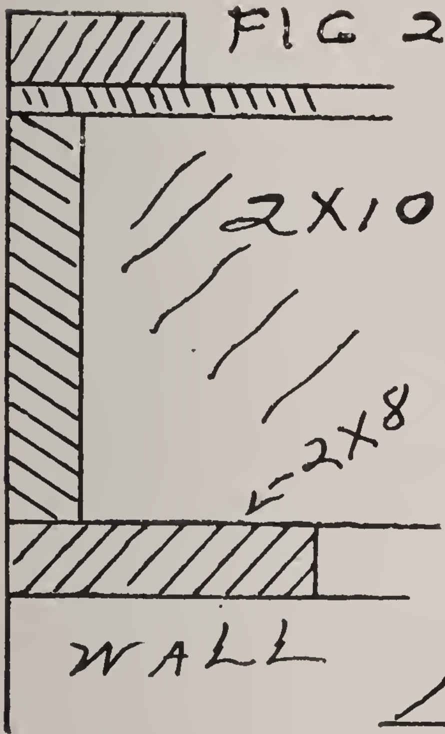


FIG 2

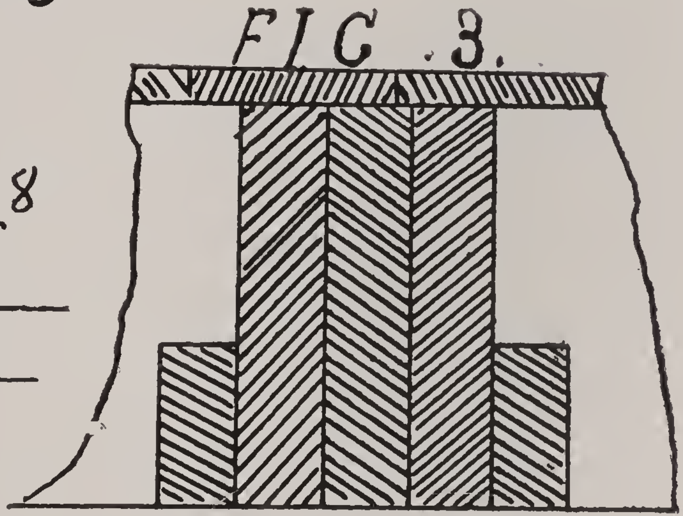


FIG. 3.

One of the best and most popular styles of floor construction is shown in Figs. 2 and 3. As is seen, the sill consists of a 2x8 on wall and 2x10 edgewise on same. Both are spiked together and leveled, then the girders and joist are placed. The sill should be run entirely around the building and thoroughly spiked into the ends of the joists. The floor lining is laid next, diagonally across the building, and a 2x4 plate run around edge of building to rest the studding on. Some builders run studs down to wall plate, but this is poor practice, because the centre partitions rest on a shoe or plate which is on top of the floor lining, thus giving more timber in centre of building than on sides to shrink. Then if studs are run down to wall plate the height of building is decreased 8 to 10 inches. Also, when the studs are run down to plate, the ends of joists are generally left open, the upright piece of the sill being omitted. This leaves an air shaft or flue from the cellar up between every pair of studs, a bad thing in case of fire, and making it easy for rats and mice to get into walls from cellar. Sometimes the space from wall to floor is bricked in to close this space up, but it costs more than the lumber saved in slighting the sill. The complete box sill is considered stronger and better in every way although it costs a little more. The table of costs for floors built like Figs. 2 and 3 are based on price of joists up to and including 16 ft. lengths, which is as long as 2x10 joists ought to be used in house work. In most parts of the country 18 and 20 ft. joists cost $4.00 or $5.00 per thousand more than 16 ft. lengths, but as the percentage of cross girders would be less if long joists were used the price would not be affected much from that given in the following table. The average material required for a square of floor for this construction has been analyzed along the same lines as laid out in the first part of this subject, the 6x8 sill being omitted and an extra joist added.

Table B—First Floor	Material		Labor
15 ft. 2x8 for box sill=	20 ft.		
15 ft. 2x10 " " =	25 ft.		
8 ft. 2x10 10 joists =	133 ft.		$1.40 (4 hours)
5 ft. lin. 6x10 girder =	25 ft.		
10 ft. lin. 2x4 for " =	7 ft.		
	210 ft.		
	at $24 00=	$5.04	
110 ft. floor lining at $23.00		2.53	.47 ($1\frac{1}{3}$ hrs)
Nails		.10	
16 pieces bridging, 2x2		.20	
		$7.87	$1.87
			7.87
Total			$9.74

Second Floor.	Material	Labor
Eight 2x10–10=133 ft. at $24.00	$3.19	$0.61 ($1\frac{3}{4}$ hours)
Nails and bridging as above	.30	
125 ft yellow pine flooring at $32	4.00	.70
Total, $8.80 per square	$7.49	$1.31

It will be noticed that Fig. 3 shows girder flush with joists. This girder is sometimes dropped below the joists, in which case the 2x4 pieces, spiked or bolted on sides, would be omitted. However this method is not as good as there is usually about half an inch of shrinkage in a 10-inch girder, and as there would be none on the outside walls the floor along the line of the girder would be apt to be lower after the shrinkage had taken place. This style of placing girder has its advantages when heating pipes are to be taken up, in as much as the girder does not have to be cut into, but care should be used in getting the girder as dry as possible. Where house is to be heated with other means than hot air furnace it is best to place girder flush. 6x10 girders are usually built up from 2x10 joists bolted or spiked together securely. In fairly good houses a common floor or lining is laid as shown in Figs. 2 and 3, and price in Table B is based on this method, the top or finished flooring being laid after plastering, and sometimes the finishing, is done. These floors are estimated separately, and room sizes only need be estimated.

No. 1 common yellow pine flooring, 4-inch, requires 125 feet to lay a square, and four hours to lay same. Thus 125×$32.00 is $4.00, and four hours' labor is $1.40, or a total of $5.40 per square. In Table A, and second floor of Table B only three hours is figured for laying a square of flooring this width, but as these floors are generally laid before many of the partitions are set, they lay faster, where in laying floors after partitions are up, and in many cases after finish is on, more care is needed in laying. Many houses have oak borders and yellow pine centres, which requires good joint where floors join, so four hours is none too much to figure as an average.

Oak floors are laid of 3/8 and 7/8 matched flooring, generally 2 1/4 inch face, although 5/16 unmatched oak floor is sometimes laid, but generally in old houses. These latter floors are not, as a rule, satisfactory, unless a good level floor is had to lay them on, then they should be glued down and must be nailed through the face which does not look very well. Oak floors are laid in borders, usually with pine centres; although hall floors, being more or less cut up, are laid all one way and solid. In giving prices for laying oak floors it is hard proposition, for one builder will do a better job than another. It requires 140 ft. of 2¼ face flooring to lay a square, this allows only 7 ft. for waste. A square ought to be laid in six hours, and twelve hours for one man does a fairly good job for dressing and scraping, although some floors have twice this amount expended upon them.

140 ft. ⅞ oak flooring at $70.00	$ 9.80
6 hours laying	2.10
12 hours dressing and scraping	4.20
Nails and paper	.15
	$16.25 or 16¼c per square foot complete.

In estimating surface for borders take length around room by the width of border. This gets the corners twice which allows a little for waste and the extra work required in dressing the corners where mitred or butted. This applies to borders from eighteen inches to two feet wide. If a whole room had an oak floor laid in from every side to centre, just figure the room size, but add about four hours per square for labor, as these corners require quite a little attention. Don't forget to figure the flooring in door ways. Clear end matched flooring has practically no end waste. Tables may be made for other kinds of flooring, which builder may use in his locality.

OUTSIDE WALLS.

In estimating outside walls for frame buildings, the majority of builders take off the studs, plates, ribs, sheathing, siding or shingles, paper, nails, and labor, for each item separately. They generally allow one stud to a foot around the building if studs are set 16 inches on centres; the extra studs being allowed for corners and trimming openings. Some builders get the outside around building into inches and divide by 16, which gives regular studs, then add for corners, and 16 to 18 lineal feet of 2x4 for each opening if double studded. Then they take length around the building two or three times for the plates Then distance around by the height for boarding, letting the openings go for waste in stock. Then add one-fifth to one-fourth to this for siding, if there are an ordinary number of openings. If no openings add one-half for 4-inch siding. The building paper is easily computed from the sheathing as there are 500 feet to a roll. Nails for studding 1½ pounds per square of outside wall, sheathing 2 pounds, siding 3 pounds Labor is generally figured at so much per thousand as follows:

300 board feet of studs and plates, one man, 8 hours.

400 feet sheathing, one man, 8 hours.

2 square siding, one man, 8 hours.

Now, all this is very well if it did not take so long to figure out all the stuff required each time. My method is to combine all these items in one table based on 10x10, or one square, then the square feet of surface in outside wall by price per square is all the figuring necessary. Also, by having less figures to handle the risk of errors and omissions is cut down to a minimum. Each builder must make his own schedules for the several different kinds of walls. This is a little work at first, but it saves a whole lot of time when called upon to estimate a building.

We will now take a plan 24x28x18 feet high, and estimate the material by both methods, then the builder can decide which way is the best.

24x28= 104 feet around house by 12 inches=1248 inches÷ by 16 inches=78 studs+8 extra for the four corners is 86 2x4—

18 feet, or	1032	board	feet
104x3=312 lineal feet plates, equals	208	"	"
13 openings, 18 feet lineal 2x4, equals	156	"	"
	1396	"	"

Now, my rule is to allow 75 board feet of 2x4 to each square of outside wall thus, 104x18=1872 square feet surface on outside of building, 18.72 square by 75 feet to the square = 1404 board feet required by the short method. It is readily seen that there is only eight feet difference in the two calculations, which is as near as we can expect to get to the exact amount by any method. Even the piece by piece method does not always come out just right to a 2x4 as a rule. If the house were a little larger with same openings the short method would run a little ahead, while if smaller, would run a little behind. However, in estimating a great many houses I have found 75 feet, board feet, of 2x4 is the average amount used in the outside walls per square. I took the 24x28 plan first, to show that my table would cover the average small house. Taking a house 30x30x18 feet is 2160 square feet surface, at 75 feet per square gives 1620 feet for studs, plates and trimmers. Now, this plan would require ninety-eight 2x4-18, or 1176 feet, and 360 lineal feet of plates, or 240 board feet. Total, 1416 feet. 1620 feet—1416 feet=204 feet left for trimming openings Allowing 12 board feet 2x4 to an opening this would allow for seventeen openings, which is about the number this size house would require.

You will say that 75 feet to a square will not be enough if studs were only fourteen feet high with the same openings. Let us try it on the 24x28 house:

86 studs, 2x4-14=	803	board feet
Plates, ------------	208	"
13 openings, -----	156	"
	1167	"

Now, 104x14=1456 square feet surface at 75 feet per square is 1092 feet required by my rule, and we had 1167 feet required by actual deduction, so I am 75 feet short on this height house, but a house this height would need gables at least at each end or 288 feet of surface for half pitch. Now, as there are no plates or trimmers to speak of required in gables, 50 board feet of 2x4 will stud up a square on an average, therefore 144 feet of 2x4 would be all that was required. Now, according to my rule the 288 feet of surface at 75 feet to the square, would amount to 216 feet allowed for gables, and as I have shown that 144 feet is enough, I am now 72 feet ahead on the gables, and as I was 75 feet short on the sides, I am now short only 3 feet of 2x4 on the whole house, or about 8 cents. Of course one would not go to all this trouble to figure out every job as I am only trying to show that my allowance of 75 feet of 2x4 to a square is ample for any kind of a house. A house such as we have just figured would probably have less openings than thirteen so we would have to be a little ahead in that case. I have analyzed a great many houses in this way and have never varied over thirty board feet between what was actually required and 75 feet to a square Then again, how many times would you get the actual amount required in estimating by the old way with the many interuptions and in the odd moments that most of us have for doing our estimating?

The sheathing, siding, nails, paper and labor can be easily figured by the square, giving identically the same result as if you were to estimate each item separately. I use a table as follows, combining all the material and labor in the whole outside wall surface for one square, then get the number of squares in building by price per square; a simple operation taking but a few minutes:

	Material	Labor
75 board feet 2x4 for studs, plates and trimmers, at $24.00 --	$1 80	.70 (2 hours)
100 feet sheathing, at $23.00 ---	2.30	.70 "
120 ft. lap siding, at $26.00 ----	3.12	$1.40 (4 hours)
One-fifth roll paper, at 75c ----	.15	
6½ pounds nails, at 2½c ------	.15	
	——	——
	$7.52	$2.80

$7.52+$2.80=$10.32 per square complete.

Now, there is one more item in connection with this table, which is, when 18 ft. studs cost more than 12, 14 or 16 ft. lengths. In my city 18 ft. studs sell for $4.00 per 1000 more than 12 to 16 foot lengths. Hence, for a building 18 feet high, we must add to table the difference in price for that part of the seventy-five feet per square which would be used for studding. I find that in allowing 75 ft. of 2x4 to a square that 55 ft. goes for studding and the rest for plates and trimming openings. Therefore, 55x$4.00=22c. per square to be added when figuring a house with 18 ft. studding, or $10.32+.22=$10.54 per square.

A point that has been raised, is, that in taking height of a building same as studding length, that in case studs rest on top of floor or joists more sheathing and siding would be required. As to this, I have found that in house work the sheathing saved at openings makes up that required along sill, and the drop of cornice takes off enough on the height so that no more siding is required, in fact with most cornices a little siding is saved.

Shingled side walls cost more than if sided with lap siding, as the labor is much greater. One square of surface would require 800 shingles at $4.00 per thousand would be $3.20. It takes about seven hours on an average to lay a aquare of shingles on the side of a building as but one course can be laid at a time, and the courses must be kept straight and level. Seven hours at 35c. would be $2.45 plus $3.20 for shingles, and about 8c. extra for nails would be $5.73. Referring to table we find that the siding and labor for one square figured $4.52. The difference between $5.73 and $4.52 is $1.21, which must be added to table if walls are shingled instead of sided, or if first story is sided and second story shingled, add 62c. or half of $1.21 to table. Also, it will be noticed that table calls for 100 ft. of sheathing. This means square edge boards. If 10-inch ship lap is used add one-ninth for waste.

CORNER BOARDS.

Corner boards for siding are used various ways, a common method being two pieces 1⅛x3 inches wide with a corner bead in the joint, sometimes a quarter-round is used. Estimate the lineal feet complete for the three members. 100 feet this style would cost as follows:

200 lin. feet 1⅛x3=63 ft. at .50	$3.15
100 " 1⅛ corner board	1.50
Labor, including jointing (9 hours)	3.15
	$7.80

or about 8c. per lineal foot.

WATERTABLE.

Watertable is used along lower edge of houses, and commonly consists of a 1x5 or 1x6 base with a beveled or lipped cap on the top. Its object, primarily, is to throw the water off, but it also adds greatly to the appearance of the building. 100 feet lineal, including labor, costs as follows:

100 ft. lin. 1x5, white pine, at $40.00=	$1.68
100 ft. cap	1.50
Labor (6 hours)	2.10
	$5.28

or about 5¼c. per foot lineal.

CEILING JOISTS.

Eight 2x4-10=53 ft., at $24.00—$1.27: labor, 35c.; total, $1.62
Eight 2x6-10=80 ft., at $24 00—$1.92: labor, 40c.; total, $2.32

These prices per square of 10 feet.

ROOFS.

It has been customary in estimating cost of roofs for house work to take off all the various lengths of rafter and reduce to board feet, then get the surface for roofing and shingles, estimating labor for each item separately. All of these may be included under one head and roofs estimated by the square or square foot. Rafters for house work are usually set two feet on centres unless they are to be lathed upon, in which case they are set sixteen inches on centres. We will first make a table of cost for plain roofs without hips nor valleys. Such roofs average thirty-six board feet of 2x4 to the square, very small roofs running a trifle more.

	Material	Labor
36 ft. 2x4, at $24.00	$0.86	$0.35 (1 hour)
100 ft. roofing, at $16.00	1.60	.53 (1½ hours)
800 clear red cedar shingles, at $4.50	3.60	1.12 (3⅕ hours, or 2000 in 8 h'rs)
7 pounds nails	.20	
	——	——
	$6 26	$2.00
		6.26
		——
Total		$8.26 per square.

Some of the estimating books upon the market lay great stress on the measuring of roofs, hip and valley roofs in particular, giving diagrams and explanations showing how to figure the surface of all the various triangles, etc., in roofs of this sort. The fact of the matter is this: As far as surface measure is concerned it does not matter what kind of a roof is put on a building, the surface is the same as long as the pitch and projection of cornice are the same Don't understand me as referring to material required, as hip and valley roofs require extra rafters and there is waste on roofing and shingles. The best way to get surface of a roof is to multiply length of common rafter and projection by the length of roof including projection, and double for the two sides. For instance, a house 24x28, one-half pitch roof, gable each end, rafter would be seventeen feet long to plate and we will say two feet projection (on the slant) makes nineteen feet. Length of roof twenty-eight feet plus projection on each end, which we will call eighteen inches in this case, would be thirty-one feet. 19x31=589 square feet by 2=1178 square feet in roof.

It would not matter if this roof had a hip on each corner in place of the gables, or if there were four gables, as long as the plate was all the same height. A roof with a dormer would contain more feet than one without as the projection on dormer would need be roofed over a part of main roof already roofed. Dormers should be estimated separately from roofs, and not considered at all in getting surface of main roofs.

A house 24x28 with roof hipped in from corners, while having the same surface, requires more material for rafters, that is for the hips, the common rafters remaining the same, averaging thirty-six board feet to the square. Hip roofs average about ten lineal feet of hip rafter to a square This is based on an average taken from houses 20x20 up to 28x36, which is a fair example of the size houses ordinarily built. 2x6 are usually used for hips on houses of this class; although 2x8 are sometimes used, generally when roof is large enough to require 2x6 common rafters. It is not as necessary to have extra material in a hip rafter as a valley, for in the former every jack rafter is a brace, and in the latter greater weight comes on the valley rafter, and it is not an uncommon sight to see valley rafters doubled on large roofs.

A shingle is supposed to be four inches wide, and if laid five inches to the weather would lay twenty square inches, or require 720 to a square, but as no allowance has been made for double courses at eaves nor for waste and shortage, I have used 800 per square for plain roofs, as will be noticed by referring to table. Now, hip and valley roofs waste a half a shingle for every one laid along the hip or valley, but even at that 800 shingles generally lays a square on any kind of a roof if shingles are laid five inches to weather.

If a roof has a hip and valley, sometimes the part of shingles left after hips are cut are used for the valleys. I have used 800 as an average for all roofs for years and find it always runs pretty close. However, each builder can figure this out for himself on the basis of one shingle being four inches wide by whatever exposure he wishes to give. We found that 720 shingles would just lay a square if there was no waste. Now, bear in mind, if you are going to figure this close that you get in the double courses and take each hip and valley one foot wide by their length and add to your surface before reducing to number of shingles.

The table on plain roofs allowed 100 feet of roofing to a square which might be a little too much if roofing was narrow and of good quality as the 2-inch spaces would be saved on roofing. However it is customary to allow this amount as there are several places around a building where roofing is used and seldom figured, such as ribbons for joist, capping partitions, stay-braces on frame, etc. Then sometimes there is quite a little waste, and there is sure to be on hip and valley roofs. Below is a table of cost for ordinary hip roofs which, it will be noticed, is about the same for material as the plain roof table, with the additions of hip and hip roll. The labor is increased on account of the extra work framing and shingling.

	Material	Labor
36 board ft. 2x4 for com. rafters at $24.00	$0.86	
10 lin ft. 2x6 hip rafter=10 ft. at $28.00	.28	$0.53 (1½ hours.)
100 ft. roofing, at $16.00	1.60	.53 (1½ hours.)
800 shingles. clear, at $4.50	3.60	1.40 (4 hours.)
10 ft. galv. iron hip roll	.50	
7 pounds nails	.20	
	$7 04	$2.46

or $9.50 per square complete, or 9½c. per square foot.

It will be noticed that hip rafter is figured at $28.00 per thousand in above table as this is the price for piece stuff from 18 to 22 feet long, which is about the length of ordinary hip rafters. The above table is intended, primarily, to take care of the ordinary square house so much in style today – houses from 20x24 up to 28x36--but this price would also be about right for hip and valley roofs in general for ordinary house work. I have shown how two different roofs may be tablized for future estimating, and will leave it to each builder to make tables to suit himself and his particular style of work. The only way to do this is to take a roof you are estimating and take off all the rafters carefully, reduce to board feet, and then divide by the number of squares in the roof. One would not want to do this every time he estimated a job, but after you have gone to the trouble once you have a price per square for all future estimating on this particular style of roof.

As has been stated, the tables are based on rafters set 2 ft. on centres. If set sixteen inches on centres add 50 per cent. of the cost of rafter and labor, or 60c. per square for plain roofs.

SLATE ROOFS.

Roofs prepared for slating require matched roofing and not less than 2x6 rafters. On the latter the length and pitch govern the size, although for ordinary roofs 2x6 is large enough. Slate is usually let out by the square or job to roofer. There are many kinds of slate and several sizes, so it is well to take this matter up with a roofer who is posted as to local prices, as freight is a large factor in making a price on slate, particularly in less than car lots. A good way to estimate this work is to take the roofing and rafters as one item and the slate as another. Another reason for urging the general contractor to see a slater before tendering his bid is on account of the different ways slaters have of measuring this work in different parts of the country. The usual method in measuring a slate roof is to allow one course extra for doubling at eaves and add six inches at each end of roof for breaking joints. Hips and valleys are added at one foot wide by their length.

Roofs ready to lay slate upon would cost as follows;

	Material	Labor
54 board feet 2x6 for rafters, at $24 00	$1.30	$0.53 (1½ hours)
120 feet 6-inch matched roofing at $26.00	3.12	1.05 (3 hours.)
Nails	.10	
	$4.52	$1.58

Total, $6.10 per square.

Hip and valley roofs would average about 10 lineal feet 2x8 per square extra for hip and valley rafters, same as explained under heading of shingled roofs.

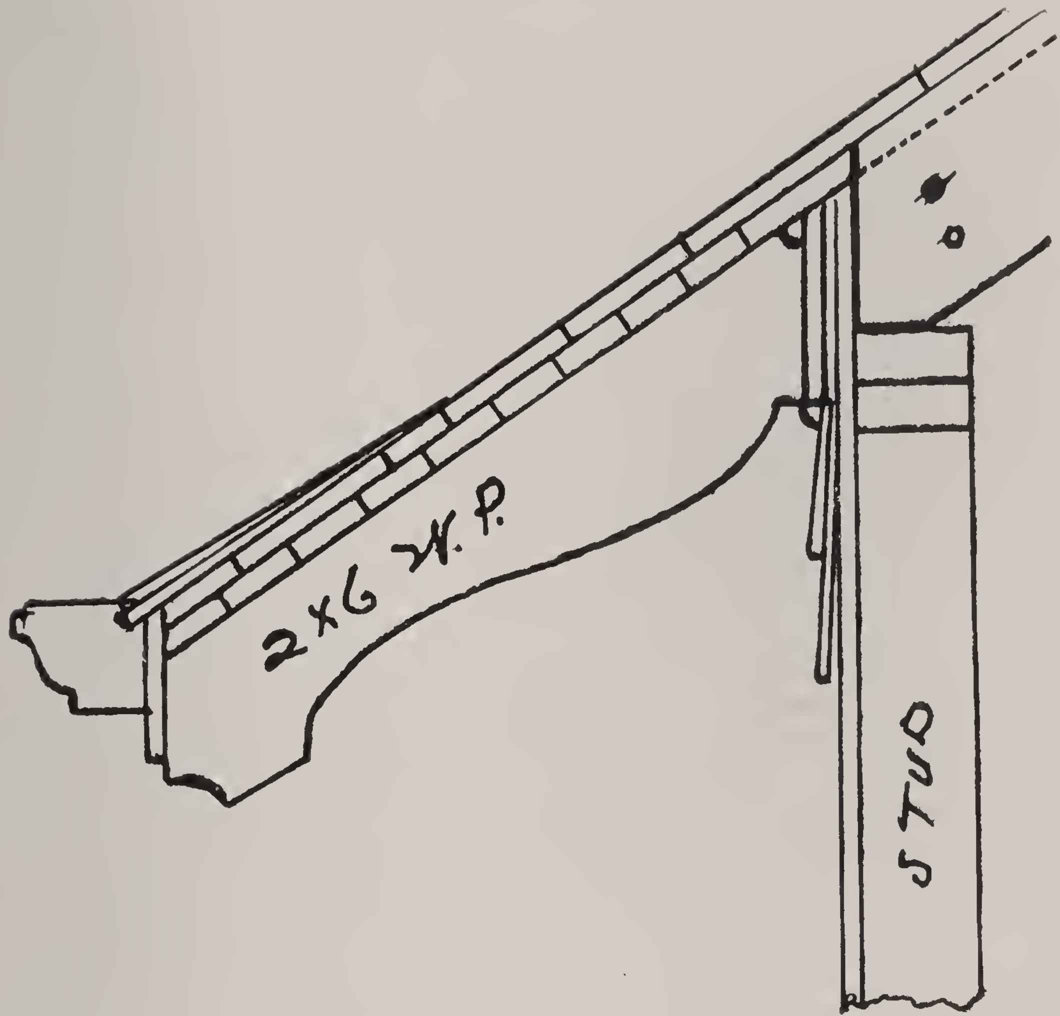
DORMER WINDOWS.

Dormer windows occurring in new work are usually estimated in with the various parts of the main building, such as studs, rafters, sheathing, roofing, shingles, etc. While this is probably near enough ordinarily, it is a fact that the labor cost is more in proportion to the material used in a dormer than on the main part of the building. This is on account of a great deal of cutting and a more difficult place to work. It is a good plan to have estimates made on several styles of dormers such as are generally used, then in estimating a plan, the builder may make one item of dormers and save estimating all the different material and labor for every job. Nearly all the square houses built today have one or more dormers, and they do not vary much in style. They average about six feet wide and five feet high. I will give an estimate on a dormer of this style, same to have hip roof, 18-inch plancher, shingled sides, and one 2-light window and frame. Size, 6 feet wide, studs 4 feet 8 inches high:

60 board feet 2x4 for studs and plates	$ 1.44
50 " 2x4 for rafters	1.20
60 feet sheathing	1.38
100 feet roofing	1.80
800 shingles, clears, at $4.50	3.60
250 shingles for sides, at $4.00	1.00
24 lin. feet of cornice, lumber and moldings	3 36
1 window and frame 28x16, 2-light	4.00
24 feet ridge roll and hip roll	1.20
Nails	.20
16 feet valley tin	.96
32 hours labor	11.20
	$31.34

Now, on a new building the space covered by the dormer is open, therefore the roofing and shingles for this part of main roof may be deducted. Nothing is deducted for main rafters as some builders leave them in just as if there were no dormer, while others double the main rafters under the sides of the dormer. On a dormer such as we have estimated, the main roofing saved would be a space 6 ft. wide by 8 ft. 5 in. long, or the length up the roof from front of dormer to point where dormer plate strikes roof. This would be 50 feet, at $18.00 would be 90c.; labor (as per table of hip roofs) would be 27c., or a total of $1.17, saved on roofing. There would be 25 feet more space saved on the shingling for that part of main roof not covered under the dormer roof from plate intersection to ridge intersection. Seventy-five feet would require 600 shingles, at $4.50 would be $2.70, and labor, $1.05, makes a total saved on shingles of $3.75. Add to this the $1.17 saved on roofing, makes $4.92 that may be deducted from the cost of dormer for that part of main roof under dormer roof. The point is sometimes raised that there would be nothing extra for roof and shingles for a dormer, but it is readily seen that the overhang of the dormer cornice would cover a part of main roof already shingled.

CORNICE.



Above cornice costs as follows: Notice the table is for two lineal feet, and then price per foot found from this. I give price on two feet, as it requires one sawed rafter end to each two feet of cornice:

1 sawed rafter end 2x6x4 feet	.30
6 feet ceiling, at 38c	.23
2 lineal feet 1x4 and 1x6 white pine, at $40.00	.07
2 feet molding, 2c.; nails, 1c	.03
Labor	.20
Total cost of two lineal feet	.83
	or 41½c. per foot.

Two men will put up fifty-five feet of this cornice in eight hours.

This cornice is used on square houses a great deal. Builder should take measure around outside of fascia so as to get the projections at corners.

CORNICE.

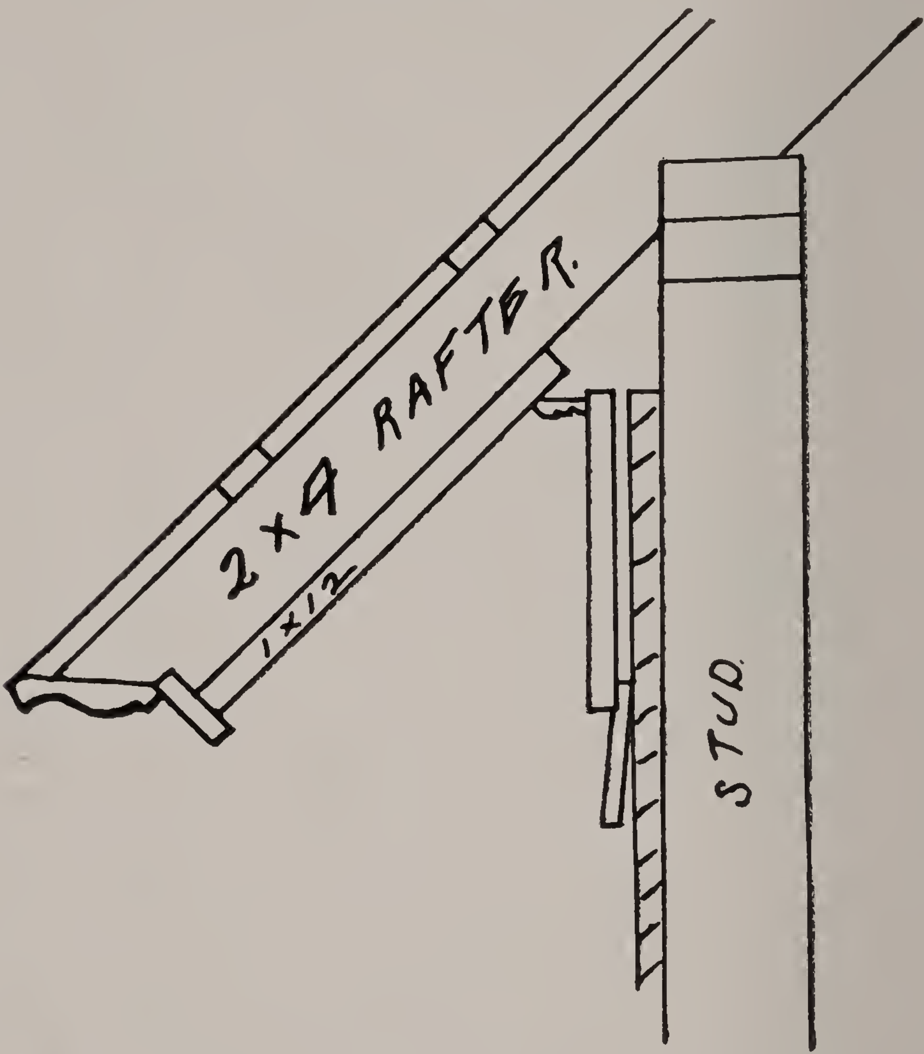


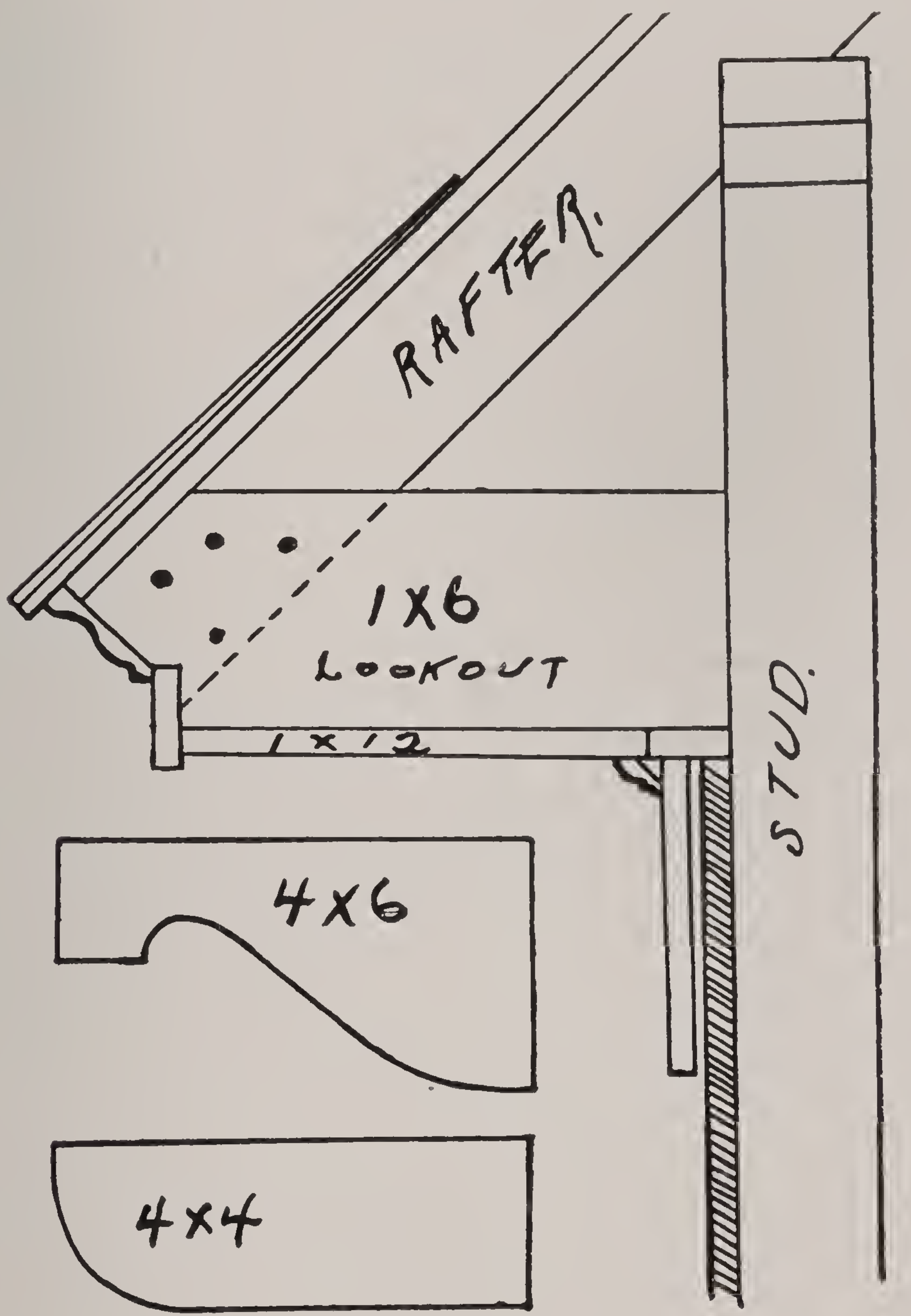
Figure 1—Scale $\frac{1}{8}$ inch = 1 inch.

Cornice is estimated by the lineal foot.

REGULAR CORNICE. (Fig. 1.)

No. 1 Select white pine.	1 lineal foot 1x12	$0.045
	1 lineal foot 1x8 / 1 lineal foot 1x4	.04
	1 lineal foot crown mold	.025
	1 lineal foot bed mold	.01
	Labor, $\frac{1}{3}$ hour	.12
	Per lineal foot	$0.24

CORNICE.



(Figure 2.)

Box cornice (Fig. 2) is more expensive because of the returns, which require tinning or shingling, also this style requires lookouts to carry it. The cost averages 3c. per foot more than regular style, on eaves, but the builder saves about twelve inches of siding, which nearly balances the additional cost.

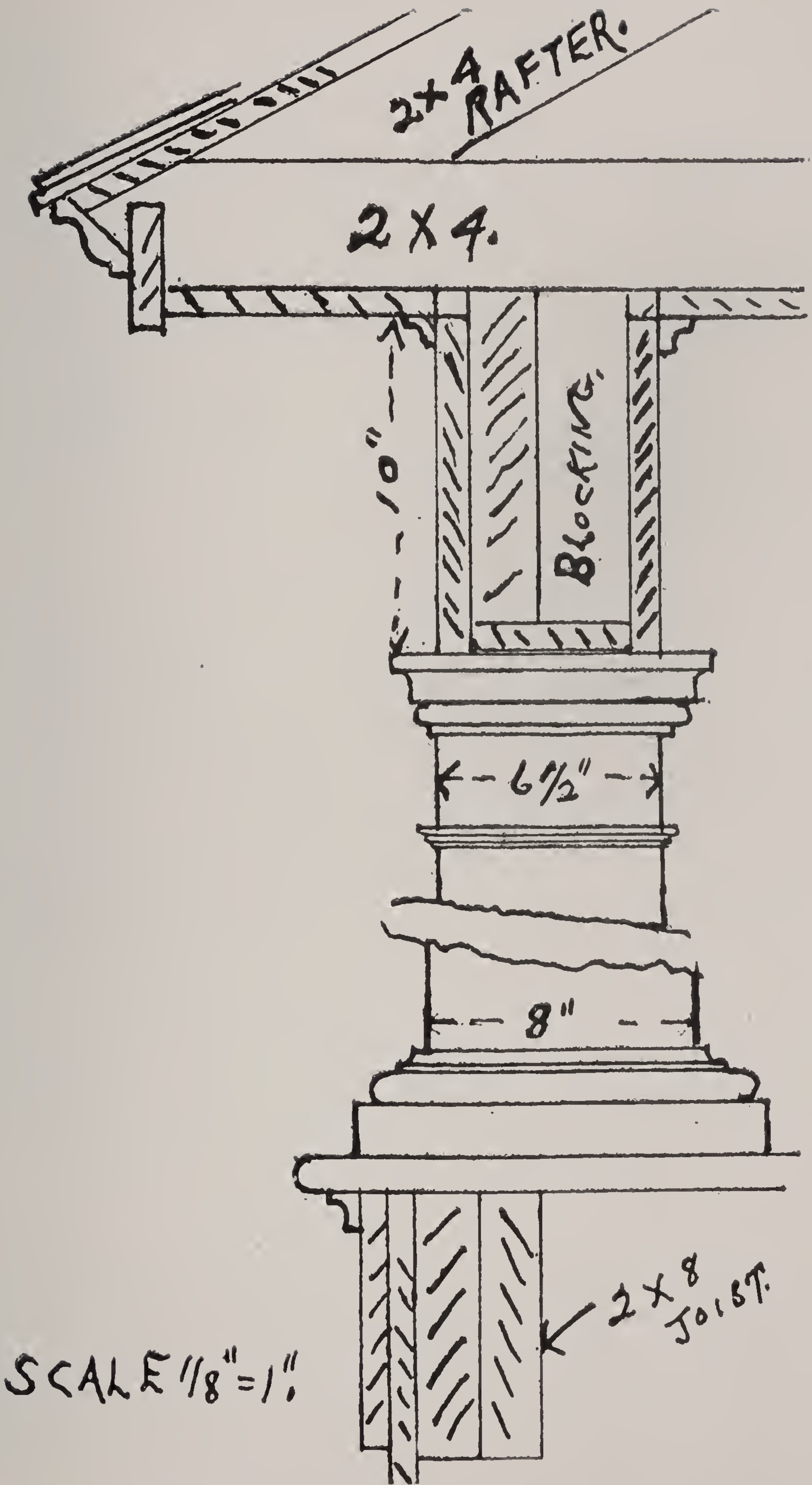
Note—Box cornice takes more feet on account of the returns. This is mentioned merely because a builder is apt to forget it if estimating from a plan without elevations. Decking returns and covering with tin cost 50c. each.

If a 12-inch frieze is used with an archatrave molding, add 5c. per foot. For bracket cornice get the price of brackets from planing mill and add to box cornice price and allow from 5c. to 8c. each for labor.

Example:—

Regular cornice price	$0 24
1 bracket to foot	.10
Extra for 12-inch frieze and molding	.05
Extra labor setting brackets	.06
	$0.45

The double houses shown in front of this book have cornice similar to above table. Circular cornices such as are required on towers should be about double price, both for material and labor.


2×4 RAFTER.
2 X 4.
10"
BLOCKING.
6½"
8"
2×8 JOIST.
SCALE 1/8" = 1".

PORCH WORK.

There is a wide range of detail used in building porches. but as every builder builds a great many of similar design it is handy to have tables of cost prepared for the various parts of the work he uses mostly Ordinary wood porches, similar in detail to illustration, may be estimated as follows: Floors, ceilings and roofs at so much per square foot; cornice, railing and skirting at so much per lineal foot; columns and steps as separate items. A few tables showing cost of these various parts of the work follow:

FLOORS.

Common porch floors are usually built with 2x8 joists, supported on 6x6 posts resting on a concrete footing in ground. Joists are set 16 to 18 inches on centres. A square of this construction requires on an average 125 board feet of lumber for joists and posts:

	Material	Labor
125 feet lumber, joists and posts, at $24 00	$3.00	$1.40 (4 hours.)
125 feet yellow pine 4-in. flooring at $38.00	4.75	1.05 (3 hours.)
Nails	.10	
	$7.85	$2.45

Total $10.30 per square.

Cypress flooring at $45.00, would cost 88c per square more.
Leading joints, 50c. per square extra.

PORCH CEILINGS.

Estimate ceilings same size as floor. The table of cost following does not give quite as much ceiling to the square as the floor table did for flooring, as the width of soffit on cornice is taken out. Detail shows ceiling joists running out to catch the cornice. These joists average 50 board feet of 2x4 to the square.

	Material	Labor
50 feet 2x4 for joists, at $24.00	$1.20	$0.70 (2 hours.)
115 feet 4-inch yellow pine ceiling, at $31.00	3.57	1.40
40 feet cove molding	.30	
Nails	.10	
	$5.17	$2.10

Total $7.27 per square.

PORCH ROOFS—SHINGLED.

Take length of roof over all by the length of common rafter out to the crown molding, to get the surface, then estimate by price per square or square foot. Rafters are usually set two feet on centres and average 40 board feet of 2x4 to a square of roof. This allows for hips from corners.

Labor costs more on porch roofs than on house roofs because there is more work in proportion to the size.

	Material	Labor
40 feet 2x4 rafters, at $24.00	$0 96	$1.05 (3 hours)
100 feet roofing, at $16.00	1.60	.70 (2 hours.)
800 shingles, clears, at $4.50	3.60	2.10 (6 hours.)
Nails	.20	
15 feet galv. iron ridge roll (av.)	.75	
Twenty-five 5x7 flashing tins	.20	
	$7.31	$3.85

Total $11.16 per square.

PORCH SKIRTING.

Skirting consists of that part of the porch from floor to ground. This is built in a number of ways. The common way is to cut a 2x4 between the posts, flush with joist, and about an inch or two from the ground. To this are nailed upright beaded slats about three-fourths inch apart. Over the slats the casings are placed, the one under the floor being eight inches wide and the bottom usually six inches wide. A table of cost for 10 lineal feet is given below;

One 2x4–10, at $24.00	$0.16
80 lineal feet 1x2¾ beaded slats, at 1¾c.	1.40
10 feet lineal 1x6 pine / 10 feet lineal 1x8 pine } =12 ft, at $45.00	54
10 feet cove molding	.08
Nails	.05
Labor (3 hours)	1.05
	$3.28

If ten lineal feet costs $3.28, one lineal foot would cost 33c. Estimate by the lineal foot. The above table is based on a height of 2 ft. 6 in. from grade to floor

PORCH RAIL.

Estimate per lineal foot, complete.

2 ft. 4 in. rail, at 5c	$0.10
10 ft , lineal, 1⅛ for balusters	.10
Labor, per foot (½ hour)	.18
	$0.38

2 ft. rail	.10
3 turned balusters, 1¾x1¾x20	.24
Labor, (½ hour)	.18
Total, per lineal foot	$0.52

These tables are for ordinary work, using square or turned balusters; other tables may be made for other sizes of rail and balusters.

Above tables for rail used with round columns. Labor about two-thirds if square columns are used.

STEPS.

A set of steps six feet long, four risers and treads, using three 2x10 stringers, 1x10 face stringer, mitered, and showing open end with slats, costs as follows:

One 2x10–14, at $24.00	$0.55
Four 1x8 six foot risers, at $45.00	.72
Eight 1⅛x6, six ft. for treads, at	2.10
9 feet lineal of 1x10 pine, at $45.00	.36
12 feet lineal, beaded slats	.21
32 feet cove molding	.24
Nails (1 pound)	.03
Labor (1 day including setting)	2.80
	$7.01

If one foot longer or shorter is required same can be figured as follows, for material only, as there would be no difference to speak of in the labor:

One-sixth of cost, risers	$0.12
Oue-sixth of cost, treads	.35
Four feet cove molding	.03
	$0.50

Thus a set of four steps, five feet long, would cost $6.50, or a set seven feet long $7.50.

PORCH CORNICE.

Taking cornice as shown on detail, which is a fair example of the cornice used on common work throughout the United States, we will estimate the amount of labor and material required for a porch 8x16. Allowing a foot projection, we would have thirty-six feet of cornice·

36 feet lineal 1x8 plancher / 36 feet lineal 1x4 fascia } 36 ft., at $40.00	$1.44
36 feet crown mold	.72
64 feet lineal 1x10 inside and outside frieze, 53 ft., at $44.00	2.33
32 feet lineal 1x5 soffit=13 ft., at $40 00	.52
32 feet bed molding	.40
32 feet lineal 2x10 Hemlock for lintel, at $24.00	1.27
Nails	.15
	$6.83
16 hours labor	5.60
	$12.43

$12.43 for 36 feet would be about 35c. per foot complete.

This price would be a fair average on porches from 6x10 up to 8x20.

Make a list of the different prices of columns.

Eight inch Colonial columns, 8 ft. long, cost $3.25 each, 10 in x 8 ft. $4.50 each in this locality. Add 50c. each for setting, or 1½ hours one man.

It is handy to have several sizes of porches estimated beforehand, such as 4x8, 6x12, 7x14, 8x16, etc , like builder usually puts up, then he can make one item of porches when estimating, which saves estimating all the material and labor each time.

An estimate is given below on an ordinary porch 7 ft. x 16 ft. Hip roof, four 8-inch Colonial columns, and general detail as shown in illustration:

112 square feet floor, joists, etc., at $10 30	$11.54
112 " feet ceiling at $7.25	8.12
34 feet cornice, at 35c.	11.90
18x9=162 square feet roof, at $11.20	18.14
4 columns, at $3.75	15.00
19 rail (6+6+7) at 40c.	7.60
23 feet skirting, at 33c.	7.59
Steps, four risers, 7 feet	7.00
	$86.89

It is handy to know just what a foot or two feet longer or shorter would be, and is easily found by taking a strip across the porch one foot wide, and making calculation same as above, and as shown below:

7 square feet floor, at $10.30	$0 72
7 square feet ceiling, at $7.25	.51
1 foot cornice, at 35c.	.35
1 foot rail	.40
1 foot skirting	.33
9 square feet roof, at $11.20	1.01
½ foot of steps	.25
	$3.57

If builder will take the trouble to estimate a few porches of different sizes as suggested before, he may make a note of cost of one foot in length, at the side of his porch estimate, which really gives him a price on five different sizes. For instance, estimate a porch 7x16, and then by having table for 7-ft. porch 1 foot long, we can easily compute porches 7x14 to 7x18. I would not advise using this for greater than two feet longer or shorter, as it might make a difference in the columns and steps, but of course builder can use his judgment in this as he sees fit.

PARTITIONS.

Partitions for house work are usually built of 2x4 studs with 2x4 plate at top and bottom. They should be priced by the lineal foot, complete. When house has wing on side the studding between the wing and main part are classed as partitions and should be taken off plan along with other partitions, then we do not have to consider them when estimating outside walls. Something depends on whether openings are double-studded or not, as to the amount of material in a partition. Openings should be doubled at sides and top in order to form a good nailing base for the casing, also to make a stronger job. A partition with an opening in it for door or archway, generally requires more material than if solid. For example, we will take a partition 12 feet long and 9 feet high with one opening 3 ft. x 7 ft. in same. Setting studs 16 inches on centres and allowing one for each end would require ten 2x4–9 ft. studs and two 2x4–12 for plates, if partition were solid. Now, if the opening was doubled, it would require two 2x4–7 ft. and one 2x4–4 extra. The four foot piece is figured for header, the other header being taken from lower plate. These headers might be a foot or so longer than four feet in some cases, but this is near enough for practical purposes. We will now get these pieces together into one table in order to get price for the 12 feet of partition. Dividing the cost by 12 gives the price for one lineal foot of partition complete:

Ten 2x4-9=60 board feet, at $28 00		$1.68
Two 2x4-12=16 " "		
One 2x4-4 = 3 " "		
Two 2x4 7 ft=9 " "		
28 " "	at $24.00	.67
Nails		.05
Labor (3 hours)		1.05
		12)$3.45(25¾c.

This is a fair average for all the partitions in an ordinary house. A little is saved if partitions do not average one opening to every 12 lineal feet, but if builder will go into this matter carefully he will find that this average is very close. Some partitions do not have any openings, while some have several, particularly on second floors, around halls, etc. An ordinary house 24 ft. x 28 ft. has about 150 lineal feet of partitions and twelve or thirteen openings which is in line with an average of one opening to 12 feet. Even if a little was saved by having fewer openings, we have not allowed anything for trusses over openings in bearing partitions. Now, I do not approve of trusses made of 2x4s cut in as braces, as the weight above pushes the sides out and causes settlement. The better way is to double a 2x8 or 2x10 over openings of this kind then the thrust is downward. In outside walls 2x4 braced trussing is all right because the sheathing holds the studs from spreading. Builders should make table for partitions eight feet high also. Most houses have first story ceiling 8 ft. 6 in. to 9 ft , and second story 7½ ft. to 8 ft. high.

CELLAR PARTITIONS AND COAL BINS.

These are usually about eight feet high, built of matched hemlock and 2x4 studs set 2 ft. on centres. A partition 8 ft. high and 20 ft. long would contain 160 sq. ft., and would require the following:

Eleven 2x4-8, = 59 feet, at $24.00	$1 42
40 ft. lin. for plate, 27 ft. at $24.00	.65
192 ft. matched hemlock, at $26.00	4.99
Nails	.10
One day carpenter	2.80
	$9.96

or about 6c. per square foot.

As these partitions usually have batten doors, estimate each door at two hours extra, 70c., and 25c. for hinges and latch, or $1.00 per door extra to above table.

INTERIOR FINISH.

Under this heading we will consider windows, doors, base, wainscot, picture moldings, stairs, cupboards, plate shelf, colonade, china closets, mantel shelves, book cases, and beam ceilings, showing how these various parts of the work may be estimated in the shortest and most accurate manner. Builder should prepare tables similar to those shown, suiting them to his style of executing the work.

DOOR AND WINDOW TRIM.

WINDOWS.

Instead of estimating sash, moldings, frames, cord, weights, casings, labor and trimmings, etc., all separately, take as one item. A 28x30 window frame and casings, etc., will nearest average the size of all windows on the ordinary plan. The difference in cost for larger or smaller is quite small.

	Y. P.	Oak
1 window frame 28x30x30	$2.50	$2 50
14 feet casing and apron	.42	.70
Head casing and molding	.23	.33
Sash lock, lift, and stop washers	.20	.20
32 lbs. weights, at 2c	.64	.64
Cord, 10c.; grounds, 8c	.18	.18
16 feet stops	.14	.20
4 feet stool	.14	.20
Labor (4 hours pine, 5 hours oak)	1.40	1.75
	$5 85	$6.70

To these add the cost of the window glazed.

Make table of ordinary sizes and prices used in your business.

Example.—At cost of $2.50 for a window 28x30x30 and $5.85 for the frame all cased up complete, the total cost would be $8.35.

Windows without weights, deduct 30c. on frame, 25c. on the labor, cost of the weights and cord 74c., and the grounds 8c. Total $1.37 less.

Windows for barns, merely figure the cost of sash frames, and labor fitting sash.

Note—Builder may procure a plate glass and sheet glass price list, with discounts, from his dealer. Then he may easily figure difference in any window for plate glass.

Prices on glass constantly change, so it would be useless to give any here.

CELLAR WINDOWS.

Cost of sash glazed, 10x14, 2-light	$0.65
Cost of frame	·70
Hinges and hook, 10c.; labor, 18c.; (½ hour to hang)	.28
Total cost of cellar window	$1.63

Make a table of cellar sash prices on the ordinary size, as:

8x10 3 lights,	10x14 2 lights,	12x16 2 lights
10x12 3 lights,	12x14 2 lights,	14x16 2 lights

A cellar frame for a sash 10x14 2 lights requires eight lineal feet of 2x8 stock rabbeted for sash, cost, 35c.; labor, 35c.; total cost of frame, 70c. Made of Norway pine.

SINGLE SASH.

A great many single sash are used now. Make a table of sizes and prices, such as 20x24, 24x28, 24x30, 36x24, 40x24, etc. Also make a table similar to one given for double sash windows, for the cost of frame, casings, labor, etc., and add cost of sash called for, to this.

Note--Your lumber dealer will provide you with a sash and door list, also discounts, from which you can figure any size window or door. This will be a great help in making out the tables.

Small square or diamond-shape lights cost 7c. to 15c. each extra for open sash or windows. No extra cost for glazing, as glass is cut from smaller lights, which being cheaper, makes up for extra work glazing small lights. However, this matter of small or diamond-light windows must be taken up with your mill man, as price varies greatly in different localities.

BASE.

Scale plan and estimate per lineal foot.

	Georgia Pine.		Oak
200 feet grounds	$ .80		$ .80
100 " base, 1x8, sanded	3.35		5.00
100 " base mold	1.20		2.00
100 " quarter round	.60		1.00
Labor, 70 feet per day	4.00	(60 feet)	4.67
Nails	.05		.05
	$10.00		$13.52

or about 10c. and 13½c. per lineal foot complete.

WAINSCOTING

Estimate per lineal foot.

	3 ft. high Georgia Pine.		4 ft. high
Grounds	.01		.015
4 ft. ceiling, at $38.00	.15	5 ft. ceiling	.19
Cap and quarter round	.02		.02
Labor	.09		.12
	27c.		34½c

Other tables may be made for other kinds of wainscot.

PICTURE MOLDINGS.

Two inch picture molding costs 1¼c. in Georgia pine and 2c. in oak. If put up at ceiling or butted against a square head casing, labor is 1c. per foot. If required to fit against molded head, labor is 2c. per foot. Based on 35 or 18 feet per hour, including sanding.

INSIDE DOORS.

2-8x6-8x1⅜	No. 1 Y. P.	Oak
Door	$ 2.90	$ 6.21
28 ft. casings (side)	.84	1.40
Head casings	.18	.24
Jambs	.50	.65
Lock, knob and butts	.50	1.00
Stops (16 feet)	.14	.20
Head molding	.30	.42
Grounds	.18	.18
Labor (6 hours)	2.10 (8 hrs)	2.80
	$7.64	$13.10

Above table is based on 5 cross panel door cased up both sides, all complete, including hardware.

Make tables for all sizes used, where there is any difference in price.

SLIDE DOORS.

	Georgia Pine.	Oak
Door, 3x7	$3.67	$7.35
Trimmings, common	.75	1.00
Hangers and track (adjustable track)	2.25	2.25
Labor, 2 days	5.60	5 60
Jambs	.75	1.10
28 feet casings	.84	1.40
Head casings and moldings	.50	.70
Stops	.37	.43
Grounds	.20	.20
	$14.93	$20.03

These figures do not include the extra partition required for sliding doors. Estimate partition with regular partitions. Often these partitions are sheathed up with matched flooring, which costs 4c. per square foot extra.

Also, if doors are bound around with stops add the cost of same. Make other tables for different size doors and different woods. Double action doors, add the difference between the D. A. hinge used and the regular price of trimmings as given in tables of doors, usually about $1.00 difference.

FRONT DOORS.

Door 3x7	$ 7.50
1 frame	2 50
Casings	1 05
Trimmings	3.00
8 hours labor	2.80
	$16.85

Add glass to this.

Builder should have several different tables pricing style doors generally used.

STAIR WORK.

Stair building is such a large subject that an attempt to estimate the many various styles would require a volume in itself. In the larger cities stairwork is gotten out at the mill and the carpenter sets same in place. In the smaller cities and country the carpenter usually builds the whole stairs on the job. I will show how an estimate is made on an ordinary open stairs, then builder can change to suit his regular styles. This estimate will be based on a flight of stairs with 16 risers 3 ft. long, closed stringer-board, turned balusters, paneled starting newel, plain 5x5 angle newel, rail and shoe plowed out for balusters, both wall and face stringers housed for treads and risers, same to be wedged in, outside stringer-board doubled, no paneling nor rail around landing at second floor, one platform in this stair case, all to be plain red oak

Three 2x10–14=70 board feet, at $24.00	$1.68
One 2x6–16 for landing	.38
40 feet grounds	.20
One 2x4 14 for blocking stringer out	.22
Nails	.02
Labor (10 hours	3.50
Cost of stringers in place before plastering	$6.00

16 risers 1x7 or 8—3 feet	$ 2.40	
14 treads $1\frac{1}{8}$x11x3 feet	5.60	
2 nosing $1\frac{1}{8}$x3x4 feet	.30	
Three 1x10–14 stringers	2.63	
1 starting newel	5.00	
2 angle and landing newels	6.00	
12 feet oak flooring	.84	
14 feet shoe 1x3 plowed	.56	
14 feet rail "	2.80	
28 balusters $1\frac{3}{4}$x$1\frac{3}{4}$	5.60	
32 feet base mold	.64	
48 feet tread mold	.48	
6 feet 1x8 base	.30	
Nails and glue	.25	
Labor (10 days)	28.00	
	$61.40	
		$61.40
		$67 40

Quarter circle steps $1.50 extra.

Half circle steps $3.00 extra.

Above table is based on carpenter doing all work on stairs at the job. In making tables builder should extend prices for yellow pine also.

Oak, $5.00.

$3.00

The newels shown here are the ones used and priced in stair work table.

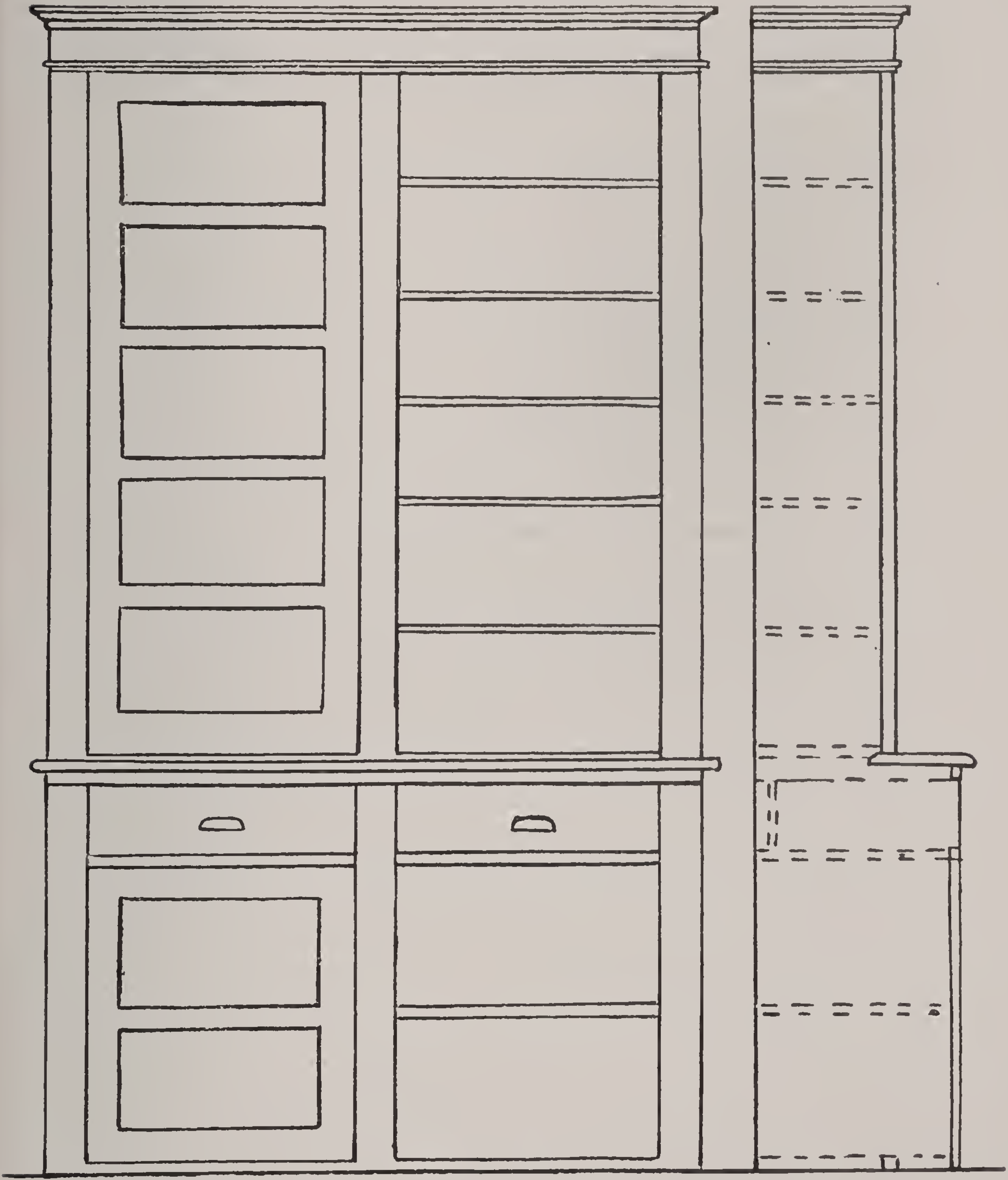
CELLAR STAIRS.

A straight flight of cellar stairs made with 2x8 stringers and 2x10 treads, resting on cleats nailed to stringer and spiked through stringer into ends of treads would require for a seven foot cellar as follows·

20 feet lineal 1x3 for cleats	$ .15
Two 2x8-12 stringers—32 feet, at $24 00	.77
Three 2x10-12 treads—60 feet, at $24.00	1.44
Nails	.05
Labor (6 hours)	2.10
	$4.51

Platform would cost about $1.00 extra.

KITCHEN CUPBOARDS.



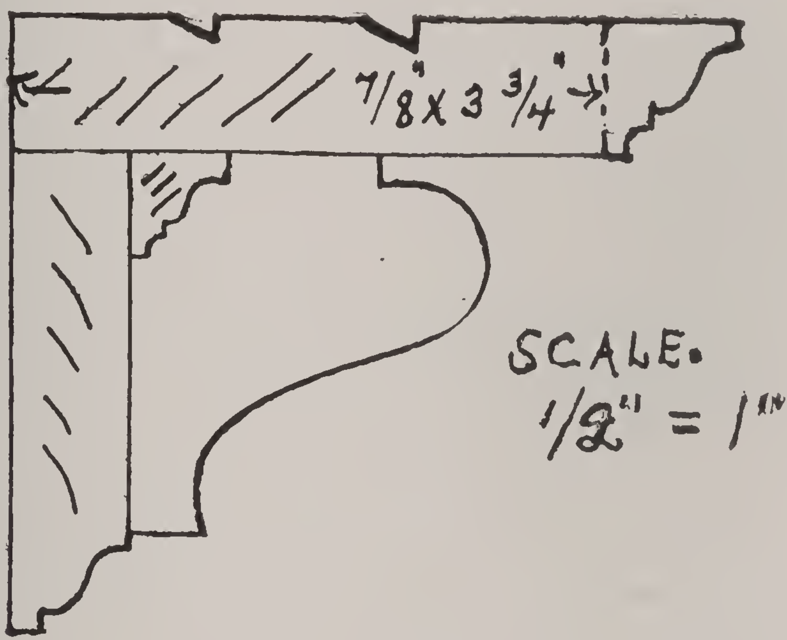
CUPBOARD FRONT AND END.
SCALE 1/2" = 1 FOOT.

Cupboards are built in a variety of ways and sizes, therefore the builder must make his tables conform to his style of work. A popular style of the ordinary cupboard is about 5 ft. wide and 8 ft. 6 in. or 9 ft. high, running from floor to ceiling. End of cupboard 1 ft. wide above broad shelf, and 16 to 20 inches wide below. These ends may be glued up or made from ceiling. There are two doors and two draws below broad shelf, and two doors above, from shelf to head casing. Usually the upper doors are 1⅛ in. thick, and the lower doors ⅞ in. thick. Bottom of cupboard raised off floor 1½ inches, one wide shelf in lower part and five 12 in. shelves in upper part. Cupboards generally come in corner of room so that only one end is required. However, I will make estimate including both ends.

Two 1x12 9-ft. ends	18 feet
Two 1x4—3-ft 2-in. ends	3 "
Five 1x12 5-ft. shelves	25 "
Three 1x18 5-ft. for two shelves and bottom	24 "
16 ft. lin. ⅞x1⅛ under doors, broad shelf, and between draws and doors	2 "
9 ft. 1x4 casing	3 "
Three 1⅛x4–5 ft. 6 in. casings, upper doors	8 "
One 1x6-6-ft head casing	3 "
16 lineal feet ⅝x6 for draws	8 "
8 sq. feet ⅜ for draw bottoms	8 "
	102 feet

102 feet yellow pine lumber, at $50.00	$ 5 10
Two doors 2 ft. x 5 ft. 6 in	3.50
8 feet head moldings	.16
Two doors 2 ft. x 2 ft. 4 in	1.60
Hinges, catches, draw pulls, nails and glue	1.25
Two days carpenter	5.60
	$17.21

PLATE SHELF.



This neat, inexpensive pattern of plate shelf could hardly be improved upon. Usually the top piece has the molded edge stuck on solid, making it necessary to mitre across the entire shelf where it returns against door or window casings. In getting this shelf out I always get the top piece with square edge and cut off square with the door casing, then return the molding only, against the casing. The finished product has the same effect, there are no wide mitres to open up, and about one-third of the time is saved. The brackets are started about four inches from the door casing or corner and spaced about 16 or 18 inches apart. It generally requires about one bracket to the foot. Brackets may be one inch or thicker as desired. The table below gives price on brackets 1⅛ inches thick. The top piece I always buy plain dressed both sides and one edge. I have the grooves put in at the job by hand. If you order this piece grooved at mill they charge you molding prices for the piece, plus an extra charge for setting up machine, if you buy less than 200 feet. The price given is to use in connection with general interior finishing. If you were to put up just a plate shelf and had no other work on the job, you should add 5c. a foot for measuring and time lost in getting carpenter to job and back, also profit.

The following table is based on 12 lineal feet of shelf and labor. The total result divided by 12 gives price per lineal foot, hence in measuring a plan get number of lineal feet of shelf at price per foot.

	Y. P.	Oak
12 lineal ft. 1x3¾	.20	.30
24 lineal ft. molding	.14	.24
12 lineal ft. ⅝x3 inch with molded edge	.24	.36
12 brackets	.30	.36
Labor	1.40	1.75
	12)2.28	12)3.01
	.19	.25

MANTELS.

Customary to allow so much for each mantel and setting in the specifications, allowing owner to select what he wishes at the price allowed when time comes for setting same.

BRICK MANTEL.

Hearth is also of brick, laid edgeways.

300 Coshocton pressed brick	$15.00
1 sack cement, 45c.; fire clay, 34c	.79
Colored mortar	.60
50 fire brick	1.75
Angle iron, 40c.; ash dump, 50c	.90
Dome damper	3.75
2 days mason and tender	13.00
	$35.79

The basket or andirons used in these fireplaces are usually furnished by the owner. However, if builder is obliged to bid on these also, a very complete line is handled by Chas. Lorenzen & Co., Chicago, Ill. This firm will send catalogue and prices. Ask for catalogue of Grates and Fireplace Fixtures.

BOOK CASE AND MANTEL SHELF.

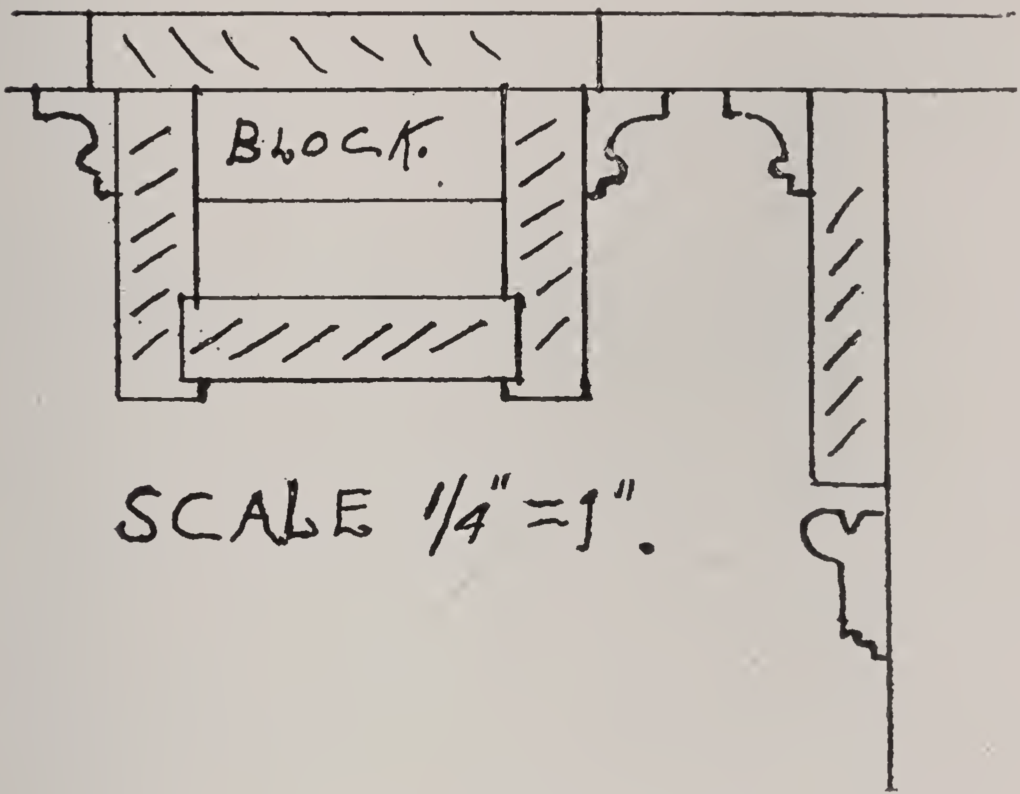
12 ft. shelf, 2x8, oak, molded edge	$ 1.80
12 ft. fascia and soffit, oak, 2 in. and 4 in	.45
12 ft. frieze and bed mold, oak	.84
5 brackets, molded	.50
70 ft. oak and W. W. for jambs, casings, shelves, etc	4.55
2 doors, glazed	5.20
2 doors, glazed	2.80
1 frame for panels	2 75
2 composition panels	8.50
12 ft. cornice (3 members)	.72
5 pairs butts and 4 catches	2.60
6 days carpenter	16.80
	$47.51

BUFFET.

BUFFET AND CHINA CLOSET.

3 leaded glass doors	$ 6 00
Two 6-lt. doors, plain glass	3 00
60 feet oak lumber	4.50
22x46 plate glass mirror	5.50
Frame for same	1.00
8 ft. oak crown mold	.40
Parting strips	1 20
50 ft. ceiling for back	2.00
2 shelves	.50
3 oak nosings	.30
Hardware, nails and glue	3 00
6 days carpenter	16.80
	$44 20

BEAM CEILING.



Beams are used a great deal in dens, dining and living rooms of the better class. There is a wide variety of designs and arrangement used, but the one illustrated is simply constructed and suitable for Colonial or Mission rooms. Note the soffit is housed into the sides, and there is a ¾ in x 6 in. board put on ceiling before plastering is done. This piece should be put on with a straight edge in order to get a perfect ceiling. Blocking is placed on this board to fasten the beams to. Builder must have a detail of the kind of beams he proposes to use, then he can make a table of the cost. The price given below is only intended to cover the cost when beams run straight or at right angles with each other. Diamond shape or irregular spaces cost more for labor, and one has to exercise his judgment as what to add to regular cost. The location of beams is generally marked on floor plans in dotted lines. Scale plan and estimate at price per lineal foot

The following table gives price on one lineal foot of beams shown above.

	Georgia Pine	Oak
3 lin ft. 1x4	.05	.07½
2 ft. molding	.02	.03
1 lin. ft. ¾x6 hemlock	.01	.01
Labor (¼ hour)	.09	.12 (⅓ hr.)
	.17	.23½

The detail shows a 5-inch frieze to right. This runs around room next to ceiling, and beams butt into this. The same moldings are used as on the beams. I give table for 12 lineal feet;

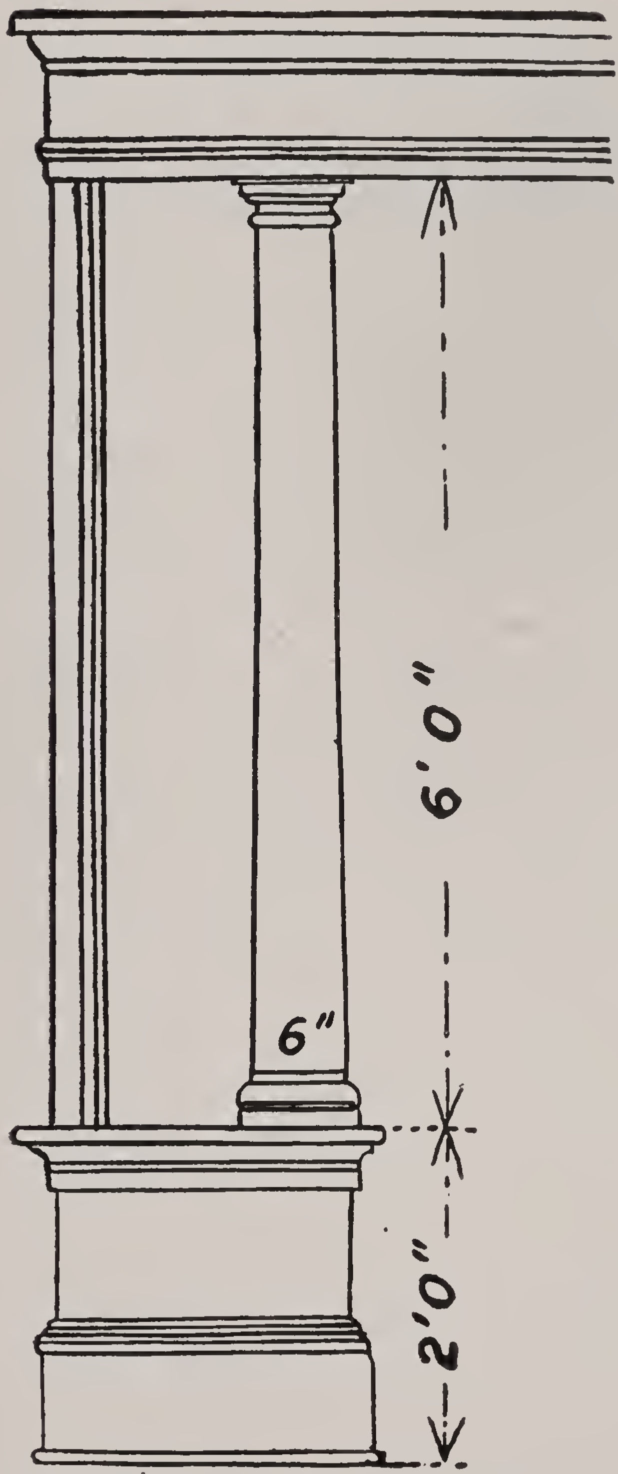
	Georgia Pine	Oak
12 lin. ft 1x5	.25	.35
12 ft. Molding	.12	.18
Labor (1 hour)	.35	.44(1¼ hrs)
	.72	.97

or about 6c. and 8c. per lineal foot.

Beam Ceiling. See page 85.
Buffet, similar to estimate on page 84.

Brick Mantel and Book Cases, similar to estimate on page 82.

COLONADE.



SCALE ½" = 1 FT.

COLONADE.

There is a wide variety of openings, with grilles or columns used now, and in most cases it is well to consult your dealer as to price, then add for setting. However, I give cost and illustration of a popular design of columned opening. It is neat, plain and generally satisfactory. We build the pedestals on the job and buy columns of lumber dealer.

Cost of one pedestal and column:

8 lin. ft. 1x12 oak, at $75.00	$0.60
5 lin ft. 1x8 oak, at $75 00	.30
5 ft. 1x3 molding, oak	.15
5 ft. base mold and quarter round	.15
5 ft. 2x6 for form (hemlock)	.12
1 column 6 in. x 6 ft	4 00
1 day carpenter	2.80
	$8.12

This price is in addition to the cost of a regularly cased opening. Quite often a heavy cornice is used instead of the regular head casing, and builder must analyze the different members and add for same.

A 10 or 12 inch head casing with 4 or 5 inch crown mold makes a neat job, and only costs about 50c. more than regular head casing, for both sides of a 6 or 7 foot opening. Where an elaborate job is required with a complete cornice, figure cost of each member and about 4c. per foot for each member for labor. Special work like this is a matter of judgment, and on account of the many different styles no set rules can be given.

WIRING.

While it is customary for the general contractor to get a sub-bid from an electrician on this work, I give the method used by most electrical contractors for what is known as the knob and tube wiring for housework. This work is usually priced at so much per opening for lights and switches plus cost of switch trimmings. Sometimes an inspection fee is added

Example:—A house having 12 lights and openings, 8 switches and two 3-way switches for operating hall lights will cost as follows:

12+8=20 openings, at $1.00	$20.00
Wiring two 3-way switches	2.00
8 snap switches, single pole	2.40
Two 3-way switches	1.00
	$25.40

Flush switches are more expensive and cost about $1.00 each, extra.

COMMON NAILS.

Size	Length and Guage				Approx. No. to lb.	Advance Over Base Price
2d	1	inch	No.	15	876	$0 70 per 100 lbs.
3d	1¼	"	"	14	568	45
4d	1½	"	"	12½	316	30
5d	1¾	"	"	12½	271	30
6d	2	"	"	11½	181	20
7d	2¼	"	"	11½	161	20
8d	2½	"	"	10¼	106	10
9d	2¾	"	"	10¼	96	10
10d	3	"	"	9	69	05
12d	3¼	"	"	9	63	05
16d	3½	"	"	8	49	05
20d	4	"	"	6	31	Base
30d	4½	"	"	5	24	"
40d	5	"	"	4	18	"
50d	5½	"	"	3	14	"
60d	6	"	"	2	11	"

INDEX.

MEMORANDA.

MEMORANDA.