A FRAMING GUIDE AND STEEL SQUARE

A PRACTICAL TREATISE GIVING SHORTEST METHODS ON ROOF FRAMING AND HOW TO USE THE STEEL SQUARE. RAFTER TABLES, SQUARE ROOT TABLES, SASH TABLES, SHINGLE TABLES AND VARIOUS TABLES

BY

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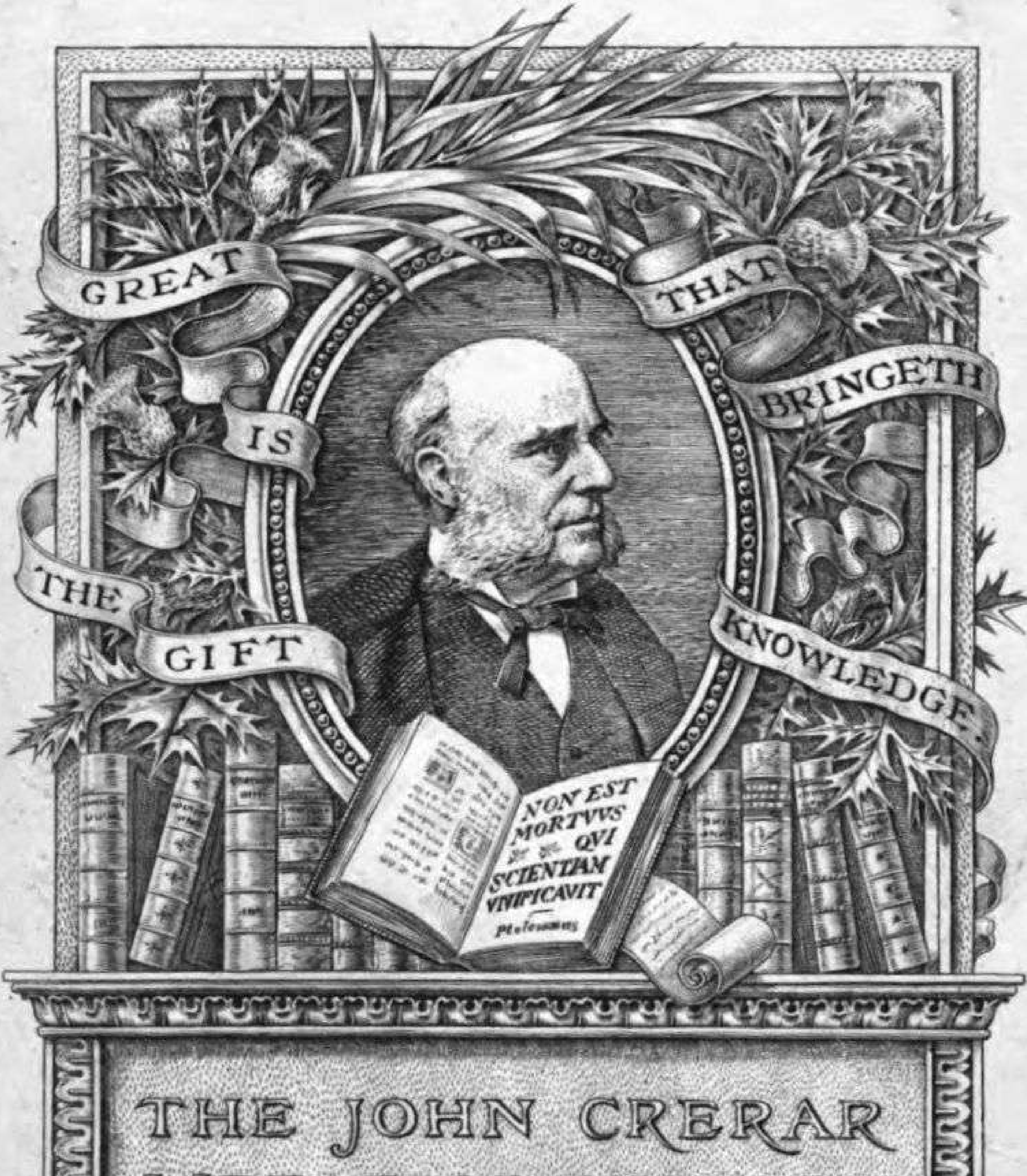

PRESENTED BY

D. L. Signon

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INTRODUCTION

It has been my desire for some time to write a small book on Roof Framing and the Steel Square. Although there are many books published on this subject, I have never been able to get hold of one that had the rafter tables as I have them here. When I started this book I hoped I would be able to give more information in it than will be possible. owing to its limited size, as it is my intention to have it pocket size for convenience sake. But I trust my readers will be satisfied with its contents. I could write a large volume on the steel square alone, but will endeavor to get most of the every-day problems in this edition. My intention is to have it small enough for the carpenter to carry in his pocket for daily reference. It will not be larger than the ordinary sash book which so many carpenters carry with them, and as this volume contains all the sash tables of stock size, it will not be necessary to carry the sash book.

This book will not be filled with illustrations, as a great many carpenters' books are, although I have no objection to illustrations, as a great many problems in carpentry can be explained better by their use. A great many carpenters will look at and study an illustration who never take a tool in their hands to try the problem, and consequently they soon forget what it looked like on paper.

I think the better and quicker way for the carpenter to learn, especially the beginner, is to learn what can be done with the steel square. Take the square, together with a straight edge board of some description. Then, while reading the article, with his straight edge or drawing board and square before him, try the cuts as directed. By doing this a few times, I believe he will remember the cuts and figures far better than by looking at the picture of a square on paper. It is true that the more frequent a mechanic handles his tools the quicker he can operate them.

Some carpenters will pick up a square to square a board, and turn it round two or three times trying to find which way to make it fit best on the board, while there are others who will have the board squared and sawed while the other man is getting ready to mark the board.—Although the first mentioned carpenter may have worked at the trade longer than the other—but he is rusty in handling his tools, and more than likely his tools are equally as rusty—as is generally the case with that kind of mechanic.

Brother Carpenter, let me say to you, that when your day's work of eight, nine or ten hours is finished, do not drop your tools and trade with the intention of thinking no more about them until the next morning. In the next two or three hours following your day's work you can, at your home, learn more about your trade and your steel square than you did the whole day while on the job.

Some people will tell you that you must have practice. Yes, that is all very true—-the carpenter must have practice. But I want to say right here, that he certainly must have some education if he wants to make a first-class mechanic—as quickly as they have to be made nowadays. It used to be that a carpenter had plenty of time to learn his trade, but at the present time the work changes so fast that a man does not live long enough to learn the trade with just what he can pick uo himself, and as the time has come when most of us are working only eight hours out of twenty-four, we do not have much time to learn while on the job, and do justice to our employers. Not long ago a contractor said to his men during the noon hour that he could not understand why there were so many carpenters who could not frame a roof. One of the carpenters said: "I can tell you the reason why. We carpenters have to work just as hard as we can go for eight hours, and we do not have time to learn how to frame a roof." Likely enough the carpenter did not think of the other sixteen hours a day which was his in which to learn some of his trade.

I want to say to the reader that all I have ever learned about the steel square and roof framing on the job while at work would not enable me to frame any kind of a roof. I learned to read my square and roof framing on my own time. The contractors pay us for what we do, not for what they are going to teach us.

Now, Brother Carpenter, let me say to you, the way to keep on the good side of your employer, and the way to get more money, is to learn part of your trade on your own time. When your day's work is done, take this little book and-read it again and again until you thoroughly understand it. Do not skip from page to page, but read it all. The chief principles of it is roof framing, and if the reader will take this book and follow its directions. and use his steel square accordingly, he certainly will soon be able to frame most any roof in which he comes in contact, even without the rafter tables.

MATHEMATICAL SIGNS USED IN CALCULATION.

= Equalitv sign. When placed between two numbers denotes that they are *equal.* Thus: 12 in.=1 ft.

+ Addition sign, called *plus.* When placed between two numbers denotes that the second to be *added* to the first. Thus: 5+3=8.

— Subtraction sign, called *minus.* When placed between two numbers denotes that the second is to be *taken from* the first. Thus: 9—3=6.

× Multiplication sign. When placed between two numbers denotes that the first is to be *multiplied* by the second. Thus: 9×3=27.

÷ Division sign. When placed between two numbers denotes that the first is to be *divided* by the second. Thus: 21÷3=7.

When adding one or more numbers, the result obtained is called the ***sum.*** When subtracting one number from another, the result is called the ***remainder.*** Thus: 9—3=6; 9 is the ***minuend,*** 3 is the ***subtrahend*** and 6 is the ***remainder.***

When multiplying one number by another the result is called the ***product.*** Thus: 9×3=27; 9 is the ***multiplicand,*** 3 is the ***multiplier*** and 27 is called the ***product.***

When dividing one number by another the result obtained is called the ***quotient.*** Thus: 21÷3=7; 21 is called the ***dividend,*** 3 is called the ***divisor*** and 7 is called the ***quotient.***

In common fractions the number above the line is called the ***numerator*** and the number below the line is called the ***denominator.*** Thus: 7/8; 8, the ***denominator,*** shows that a whole thing or unit has been divided into 8 parts, and the 7 shows that 7 parts have been taken.

WEIGHTS AND MEASURES.

UNITED STATES MONEY.

10 mills (m.)=1 cent (ct.).
10 cents=1 dime (d.).
10 dimes=1 dollar ($).

ENGLISH MONEY.

4 farthings (far.)=1 penny (d.).
12 pence=1 shilling (s.).
20 shillings=1 pound (£).

LINEAR MEASURE.

12 inches (in.)=1 foot (ft.).
3 feet=1 yard (yd.).
5½ yards=1 rod (rd.).
40 rods=1 furlong (fur.).
8 furlongs=1 mile (mi.).

One mile contains 8 fur., 320 rd., 1,760 yd., 5,280 ft., 63,360 in.

SURVEYORS' MEASURE.

7.92 inches (in.)=1 link (li.).
25 links=1 rod (rd.).
4 rods }
100 links } =1 chain (ch.).
66 ft }
80 chains=1 mile (mi.).

One mile contains 80 ch., 320 rd., 8,000 li., 63,360 in.

SQUARE MEASURE.

144 square inches (sq. in.)=1 square foot (sq. ft.).
9 square feet=1 square yard (sq. yd.).
30¼ square yards=1 square rod (sq. rd.).
160 square rods=1 acre (A.).
640 acres=1 square mile (sq. mi.).

One square mile contains 640 A., 102,400 sq. rd. 3,097,600 sq. yd., 27,878,400 sq. ft., 4,014,489,600 sq. in.

SURVEYORS' SQUARE MEASURE.

625 square links (sq. li.)=1 square rod (sq. rd.).
16 square rods=1 square chain (sq. ch.).
10 square chains=1 acre (A.).
640 acres=1 square mile (sq. mi.).
36 square miles (or 6 mi. sq.)=1 township (Tp.).

One square mile contains 640 A., 6,400 sq. ch., 102,400 sq. rd., 64,000,000 sq. li. The acre contains 4,840 sq. yd., 43,560 sq. ft., 6,272,640 sq. in. When an acre is squared one side is 208.71 ft. long or 2,504.52 in. long on a side.

CUBIC MEASURE.

1,728 cubic inches (cu. in.)=1 cubic foot (cu. ft.).

27 cubic feet=1 cubic yard (cu. yd.).
128 cubic feet=1 cord (cd.).
24¾ cubic feet=1 perch (p.).
231 cubic inches=1 gallon (gal.).
2,150.4 cubic inches=1 bushel (1 bu.).

One cubic yard contains 27 cu. ft. or 46,656 cu. in.

CIRCULAR MEASURE.

60 seconds (″)=1 minute (′).
60 minutes=1 degree (°).
360 degrees=1 circle (1 cir.).
90 degrees=1 rt. angle or quadrant.

One circle contains 360°, 21,600′ or 1,296,000″.

DRY MEASURE.

2 pints (pt.)=1 quart (qt.).
8 quarts=1 peck (pk.).
4 pecks=1 bushel (bu.).

One bushel contains 4 pk., 32 qt. or 64 pt.

A bushel contains 1¼ cu. ft.

A bushel measure is 18½ in. in diameter and 8 in. deep. The dry gallon contains 268.8 cu. in.

LIQUID MEASURE.

4 gills (gi.)=1 pint (pt.).
2 pints=1 quart (qt.).
4 quarts=1 gallon (gal.).
31½ gallons=1 barrel (bbl.).

2 barrels or 63 gallons=1 hogshead (hhd.).

One hogshead contains 2 bbl., 63 gal., 252 qt., 504 pt. or 2,016 gi.

The U. S. gallon contains 231 cu. in., .134 cu. ft., nearly.

One cu. ft. of water is equal to 7.48 or 7½ gal.

A measure 3½ in. in diameter and 3 in. high =1 pint, or 3½ in. in diameter and 6 in. high =1 quart, and 7 in. in diameter and 6 in. deep contains 1 gallon.

TIME MEASURE.

60 seconds (sec.)=1 minute (min.).
60 minutes=1 hour (hr.).
24 hours=1 day (da.).
365¼ days=1 year (yr.).

One year contains 365¼ days, 8,766 hr., 525,960 min. or 31,557,600 sec.

AVOIRDUPOIS WEIGHT.

437½ grains (gr.)=1 ounce (oz.).
16 ounces=1 pound (℔.).
100 pounds=1 hundredweight (cwt.).
20 hundredweight or 2,000 ℔=1 ton (T.).

One ton contains 20 cwt., 2,000 ℔., 32,000 oz., or 14,000,000 gr.

The avoirdupois pound contains 7,000 gr.

TROY WEIGHT.

24 grains (gr.)=1 pennyweight (pwt.).
20 pennyweight=1 ounce (oz.).
12 ounces=1 pound (lb.).

One pound contains 12 oz., 240 pwt., 5,760 gr.

COMMERCIAL WEIGHT.

16 drams (dr.)=1 ounce (oz.).
16 ounces=1 pound (lb.).
2,000 pounds=1 ton (T.).

One ton contains 2,000 lb., 32,000 oz., or 512,000 drams. In 1 pound there are 256 drams.

LONG TON TABLE.

16 ounces (oz.)=1 pound (lb.).
112 pounds=1 hundredweight (cwt.).
20 cwt. or 2,240 lb.=1 ton (T.).

MISCELLANEOUS TABLE.

12 articles=1 dozen.
12 dozen=1 gross.
12 gross=1 great gross.
2 articles=1 pair.
20 articles=1 score.
24 sheets=1 quire.
20 quires=1 ream.
1 league=3 miles.
1 fathom=6 feet.

1 hand=4 inches.
1 palm=3 inches.
1 span=9 inches.
1 knot (U. S.)=6,086.07 feet.
1 meter=3 ft. 3⅜ in., nearly.

WEIGHTS OF DRY WOODS.

Name of Woods	Weight per foot B. M. lbs.	Weight per Cu. Ft. lbs.
Ash	3.9	47.0
Ash, White	3.2	38.0
Boxwood	5.0	60.0
Cherry	3.5	42.0
Chestnut	3.4	41.0
Cork	1.3	15.6
Ebony	6.3	76.1
Elm	2.9	35.0
Hemlock	2.1	25.0
Hickory	4.4	53.0
Lignum Vitæ	6.9	83.0
Mahogany, Spanish	4.4	53.0
Mahogany, Honduras	3.0	36.0
Maple	4.1	49.0
Oak, Live	4.9	59.3
Oak, White	4.0	48.0
Oak, Red	3.3	40.0
Pine, White	2.1	25.0
Pine, Yellow	2.8	34.0
Sycamore	3.1	37.0
Spruce	2.1	25.0
Walnut	3.2	38.0

WEIGHTS OF METALS.

Name of Metals	Weight per cu. ft. lbs.
Aluminum	166
Antimony	418
Bismuth	607
Brass, cast	504
Brass, rolled	524
Bronze	529
Copper, cast	542
Copper, rolled	555
Gold, 24 carat	1,204
Iron, cast	450
Iron, wrought	480
Lead, commercial	710
Mercury, 60° F.	846
Platinum	1,342
Silver	655
Steel	490
Tin, cast	459
Zinc	437

I will now explain the square which I will illustrate later. This square is made by the Eagle Square Co. No. 100 N. P., and has a rafter table on the face of the blade or body, and reading from left to right, or from the end of blade toward the heel, and giving the length of main rafters, hips and valleys per foot of run; also the length of the first jack rafters and the difference in the length of the others, spaced 16 inches and 2 feet on centers. There are seven parallel lines drawn along the body or blade, forming 6 spaces, and in these spaces are given the lengths and cuts for 17 different pitches, from 2-inch rise per foot, to 18 inches' rise. The first space gives the length of main rafters per foot run. The second space gives the length of hip and valleys. The third space gives the length of first jack rafter, and their difference spaced 16 inches on centers. The fourth space gives the length of first jack rafter and their difference, spaced 2 feet on centers. The fifth space gives the figures to be used with 12 for the cheek, or side cut, of jack rafters against hips and valleys. The sixth space gives the figures to be used with 12 for the cheek, or side cuts, for hips and valleys against ridge board or deck. These cuts always come on 12 or long angle. The figures taken from these lengths and cuts must always be gotten from under the number corresponding to the number of inches' rise you are giving your roof to each foot of run of common or main rafters. The figures in first and second spaces, giving the length of rafters, are read inches and hundredths of an inch, or feet and hundredths of a foot; and these figures must be multiplied by half the width of the building in feet, unless the building be 24 feet wide, then the length would be just what is shown on the square in feet and hundredths.

We will now use this rafter table for a building 34 feet wide, and a rise of 10 inches per foot. We now look under the 10 graduation mark, for as we are using 10 inches rise we must follow under 10 for the entire roof, so long as that pitch is used. Under 10 and in first space we find the figures 15.62, which tells us that the distance from 10 to 12 is 15 inches and $\frac{62}{100}$ of an inch, which is nearly 15⅝ inches. Now, as the building is 34 feet wide, then half the width or run would be 17 feet. Now 15.62×17=265.54 inches, then 265 inches÷12=22 ft. 1 inch and the $\frac{54}{100}$ of an inch is equal to a little over ½ inch. The length of the main rafter, therefore, would be 22 ft. 1½ in. As you will find in rafter table of a 10 in. rise per foot and a 34-foot building.

We will now get the length of the hip and valley rafters, which are both the same in length. Under 10 on the square and in second space we find the figures 19.72, which is the length from 17 inches across to 10 inches. We multiply half the width, 17×19.72, and it gives us 335.24 inches and 335 inches=27 feet 11 inches and $\frac{24}{100}$=(¼ inch nearly). So the length of hips and valleys are 27 ft. 11¼ in., as you will see in rafter table of same pitch. In the third space, under 10, are the figures 20⅞ in. They tell us that the first jack rafter, when spaced 16 inches on centers, has a length of 20⅞ inches, and which is also the difference in the length of the other jack rafters. In the fourth space we find 2 feet 7¼ inches, which is the length of first jack rafter, when spaced 2 feet on centers, and the second jack rafter would be twice that length, and the third three times, and so on. Though it is always customary to frame the longest rafters first and take the length of first jack from the main rafter for length of the longest jack, and twice that amount off for next longest, etc. My usual way of framing is not to have any crotch rafters where my hips connect. Then I take off half the length of the first jack rafter from the main rafter for the length of longest jacks. In this case, if the run of the building be even feet, it would make the short jacks come 1 foot from the corner of building when spaced 2 feet on centers; but where a building is 14, 18, 22, 26, 30, 34, 38 or 42 feet wide, it will always bring the short jacks 2 feet from corner of building. My reason for framing this way is to keep from cutting a rafter in two for chimneys and flues, as you will notice in hip roofs where there are crotch rafters that seven timse out of ten they have to be cut into for a chimney or flue. Always remember that half the thickness of hips and valleys must be taken off the length of jack rafters square over from the cheek cut. And also remember that half the thickness of ridge board must be taken from the main rafters square over from plumb cut. Now under 10 and in fifth space are the figures 9⅜ inches, which are the figures to be used with 12 on the square for getting cheek cuts of the jack rafters, and in sixth space are the figures 10⅜ to be used with 12 for the cheek or side cuts of hips and valleys. These cheek cuts are always made on the highest number, for it is always less than a 45° angle. Some squares have a framing table on them that differ a little from this one I have just explained, by having two sets of figures for getting the cheek cuts, and cutting on the highest figure, and some squares give the cuts for sheathing boards over hips and valleys.

STEEL SQUARE OCTAGON SCALE.

(See Fig. 2.)

This scale, which is known by mechanics as the octagon or eight-square scale, is along the center of the face of the tongue of the steel square, and consists of two parallel lines drawn along the center of tongue from the 2-inch graduation mark to end of tongue, and these lines are about $\frac{3}{16}$ of an inch apart, with a series of small holes or dots along in this space. On a square with a 16-inch tongue there are 67 spaces; these dots read from heel to point of tongue, and are numbered every 5 or 10 spaces. Thus: 5|, 1|0, 1|5, 2|0, etc. *Example*: Now, suppose we have a stick of timber 8 inches square and we want to take off the four corners so as to make an octagon or eight-square stick. The first thing to do is to draw a straight line through the center of timber, which, in this case, would be 4 inches from edge of timber, then take the compasses or dividers and set hem 8 spaces and lay off this distance from center of timber towards outer edge, from that point to corner is the amount to be taken off. The rule is to take as many spaces from the square as there are inches in the width of timber and set off that distance from center of timber, and lay off the four sides the same. If the timber be 9 inches square, take 9 spaces, and if 12, take 12 spaces, etc.

LAYING OUT OCTAGON FROM A SQUARE.

Another way to get an octagon is to take half the diagonal distance of the square of timber and measure out one side from corner, and what it lacks of reaching to other corner will be the amount to be taken off the corners to form the octagon.

Another way is to take the square or 2-foot pocket rule and measure across the stick of timber diagonally, so that 2 feet will just reach across, and mark at the 7 and 17 inch marks on rule or square; from these marks to corner will be the amount to be taken off. This rule is not accurate, but near enough for most purposes. There are other ways, one of which is to take the width of one side of timber and lay off that distance on the diagonal line across end of timber, then square over from side of timber to this point and you have the gauge line for the octagon.

STEEL SQUARE BOARD MEASURE.

(See Fig. 3.)

We will now turn the steel square over and see what we can find on the other side, which is called the back of the square. We will first take the blade or body of the square. On it we find what is called the Essex board measure, giving the correct amount of square feet in boards. This board measure consists of several parallel lines drawn along the blade 22 inches long with perpendicular lines across them. In the middle of the blade, under the 12 graduation mark, you will find the length of boards. Thus: 8, 9, 10, 11, 13, 14 and 15. And the width is found under the graduation mark corresponding to the width number. *Example*: Suppose we have a board 9 feet long and 7 inches wide, we find 9 under 12 in the second space; now we follow that same space to the left until we come under 7 (which is the width), and we find the figures 5|3, which tell us the amount of square feet is 5 feet and 3 inches or 5¼ feet. Now if the 9-foot board is 16 inches wide, we would follow that same space until we come under 16 and we find the board to contain 12 feet; and a board 10 feet long and 17 inches wide would contain 14 feet 2 inches, or 14 1-6 feet. Some board measures on squares have the figure 12 under the 12 graduation, between the 11 and 13 (not shown on this square), but the use of that figure is of very little benefit, for if a board is 12 feet long, there are as many feet in it as it is inches wide; and, therefore, the square feet number would be the same as the width figures at the top of square. Plank can be measured with this table also. If 2 inches thick, double the amount, and if three inches, thick treble the amount, etc.

STEEL SQUARE BRACE MEASURE.

(See Fig. 4.)

We will now read the brace measure rule, which is on the back of the tongue of the steel square, and which consists of groups of figures along the center of the tongue, as

$\begin{matrix}18\\24\end{matrix}$ **30 and** $\begin{matrix}54\\54\end{matrix}$ 76^{37} **and** $\begin{matrix}51\\51\end{matrix}$ 72^{12}

The first group of figures show us that the diagonal distance from 18 to 24 is 30, and the next shows us that the diagonal of 54 and 54 is 76 and 37 one-hundredths; or, if we want to cut a brace with a run of 51 inches and a rise of 51 inches, the length of brace would be 72 inches and 12 one-hundredths of an inch. or, if the run and rise of brace is feet instead of inches, the length would be 72 feet and 12 one-hundredths of a foot. The figures on the right gives the diagonal distance of the left-hand figures. Another quick and simple way to get the length of a brace when the run and rise is the same, is to multiply one of the numbers by 17 and divide by 12. *Example*: We will now get the length of a brace with a run and a rise of 54 inches, 54× 17=918÷12=76½ inches, the length of brace. While the square gives 76 and 37 one-hundredths inches. The above rule of using 17 is not accurate, as it always gives a little too much. In the above case it is about ⅛ in. too much, but it is near enough in most cases. To get the length more accurate multiply by 16.97 instead of 17 and divide by 12.

ANGLE LOOKOUTS.

The rule of 17, as I call it, is a very good way to get the length of an angle lookout on the corner of a building. Now suppose our main lookouts are 33 inches long, then 33× 17=561÷12=46¾ inches, which is the length of angle lookout; another way is to take half the length of main lookout on both blade and tongue of square and take twice the diagonal. Thus: If the main lookout is 33 inches, then take 16½ on both blade and tongue and measure across, which is 23 and 33 one-hundredths inches, and twice this amount is 46 $\frac{66}{100}$ inches, which is the length of angle lookout. If half the length of main lookout is longer than the tongue of square, then take one-third the length on blade and tongue; in the above case it would be 11, which is one-third of 33. From 11 to 11 is $15\frac{9}{16} \times 3 = 46\frac{11}{16}$ inches. Angle lookouts should always be cut longer than this measure, as they have to be cut on a mitre where they connect with the joist, for the measurement of a lookout is always taken through the center of edge, and the thicker the lookout the more allowance must be made for mitering.

The way to set an angle lookout is first to measure the distance from outside of plate to near side of joist, then measure same distance out the joist from outside of plate; then this point should be the center of the lookout.

STEEL SQUARE DIAGONAL SCALE.

(See Fig. 5.)

All the No. 100 squares have some way in in which to get the hundredth part of an inch. This is always located on the back of the square near the junction of the tongue and blade. Some squares have one inch divided into one-hundredth parts and every fifth mark can easily be seen with the naked eve. Other squares have what is called the diagonal scale, which is on the back of the tongue, near its junction with the blade and is used for taking off the hundredth parts of an inch. Thus: Suppose we wish to take of 67 one-hundredths of an inch, we start at the left hand lower corner and count from A to B, 6 spaces; then count from B to C, 7 spaces;; then from D to C is the required length. For 42 one-hundredths we would count from A to B, 4 spaces, and up 2 spaces, and from this point to left is length.

ILLUSTRATION OF SQUARE.

On the following pages I will give some figures of the carpenter's steel square, known as the No. 100 square. There are many kinds of squares. Some have 12-inch tongues, some 16, some 17 and some 18-inch. Some carpenters prefer one, some another. But my favcrite is the No. 100 with a 16-inch tongue, as it is handier than the other length for spacing: although good spacing can be done with an 18-inch tongue, if the mechanic is used to that kind. But I think a carpenter should use the same length tongue all the time, and then he is not so liable to make a mistake as he would be if he used one length a while and then another.

ILLUSTRATIONS

OF THE

STEEL SQUARE

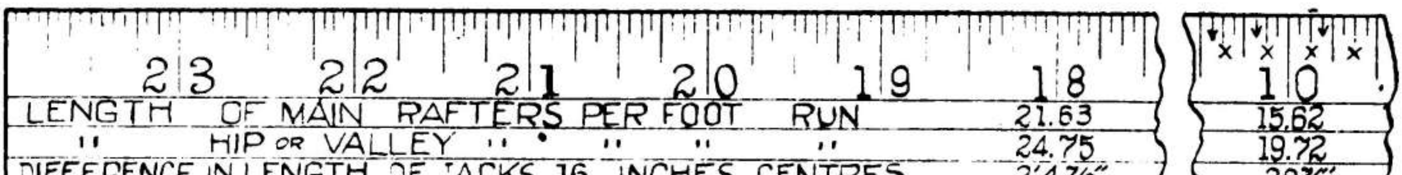

Fig. 1—Framing Table. On Face of Blade of Square. See Steel Square Framing Table for Directions

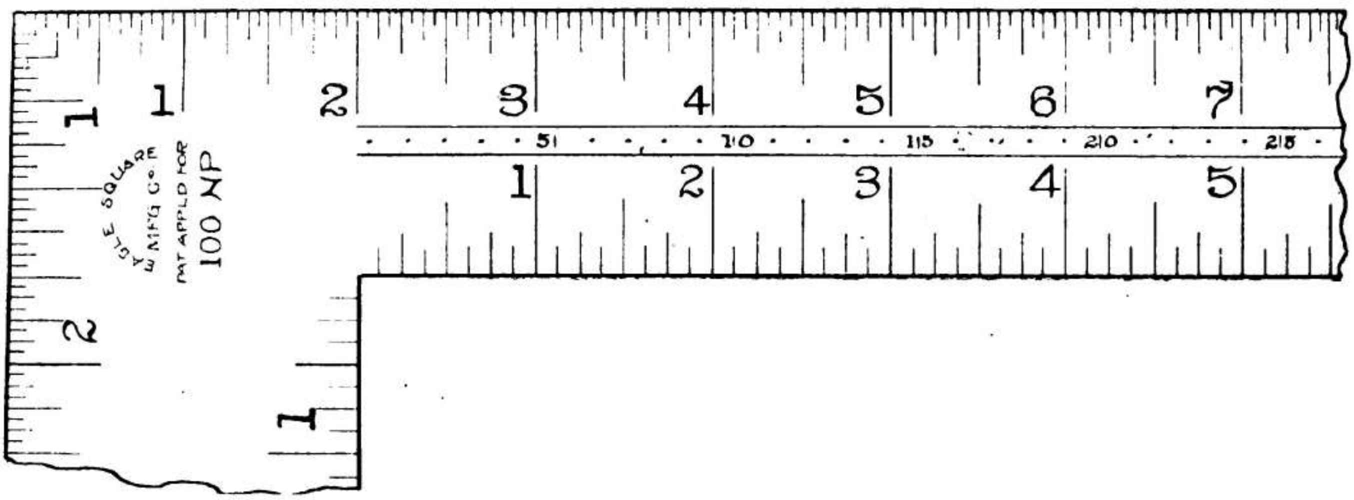

FIG. 2—Octagon Scale. On Face of Tongue of Square. See Steel Square, Octagon Scale for Directions

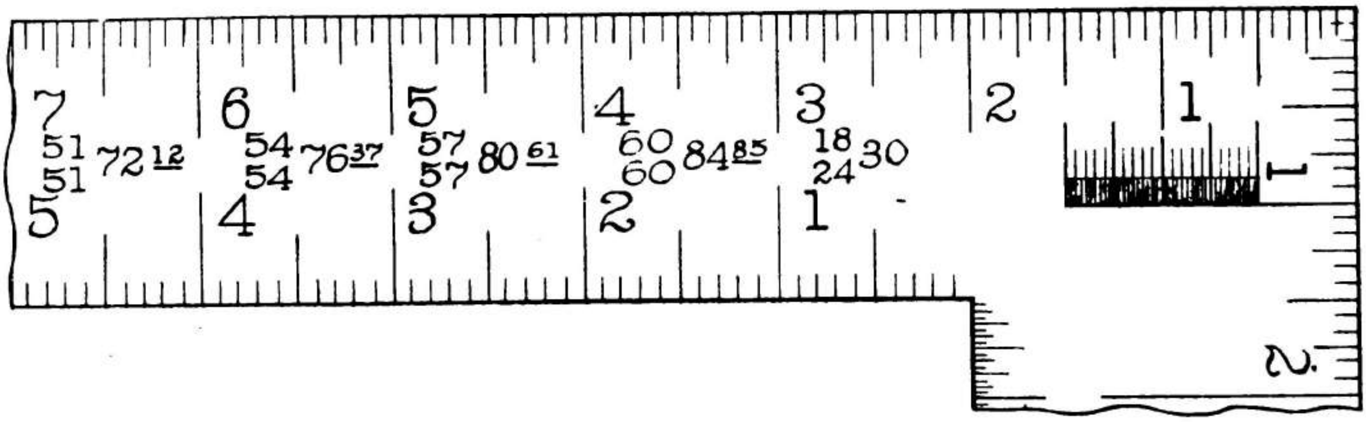

FIG. 4—Brace Measure. On Back of Tongue of Square. See Steel Square Brace Measure for Directions.

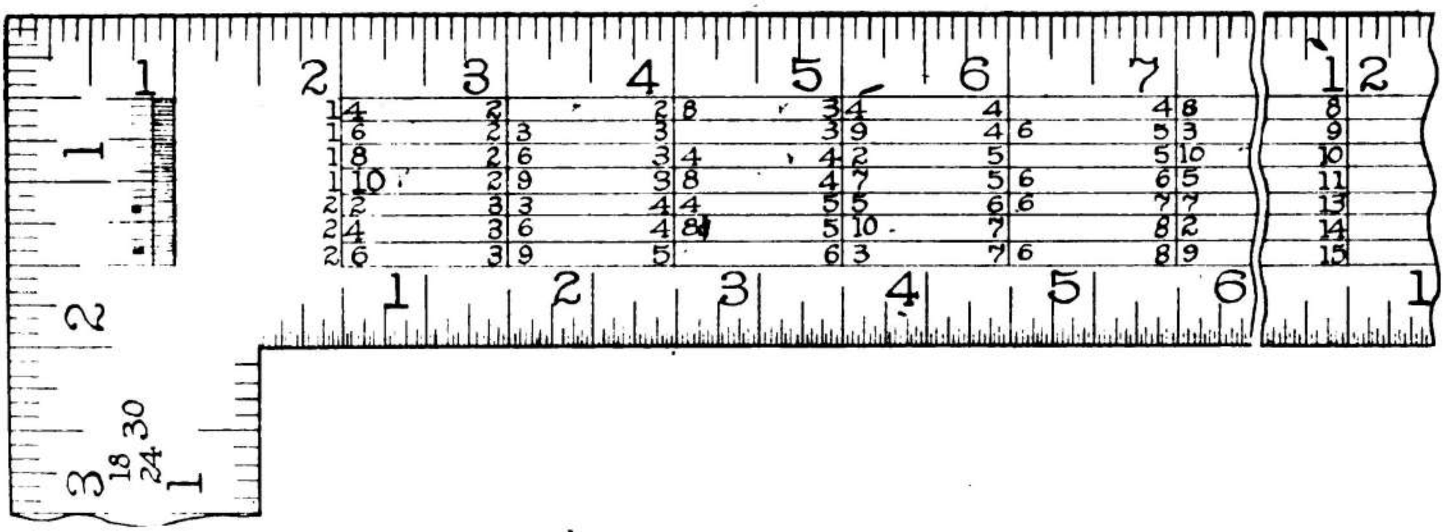

FIG. 3—Board Measure. On Back of Blade of Square. See Steel Square Board Measure for Directions

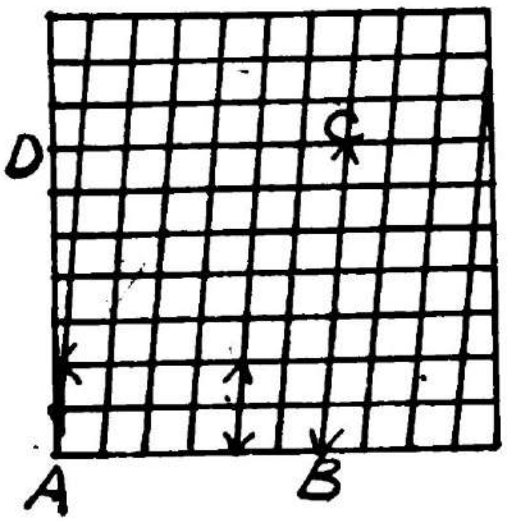

FIG. 5.

DIRECTIONS FOR USING RAFTER TABLES.

I will here devote a few pages to giving some directions in regard to using the rafter tables, on which I have spent a good many hours of hard work in figuring them out, as you will believe when you see them. It is not a small item to figure out the lengths of all the rafters, as I have, and I have not only gone over them once, but several times, and if there are any mistakes, you can lay them on me, for it is certainly me who made them.

The rafter tables in this book run from 2 inches rise per foot to 16 inches, which I think will cover all the pitches the mechanic will come into contact with.

The tables give width of buildings from 2 feet in width to 48 feet, and wider widths can be easily gotten by doubling these widths. The first column in tables gives the width of buildings in feet, the second the length of main or common rafters, the third gives the length of hip and valley rafters, and the fourth column gives the rise or height of ridge above plate in feet and inches. These tables give the correct length of rafters regardless of the odd inches of width in the building (example), Suppose we take a building 37 feet 5 inches wide and 8 inches rise per foot or 1-3 pitch, we find rafter table 8 inch rise per foot and follow down to 37 feet in first column and we find the length of main rafter to be 22 feet 2¾ inches. Now the 5 inches we get by taking the 5 foot building length in same table, we find it to be 3 feet, now instead of using it as feet, we call it 3 inches, which we add to the rafter 22 feet 2¾ inches, add 3 inches=22 feet 5¾ inches, the correct length of main rafters. For a building 37 feet 5 inches wide and 1-3 pitch. Always take the odd inches and find same in first column and read its answer in inches and twelfths instead of feet and inches and add same to length of rafters. Likely some of my readers will wonder why I have the width as low as two feet. This is just the reason I want to get the correct length of any rafter and any width. Now if a building be a certain number of feet wide and 1 inch over, I would just take one-half the length following the 2 feet building in inches and twelfths and add it to the long length, and I have it correct. We will now get the length of hips and valleys for this same width building, which is 37 feet 5 inches wide and one-third pitch. (See rafter table 1-3 pitch.) The length of hip or valley for a 27 foot building is 28 feet 11⅜ inches and for the 5 inches is 3 $\frac{11}{12}$ in.; 28 ft. 11⅜ in.+3 $\frac{11}{12}$ in.=29 ft. 3 $\frac{7}{24}$ inches the length of hip and valley rafters. A better way in this case is to call the 3 $\frac{11}{12}$ inches 4 inches, which is near enough. Then 28 feet 11⅜ in.+4 in.=29 feet 3⅜ in; you would also be accurate enough if you should leave off the ⅜ inches and call it 29 feet 3 inches. If you always get that near the length you can always frame your roof good enough.

Now, I suppose the reader would like to know how to get the correct height or rise of roof in a building when it has extra inches over the even feet. Well, we will now take the same building, which is 37 feet 5 inches wide and 1-3 pitch, which is 8 inches rise to each foot of run. A 37-foot building has a rise of 12 feet 4 inches; and the 5 inches would have a rise of 1 $\frac{8}{12}$ inches; then 12 feet 4 inches +1 $\frac{8}{12}$ in.=12 ft. 5 $\frac{8}{12}$ in., which is the correct rise of a roof for a building 37 feet 5 inches and one-third pitch. So you can easily see how the rise of any roof can be gotten. While the rafter tables give the length of jack rafters at bottom of tables, I will also show another way in which the length of any jack can be gotten by using the length of main rafters. Suppose we wish to get the length of jack rafters for a roof of 10 inches rise per foot and spaced 16 inch centers. Now, when a jack rafter is spaced 16 inch centers it has a run of 16 inches. We find out by the table how long a main rafter is with a run of 16 feet. Therefore we must take a building 32 feet wide, and we find the length to be 20 feet 9⅞ inches; using this as inches and twelfths, the length of first jack is 20 inches 9⅞ twelfths, or 20 $\frac{10}{12}$ inches, which is near enough. Any other jack can be gotten the same way. Another way is to make a drawing of the roof, using 1 inch, ½ or ¼ inch to the foot and measure the run of any jack as it measures on plan, then find the length of a main rafter for a building double that run and call it inches and twelfths. Now, suppose we scale a jack rafter on a drawing and it scales 7 feet; then we find the length of a 14-foot building and we have the length of that jack rafter. Now, if the jack scales 8½ feet, get the length of a 17-foot building.

Example: We now take a jack rafter that scales or measures 7½ feet on a drawing, and we give the roof 9 inches rise per foot; now, twice 7½ is 15, and we find the length of a main rafter for a 15-foot building and 9 inches rise to be 9 feet 4½ inches, etc.

There can also be lengths of braces gotten from these tables which I will not take up any more room in this book to mention.

RAFTER TABLE.

2 inches rise per foot run, or 1/12 pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	1/8	1	5 1/8		2
3	1	6 1/4	2	1 5/8		3
4	2	3/8	2	10 1/4		4
5	2	6 3/8	3	6 3/4		5
6	3	1/2	4	3 3/8		6
7	3	6 1/2	4	11 7/8		7
8	4	5/8	5	8 1/2		8
9	4	6 3/4	6	5		9
10	5	3/4	7	1 1/2		10
11	5	6 7/8	7	10 1/8		11
12	6	1	8	6 5/8	1	0
13	6	7	9	3 1/4	1	1
14	7	1 1/8	9	11 3/4	1	2
15	7	7 1/4	10	8 3/8	1	3
16	8	1 1/4	11	4 7/8	1	4
17	8	7 3/8	12	1 3/8	1	5
18	9	1 1/2	12	10	1	6
19	9	7 1/2	13	6 1/2	1	7
20	10	1 5/8	14	3 1/8	1	8
21	10	7 5/8	14	11 5/8	1	9
22	11	1 3/4	15	8 1/4	1	10
23	11	7 7/8	16	4 3/4	1	11
24	12	1 7/8	17	1 3/8	2	0
25	12	8	17	9 7/8	2	1
26	13	2 1/8	18	6 3/8	2	2
27	13	8 1/8	19	3	2	3

RAFTER TABLE.

2 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	14	2¼	19	11½	2	4
29	14	8⅜	20	8⅛	2	5
30	15	2⅜	21	4⅝	2	6
31	15	8½	22	1¼	2	7
32	16	2½	22	9¾	2	8
33	16	8⅝	23	6¼	2	9
34	17	2¾	24	2⅞	2	10
35	17	8¾	24	11⅜	2	11
36	18	2⅞	25	8	3	0
37	18	9	26	4½	3	1
38	19	3	27	1⅛	3	2
39	19	9⅛	27	9⅝	3	3
40	20	3¼	28	6¼	3	4
41	20	9¼	29	2¾	3	5
42	21	3⅜	29	11¼	3	6
43	21	9	30	7⅞	3	7
44	22	3½	31	4⅜	3	8
45	22	9⅝	32	1	3	9
46	23	3⅝	32	9½	3	10
47	23	9¾	33	6⅛	3	11
48	24	3⅞	34	2⅝	4	0

Length of first jack rafter 16 in., cent. 16⅛ in.
Length of first jack rafter 2 ft., cent. 24¼ in.
Side cut of jack rafter 11¾ and 12 cut on 12.
Side cut of hip and valley rafter 11⅞ and 12 cut on 12.

RAFTER TABLE.

3 inches rise per foot run, or ⅛ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	⅜	1	5¼		3
3	1	6½	2	1¾		4½
4	2	¾	2	10½		6
5	2	6⅞	3	7⅛		7½
6	3	1⅛	4	3¾		9
7	3	7¼	5	⅜		10½
8	4	1½	5	9	1	0
9	4	7⅝	6	5⅝	1	1½
10	5	1¾	7	2¼	1	3
11	5	8	7	10⅞	1	4½
12	6	2⅛	8	7½	1	6
13	6	8⅜	9	4⅛	1	7½
14	7	2½	10	¾	1	9
15	7	8¾	10	9⅜	1	10½
16	8	2⅞	11	6	2	0
17	8	9	12	2⅝	2	1½
18	9	3¼	12	11¼	2	3
19	9	9⅜	13	7⅞	2	4½
20	10	3⅝	14	4½	2	6
21	10	9¾	15	1⅛	2	7½
22	11	4	15	9¾	2	9
23	11	10⅛	16	6⅜	2	10½
24	12	4⅜	17	3	3	0
25	12	10½	17	11⅝	3	1½
26	13	4⅝	18	8¼	3	3
27	13	10⅞	19	4⅞	3	4½

RAFTER TABLE.

3 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	14	5	20	1½	3	6
29	14	11¼	20	10⅛	3	7½
30	15	5⅜	21	6¾	3	9
31	15	11⅝	22	3⅜	3	10½
32	16	5¾	23	0	4	0
33	16	11⅞	23	8⅝	4	1½
34	17	6⅛	24	5¼	4	3
35	18	¼	25	1⅞	4	4½
36	18	6½	25	10½	4	6
37	19	⅝	26	7⅛	4	7½
38	19	6⅞	27	3¾	4	9
39	20	1	28	⅜	4	10½
40	20	7¼	28	9	5	0
41	21	1⅜	29	5⅝	5	1½
42	21	7½	30	2¼	5	3
43	22	1¾	30	10⅞	5	4½
44	22	7⅞	31	7½	5	6
45	23	2⅛	32	4⅛	5	7½
46	23	8¼	33	¾	5	9
47	24	2½	33	9⅜	5	10½
48	24	8⅝	34	6	6	0

Length of first jack rafter 16 in., cent. 16½ in.
Length of first jack rafter 2 ft., cent. 24¾ in.
Side cut of jack rafter 11½ and 12 cut on 12.
Side cut of hip and valley rafter 11¾ and 12 cut on 12.

RAFTER TABLE.

4 inches rise per foot run, or $\frac{1}{6}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	⅝	1	5½		4
3	1	7	2	2¼		6
4	2	1⅜	2	10⅞		8
5	2	4⅝	3	7⅝		10
6	3	2	4	4⅜	1	0
7	3	8¼	5	1⅛	1	2
8	4	2⅝	5	9⅞	1	4
9	4	8⅞	6	6⅝	1	6
10	5	3¼	7	3¼	1	8
11	5	9½	8	0	1	10
12	6	3⅞	8	8¾	2	0
13	6	10⅛	9	5½	2	2
14	7	4½	10	2¼	2	4
15	7	10¾	10	11	2	6
16	8	5⅛	11	7⅝	2	8
17	8	11½	12	4⅜	2	10
18	9	5¾	13	1⅛	3	0
19	10	⅛	13	9⅞	3	2
20	10	6⅜	14	6⅝	3	4
21	11	¾	15	3⅜	3	6
22	11	7	16	0	3	8
23	12	1⅜	16	8¾	3	10
24	12	7⅝	17	5½	4	0
25	13	2	18	2¼	4	2
26	13	8⅜	18	11	4	4
27	14	2⅝	19	7¾	4	6

RAFTER TABLE.

4 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	14	9	20	4½	4	8
29	15	3¼	21	1⅛	4	10
30	15	9⅝	21	9⅞	5	0
31	16	3⅞	22	6⅝	5	2
32	16	10¼	23	3⅜	5	4
33	17	4½	24	⅛	5	6
34	17	10⅞	24	8⅞	5	8
35	18	5¼	25	5½	5	10
36	18	11½	26	2¼	6	0
37	19	5⅞	26	11	6	2
38	20	⅛	27	7¾	6	4
39	20	6½	28	4½	6	6
40	21	¾	29	1¼	6	8
41	21	7⅛	29	9⅞	6	10
42	22	1⅜	30	6⅝	7	0
43	22	7¾	31	3⅜	7	2
44	23	2⅛	32	⅛	7	4
45	23	8⅜	32	10⅞	7	6
46	24	2¾	33	5⅝	7	8
47	24	9	34	2⅜	7	10
48	25	3⅜	34	11	8	0

Length of first jack rafter 16 in., cent. 16⅞ in.
Length of first jack rafter 2 ft., cent, 25¼ in.
Side cuts of jack rafter 11⅜ and 12 cut on 12.
Side cuts of hip and valley rafter 11⅝ and 12 cut on 12.

RAFTER TABLE.

5 inches rise per foot run, or $\frac{5}{24}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	1	1	5¾		5
3	1	7½	2	2⅝		7½
4	2	2	2	11½		10
5	2	8½	3	8¼	1	½
6	3	3	4	5⅛	1	3
7	3	9½	5	2	1	5½
8	4	4	5	10⅞	1	8
9	4	10½	6	7¾	1	10½
10	5	5	7	4⅝	2	1
11	5	11½	8	1½	2	3½
12	6	6	8	10⅜	2	6
13	7	½	9	7⅛	2	8½
14	7	7	10	4	2	11
15	8	1½	11	¾	3	1½
16	8	8	11	9¾	3	4
17	9	2½	12	6⅝	3	6½
18	9	9	13	3½	3	9
19	10	3½	14	⅜	3	11½
20	10	10	14	9¼	4	2
21	11	4½	15	6	4	4½
22	11	11	16	2⅞	4	7
23	12	5½	16	11¾	4	9½
24	13	0	17	8⅝	5	0
25	13	6½	18	5½	5	2½
26	14	1	19	2⅜	5	5
27	14	7½	19	11¼	5	7½

RAFTER TABLE.

5 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	15	2	20	8⅛	5	10
29	15	8½	21	5	6	½
30	16	3	22	1¾	6	3
31	16	9½	22	10⅝	6	5½
32	17	4	23	7½	6	8
33	17	10½	24	4⅜	6	10½
34	18	5	25	1¼	7	1
35	18	11½	25	10⅛	7	3½
36	19	6	26	7	7	6
37	20	½	27	3⅞	7	8½
38	20	7	28	⅝	7	11
39	21	1½	28	9½	8	1½
40	21	8	29	6⅜	8	4
41	22	2½	30	3¼	8	6½
42	22	9	31	⅛	8	9
43	23	3½	31	9	8	11½
44	23	10	32	5⅞	9	2
45	24	4½	33	2¾	9	4½
46	24	11	33	11½	9	7
47	25	5½	34	8⅜	9	9½
48	26	0	35	5¼	10	0

Length of first jack rafter 16 in., cent. 17⅜ in.
Length of first jack rafter 2 ft., cent. 26 in.
Side cut of jack rafter 11⅛ and 12 cut on 12.
Side cut of hip and valley rafter 11⅜ and 12 cut on 12.

RAFTER TABLE.

6 inches rise per foot run, or ¼ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	1⅜	1	6		6
3	1	8⅛	2	3		9
4	2	2⅞	3	0	1	0
5	2	9½	3	9	1	3
6	3	4½	4	6	1	6
7	3	11	5	3	1	9
8	4	5⅝	6	⅛	2	0
9	5	⅜	6	9⅛	2	3
10	5	7	7	6⅛	2	6
11	6	1¾	8	3⅛	2	9
12	6	8½	9	⅛	3	0
13	7	3⅛	9	9⅛	3	3
14	7	9⅞	10	6⅛	3	6
15	8	4⅝	11	3⅛	3	9
16	8	11¼	12	⅛	4	0
17	9	6	12	9⅛	4	3
18	10	¾	13	6⅛	4	6
19	10	7⅜	14	3⅛	4	9
20	11	2⅛	15	¼	5	0
21	11	8¾	15	9¼	5	3
22	12	3½	16	6¼	5	6
23	12	10½	17	3¼	5	9
24	13	5	18	¼	6	0
25	13	11⅝	18	9¼	6	3
26	14	6⅜	19	6¼	6	6
27	15	1	20	3¼	6	9

RAFTER TABLE.

6inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	15	7¾	21	¼	7	0
29	16	2½	21	9¼	7	3
30	16	9⅛	22	6¼	7	6
31	17	3⅞	23	3¼	7	9
32	17	10½	24	⅜	8	0
33	18	5¼	24	9⅜	8	3
34	19	0	25	6⅜	8	6
35	19	6¾	26	3⅜	8	9
36	20	1⅜	27	⅜	9	0
37	20	8⅛	27	9⅜	9	3
38	21	2¾	28	6⅜	9	6
39	21	9½	29	3⅜	9	9
40	22	4¼	30	⅜	10	0
.41	22	10⅞	30	9⅜	10	3
42	23	5⅝	31	6⅜	10	6
43	24	⅜	32	3⅜	10	9
44	24	7	33	½	11	0
45	25	1¾	33	9½	11	3
46	25	8⅜	34	6½	11	6
47	26	3⅛	35	3½	11	9
48	26	9⅞	36	½	12	0

Length of first jack rafter 16 in., cent. 17⅞ in.
Length of first jack rafter 2 ft., cent. 26⅞ in.
Side cut of jack rafter 10⅞ and 12 cut on 12.
Side cut of hip and valley rafter 11¼ and 12 cut on 12.

RAFTER TABLE.

7 inches rise per foot run or $\frac{7}{24}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	1⅞	1	6⅜		7
3	1	8⅞	2	3⅝		10½
4	2	3¾	3	¾	1	2
5	2	10¾	3	10	1	5½
6	3	5⅝	4	7⅛	1	9
7	4	⅝	5	4⅜	2	½
8	4	7½	6	1½	2	4
9	5	2½	6	10¾	2	7½
10	5	9½	7	7⅞	2	11
11	6	4⅜	8	5	3	2½
12	6	11⅜	9	2¼	3	6
13	7	6¼	9	11½	3	9½
14	8	1¼	10	8⅝	4	1
15	8	8⅛	11	5⅞	4	4½
16	9	3⅛	12	3	4	8
17	9	10	13	¼	4	11½
18	10	5	13	9⅜	5	3
19	11	0	14	6⅝	5	6½
20	11	6⅞	15	3⅞	5	10
21	12	1⅞	16	1	6	1½
22	12	8¾	16	10⅛	6	5
23	13	3¾	17	7⅜	6	8½
24	13	10¾	18	4½	7	0
25	14	5¾	19	1¼	7	3½
26	15	½	19	11	7	7
27	15	7½	20	8⅛	7	10½

RAFTER TABLE.

7 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	16	2½	21	5⅜	8	2
29	16	9⅜	22	2½	8	5½
30	17	4⅜	22	11¾	8	9
31	17	11¼	23	8⅞	9	½
32	18	6¼	24	6	9	4
33	19	1⅛	25	3¼	9	7½
34	19	8⅛	26	½	9	11
35	20	3	26	9⅝	10	2½
36	20	10	27	6⅞	10	6
37	21	5	28	4	10	9½
38	22	0	29	1¼	11	1
39	22	6⅞	29	10⅜	11	4½
40	23	1⅞	30	7⅝	11	8
41	23	8¾	31	4¾	11	11½
42	24	3¾	32	2	12	3
43	24	10⅝	32	11⅛	12	6½
44	25	5⅝	33	8⅜	12	10
45	26	½	34	5½	13	1½
46	26	7½	35	2¾	13	5
47	27	2⅜	35	11⅞	13	8½
48	27	9⅜	36	9⅛	14	0

Length of first jack rafter 16 in., cent. 18½ in.
Length of first jack rafter 2 ft., cent 27¾ in.
Side cut of jack rafter 10½ and 12 cut on 12.
Side cut of hip and valley rafter 11 and 12 cut on 12.

RAFTER TABLE.

8 inches rise per foot run or ⅓ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	2⅜	1	6¾		8
3	1	9⅝	2	4⅛	1	0
4	2	4⅞	3	1½	1	4
5	3	0	3	11	1	8
6	3	7¼	4	8⅜	2	0
7	4	2½	5	5¾	2	4
8	4	9⅝	6	3⅛	2	8
9	5	4⅞	7	½	3	0
10	6	⅛	7	9⅞	3	4
11	6	7¼	8	7¼	3	8
12	7	2½	9	4⅝	4	0
13	7	9¾	10	2⅛	4	4
14	8	5	10	11½	4	8
15	9	⅛	11	8⅞	5	0
16	9	7⅜	12	6¼	5	4
17	10	2½	13	3⅝	5	8
18	10	9¾	14	1	6	0
19	11	5	14	10⅜	6	4
20	12	¼	15	7¾	6	8
21	12	7½	16	5¼	7	0
22	13	2⅝	17	2⅝	7	4
23	13	9¾	18	0	7	8
24	14	5	18	9⅜	8	0
25	15	¼	19	6¾	8	4
26	15	7½	20	4⅛	8	8
27	16	2⅝	21	1½	9	0

RAFTER TABLE.

8 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	16	9⅞	21	10⅞	9	4
29	17	5	22	8¼	9	8
30	18	¼	23	5¾	10	0
31	18	7½	24	3⅛	10	4
32	19	2¾	25	½	10	8
33	19	10	25	9⅞	11	0
34	20	5⅛	26	7¼	11	4
35	21	⅜	27	4⅝	11	8
36	21	7½	28	2	12	0
37	22	2¾	28	11⅜	12	4
38	22	10	29	8⅞	12	8
39	23	5¼	30	6¼	13	0
40	24	⅜	31	3⅝	13	4
41	24	7⅝	32	1	13	8
42	25	2⅞	32	10⅜	14	0
43	25	10	33	7¾	14	4
44	26	5¼	34	5⅛	14	8
45	27	½	35	2½	15	0
46	27	7⅝	36	0	15	4
47	28	2⅞	36	9⅜	15	8
48	28	10⅛	37	6¾	16	0

Length of first jack rafter 16 in., cent. 19¼ in.
Length of first jack rafter 2 ft., cent. 28⅞ in.
Side cut of jack rafter 10⅛ and 12 cut on 12.
Side cut of hip and valley rafter 10⅞ and 12 cut on 12.

RAFTER TABLE.

9 inches rise per foot run or ⅜ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	3	1	7¼		9
3	1	10½	2	4⅞	1	1½
4	2	6	3	2½	1	6
5	3	1½	4	⅛	1	10½
6	3	9	4	9¾	2	3
7	4	4½	5	7¼	2	7½
8	5	0	6	4⅞	3	0
9	5	7½	7	2½	3	4½
10	6	3	8	⅛	3	9
11	6	10½	8	9¾	4	1½
12	7	6	9	7⅜	4	6
13	8	1½	10	5	4	10½
14	8	9	11	2⅝	5	3
15	9	4½	12	¼	5	7½
16	10	0	12	9⅞	6	0
17	10	7½	13	7½	6	4½
18	11	3	14	5⅛	6	9
19	11	10½	15	2¾	7	1½
20	12	6	16	¼	7	6
21	13	1½	16	10	7	10½
22	13	9	17	7½	8	3
23	14	4½	18	5⅛	8	7½
24	15	0	19	2¾	9	0
25	15	7½	20	⅜	9	4½
26	16	3	20	10	9	9
27	16	10½	21	7⅝	10	1½

RAFTER TABLE.

9 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	17	6	22	5¼	10	6
29	18	1½	23	2¾	10	10½
30	18	9	24	½	11	3
31	19	4½	24	10	11	7½
32	20	0	25	7⅝	12	0
33	20	7½	26	5¼	12	4½
34	21	3	27	3	12	9
35	21	10½	28	½	13	1½
36	22	6	28	10½	13	6
37	23	1½	29	7¾	13	10½
38	23	9	30	5⅜	14	3
39	24	4½	31	3	14	7½
40	25	0	32	½	15	0
41	25	7½	32	10¼	15	4½
42	26	3	33	7¾	15	9
43	26	10½	34	5½	16	1½
44	27	6	35	3	16	6
45	28	1½	36	⅞	16	10½
46	28	9	36	10¼	17	3
47	29	4½	37	7⅞	17	7½
48	30	0	38	5½	18	0

Length of first jack rafter 16 in., cent. 20 in.
Length of first jack rafter 2 ft., cent. 30 in.
Side cut of jack rafter 9¾ and 12 cut on 12.
Side cut of hip and valley rafter 10⅝ and 12 cut cn 12.

RAFTER TABLE.

10 inches rise per foot run or $\frac{5}{12}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	3⅝	1	7¾		10
3	1	11⅜	2	5⅝	1	3
4	2	7¼	3	3½	1	8
5	3	3	4	1¼	2	1
6	3	10⅞	4	11⅛	2	6
7	4	6⅝	5	9	2	11
8	5	2½	6	6⅞	3	4
9	5	10¼	7	4¾	3	9
10	6	6⅛	8	2⅝	4	2
11	7	1⅞	9	½	4	7
12	7	9¾	9	10⅜	5	0
13	8	5½	10	8⅛	5	5
14	9	1⅜	11	6	5	10
15	9	9½	12	3⅞	6	3
16	10	5	13	1¾	6	8
17	11	¾	13	11⅝	7	1
18	11	8⅝	14	9½	7	6
19	12	4⅜	15	7⅜	7	11
20	13	¼	16	5¼	8	4
21	13	8	17	3	8	9
22	14	3⅞	18	1	9	2
23	14	11⅝	18	10½	9	7
24	15	7½	19	8⅝	10	0
25	16	3¼	20	6½	10	5
26	16	11	21	4⅜	10	10
27	17	6⅞	22	2¼	11	3

RAFTER TABLE.

10 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	18	2⅝	23	⅛	11	8
29	18	10½	23	10	12	1
30	19	6¼	24	7¾	12	6
31	20	2⅛	25	5⅝	12	11
32	20	9⅞	26	3½	13	4
33	21	5¾	27	1⅜	13	9
34	22	1½	27	11¼	14	2
35	22	9¼	28	9⅛	14	7
36	23	5⅛	29	7	15	0
37	24	1	30	4⅞	15	5
38	24	8¾	31	2⅝	15	10
39	25	4⅝	32	½	16	3
40	26	⅜	32	10⅜	16	8
41	26	8¼	33	8¼	17	1
42	27	4	34	6⅛	17	6
43	27	11⅞	35	4	17	11
44	28	7⅝	36	1⅞	18	4
45	29	3½	36	11¾	18	9
46	29	11¼	37	9½	19	2
47	30	7⅛	38	7⅜	19	7
48	31	2⅞	39	5¼	20	0

Length of first jack rafter 16 in., cent. 20⅞ in.
Length of first jack rafter 2 ft., cent. 31¼ in.
Side cut of jack rafter 9⅜ and 12 cut on 12.
Side cut of hip and valley rafter 10⅜ and 12 cut on 12.

RAFTER TABLE.

11 inches rise per foot run or $\frac{11}{24}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	4¼	1	8¼		11
3	2	⅜	2	6⅜	1	4½
4	2	8½	3	4½	1	10
5	3	4⅝	4	2⅝	2	3½
6	4	¾	5	¾	2	9
7	4	9	5	10⅞	3	2½
8	5	5⅛	6	9	3	8
9	6	1¼	7	7⅛	4.	1½
10	6	9⅜	8	5¼	4	7
11	7	5½	9	3⅜	5	½
12	8	1⅝	10	1½	5	6.
13	8	9¾	10	11½	5	11½
14	9	5⅞	11	9⅝	6	5
15	10	2	12	7¾	6	10½
16	10	10⅛	13	5⅞	7	4
17	11	6¼	14	4	7	9½
18	12	2⅜	15	2⅛	8	3
19	12	10⅝	16	¼	8	8½
20	13	6¾	16	10⅜	9	2
21	14	2⅞	17	8½	9	7½
22	14	11	18	6⅝	10	1
23	15	7⅛	19	4¾	10	6½
24	16	3¼	20	2⅞	11	0
25	16	11⅜	21	1	11	5½
26	17	7½	21	11⅛	11	11
27	18	3⅝	22	9¼	12	4½

RAFTER TABLE.

11 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	18	11¾	23	7⅜	12	10
29	19	7⅞	24	5½	13	3½
30	20	4	25	3⅝	13	9
31	21	⅛	26	1¾	14	2½
32	21	8⅜	26	11⅞	14	6
33	22	4½	27	10	15	1½
34	23	⅝	28	8⅛	15	7
35	23	8¾	29	6¼	16	½
36	24	4⅞	30	4⅜	16	6
37	25	1	31	2½	16	11½
38	25	9⅛	32	½	17	5
39	26	5¼	32	10⅝	17	10½
40	27	1⅜	33	8¾	18	4
41	27	9½	34	6⅞	18	9½
42	28	5⅝	35	5	19	3
43	29	1¾	36	3⅛	19	8½
44	29	10	37	1¼	20	2
45	30	6⅛	37	11⅜	20	7½
46	31	2¼	38	9½	21	1
47	31	10⅜	39	7⅝	21	6½
48	32	6½	40	5¾	22	0

Length of first jack rafter 16 in., cent. 21¾ in.
Length of first jack rafter 2 ft., cent. 32½ in.
Side cut of jack rafter 8⅞ and 12 cut on 12.
Side cut of hip and valley rafter 10⅛ and 12 cut on 12.

RAFTER TABLE.

12 inches rise per foot run or ½ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	5	1	8¾	1	0
3	2	1½	2	7¼	1	6
4	2	10	3	5⅝	2	0
5	3	6⅜	4	4	2	6
6	4	2⅞	5	2⅜	3	0
7	4	11⅜	6	¾	3	6
8	5	7⅞	6	11¼	4	0
9	6	4⅜	7	9⅝	4	6
10	7	⅞	8	8	5	0
11	7	9⅜	9	6¾	5	6
12	8	5⅞	10	4⅜	6	0
13	9	2¼	11	3¼	6	6
14	9	10¾	12	1⅝	7	0
15	10	7¼	13	0	7	6
16	11	3¾	13	10⅜	8	0
17	12	¼	14	8¾	8	6
18	12	8¾	15	7¼	9	0
19	13	5¼	16	5⅝	9	6
20	14	1¾	17	4	10	0
21	14	10¼	18	2⅜	10	6
22	15	6⅝	19	¾	11	0
23	16	3⅛	19	11¼	11	6
24	16	11⅝	20	9⅝	12	0
25	17	8⅛	21	8	12	6
26	18	4⅝	22	6⅜	13	0
27	19	1⅛	23	4¾	13	6

RAFTER TABLE.

12 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	19	9⅝	24	3¼	14	0
29	20	6⅛	25	1⅝	14	6
30	21	2½	26	0	15	0
31	21	11	26	10⅜	15	6
32	22	7½	27	8¾	16	0
33	23	4	28	7¼	16	6
34	24	½	29	5⅝	17	0
35	24	9	30	4	17	6
36	25	5½	31	2⅜	18	0
37	26	2	32	¾	18	6
38	26	10⅜	32	11¼	19	0
39	27	6⅞	33	9⅝	19	6
40	28	3⅜	34	8	20	0
41	28	11⅞	35	6⅜	20	6
42	29	8⅜	36	4¾	21	0
43	30	4⅞	37	3¼	21	6
44	31	1⅜	38	1⅝	22	0
45	31	10⅞	39	0	22	6
46	32	6¼	39	10⅜	23	0
47	33	2¾	40	8¾	23	6
48	33	11¼	41	7¼	24	0

Length of first jack rafter 16 in., cent. 22⅝ in.
Length of first jack rafter 2 ft., cent. 34 in.
Side cut of jack rafter 8½ and 12 cut on 12.
Side cut of hip and valley rafter 9⅞ and 12 cut on 12.

RAFTER TABLE.

13 inches rise per foot run or $\frac{13}{24}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	5¾	1	9⅜	1	1
3	2	2½	2	8⅛	1	7½
4	2	11⅜	3	6¾	2	2
5	3	8¼	4	5½	2	8½
6	4	5⅛	5	4¼	3	3
7	5	1⅞	6	2⅞	3	9½
8	5	10¾	7	1⅝	4	4
9	6	7⅝	8	¼	4	10½
10	7	4½	8	11	5	5
11	8	1¼	9	9¾	5	11½
12	8	10⅛	10	8⅜	6	6
13	9	7	11	7⅛	7	½
14	10	3⅞	12	5¾	7	7
15	11	⅝	13	4½	8	1½
16	11	9½	14	3¼	8	8
17	12	6⅜	15	1⅞	9	2½
18	13	3¼	16	⅝	9	9
19	14	0	16	11¼	10	3½
20	14	8⅞	17	10	10	10
21	15	5¾	18	8¾	11	4½
22	16	2⅝	19	7⅜	11	11
23	16	11⅜	20	8⅛	12	5½
24	17	8¼	21	4¾	13	0
25	18	5⅛	22	3½	13	6½
26	19	2	23	2¼	14	1
27	19	10⅞	24	⅞	14	7½

RAFTER TABLE.

13 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	20	7⅝	24	11⅝	15	2
29	21	4½	25	10¼	15	8½
30	22	1⅜	26	9	16	3
31	22	10¼	27	7¾	16	9½
32	23	7	28	6⅜	17	4
33	24	3⅞	29	5⅛	17	10½
34	25	¾	30	3¾	18	5
35	25	9⅝	31	2½	18	11½
36	26	6⅜	32	1¼	19	6
37	27	3¼	32	11⅞	20	½
38	28	⅛	33	10⅝	20	7
39	28	9	34	9¼	21	1½
40	29	5¾	35	8	21	8
41	30	2⅝	36	6¾	22	2½
42	30	11½	37	5⅜	22	9
43	31	8⅜	38	4⅛	23	3½
44	32	5⅛	39	2¾	23	10
45	33	2	40	1½	24	4½
46	33	10⅞	41	¼	24	11
47	34	7¾	41	10⅞	25	5½
48	35	4½	42	9⅝	26	0

Length of first jack rafter 16 in., cent. 23⅝ in.
Length of first jack rafter 2 ft., cent. 35⅜ in.
Side cut of jack rafter 8⅛ and 12 cut on 12.
Side cut of hip and valley rafter 9⅝ and 12 cut on 12.

RAFTER TABLE.

14 inches rise per foot run or $\frac{7}{12}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	6⅜	1	10	1	2
3	2	3⅝	2	9	1	9
4	3	⅞	3	8	2	4
5	3	9⅛	4	7	2	11
6	4	6¼	5	6	3	6
7	5	4½	6	5⅛	4	1
8	6	1¾	7	4⅛	4	8
9	6	10⅞	8	3⅛	5	3
10	7	8⅛	9	2⅛	5	10
11	8	5⅜	10	1⅛	6	5
12	9	2⅝	11	⅛	7	0
13	9	11¾	11	11⅛	7	7
14	10	9⅛	12	10⅛	8	2
15	11	6¼	13	9⅛	8	9
16	12	3⅜	14	8⅛	9	4
17	13	⅝	15	7⅛	9	11
18	13	9⅞	16	6⅛	10	6
19	14	7⅛	17	5⅛	11	1
20	15	4¼	18	4¼	11	8
21	16	1½	19	3¼	12	3
22	16	10¾	20	2¼	12	10
23	17	8	21	1¼	13	5
24	18	5⅛	22	¼	14	0
25	19	2⅜	22	11¼	14	7
26	19	11⅝	23	10¼	15	2
27	20	8¾	24	9¼	15	9

RAFTER TABLE.

14 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	21	6	25	8¼	16	4
29	22	3¼	26	7¼	16	11
30	23	½	27	6¼	17	6
31	23	9⅝	28	5¼	18	1
32	24	6⅞	29	4⅜	18	8
33	25	4⅛	30	3⅜	19	3
34	26	1¼	31	2⅜	19	10
35	26	10½	32	1⅜	20	5
36	27	7¾	33	⅜	21	0
37	28	5	33	11⅜	21	7
38	29	2⅛	34	10⅜	22	2
39	29	11⅜	35	9⅜	22	9
40	30	8⅝	36	8⅜	23	4
41	31	5⅞	37	7⅜	23	11
42	32	3	38	6⅜	24	6
43	33	¼	39	5⅜	25	1
44	33	9½	40	4½	25	8
45	34	6⅝	41	3½	26	3
46	35	3⅞	42	2½	26	10
47	36	1⅛	43	1½	27	5
48	36	10⅜	44	½	28	0

Length of first jack rafter 16 in., cent. 24⅝ in.
Length of first jack rafter 2 ft., cent. 36⅞ in.
Side cut of Jack rafter 7¾ and 12 cut on 12.
Side cut of hip and valley rafter 9⅜ and 12 cut on 12.

RAFTER TABLE.

15 inches rise per foot run or ⅝ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	7¼	1	10⅝	1	3
3	2	4¾	2	10	1	10½
4	3	2⅜	3	9⅜	2	6
5	4	0	4	8⅝	3	1½
6	4	9⅝	5	8	3	9
7	5	7¼	6	7⅜	4	4½
8	6	4¾	7	6⅝	5	0
9	7	2⅜	8	6	5	7½
10	8	0	9	5⅜	6	3
11	8	9⅝	10	4⅝	6	10½
12	9	7¼	11	4	7	6
13	10	4¾	12	3⅜	8	1½
14	11	2⅜	13	2⅝	8	9
15	12	0	14	2	9	4½
16	12	9⅝	15	1⅜	10	0
17	13	7¼	16	¾	10	7½
18	14	4¾	17	0	11	3
19	15	2⅜	17	11⅜	11	10½
20	16	0	18	10¾	12	6
21	16	9⅝	19	10	13	1½
22	17	7¼	20	9⅜	13	9
23	18	4¾	21	8¾	14	4½
24	19	2⅜	22	8	15	0
25	20	0	23	7⅜	15	7½
26	20	9⅝	24	6¼	16	3
27	21	7¼	25	6	16	10½

RAFTER TABLE.

15 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	22	4¾	26	5⅜	17	6
29	23	2⅜	27	4¾	18	1½
30	24	0	28	4	18	9
31	24	9⅝	29	3⅜	19	4½
32	25	7¼	30	2¾	20	0
33	26	4¾	31	2	20	7½
34	27	2⅜	32	1⅜	21	3
35	28	0	33	¾	21	10½
36	28	9⅝	34	0	22	6
37	29	7¼	34	11⅜	23	1½
38	30	4¾	35	10¾	23	9
39	31	2⅜	36	10⅛	24	4½
40	32	0	37	9⅜	25	0
41	32	9⅝	38	8¾	25	7½
42	33	7¼	39	8⅛	26	3
43	34	4¾	40	7⅜	26	10½
44	35	2⅜	41	6¾	27	6
45	36	0	42	6⅛	28	1½
46	36	9⅝	43	5⅜	28	9
47	37	7¼	44	4¾	29	4½
48	38	4¾	45	8⅛	30	0

Length of first jack rafter 16 in.. cent. 25⅝ in.
Length of first jack rafter 2 ft., cent. 38½ in.
Side cut of jack rafter 7½ and 12 cut on 12.
Side cut of hip and valley rafter 9 and 12 cut on 12.

RAFTER TABLE.

16 inches rise per foot run or $\frac{2}{3}$ pitch.

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
2	1	8	1	11⅜	1	4
3	2	6	2	11	2	0
4	3	4	3	10⅝	2	8
5	4	2	4	10⅜	3	4
6	5	0	5	10	4	0
7	5	10	6	9¾	4	8
8	6	8	7	9⅜	5	4
9	7	6	8	9	6	0
10	8	4	9	8¾	6	8
11	9	2	10	8⅜	7	4
12	10	0	11	8	8	0
13	10	10	12	7¾	8	8
14	11	8	13	7⅜	9	4
15	12	6	14	7	10	0
16	13	4	15	6¾	10	8
17	14	2	16	6⅜	11	4
18	15	0	17	6	12	0
19	15	10	18	5¾	12	8
20	16	8	19	5⅜	13	4
21	17	6	20	5⅛	14	0
22	18	4	21	4¾	14	8
23	19	2	22	4⅜	15	4
24	20	0	23	4⅛	16	0
25	20	10	24	3¾	16	8
26	21	8	25	3⅜	17	4
27	22	6	26	3⅛	18	0

RAFTER TABLE.

16 inches rise per foot run (continued).

Width of Building	Length of Main Rafters		Length of Hip and Val. Rafters		Rise of Roof	
Feet	Ft.	In.	Ft.	In.	Ft.	In.
28	23	4	27	2¾	18	8
29	24	2	28	2⅜	19	4
30	25	0	29	2⅛	20	0
31	25	10	30	1¾	20	8
32	26	8	31	1½	21	4
33	27	6	32	1⅛	22	0
34	28	4	33	¾	22	8
35	29	2	34	½	23	4
36	30	0	35	⅛	24	0
37	30	10	35	11¾	24	8
38	31	8	36	11½	25	4
39	32	6	37	11⅛	26	0
40	33	4	38	10¾	26	8
41	34	2	39	10½	27	4
42	35	0	40	10⅛	28	0
43	35	10	41	9¾	28	8
44	36	8	42	9½	29	4
45	37	6	43	9⅛	30	0
46	38	4	44	8⅞	30	8
47	39	2	45	8½	31	4
48	40	0	46	8⅛	32	0

Length of first jack rafter 16 in., cent. 26¾ in.
Length of first jack rafter 2 ft., cent. 40 in.
Side cut of jack rafter 7⅛ and 12 cut on 12.
Side cut of hip and valley rafter 8¾ and 12 cut on 12.

RAFTER TABLE No. 2.

This Table gives the lengths of all rafters from 1 inch rise per foot run to 24 inches rise.

Rise per Foot	Length of Main	Length of Hip & Val.	Rise per Foot	Length of Main	Length of Hip & Val.
1	12.04	17.02	13	17.69	21.40
2	12.16	17.11	14	18.43	22.02
3	12.37	17.25	15	19.20	22.67
4	12.65	17.46	16	20.00	23.34
5	13.00	17.72	17	20.80	24.04
6	13.41	18.02	18	21.63	24.75
7	13.89	18.38	19	22.47	25.49
8	14.42	18.78	20	23.32	26.24
9	15.00	19.23	21	24.~~26~~	27.01
10	15.62	19.72	22	25.06	27.80
11	16.28	20.24	23	25.94	28.60
12	16.97	20.80	24	26.83	29.41

DIRECTIONS.

To get the length of any rafter by using this table, you simply find the number in first column to correspond with rise per foot in inches. And in second column to the right of this number you will find the number to be used for main rafter, and in third column is the figures to be used for hip and valley rafters for that same pitch roof.

Example. We will now take a building 32 feet wide and a rise of eight inches to each foot of run which is 1-3 pitch. We first find 8 inches in first column, now we find 14.42 to be the length of main rafters, and 18.78 the length of hips and valleys per foot of run. Now, as we have 16 feet, half the width of building for the run of rafters, to get the length of main rafters we must multiply 14.42 by 16, which makes 230.72 inches. We next divide the inches by 12 to give us feet: 230÷12=19 ft. 2 in., and the 72 one-hundredths is ¾ in. nearly. Therefore, we have a length of 19 ft. 2¾ in. for the length of main rafters. The length of hip and valley rafters is found the same way: 18.78×16=300.48 in.; 300÷12=25 ft. and the 48 one-hundredths is ½ in. nearly. So the length of hip and valley rafters are 25 ft. ½ in., as you will see in the rafter table of 8 inches rise per foot and following the 32-foot building.

All the rafters in this book were figured from this table, in getting their lengths. The figures which we have just used (14.42) is simply the distance from 12 to 8, and the figures 18.78 is the distance from 17 to 8, etc.

SQUARE ROOT TABLES.

From 1 to 1000.

From 1 to 100.

No.	Sq.Rt.	No.	Sq.Rt.	No.	Sq.Rt.	No.	Sq.Rt.
1	1.00	26	5.09	51	7.14	76	8.71
2	1.41	27	5.19	52	7.21	77	8.77
3	1.73	28	5.29	53	7.28	78	8.83
4	2.00	29	5.38	54	7.34	79	8.88
5	2.23	30	5.47	55	7.41	80	8.94
6	2.44	31	5.56	56	7.48	81	9.00
7	2.64	32	5.65	57	7.55	82	9.05
8	2.82	33	5.74	58	7.61	83	9.11
9	3.00	34	5.83	59	7.68	84	9.16
10	3.16	35	5.91	60	7.74	85	9.21
11	3.31	36	6.00	61	7.81	86	9.27
12	3.46	37	6.08	62	7.87	87	9.32
13	3.60	38	6.16	63	7.93	88	9.38
14	3.74	39	6.24	64	8.00	89	9.43
15	3.87	40	6.32	65	8.06	90	9.48
16	4.00	41	6.40	66	8.12	91	9.53
17	4.12	42	6.48	67	8.18	92	9.59
18	4.24	43	6.55	68	8.24	93	9.64
19	4.35	44	6.63	69	8.30	94	9.69
20	4.47	45	6.70	70	8.36	95	9.74
21	4.58	46	6.78	71	8.42	96	9.79
22	4.69	47	6.85	72	8.48	97	9.84
23	4.79	48	6.92	73	8.54	98	9.89
24	4.89	49	7.00	74	8.60	99	9.95
25	5.00	50	7.07	75	8.66	100	10.00

DIRECTIONS FOR SQUARE ROOT TABLES.

I will now explain the benefit of the square root tables, and how they can be used as a time-saver to the mechanic of any trade who has to extract the square root of any number from 1 to 1000. The tables give the correct answer to two decimal points. Suppose it is desired to get the correct length of a rafter, a brace or a batter post to the hundredth part of an inch. Multiply the run by itself, then the rise by itself, and add the two products together. Now find this number in the square root tables in the No. column; to the right of this No. and in Sq. Rt. column will be found the correct length to the hundredth part of an inch, or foot, which ever is being used.

Example: A brace is to be cut at the corner of a building, and is to reach out the sill 9 feet from the corner post and up the post 7 feet; therefore 9×9=81, and 7×7=49; then 81+49=130. Find the No. 130 in square root table and to the right of it tne answer, which is 11 feet and 40 one-hundredths of another foot.

For the benefit of those who cannot readily tell how many inches 40 one-hundredths of a foot is, I have prepared a table called a

Decimal Table, which we will now refer to, and find that 40 one-hundredths of a foot is equal to 4¾ inches. Therefore the brace is 11 feet 4¾ inches long. The correct lengths of rafters, also batter posts for trestles can be gotten in the same manner. In getting the length of a batter post, the spread is used for the rise and the heighth of plumb post for the run.

EIGHT-LIGHT WINDOWS.

Plain Rail 1⅛ in. Thick.

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
8	x	10	1	8½	x	3	9¼	10
8	x	12	1	8½	x	4	6	12
8	x	14	1	8½	x	5	2	14
8	x	16	1	8½	x	5	10	19
9	x	12	1	10½	x	4	6	14
9	x	14	1	10½	x	5	2	17
9	x	16	1	10½	x	5	10	20
10	x	12	2	0½	x	4	6	15
10	x	14	2	0½	x	5	2	18
10	x	16	2	0½	x	5	10	20
10	x	18	2	0½	x	6	6	23
12	x	14	2	4½	x	5	2	19
12	x	16	2	4½	x	5	10	22
12	x	18	2	4½	x	6	6	25

TWELVE-LIGHT WINDOWS.

Plain Rail 1⅛ in. Thick.

Glass Size			Weight Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
7	x	9	2	1	x	3	5½	13
8	x	10	2	4	x	3	9¼	14
8	x	12	2	4	x	4	6	18
8	x	14	2	4	x	5	2	19
9	x	12	2	7	x	4	6	20
9	x	13	2	7	x	4	10	21
9	x	14	2	7	x	5	2	22
9	x	15	2	7	x	5	6	24
9	x	16	2	7	x	5	10	26
9	x	18	2	7	x	6	6	28
10	x	12	2	10	x	4	6	21
10	x	14	2	10	x	5	2	23
10	x	15	2	10	x	5	6	24
10	x	16	2	10	x	5	10	26
10	x	18	2	10	x	6	6	29
10	x	20	2	10	x	7	2	31
12	x	14	3	4	x	5	2	25
12	x	16	3	4	x	5	10	28
12	x	18	3	4	x	6	6	31

EIGHT-LIGHT WINDOWS.

Check Rail 1⅜ in. Thick.

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
9	x	12	1	11	x	4	6	17
9	x	14	1	11	x	5	2	18

Eight-Light Windows—Continued

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
9	x	16	1	11	x	5	10	19
10	x	12	2	1	x	4	6	18
10	x	14	2	1	x	5	2	19
10	x	16	2	1	x	5	10	22
10	x	18	2	1	x	6	6	24
10	x	20	2	1	x	7	2	26
12	x	14	2	5	x	5	2	23
12	x	16	2	5	x	5	10	24
12	x	18	2	5	x	6	6	27
12	x	20	2	5	x	7	2	30
14	x	16	2	9	x	5	10	28
14	x	18	2	9	x	6	6	31
14	x	20	2	9	x	7	2	35
14	x	22	2	9	x	7	10	37
14	x	24	2	9	x	8	6	40

TWELVE-LIGHT WINDOWS.

Check Rail 1⅜ in. Thick.

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
8	x	10	2	4½	x	3	10	19
8	x	12	2	4½	x	4	6	20
8	x	14	2	4½	x	5	2	22
9	x	12	2	7½	x	4	6	22
9	x	13	2	7½	x	4	10	24
9	x	14	2	7½	x	5	2	25
9	x	15	2	7½	x	5	6	26
9	x	16	2	7½	x	5	10	27

Twelve-Light Windows—Continued

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
10	x	12	2	10½	x	4	6	23
10	x	14	2	10½	x	5	2	26
10	x	15	2	10½	x	5	6	27
10	x	16	2	10½	x	5	10	29
10	x	18	2	10½	x	6	6	32
10	x	20	2	10½	x	7	2	34
12	x	14	3	4½	x	5	2	28
12	x	16	3	4½	x	5	10	30
12	x	18	3	4½	x	6	6	32
12	x	20	3	4½	x	7	2	36

FOUR-LIGHT WINDOWS.

Check Rail 1⅜ in. Thick.

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
10	x	16	2	1	x	3	2	18
10	x	18	2	1	x	3	6	18
10	x	20	2	1	x	3	10	19
10	x	22	2	1	x	4	2	19
10	x	24	2	1	x	4	6	21
10	x	26	2	1	x	4	10	21
10	x	28	2	1	x	5	2	22
10	x	30	2	1	x	5	6	22
10	x	32	2	1	x	5	10	23
10	x	34	2	1	x	6	2	24
10	x	36	2	1	x	6	6	25
12	x	16	2	5	x	3	2	18

Four-Light Windows—Continued

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
12	x	18	2	5	x	3	6	19
12	x	20	2	5	x	3	10	19
12	x	22	2	5	x	4	2	20
12	x	24	2	5	x	4	6	21
12	x	26	2	5	x	4	10	21
12	x	28	2	5	x	5	2	22
12	x	30	2	5	x	5	6	24
12	x	32	2	5	x	5	10	25
12	x	34	2	5	x	6	2	26
12	x	36	2	5	x	6	6	27
12	x	38	2	5	x	6	10	28
12	x	40	2	5	x	7	2	30
12	x	42	2	5	x	7	6	31
12	x	44	2	5	x	7	10	32
12	x	46	2	5	x	8	2	33
12	x	48	2	5	x	8	6	35
14	x	20	2	9	x	3	10	22
14	x	22	2	9	x	4	2	22
14	x	24	2	9	x	4	6	23
14	x	26	2	9	x	4	10	23
14	x	28	2	9	x	5	2	24
14	x	30	2	9	x	5	6	26
14	x	32	2	9	x	5	10	28
14	x	34	2	9	x	6	2	28
14	x	36	2	9	x	6	6	30
14	x	38	2	9	x	6	10	30
14	x	40	2	9	x	7	2	31
14	x	42	2	9	x	7	6	32
14	x	44	2	9	x	7	10	33
14	x	46	2	9	x	8	2	34
14	x	48	2	9	x	8	6	36

Four-Light Windows—Continued

Glass Size			Window Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
15	x	20	2	11	x	3	10	23
15	x	22	2	11	x	4	2	23
15	x	24	2	11	x	4	6	24
15	x	26	2	11	x	4	10	24
15	x	28	2	11	x	5	2	25
15	x	30	2	11	x	5	6	27
15	x	32	2	11	x	5	10	29
15	x	34	2	11	x	6	2	29
15	x	36	2	11	x	6	6	31
15	x	38	2	11	x	6	10	32

TWO-LIGHT WINDOWS.

Check Rail 1⅜ in. Thick.

Glass Size			Window Size					Weight Glazed S. S.	Weight Glazed D. S.
Inches			Ft.	In.		Ft.	In.	Lbs.	Lbs.
16	x	20	1	8⅛	x	3	10	14	15
16	x	22	1	8⅛	x	4	2	15	16
16	x	24	1	8⅛	x	4	6	16	17
16	x	26	1	8⅛	x	4	10	16	17
16	x	28	1	8⅛	x	5	2	17	18
16	x	30	1	8⅛	x	5	6	18	19
16	x	32	1	8⅛	x	5	10	19	21
16	x	34	1	8⅛	x	6	2	21	23
16	x	36	1	8⅛	x	6	6	22	24
18	x	20	1	10⅛	x	3	10	14	15
18	x	22	1	10⅛	x	4	2	15	16
18	x	24	1	10⅛	x	4	6	16	18

Two-Light Windows—Continued

Glass Size	Window Size	Weight Glazed S. S.	Weight Glazed D. S.
Inches	Ft. In. Ft. In.	Lbs.	Lbs.
18 x 26	1 10⅛ x 4 10	17	21
18 x 28	1 10⅛ x 5 2	17	22
18 x 30	1 10⅛ x 5 6	19	24
18 x 32	1 10⅛ x 5 10	21	24
18 x 34	1 10⅛ x 6 2	22	25
18 x 36	1 10⅛ x 6 6	23	25
18 x 38	1 10⅛ x 6 10	23	26
18 x 40	1 10⅛ x 7 2	24	27
20 x 20	2 0⅛ x 3 10	16	17
20 x 22	2 0⅛ x 4 2	17	18
20 x 24	2 0⅛ x 4 6	18	20
20 x 26	2 0⅛ x 4 10	20	21
20 x 28	2 0⅛ x 5 2	21	23
20 x 30	2 0⅛ x 5 6	22	24
20 x 32	2 0⅛ x 5 10	24	26
20 x 34	2 0⅛ x 6 2	24	27
20 x 36	2 0⅛ x 6 6	24	28
20 x 38	2 0⅛ x 6 10	25	29
20 x 40	2 0⅛ x 7 2	25	30
22 x 20	2 2⅛ x 3 10	15	16
22 x 22	2 2⅛ x 4 2	16	17
22 x 24	2 2⅛ x 4 6	16	19
22 x 26	2 2⅛ x 4 10	19	21
22 x 28	2 2⅛ x 5 2	20	22
22 x 30	2 2⅛ x 5 6	22	24
22 x 32	2 2⅛ x 5 10	23	26
22 x 34	2 2⅛ x 6 2	24	27
22 x 36	2 2⅛ x 6 6	25	28
22 x 38	2 2⅛ x 6 10	27	30
22 x 40	2 2⅛ x 7 2	28	32
22 x 42	2 2⅛ x 7 6	28	34

Two-Light Windows—Continued

Glass Size	Window Size					Weight Glazed S. S.	Weight Glazed D. S.
Inches	Ft.	In.		Ft.	In.	Lbs.	Lbs.
22 x 44	2	2⅛	x	7	10	29	35
22 x 46	2	2⅛	x	8	2	30	36
22 x 48	2	2⅛	x	8	6	30	38
24 x 18	2	4⅛	x	3	6	16	18
24 x 20	2	4⅛	x	3	10	18	20
24 x 22	2	4⅛	x	4	2	19	21
24 x 24	2	4⅛	x	4	6	20	22
24 x 26	2	4⅛	x	4	10	22	23
24 x 28	2	4⅛	x	5	2	22	24
24 x 30	2	4⅛	x	5	6	23	25
24 x 32	2	4⅛	x	5	10	24	28
24 x 34	2	4⅛	x	6	2	25	29
24 x 36	2	4⅛	x	6	6	27	32
24 x 38	2	4⅛	x	6	10	29	33
24 x 40	2	4⅛	x	7	2	29	34
24 x 42	2	4⅛	x	7	6	30	35
24 x 44	2	4⅛	x	7	10	32	37
24 x 46	2	4⅛	x	8	2	33	38
24 x 48	2	4⅛	x	8	6	34	39
26 x 20	2	6⅛	x	3	10	20	21
26 x 22	2	6⅛	x	4	2	21	22
26 x 24	2	6⅛	x	4	6	22	23
26 x 26	2	6⅛	x	4	10	23	24
26 x 28	2	6⅛	x	5	2	25	25
26 x 30	2	6⅛	x	5	6	26	26
26 x 32	2	6⅛	x	5	10	28	28
26 x 34	2	6⅛	x	6	2	29	30
26 x 36	2	6⅛	x	6	6	30	31
26 x 38	2	6⅛	x	6	10	31	34
26 x 40	2	6⅛	x	7	2	32	35
26 x 42	2	6⅛	x	7	6	34	36
26 x 44	2	6⅛	x	7	10	35	38

Two-Light Windows—Continued

Glass Size	Window Size					Weight Glazed S. S.	Weight Glazed D. S.
Inches	Ft.	In.		Ft.	In.	Lbs.	Lbs.
26 x 46	2	6⅛	x	8	2	36	39
26 x 48	2	6⅛	x	8	6	37	41
28 x 24	2	8⅛	x	4	6	22	24
28 x 26	2	8⅛	x	4	10	23	25
28 x 28	2	8⅛	x	5	2	25	27
28 x 30	2	8⅛	x	5	6	27	30
28 x 32	2	8⅛	x	5	10	27	31
28 x 34	2	8⅛	x	6	2	28	32
28 x 36	2	8⅛	x	6	6	30	33
28 x 38	2	8⅛	x	6	10	31	34
28 x 40	2	8⅛	x	7	2	33	37
28 x 42	2	8⅛	x	7	6	35	38
28 x 44	2	8⅛	x	7	10	37	40
28 x 46	2	8⅛	x	8	2	38	41
28 x 48	2	8⅛	x	8	6	39	43
30 x 24	2	10⅛	x	4	6	23	25
30 x 26	2	10⅛	x	4	10	25	26
30 x 28	2	10⅛	x	5	2	27	30
30 x 30	2	10⅛	x	5	6	30	33
30 x 32	2	10⅛	x	5	10	31	34
30 x 34	2	10⅛	x	6	2	32	35
30 x 36	2	10⅛	x	6	6	33	37
30 x 38	2	10⅛	x	6	10	34	37
30 x 40	2	10⅛	x	7	2	36	38
30 x 42	2	10⅛	x	7	6	37	38
30 x 44	2	10⅛	x	7	10	38	39
30 x 46	2	10⅛	x	8	2	39	41
30 x 48	2	10⅛	x	8	6	41	43
30 x 50	2	10⅛	x	8	10	42	45
32 x 24	3	0⅛	x	4	6	24	28
32 x 26	3	0⅛	x	4	10	26	29
32 x 28	3	0⅛	x	5	2	27	31
32 x 30	3	0⅛	x	5	6	31	34

Two-Light Windows—Continued

Glass Size	Window Size					Weight Glazed S. S.	Weight Glazed D. S.
Inches	Ft.	In.		Ft.	In.	Lbs.	Lbs.
32 x 32	3	0⅛	x	5	10		35
32 x 34	3	0⅛	x	6	2		37
32 x 36	3	0⅛	x	6	6		38
32 x 38	3	0⅛	x	6	10		39
32 x 40	3	0⅛	x	7	2		40
32 x 42	3	0⅛	x	7	6		41
32 x 44	3	0⅛	x	7	10		42
32 x 46	3	0⅛	x	8	2		43
32 x 48	3	0⅛	x	8	6		45
32 x 50	3	0⅛	x	8	10		47
34 x 24	3	2⅛	x	4	6	25	29
34 x 26	3	2⅛	x	4	10	28	31
34 x 28	3	2⅛	x	5	2	29	32
34 x 30	3	2⅛	x	5	6	32	34
34 x 32	3	2⅛	x	5	10		37
34 x 34	3	2⅛	x	6	2		38
34 x 36	3	2⅛	x	6	6		39
34 x 38	3	2⅛	x	6	10		40
34 x 40	3	2⅛	x	7	2		42
34 x 42	3	2⅛	x	7	6		43
34 x 44	3	2⅛	x	7	10		44
34 x 46	3	2⅛	x	8	2		45
34 x 48	3	2⅛	x	8	6		47
34 x 50	3	2⅛	x	8	10		50
36 x 24	3	4⅛	x	4	6	27	32
36 x 26	3	4⅛	x	4	10	29	33
36 x 28	3	4⅛	x	5	2	30	34
36 x 30	3	4⅛	x	5	6	31	37
36 x 32	3	4⅛	x	5	10		38
36 x 34	3	4⅛	x	6	2		39
36 x 36	3	4⅛	x	6	6		40
36 x 38	3	4⅛	x	6	10		42
36 x 40	3	4⅛	x	7	2		43

Two-Light Windows—Continued

Glass Size	Window Size					Weight Glazed S. S.	Weight Glazed D. S.
Inches	Ft.	In.		Ft.	In.	Lbs.	Lbs.
36 x 42	3	4⅛	x	7	6		44
36 x 44	3	4⅛	x	7	10		45
36 x 46	3	4⅛	x	8	2		47
36 x 48	3	4⅛	x	8	6		49
36 x 50	3	4⅛	x	8	10		53
40 x 24	3	8⅛	x	4	6		35
40 x 26	3	8⅛	x	4	10		36
40 x 28	3	8⅛	x	5	2		37
40 x 30	3	8⅛	x	5	6		39
40 x 32	3	8⅛	x	5	10		40
40 x 34	3	8⅛	x	6	2		41
40 x 36	3	8⅛	x	6	6		42
40 x 38	3	8⅛	x	6	10		43
40 x 40	3	8⅛	x	7	2		44
40 x 42	3	8⅛	x	7	6		45
40 x 44	3	8⅛	x	7	10		46
44 x 30	4	0⅛	x	5	6		47
44 x 32	4	0⅛	x	5	10		48
44 x 34	4	0⅛	x	6	2		49
44 x 36	4	0⅛	x	6	6		50
44 x 38	4	0⅛	x	6	10		51
44 x 40	4	0⅛	x	7	2		52
44 x 42	4	0⅛	x	7	6		53
44 x 44	4	0⅛	x	7	10		54
48 x 30	4	4⅛	x	5	6		42
48 x 32	4	4⅛	x	5	10		43
48 x 34	4	4⅛	x	6	2		44
48 x 36	4	4⅛	x	6	6		45
48 x 38	4	4⅛	x	6	10		47
48 x 40	4	4⅛	x	7	2		49
48 x 42	4	4⅛	x	7	6		56
48 x 44	4	4⅛	x	7	10		60

FOUR-LIGHT PANTRY WINDOWS.

One Light Wide.

Check Rail 1⅜ in. Thick.

Glass Size	Window Size					Weight Open	Weight Glazed
Inches	Ft.	In.		Ft.	In.	Lbs.	Lbs.
12 x 14	1	4⅛	x	5	2	7	17
12 x 16	1	4⅛	x	5	10	8	18
12 x 18	1	4⅛	x	6	6	9	20

TWO-LIGHT PANTRY WINDOWS.

One Light Wide.

Check Rail 1 ⅜ in. Thick.

Glass Size	Window Size					Weight Glazed
Inches	Ft.	In.		Ft.	In.	Lbs.
12 x 20	1	4⅛	x	3	10	13
12 x 24	1	4⅛	x	4	6	13
12 x 26	1	4⅛	x	4	10	14
12 x 28	1	4⅛	x	5	2	14
12 x 30	1	4⅛	x	5	6	15
12 x 32	1	4⅛	x	5	10	15
12 x 34	1	4⅛	x	6	2	15
12 x 36	1	4⅛	x	6	6	16
14 x 20	1	6⅛	x	3	10	16
14 x 24	1	6⅛	x	4	6	17
14 x 26	1	6⅛	x	4	10	17
14 x 28	1	6⅛	x	5	2	17
14 x 30	1	6⅛	x	5	6	19
14 x 32	1	6⅛	x	5	10	19
14 x 34	1	6⅛	x	6	2	20
14 x 36	1	6⅛	x	6	6	21

STALL SASH.

One Light. 1⅜ in. Thick.

Glass Size			Sash Size					Weight Glazed
Inches			Ft.	In.		Ft.	In.	Lbs.
8	x	10	1	0	x	0	14	4
10	x	12	1	2	x	0	16	4
10	x	14	1	2	x	0	18	6
12	x	16	1	4	x	0	20	6

BARN SASH.

Four Light. 1⅛ in. Thick.

Glass Size			Sash Size				Weight Glazed
Inches			Ft.	In.		In.	Lbs.
8	x	10	1	8	x	24	6
9	x	12	1	10	x	28	7
9	x	14	1	10	x	32	9
10	x	12	2	0	x	28	8
10	x	14	2	0	x	32	10
10	x	16	2	0	x	36	12
12	x	14	2	4	x	32	14
12	x	16	2	4	x	36	16

Six Light.

7	x	9	2	1	x	22	8
8	x	10	2	4	x	24	10
10	x	12	2	10	x	28	14

HOT BED SASH.

Made for 7 in. Glass.

Thickness	Sash Size					Weight Glazed
Inches	Ft.	In.		Ft.	In.	Lbs.
1⅜	3	0	x	6	0	29
1¾	3	0	x	6	0	36

For 8 in. Glass.

1⅜	3	4	x	6	0	34
1¾	3	4	x	6	0	42

ATTIC SASH.

3 in. Bottom Rail.

Thickness	Glass Size					
Inches	Ft.	In.		Ft.	In.	Lbs.
1⅜		18	x	20		6
1⅜		20	x	20		8
1⅜		20	x	24		10
1⅜		24	x	24		14
1⅜		24	x	28		16

TRANSOM SASH.

1 and 2 Lights. 1⅜ in. Thick.

Sash Size				Weight Glazed S. S.	Weight Glazed D. S.
Ft.	In.		In.	Lbs.	Lds.
2	6	x	10	5	
2	6	x	12	6	

Transom Sash—Continued

Sash Size				Weight Glazed S. S.	Weight Glazed D. S.
Ft.	In.		In.	Lbs.	Lbs.
2	6	x	14	6	
2	6	x	16	7	
2	6	x	18	7	
2	6	x	20	8	
2	8	x	10	5	
2	8	x	12	6	
2	8	x	14	7	
2	8	x	16	7	
2	8	x	18	8	
2	8	x	20	8	
2	8	x	22	9	
2	8	x	24	10	
2	10	x	14	8	
2	10	x	16	8	
2	10	x	18	9	
2	10	x	20	9	
2	10	x	22	10	
2	10	x	24	11	
3	0	x	14	6	
3	0	x	16	7	
3	0	x	18	7	
3	0	x	20	8	
3	0	x	22	11	
3	0	x	24	13	
3	6	x	14	8	9
3	6	x	16	9	10
3	6	x	18	10	11
3	6	x	20	10	11
3	6	x	22	11	12
3	6	x	24	12	13
3	8	x	14	8	10
3	8	x	16	9	11

Transom Sash—Continued

Sash Size				Weight Glazed S. S.	Weight Glazed D. S.
Ft.	In.		In.	Lbs.	Lbs.
2	6	x	14	6	
3	8	x	18	10	12
3	8	x	20	11	12
3	8	x	22	12	13
3	8	x	24	14	15
4	0	x	16	9	13
4	0	x	18	10	14
4	0	x	20	10	14
4	0	x	22	13	16
4	0	x	24	13	16
4	4	x	14	10	11
4	4	x	16	11	12
4	4	x	18	12	13
4	4	x	20	13	15
4	4	x	22	14	16
4	4	x	24	15	17
4	6	x	14	11	12
4	6	x	16	12	13
4	6	x	18	13	14
4	6	x	20	14	16
4	6	x	22	15	17
4	6	x	24	15	18
5	0	x	14	11	13
5	0	x	16	11	14
5	0	x	18	12	15
5	0	x	20	13	16
5	0	x	22	15	17
5	0	x	24	16	19
5	0	x	26	16	20
5	6	x	18	16	17
5	6	x	20	16	17
5	6	x	22	17	18

Transom Sash—Continued

Sash Size				Weight Glazed S. S.	Weight Glazed D. S.
Ft.	In.		In.	Lbs.	Lbs.
5	6	x	24	17	19
5	6	x	26	18	21
5	6	x	28	18	22
5	6	x	30	19	24
6	0	x	20	17	21
6	0	x	22	18	21
6	0	x	24	19	22
6	0	x	26	20	23
6	0	x	28	21	26
6	0	x	30	23	27
6	0	x	32	24	29
6	0	x	34	26	31

CELLAR SASH.

Two Lights. 1⅜ in. Thick.

Glass Size			Sash Size					Weight Glazed
Inches			Ft..	In.		Ft.	In.	Lbs.
10	x	12	2	1	x	1	4	7
10	x	14	2	1	x	1	6	7
10	x	16	2	1	x	1	8	8
10	x	18	2	1	x	1	10	8
12	x	12	2	5	x	1	4	6
12	x	14	2	5	x	1	6	7
12	x	16	2	5	x	1	8	8
12	x	18	2	5	x	1	10	9
12	x	20	2	5	x	2	0	9
12	x	22	2	5	x	2	2	10
12	x	24	2	5	x	2	4	10

Cellar Sash—Continued

Glass Size	Sash Size	Weight Glazed
Inches	Ft. In. Ft. In.	Lbs.
12 x 26	2 5 x 2 6	11
12 x 28	2 5 x 2 8	12
14 x 16	2 9 x 1 8	13
14 x 18	2 9 x 1 10	14
14 x 20	2 9 x 2 0	15
14 x 22	2 9 x 2 4	16
14 x 24	2 9 x 2 6	18
Three Lights—1⅛ in. Thick.		
7 x 9	2 1 x 1 1	6
8 x 10	2 4 x 1 2	6
8 x 12	2 4 x 1 4	6
9 x 12	2 7 x 1 4	7
9 x 13	2 7 x 1 5	7
9 x 14	2 7 x 1 6	7
9 x 16	2 7 x 1 8	8
10 x 12	2 10 x 1 4	8
10 x 14	2 10 x 1 6	9
10 x 16	2 10 x 1 8	10
12 x 12	3 4 x 1 4	10
12 x 14	3 4 x 1 6	11
12 x 16	3 4 x 1 8	12

COTTAGE FRONT SASH.

Check Rail 1⅜ in. Thick.

Size of Opeuing	Bottom Light	Top Light	Weight Glazed
Ft. In. Ft. In.	In. In.	In. Iu.	Lbs.
3 8 x 5 2	40 x 40	40 x 16	44
3 8 x 5 6	40 x 44	40 x 16	46
3 8 x 5 10	40 x 48	40 x 16	48

Cottage Front Sash—Continued

Size of Opening					Bottom Light			Top Light			Weight Glazed
Ft.	In.		Ft.	In.	In.		In.	In.		In.	Lbs.
3	8	x	6	2	40	x	50	40	x	18	49
3	8	x	6	2	40	x	52	40	x	16	51
3	10	x	5	2	42	x	40	42	x	16	45
3	10	x	5	6	42	x	44	42	x	16	46
3	10	x	5	10	42	x	48	42	x	16	48
3	10	x	6	2	42	x	48	42	x	20	49
4	0	x	5	2	44	x	40	44	x	16	50
4	0	x	5	6	44	x	44	44	x	16	52
4	0	x	5	10	44	x	46	44	x	18	54
4	0	x	5	10	44	x	48	44	x	16	56
4	0	x	6	2	44	x	50	44	x	18	57
4	0	x	6	6	44	x	50	44	x	22	59
4	0	x	6	2	44	x	52	44	x	16	60
4	4	x	5	2	48	x	40	48	x	16	53
4	4	x	5	6	48	x	42	48	x	18	56
4	4	x	5	6	48	x	44	48	x	16	58
4	4	x	5	10	48	x	46	48	x	18	60
4	4	x	5	10	48	x	48	48	x	16	60
4	4	x	6	2	48	x	50	48	x	18	62
4	4	x	6	6	48	x	52	48	x	20	63
4	6	x	5	2	50	x	40	50	x	16	58
4	6	x	5	6	50	x	44	50	x	16	60
4	6	x	5	10	50	x	48	50	x	16	62
4	6	x	6	2	50	x	50	50	x	18	65
4	6	x	6	6	50	x	50	50	x	22	65
4	8	x	5	2	52	x	40	52	x	16	64
4	8	x	5	6	52	x	42	52	x	18	66
4	8	x	5	10	52	x	46	52	x	18	68
4	8	x	6	2	52	x	48	52	x	20	69
4	8	x	6	6	52	x	52	52	x	20	70
5	0	x	5	6	56	x	44	56	x	16	72
5	0	x	5	10	56	x	48	56	x	16	75

Cottage Front Sash—Continued

Size of Opening					Bottom Light	Top Light	Weight Glazed
Ft.	In.		Ft.	In.	In. In.	In. In.	Lbs.
5	0	x	6	2	56 x 48	56 x 20	78
5	0	x	6	6	56 x 52	56 x 20	81
5	0	x	7	2	56 x 56	56 x 24	85

DOOR TABLE.

This Table gives the size of Doors usually kept in stock.

Ft. In. Ft. In.	Ft. In. Ft. In.	Ft. In. Ft. In.
2 0 x 6 0	2 6 x 6 0	2 10 x 6 8
2 0 x 6 6	2 6 x 6 4	2 10 x 6 10
2 0 x 6 8	2 6 x 6 6	3 0 x 6 0
2 0 x 6 10	2 6 x 6 8	3 0 x 6 8
2 4 x 6 0	2 6 x 6 10	3 0 x 6 6
2 4 x 6 4	2 6 x 7 0	3 0 x 6 10
2 4 x 6 6	2 8 x 6 0	3 0 x 7 0
2 4 x 6 8	2 8 x 6 8	2 8 x 7 6
2 4 x 6 10	2 8 x 6 10	3 0 x 7 6
2 4 x 7 0	2 8 x 7 0	3 0 x 8 0

NUMBER AND LENGTH OF COMMON NAILS IN A POUND.

Size d	Length In.	No. to lb.	Size d	Length In.	No. to lb.
3	1¼	500	16	3½	38
4	1½	300	20	4	25
6	2	168	30	4½	18
8	2½	90	40	5	14
10	3	60	50	5½	11
12	3¼	50	60	6	9

SIDE LIGHTS FOR DOORS.

1⅜ in. Thick.

Sash Size				
Ft.	**In**		**Ft.**	**In.**
1	0	x	6	6
1	0	x	6	8
1	0	x	6	10
1	0	x	7	0
1	0	x	7	6
1	2	x	6	6
1	2	x	6	8
1	2	x	6	10
1	2	x	7	0
1	2	x	7	6
1	2	x	8	0

MAIN RAFTER LENGTH.

To get the length of main rafters with square, take half the width of building on the blade and the rise of roof on the tongue and measure the distance across from one number to the other, and you have the length in inches and twelfths, and call the inches feet and the twelfths inches. A second way is to take 12 on the blade and the number of inches rise per foot on the tongue, and step out the rafter as many times as there are feet in half the width of building, using the same figures each time.

The blade will give the plate cut, the tongue the top or plumb cut. A third way is to take run on the blade and the rise of roof on tongue and step 12 times.

I will now explain the first way: Suppose we have a building 26 feet wide and the roof rises 8 ft. 8in. We take 13 on the blade and 8 8-12 in. on the tongue, and measure across the square from one to the other, which is 15 in. 7½ twelfths. So the length of main rafter is 15 ft. 7½ in., as you will see in rafter table of 8 in. rise per foot.

Now I will show the second way in which we can get the length: We will take 12 on blade and 8 in. (rise per foot) on the tongue. By laying the square on timber to be cut with these figures and step 13 times (which is the run), we have the length, 15 ft. 7½ in.

I will now show the third way and use the same building, 26 ft. wide and 8 in. rise per foot run. In a 26-foot building with 8 in. rise per foot, the height of roof is $8 \times 13 = 104$ in., or 8 ft. 8 in. We take the 13 on blade and 8 8-12 in. on the tongue and step 12 times and we have the same length, 15 ft. 7½ in.

So you can readily see that the steel square will never lie to you if properly handled. While I show these three ways, I do not mean for the mechanic to use all of them. He can select his own choice out of the three.

LENGTH OF JACK RAFTERS.

The top and plate cuts of jack rafters

are always the same as the main rafters. A good way to get the length of shortest jack is to take 12 on blade and the inches rise per foot on tongue, and lay the square on a straight edge board, with these figures set to edge of board, then mark along outside of blade, then slide blade to number corresponding to the distance you wish to set them on centers; always keep the blade with the mark on board. Now where the tongue crosses the straight edge make another mark, and the distance from one mark to the other is the length of the jack. *Example*: Now, suppose we take a building of any width, and 8-inch rise per foot, we lay square on a straight edge 12 on blade and 8 on tongue, and mark at blade, then slide blade up to 16 inch mark, then the tongue will cross the straight edge at 10 8-12 inches; from 16 to 10 8-12 inches is 19¼ inches, which is the length of first jack, spaced 16 inches on centers, when 8 inch rise per foot is used. This rule is called the rule of proportion by steel square. We will now try the example with figures; therefore, the numbers we want to get must be to 16 as 8 is to12. Now 8 is 2-3 of 12 and 2-3 of $16 = 16 \div 3 = 5$ 1-3 and 5 1-3 $\times 2 = 10$ 2-3, showing us that the tongue of square would cross the straight edge at 10 2-3 or 10 8-12 as before; then from this number to 16 is length of first jack. Now again, if the rafters were spaced two feet on centers we would slide the blade to 2 feet instead of 16 inches, then the tongue would cross at 16 inches, as 16 is 2-3 of 24. Then from 16 across to 24 would be 28⅞ inches, which is the length when spaced 2 feet on centers. When jack rafters are spaced 1 foot centers their length is from 12 to rise numbers. When 2-foot centers, twice that, etc. Another good way to get the length of shortest jack is to divide the length of the main rafter by one unit more than the number of jacks to go between the corner and the center of width of building. *Example*: Suppose we take a building 16 feet wide and 10 inches rise per foot, and space the jacks 2 feet on centers; then there will be 3 jacks between the corners and the crotch or first main rafter; now, as we have 3, there will be 4 spaces; the main rafter length is 10 feet 5 inches, or 125 in.÷4=31¼ in., as you will see in rafter table of 10 in. rise.

There are still other ways of getting the lengths of jacks, but I think the above ways will be sufficient for the mechanic.

JACK RAFTER SIDE CUTS.

Here I give some of the ways in which to obtain the side or cheek cuts of jack rafters with the steel square. Now, in roof framing it is a good idea to use 12 on the square for the run of main and jack rafters, regardless of the width of building, and for length use diagonal from 12 to rise number. Now, with 8 inches rise per foot 12 is the run, 8 is the rise and from 12 to 8 is the length, which is 14 42-100 inches or 14 5-12 inches. Here we have it all—length, run and rise is all we need to get any of the cuts for main and jack rafters. The cheek or side cut of any jack rafter is length and run cut on length. In the above case, with 8 inches rise per foot, the cut would be 12 and 14 5-12 inches cut on 14 5-12. Now, if the rise be 10 inches per foot, the cut would be 12 and 15⅝ cut on 15⅝, etc.

Another way to get the side cut of jack rafters is to lay off the top or plumb cut on the rafter, then square back from the plumb line on side of rafter the thickness of rafter; then square this mark across the top edge of rafter and draw a line from this diagonally across to plumb mark, and you have the cut. The best way is to square both lines across the edge, then the diagonal line can be drawn from either side, so as to put the side cut on either side wanted. This way will give the correct side cut for any pitch roof. This cut is known as the hopper cut. The side cut of jacks can also be laid off similar to this on a board, which I don't think is necessary to explain. All the mechanic has to remember is length and run cut on length. You can use length of main or jack rafters and their runs.

HIP AND VALLEY RAFTER LENGTHS.

The length of hip and valley rafters are gotten in several different ways, as all other rafters. The first way I will explain is to first find out the run of hip or valley, which is not half the width of building, as main rafters, but it is the diagonal distance of half the width of building that gives the run, and this diagonal with the rise gives the length. We will now take a building 28 feet wide and 8 inches rise per foot; half the width is 14 feet and the run is the distance from 14 to 14, which is a little over 19¾ inches; the rise of this roof is $14 \times 8 = 112$ inches, or 9 feet 4 inches; the length is the distance from 19¾ inches to 9 4-12 inches, which is 21 11-12 inches, nearly; or we will call it 21 feet 11 inches, which is the length of hips and valleys.

The second way is to take 17 inches on the blade of square and the inches rise per foot on the tongue, and step out the rafter as many times as there are feet in half the width of building, and this will also give the length. A third way is to take the length of main rafter on blade and half the width of building on tongue and measure the distance from one to the other, and it gives the length. I will also give the fourth way of getting the length, which is to take the run of hip on the blade and the rise of roof on the tongue and step out the rafter 12 times, and you have the length. There is another way which would be the fifth way, by drawing and scaling, and if there are other ways, I have not learned them.

HIP AND VALLEY CUTS

I will here try to tell my readers how to get the cuts of hips and valleys. A hip and a valley rafter is one and the same rafter when it comes to lengths and cuts. The bottom and top cuts of all rafters are made with the same sets of figures. That is, the blade gives one cut while the tongue gives the other without changing to any other figures; and the two cuts are always square to each other, or at right angles to one another. For hips and valleys we always use 17 for run instead of 12, which we use for main and jack rafters; the reason for this is that 17 is supposed to be the diagonal of 12, or the diagonal of 1 foot, while it is a little too much, it is accurate enough for all rafters.

As I said before, 17 is the run and the distance from 17 to the rise number is the length. For the plate and plumb cuts, take 17 on blade and rise number on tongue; 17 gives plate cut; rise number gives top or plumb cuts.

HIP AND VALLEY SIDE CUTS.

As I said before, the length and run gives the side or cheek cuts. We will now take a roof with 8 inches rise per foot. Now, 17 is the run, and from 17 to 8 is the length, which is 18¾ inches; 17 inches and 18¾ inches cut on the latter give the side cuts for hips and valleys. Again, if these numbers run too high for the square, they can be made smaller by taking half of each number. As half of 17 is 8½ and half of 18¾ is 9⅜, then 8½ and 9⅜ cut on the latter is also correct Always remember that the cheek or side cut is always less than a 45° angle. If rafters lay on a level as porch joist do, their side cuts would be a 45° angle, but as they rise at one end, the angle becomes sharper and the more they rise the sharper the angle gets. The side cuts of jack rafters are always a less angle than the hips and valleys are, for they never have the same degree of pitch. The cheek or side cuts of hip or valley rafters can also be gotten by squaring over from the plumb or top cut; the thickness of timber, in the same way as I have just stated for the jack rafters in the foregoing pages. It is an easy matter to frame any kind of a roof if you only understand the square and what it means towards a roof.

SHEATHING CUTS ON HIP ROOFS.

The sheathing cuts are gotten by using length of main with run and rise. The face cuts of sheathing boards over hip and valley rafters are length and run of main R-cut on run. The edge cut is length and rise cut on rise. We will now cut sheathing boards for a roof with 10 inches rise per foot; then 12 is the run and the distance from 10 to 12 is 15⅝, which is the length. The face cut of sheathing or roof boards for this pitch roof would be 15⅝ and 12 cut on 12. The edge cut would be 15⅝ and 10 cut on 10.

SHINGLE CUTS IN VALLEY.

The shingle cuts for valleys are same as the side or cheek cuts of jack rafters, which is length and run cut on length.

RAKE CORNICE CUTS.

A rake cornice is one that is square with the roof—not square with the building, as is the case where lookouts are used. When a roof has hips or valleys and has a rake cornice, there is always a double cut or miter to the cornice where it strikes a hip or valley, but there are a good many mechanics who do not thoroughly understand these cuts. As I have stated several times, the length, run and rise is all you need to get any of these cuts, if you know how to use them on the lumber. **The run of hips and valleys 17** is never used in rake cornice cuts; in other words, 17 is used only for getting the length of hip, or bottom, top or side cuts of hips or valleys. I will now show how to get the cuts for a rake cornice on a roof with 1-3 pitch, which is 8 inches rise per foot of run. Now, 8 is rise, 12 is run, and from 8 to 12 is the length, which is 14 5-12. The face cuts of facia boards is length and rise cut on rise, which is 14 5-12 and 8 cut on 8, the edge cut of facia is length and run cut on run, or 14 5-12 and 12 cut on 12. The cuts for a gable freize where it connects with level freize at the corner of a building is another cut that bothers a good many carpenters. First cut the level freize at corner of building on a 45° angle or miter cut; now the face cut of gable freize at corner is the same as the top cut of rafters, while its edge cut is not a 45° angle, as a good many carpenters take it to be. If its face cut was square across, then the edge cut would be a 45° angle, and then if it was fit to level freize it would also be level. But, like the jack rafter, as it rises on one end, its edge cut becomes a sharper cut, and therefore its edge cut is the same as the cheek cut of jack rafters, which is length and run cut on length, or 14 5-12 and 12 cut on 14 5-12, and its edge or bevel cut can be gotten by squaring over from face or plumb cut the thickness of freize. Now, the cuts for plancier boards of a rake cornice is the same as sheathing boards over hips and valleys.

RAKE CORNICE MITER BOX.

The cuts for mouldings on rake cornices are the same as the cuts for facia and cannot be very well cut without a miter box. A box of this kind has a double cut; that is, it has an angle across top of box and another angle down the sides. For the cut across top of box take length and run cut on run, and for the cut down the sides use length and rise cut on rise. Always make two cuts, so as to have a right and left-hand cut. Now, put moulding in box with top side down and cut it, and if it don't fit, ask me what is wrong with it.

Now, I think by the time the carpenter masters these few pages which I have just gone over, he will be able to make any of the cuts necessary for a rake cornice, or, at least, I hope he can, for I have given all the cuts about as near as I know how in writing.

ESTIMATING OF SHINGLES.

The length of shaved shingles usually run from 18 to 30 inches in length and are about ½ inch thick at the butt, and 1-16 inch at the top, while sawed shingles run from 14 to 18 inches in length and are about 7-16 inch thick at the butt and 1-16 inch at top. The way to determine the number of shingles to the square (which is 100 square feet), is to multiply the exposure to weather by the width of shingle; then you have the exposed area of one shingle; then divide 14,400 (the amount of square inches in a square), by the exposed area of one shingle.

Example: We now have shingles 4 inches wide, and the exposure of one shingle is 4½ inches to weather; $4\frac{1}{2} \times 4 = 18$ and $14{,}400 \div 18 = 800$, the amount it will take to cover one square. In estimating shingles, an allowance should always be made for waste, especially where there are hips and valleys to shingle over. The exposure of a shingle should never be too great so as to have the top shingle come less than 3 inches over the top of the third shingle below it. The way to determine this lap is to deduct 3 inches from the length of shingle and divide the remainder by 3. Thus: The length of shingle is 18 inches; $18 - 3 = 15$ and $15 \div 3 = 5$ inches, which is the exposure that a shingle 18 inches should have, with a lap of 3 inches over the third shingle below it.

The following table, giving the amount of shingles of four different widths required to cover 100 square feet of roof:

SHINGLE TABLE.

Exposure to Weather Inches	Number of Shingles required for 100 Sq. Ft. of Roof			
	3 in. Wide	4 in. Wide	5 in. Wide	6 in. Wide
4	1200	900	720	600
4½	1067	800	640	534
5	960	720	576	480
5½	874	655	524	437
6	800	600	480	400
7	685	514	412	343
8	600	450	360	300

MENSURATION.

SQUARE. To find the area of a square, multiply one side bv itself.

PARALLELOGRAM. To find the area of a parallelogram, multiply the length by the width.

RIGHT-ANGLE TRIANGLE. To find the area of a right-angle triangle, multiply the base by the perpendicular and divide by 2.

CIRCLE. To find the area of a circle, multiply the square of the diameter by .7854.

CUBE. To find the solidity of a cube, raise the length of one side to the third power.

PARALLELOPIPED. To find the solidity of a parallelopiped, multiply the length, width and depth together.

CIRCLE. To find the circumference of a cricle, multiply the diameter by 3.1416. To find the diameter of a circle, divide the circumference by 3.1416.

GLOBE. To find the solidity of a globe, multiply the cube of the diameter by .5236. To find the surface of a globe, multiply the square of the diameter by 3.1416.

CYLINDER. To find the area of a cylinder, multiply the circumference by the length, and to the product add the area of the bases, To find the solidity of a cylinder, multiply the area of the base by the length or height.

CONE. To find the area of a cone or pyramid, multiply the circumference of the base by the slant height and divide the product by 2; then add the area of the base. To find the solidity of a cone or p··ramid, multiply the area of the base by the perpendicular height and divide by 3.

LUMBER. To find the contents of lumber, multiply the length, width and thickness together and divide by 12.

CORDWOOD. To find the number of cords in a pile of wood, multiply the length, width and height together and divide by 128.

STONE. A perch of stone masonry contains 24¾ cu. ft. To find the number of perches in a wall, divide the number of cu. ft. by 24¾, or multiply cu. ft. by .0404.

GRAIN. To find the capacity of a bin, box or wagon bed, multiply the number of cu. ft. by .8. The result will be in bushels.

LAND. To find the number of acres in a tract of land, divide the numebr of sq. rd. by 160; or the number of sq. chains by 10.

CISTERNS. To find the capacity of a cistern or tank, multiply the square of the mean diameter by the depth (all in feet) and the product by 5⅞; the result will be in gallons. To find the contents in barrels, divide the gallons by 31½.

NOTE.—The square of a number is the number multiplied by itself. The square of 3 is 9, the square of 8 is 64, etc.

TANKS. To find the capacity of a square tank or cistern, multiply the number of cu. ft. by 7½; the result will be in gallons. To find the contents in barrels, multiply the cu. ft. by 2⅜, and point off one figure to the right, or divide the gallons by 31½.

BARRELS. To find contents of a barrel or cask, multiply the square of mean diameter by the depth (all in inches) and multiply the product by .0034; the result will be in gallons.

The correct number of gallons of any tank or cistern can be gotten by dividing the cu. in. by 231, or the number of bushels, by dividing the cu. in by **2150.42**

BRICK. The eastern standard brick are about 8¼×4×2¼ inches in dimensions. It takes about 22½ brick to a cu. ft. of wall. When laid flatwise, it takes about 4¼ brick to the square foot. Common brick weigh about 4½ lbs., while pressed brick the same size will weigh 5 lbs. About 500 brick are required to a cubic yard of wall.

PLASTERING LATHES are 1½ inches wide and 4 feet long, and it takes about 16 to the square yard.

WALL PAPER. A roll of wall paper contains about 36 square feet or 4 square yards.

IRON. To find the weight of round iron per lineal foot, square the diameter in ¼ inches and divide by 6, To find the weight of square or flat iron per lineal yard, multiply the width by the thickness and the product by 10. To find the tensile strength of round iron, square the diameter in quarter inches; the result will be the tearing strength in tons. If square iron, add ¼. The strength of steel is about three times that of iron.

FURNITURE. Chairs—The height of seat above floor is 18 inches; the depth of seat of standard rocking chairs is 19 inches; while there are some chairs that have a seat depth of 16 inches. The backs of standard chairs are 38 inches above the floor; chair arms are 9 inches above seat. Lounges are 6 feet long and 30 inches wide. Writing and dining tables are 2 feet 5 inches high. Bedsteads, single size, are from 3 to 4 feet wide; three-fourths size, from 4 feet to 4 feet 6 inches wide; double size are 5 feet wide; length, from 6 feet to 6 feet 8 inches, inside. Bureaus are from 2 feet 6 inches to 3 feet high. Night stools are 18 inches high. Chiffoniers are 4 feet 4 inches high. Washstands are 2 feet 7 inches high; wardrobes are from 6 feet 9 inches to 8 feet high. Sideboards are 3 feet 3 inches high.

UNEVEN PITCH ROOF.

An uneven pitch roof is one that has two or more different pitches in the same roof.

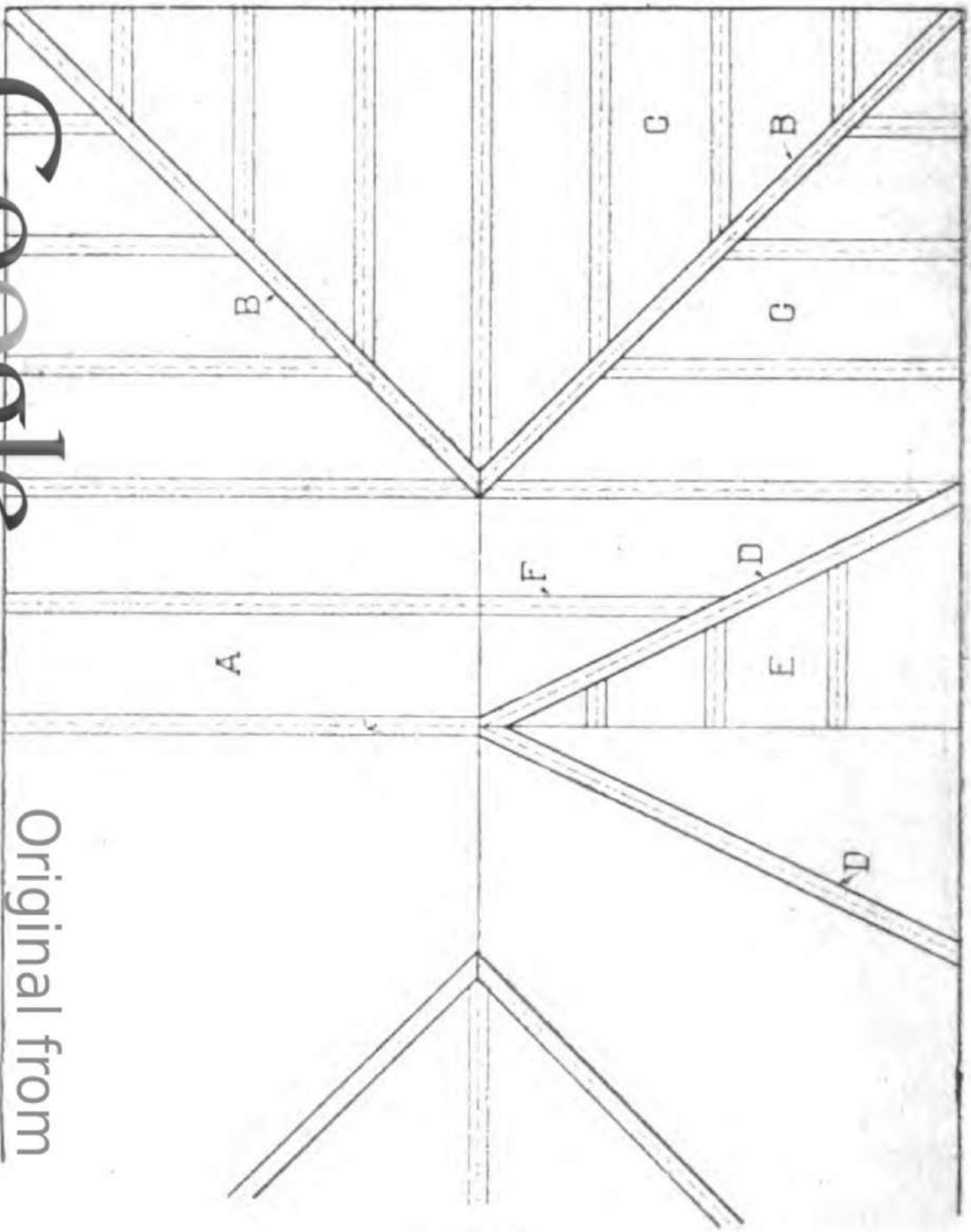

Fig. 6.

Figure 6 is a construction of a roof with two different pitches. The building is 16×24, with a gable on front side 8 feet wide. The main roof has 1-3 pitch or 8 inches rise per foot of run, while the gable has 2-3 pitch or 16 inches rise per foot. The way to get the rise of main roof is to multiply half the width of building by 8 (the rise number) and divide by 12, which gives us 5 feet 4 inches for the height of roof. The height or rise of roof can also be gotten by laying the square on a straight edge with 12 on blade and 8 on tongue; mark along blade, then slide the blade to one-half the width of building, which in this case is 8, and where the tongue crosses the straight edge is the height of ridge board above plate, which is 5 4-12 or 5 feet 4 inches. In this roof the height of gable ridge is the same as the main ridge, and is gotten in the same manner.

Main Rafters—To get the length of main rafters (A) measure the distance on the square from 8 (the run) to 5 4-12 (the height of roof), and it gives us a little over 9 feet 7 inches. Another way is to take 12 on blade and 8 on the tongue and step out the rafter as many times as there are feet in half the width of building and it gives the same length.

Hip Rafters—To get the length of the hip rafters (B) we must first get their run, which is done by finding the diagonal of half the width of building, from 8 across to 8, which is 11¼, the run of hip; now, from this run across to rise of roof is the length. Thus: From 11¼ to 5 4-12 is 12 feet 6 inches, the length of hips. There are several other ways of getting the length of hips, which I have given in the front of this book. A good way is to take 17 on the blade and the rise per foot, 8 on the tongue, and lay on straight edge and mark along blade and slide blade to the run of hip 11¼, then the distance between where the blade and tongue crosses the straight edge is the length. With this rule there are two birds killed with one stone; for when we slide the blade from 17 to run 11¼, the diagonal distance gives us the length, and at the same time the distance where the tongue crosses gives the height or rise of roof. The same occurs with main rafters when we use 12 with rise number and slide 12 side to run of main rafter; then where the tongue crosses is the rise of roof and the diagonal is the length, which is getting rise and length at one operation.

Jack Rafters—There are several ways of getting the length of the jack rafters (C), one of which is to divide the length of main rafter by one unit more than the amount of **jacks** that are to go between the corner and the crotch or first main. On this roof the jacks are spaced 2 feet on centers and there are three between the corner and the crotch rafter. Now, we divide the length of main rafter, 9 feet 7 inches, by 4, which gives 28¾ inches for the length of shortest jack. Another way is to take 12 on blade and rise per foot on the tongue and mark at blade and slide to the number of inches the jacks are to be spaced on centers; then the diagonal is the length of jack. Another way is to multiply the diagonal of 12 and rise per foot number by the number of inches the jacks are spaced on centers and divide by 12.

Example: The distance from 12 to 8 is 14 5-12, or $14.42 \times 24 \div 12 = 28$ 10-12 inches for length of jack rafters.

Gable Main Rafters—Their length are gotten the same as main rafters on main roof, which is the distance from their run across to their rise. Thus: From 4 the run to 5 4-12 the rise, which is 6 feet 8 inches, the length of gable main rafters. In this gable there are only one pair of main rafters, which are not shown on plan.

Valley Rafters—Now, as the valley rafters (D) do not form a right-angle where they connect each other, as the hips do, their length is gotten a little different. To get the run of valley, take 4 (the run of gable) and 8 (the length of gable ridge) and measure across from one to the other, and it gives 8 11-12, which is the run; then from the run 8 11-12 to the height of roof 5 4-12 is the length which is 10 feet 4 inches, the length of valleys.

Gable Jack Rafters. The length of the gable jacks (E) are gotten by dividing the length of gable main rafters, 6 feet 8 inches, by 4, the amount of spaces between the gable main rafters and the main ridge; 6 feet 8 inches divided by 4=20 inches, which is the length of shortest jack on gable; the next longest jack is twice that of the first. Thus: 20 inches, 40 inches, 60 inches and the main rafters are 80 inches.

Jack Rafter—(F) This length is gotten by dividing main rafter (A) by 2, the amount of spaces along the valley on the main roof side. Thus: 9 ft. 7 in.÷2=4 ft. 9½ in.

Hip Rafter Side Cuts. The side cuts of Hips (B) where they come together at the ridge are gotten by taking length of hip 12½ and run of hip 11¼ cut on 12½.

Jack Rafter Side Cuts—The side cuts of jack rafters on main roof are gotten by taking the length of main 9 7-12 with the run of main rafter 8 and cut on length. The side cut of jack rafter (F) is gotten by taking length of main rafter (A) with the run of gable rafter, cut on length. The side cuts of jack rafters (E) are gotten by taking length of gable main rafters and the run of main roof 8, cut on length.

Side Cut of Valley Rafters—(D) Where they connect each other at gable ridge are gotten by taking the length of gable ridge or the run of main roof 8 on the blade and the run of gable 4 on the tongue; mark at blade then slide blade to the run of valley rafter, 8 11-12, where the tongue crosses the straight edge at 4½ in. is run we wish. Now, with this run 4½ and the length of valley 10 4-12 and cut on length, we have the cut. For the side cut of valley where it strikes the main roof, we take the length of gable ridge or the distance the valleys reach over from end of gable or the run of main roof, 8 on the blade, and run of gable roof, 4 on tongue, then mark and slide to run of valley rafter, 8 11-12; the blade will give 17 10-12 for run; now, using this run 17 10-12 with the length of valley rafter 10 4-12 and cut on length gives the cut. There are several other ways of getting the side cuts, one of which is to make a drawing of the valleys and extend the length of valleys until they reach the ridge, and the angle of rafter and ridge on plan will be the side cut. The bottom and top cuts of these rafters are all gotten by using their run and rise, the run giving the bottom cut, the rise the top cut, or either use 12 and rise per foot number for the main and jacks; and 17 and rise per foot for hips and valleys; the rise number always gives the top or plumb cut, while the other gives the bottom or plate cut. The bottom and top cuts of jack rafters are always the same as main rafters of the same pitch. Always remember that one-half the thickness of ridge board must be taken from the length of hips and valleys, not from their total length, but square over from their side or cheek cut; also half the thickness of ridge is to be taken from main rafters square over from their down bevel; and always take one-half the thickness of hips and valleys from the length of jack rafters square over from their side bevel.

Roof Boards—The face cut of roof boards over hips is length of main rafter (A), and run of main roof cut on run; the edge cut of roof boards over hips is length of main rafter (A), and rise of roof cut on rise. The face cut of boards on main roof to fit valley is length of main rafter (A), and run of gable cut on run. The edge cut is length of main rafter (A) and rise of gable, cut on rise.

Roof Boards Over Valley on Gable. Face cut is length of main rafter on gable and the run of main roof cut on run. Edge cut is length of gable rafter and rise of main roof cut on rise. Shingle cuts for valley are same as side cut of jack rafters. Face cut of facia boards are same as edge cut of roof boards; edge cut of facia boards are same as face cut of roof boards; plancier board cuts are same as roof boards.

Gutter Cuts—The cuts of the gutter boards are same as edge cut of roof boards. The side cut of gutter is same as face cut of roof boards.

Purlins—The cuts of purlins at hips and valleys are same as the cuts of facia boards.

Backing of Hip Rafters. The backing of hip rafters were once considered a necessity, but nowadays it is seldom done; in this case the hips had to have their top corners taken off, so as the sheathing or roof boards would fit the hips on their tops, the same as main and jack rafters. There are several ways of getting this bevel for the backing of the hips, one of which we take the length of hip on blade and its rise on the tongue; the latter gives the cut. Another way is to take half the thickness of hip and lay it off along the line of the plate cut, measuring from back of hip, and from this point to center of back of hip is the amount to be taken off. There is another way which is to lay the square on the seat or bottom of hip, after it is cut, using the square just as if it was the toe board or plate, and mark along side of blade and tongue, and cut off to these lines, and the backing of hip is completed.

Now, I think I have written enough on roof framing to enable the reader to frame most any kind of a roof he may come into contact with. But I wish to say a little more in regard to side cuts. It is always the length and run of a rafter that gives the side cut, and cut on length, when getting side cuts for uneven pitch roofs, always use the length of rafter from the side you are working on, and the run from the opposite pitch, and cut on length; the rule is to always take the run and rise from the opposite side pitch from where the rafter is to be placed. This only occurs where there are more than one pitch in the same roof.

DORMER ROOFS.

A dormer roof is a roof which is placed on top of another roof and is more for an ornament than for durability. When dormer rafters are placed on top of another roof, their bottoms have a side bevel, so as to make a good fit on the sheathing of the main roof. The first or longest pair of rafters are gotten the same as any common rafter, their length being the distance from their run to their rise. To get the length of the next longest pair, first find out how many pairs there are to be on the dormer, and divide the length of the first or longest rafter in inches by the number of pairs to be used, and the quotient will be the length in inches of the shortest rafter, or the amount to be taken from the longest rafter for length of second longest. Thus: If the ridge or level length of a dormer roof is 10 feet, and the rafters are to be spaced two feet on centers, then there would be 5 pairs or 5 spaces. Now, the first or longest rafter is 9 feet 2 inches or 110 inches, divided by 5=22 inches, which is the common difference or the length of shortest pair. If the dormer be the same pitch as the main roof on which it is placed, and the rafters are spaced the same distance on centers as the main roof rafters, then the shortest dormer rafters would be the same length as the shortest jack on main roof.

Side Cuts—Now, when the dormer and main roof have the same pitch, then the side bevel of dormer rafter to fit on main roof is the same as side bevel of jack on main roof, which is length of main rafter and its run, cut on length. This bevel can also be gotten by squaring over the thickness of rafter, same as for jack rafters or hips. But remember that the plumb cut must be used to square over from instead of the plate cut. Then the same bevel can be set at foot of dormer rafter. This rule will only work when both dormer and main roof is of the same pitch.

I will now give my readers a few ways of getting the side cuts of dormer rafters where they rest on the other roof, regardless of the pitch of the main roof, or of any pitch the dormer may have. We will now take a dormer roof with one-third pitch (or 8 inches rise per foot of run) placed on a main roof with 5-12 pitch (or 10 inches rise per foot). Now, the side bevel of dormer rafter is length of dormer rafter and run of main roof, cut on length. But it must be remembered that the main roof must be brought to a run that would raise its ridge to the same height as that of the dormer; this is based on a building with a width of 24 feet, as all roof framing, so as to get a run of 12 feet. As the dormer is 8 inches rise per foot and we will give it a run of 12 feet, which would raise its ridge to a height of 8 feet; the next thing to do is to find out how much run the main roof would have to raise its ridge to a height of 8 feet with 10 inches rise per foot. Now take the pitch of main roof, 10 and 12 on the square mark on 10 side, then slide 10 side to pitch of dormer 8; now the other wing of the square will cross at 9 7-12, showing very plainly that the main roof would have a run of 9 feet 7 inches to bring it to a height of 8 feet. The length of a rafter one-third pitch is 14 5-12, taken with a run 9 7-12 and cut on length, gives the side cut of the dormer rafter at bottom. Another way to get this run is to multiply the rise number of the dormer by 12 and divide the product by the rise number of the main roof. Thus: $8 \times 12 = 96 \div 10 = 9$ 3-5, which is the correct run wanted. Now, as we cannot very handily get 9 3-5 from the square, we will call it 9 7-12, which is a very small fraction less, although near enough for any of the cuts. There is another way of getting this run proportioned, which is to multiply the rise number of the main roof 10 by 12 and the product by the rise number of the dormer 8. Thus: $10 \times 12 \times 8 = 9.60$, which is equal to 9 3-5 as before. We will now reverse the operation and put the 10-inch rise on top of a main roof with an 8-inch rise; now, as before, take the pitch of the main roof, 8 and 12 on the square mark on the pitch side 8, and slide to pitch of the dormer 10, then the other side of the square will cross at 15, which is the run of the main roof, to give it a height equal to that of the dormer.

Now, as the length of a rafter of 10 inches rise per foot is 15⅝ and used with this run 15 and cut on length, we also have the cheek cut of dormer rafter. Most any carpenter can readily see that a building with an 8-inch rise and a run of 15 feet will rise to the same height as a building with 10 inches rise and a run of 12 feet. These rules all work correct for any uneven pitch roof for getting the side cuts of roof boards and rake cornice cuts. When one of the pitches does not rise to the height of the other, then proportion them to the same height, and proceed as above directed.

Gable Aprons, where they are shingled, and the frieze and plancier boards, have to fit down on the shingles their side cuts are the same as the dormer side cuts. When the apron is the same pitch as the gable, then the side bevel of frieze is the same as side cut of jack rafters, while its bevel or face cut is the same as the bottom cut of the main rafters on gable. When the apron is a different pitch of that of the gable, then the plancier and frieze cuts are gotten as the above dormer cuts.

Lapping a rafter on another roof of a steeper pitch. Now suppose we have a main roof with a rise of 10 inches per foot, and wish to lap another roof on top of the one with ¼ pitch, or 4 inches rise per foot. To get the proper cut for the ¼ pitch rafter to fit on the main roof rafter, first lay off the plumb cut of the ¼ pitch and from that mark lay off the plumb cut of the main roof, and you have the cut.

Octagon Roofs—An octagon roof can be framed in several different ways, one of which is to have an octagon pole through the center of roof. In this case all the hip rafters would be cut the same length and then the hips would not have any side bevel at their top ends, for they would fit against the pole, and one-half the square width or half the short diameter of the pole should be taken from the length of each hip rafter square over from its down bevel. Another way is to cut a side bevel on each side of all the hips and have them all the same length. Another good way to frame an octagon roof is to cut the first pair of hips full length and let them come together at top with a plumb cut only. Now, the second pair of hips are laid out the same as first pair, but half the thickness of the first pair must be taken from the length of second pair square over from their down bevel. Now, the third and fourth pairs should be cut shorter than the first pair by one-half the diagonal of a square with a side equal to the thickness of the first pair. If the first pair is 2 inches thick, then each rafter of the third and fourth pairs would cut shorter one-half the diagonal of 2 inches, which is about 1 5-12 inches. Now, as these two pairs of hips are placed in a crotch formed by the other two pairs, they must have a side cut on each side.

These side or cheek cuts are gotten by taking the length of hip on blade and the run of hip on the tongue, the blade gives the cut. The length of octagon rafters are gotten the same as any other rafter from their run to their rise. The run of a main rafter is one-half the square width of the octagon, and the run of hip is half the diagonal of the octagon. The top and bottom cuts of main and jack rafters are the same as for a building with a square corner, using run and rise or 12 and rise number per foot of run. For the top and bottom cuts of hips use 13 with rise number. Thus: If the roof is 8 inches rise per foot of run, then 13 gives bottom cut and 8 gives top cut. The length of the jack rafters are gotten by dividing the length of the main or middle jack by the number of spaces between the middle jack and the hip rafter. Another way to get the length of the shortest jack is to multiply the diagonal of 12 and rise number by 2.4 and the product by number of inches they are spaced on centers and divide by 12; the result will be the length in inches of the shortest jack. Now, suppose we have an octagon roof with 10 inches rise per foot and space the jacks 16 inches on centers; the distance from 10 to 12 is 15.62×2.4=37.488×16=599.808÷12=50 inches, nearly, which is the length of the shortest jack. The side cut of octagon jacks are gotten by taking length of main or middle jack on the blade and half one side of the octagon on the tongue, the blade gives the cut. Another way to get this side cut is to take the distance from 12 to rise number on blade and 5 on the tongue, the blade gives the cut.

Backing of hips are gotten by taking the length of hip on blade and 5-12 of the rise on the tongue, the blade gives the cut.

Octagon side cuts are length and 5-12 the run cut on length. Now, when we use the rise for getting cuts, as in other roofs, we take 5-12 of the rise instead of the total rise.

For hexagon roofs use 7-12 of the run and rise with the length.

Polygons. In the following table will be found the name, number of sides, degrees of angle and miter for all polygons up to 12 sides. There is also another table following this one which gives the figures to be used on the square to form these polygons and to obtain their meters; also the figures for getting other degrees up to 85:

POLYGON TABLE.

Name of Polygon	No. of Sides	Degree of Angle	Degree of Miter
Pentagon	5	72°	36°
Hexagon	6	60°	30°
Heptagon	7	51½°	25¾°
Octagon	8	45°	22½°
Nonagon	9	40°	20°
Decagon	10	36°	18°
Undecagon	11	33°	16½°
Dodecagon	12	30°	15°

DEGREE TABLE.

Degrees	Figures on Square	Degrees	Figures on Square
5	12 and $1\frac{1}{16}$	38½	12 and $9\frac{9}{16}$
10	12 " $2\frac{1}{8}$	40	12 " $10\frac{1}{16}$
15	12 " $3\frac{7}{32}$	45	12 " 12
16½	12 " $3\frac{9}{16}$	50	$10\frac{1}{16}$ " 12
18	12 " $3\frac{29}{32}$	51½	$9\frac{9}{16}$ " 12
20	12 " $4\frac{3}{8}$	55	$8\frac{13}{32}$ " 12
22½	12 " 5	60	$6\frac{15}{16}$ " 12
25	12 " $5\frac{5}{8}$	65	$5\frac{5}{8}$ " 12
25¾	12 " $5\frac{13}{16}$	70	$4\frac{3}{8}$ " 12
30	12 " $6\frac{15}{16}$	72	$3\frac{29}{32}$ " 12
33	12 " $7\frac{13}{16}$	75	$3\frac{7}{32}$ " 12
35	12 " $8\frac{13}{32}$	80	$2\frac{1}{8}$ " 12
36	12 " $8\frac{3}{4}$	85	$1\frac{1}{16}$ " 12

When using the above table to get degrees, take one set of figures on the blade and the other set on the tongue of the square, and always mark and cut on first set of figures, which is 12 up to 45 degrees, and from 45° up to 85° cut on the other number. Now, if it is desired to lay off any of the 8 polygons, first find their degree of angle in first table, then find same degree in second table. At right of same degrees will be found the figures to be used on square to form the polygon.

Example: Now we wish to draw or lay out an octagon or eight-sided figure, in first or polygon table. We find its degree of angle is 45. Now we find that the figures to be used for 45 degrees is 12 and 12. Draw a straight line a good deal longer than we wish to have one side of the octagon, so that the square can be used on the line. Place the square on this line, using the proper figures, and run a line of 45 degrees from this line any length.

Now, measure from first line up the last one the length of one side; lay square on this last line with one wing at the length mark and run the same angle of degrees from this line as before; then mark off the length of another side, always using the last line for a base line to lay off the next form, and so on until you get around to the first line made, and the Polygon is drawn. Always be sure to measure each side equal in length; if not when you get around the polygon the last side will not equal the other sides. The miter for the polygons are gotten from the tables in the same manner. There are 360 degrees in one circle. Therefore, to get the degrees of an angle for any polygon, divide 360 by the number of sides in the polygon, and the result will be the degrees. For the miter of degrees divide 180 by the number of sides in the polygon. Now, if other degrees than those in tables are wanted, they can easily be gotten by laying of the degrees on each side of the one wanted and divide the space to suit. Thus: We wish to get 57 degrees, which is not in the table. We lay off a base line and from this line we lay off 55 degrees and also 60 degrees, then we divide this space between the two lines into 5 spaces and take two of these added to 55 and we have 57 degrees.

To get the length of one side of an octagon, subtract the diameter from the diagonal of the diameter, or take 5-12 of the short diameter.

SEGMENTS.

To get the radius of a segment or a part of a circle. Fig. 7 is:

A part of a circle is called a segment, and from A to B is called the span or chord and is 7 feet long, and the rise from C to D is 21 inches. Now, to get the radius, divide

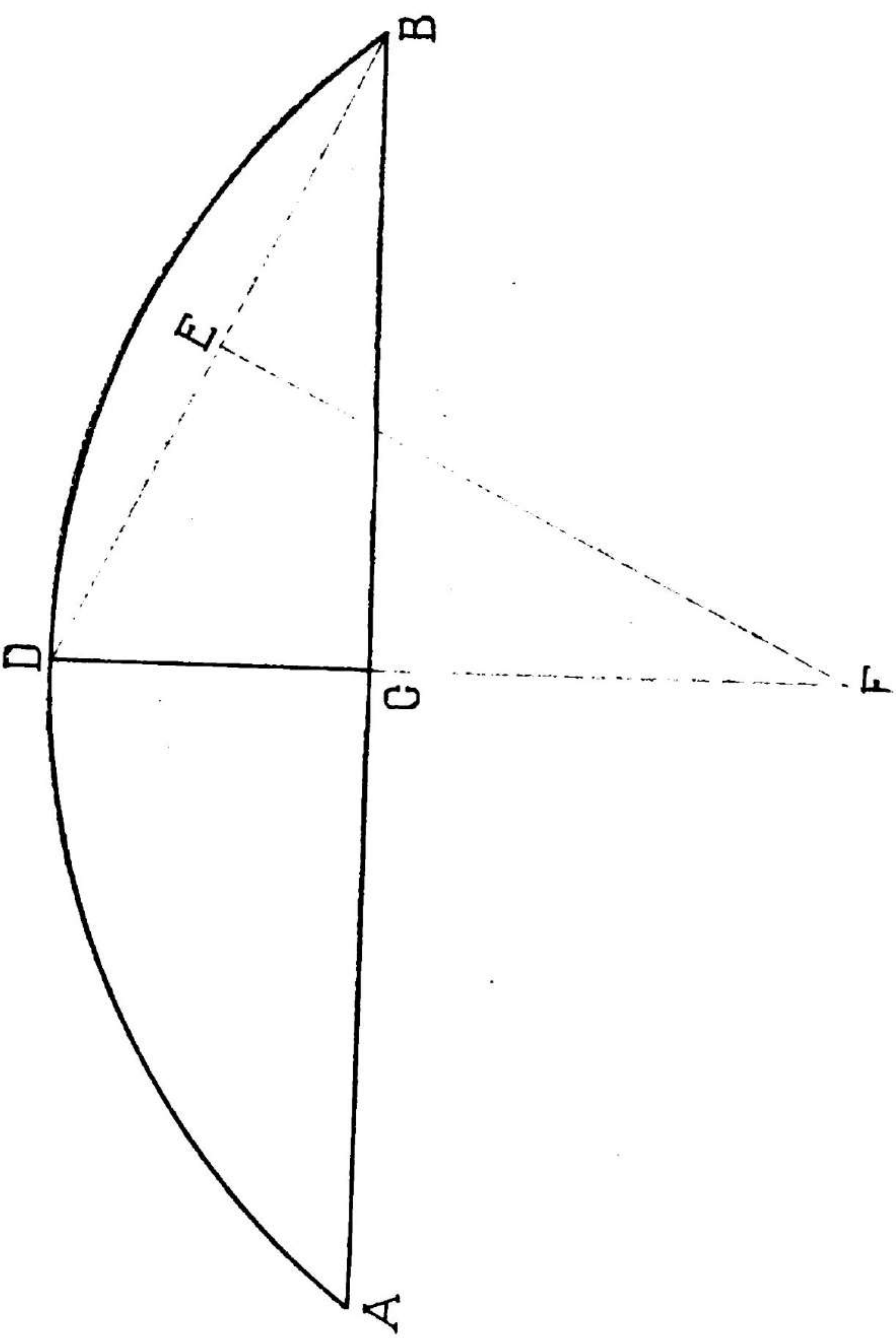

FIG. 7

the square of half the span by the rise, then add the rise, and take half the amounts. *Example*: Now, as the span is 7 feet, then one-half the span is 3½ feet, or 42 inches; the square of 42 is 1764, therefore the radius is 1764÷21+21÷2=52½ inches or 4 feet 4½ inches.

Another way the radius can be gotten with the square is to lay off the span A and B, then find the center of A and B, as at C, then square up from C to the rise D; also square down from C any length. Then draw a line from D to B; find the center of this line, as at E; then square down from E to the plumb line at F; then from F to D is the radius.

DISTANCE ACROSS A RIVER.

When it is desired to find the distance across a stream or river as from A to B in Fig. 8.

First, select some object on the other side of the river as tree, a stake, or some other object, as at B, then set a stake at A, then run a line along the river A C at any angle with A B and set a stake at C, then run a line C D parallel with A B and any length; set stake at D and sight from D to object at B, then where the line crosses A C at E set another stake; then the distance from A

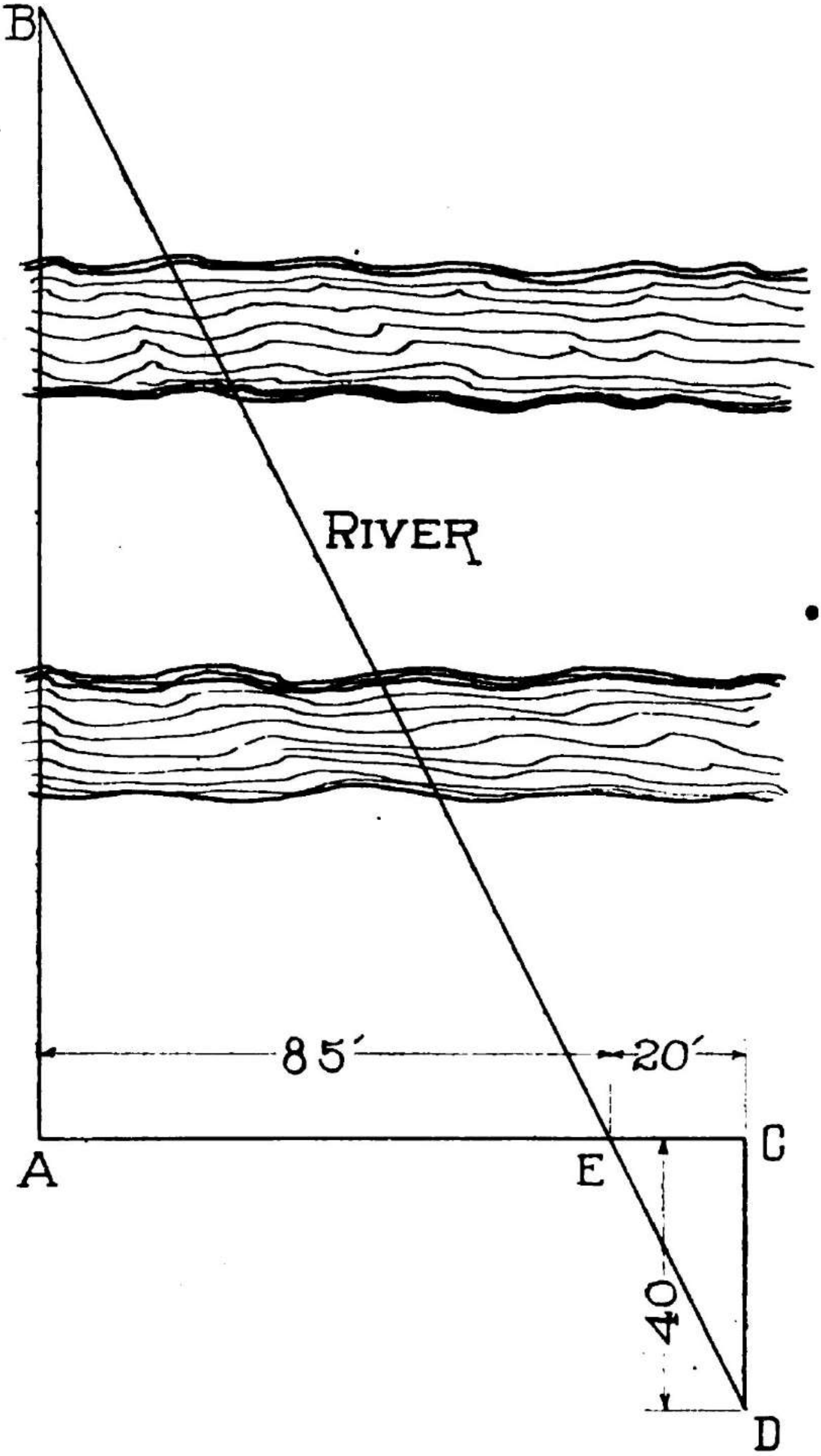

FIG. 8

to B is the length of A E multiplied by C D and divided by E C. Thus: 85×40÷20=170 feet, which is the distance from A to B.

HEIGHT OF A TREE.

The height of a tree can be measured the same way by using the steel square, taking A, C, D for the square. Now, we will call A B a tree and A C the blade of square and C D the tongue 16 inches long. We place the end of blade against the tree with the blade level or the tongue parallel with the tree and using inches on the square for feet; now place a straight edge at end of tongue D, letting it cross the blade at E and in line with the top of tree. Suppose the straight edge crosses the blade at the 6-inch mark, then there would be 18 inches from that point to the tree and the height of tree would be A E 18 multiplied by C D 16 diivded by E C 6. Thus: 18×16÷6=48 feet, which is the distance from where the blade hits tree to top. The distance from where the blade is placed against tree to the ground must always be added to this measurement. Now. if the tree is not plumb, put the tongue parallel with the tree, and it always works right, even if the tree leans at an angle of 45 degrees.

PROPORTION WITH STEEL SQUARE.

If lumber is $24.00 per thousand, what would be the cost of 750 feet? Now, lay the square on a straight edge, with 24 on blade and 10 (the thousand) on the tongue, and mark along 10 side; then slide along that mark to 7½; then the blade will cross the straight edge at 18, showing that 750 feet would cost $18.00 at $24.00 per thousand.

Now, again, if lumber is $24.00 per thousand, how many feet can we buy for $18.00? Lay the square on straight edge as before, with 24 on blade and 10 on tongue; this time we mark along blade or 24 side and slide the blade to 18, then the tongue will cross at 7½; therefore, for $18.00 we could buy 750 feet at the rate of $24.00 per thousand. It is a poor rule that won't work both ways.

Now, if eggs are worth 20 cents per dozen, how much would 9 eggs be worth? Take 20 on the blade and the dozen (12) on the tongue, and mark along tongue on 12 side and slide tongue to 9, then the blade will cross the straight edge at 15; therefore, 9 eggs would be worth 15 cents at 20 cents per dozen.

Now, if it is desired to find out how much one egg is worth at this rate, then slide the 12 side to the 1 inch mark and the blade will cross at 1 2-3 inches, which is the cost of one egg at 20 cents per dozen.

CLOTH: If cloth costs 5½ cents per yard, how much would 4¼ yards be worth? Now, take the price (5½) on the blade and 1 on the tongue, mark at tongue on one side, then slide tongue to 4¼, and the blade will cross at 23⅜ inches. The rule is to take the price on the blade of square, and the yard, dozen or thousand on the tongue and mark at tongue and slide tongue to the amount, and where the blade crosses will be the cost.

When using 1 inch on the square, it is better and more accurate to double or multiply both numbers by the same figure. In the above cloth problem, instead of using 5½ and 1, use 11 and 2 or 22 and 4. When using the square the marking should be done very accurately, especially when using a number close to the heel of the square; for if the heel of the square should be held at one certain point and the blade should be moved 1-32 of an inch at the 1 inch mark, the other end of blade at the 24 inches would move ¾ of an inch. So you can readily see that we should be very accurate in handling the square.

MULTIPLICATION BY SQUARE.

Multiply 4 by 3¼: Take 4 on blade and 1

on tongue, mark along tongue and slide to 3¼ and the blade gives the answer—13.

Multiply 4¾ by 3½: Take 3½ on blade and 1 on tongue, mark and slide tongue to 4¾, and the blade gives the product—16⅝.

Now, in multiplication either of the two numbers can be used on the blade, for it is very plain that 4 times 3 is just as much as 3 times 4.

DIVISION BY SQUARE.

Divide 22½ by 4½: Take 4½ on blade and 1 on tongue, mark at blade, then slide blade to 22½, and where the tongue crosses will be the answer, which is 5.

BRIDGING AND TRESTLE WORK.

I will now give a few ways in which the gain, the spread and the length of batter posts can be gotten for bridges and trestles. The spread of batter posts of trestle work is usually from 1 inch to 5 inches for each foot of height of the plumb post. A good way to get the spread of batter post is to take 12 on the blade of square and the spread number on the tongue and place square on straight edge with these figures, then mark along blade on 12 side and slide blade along this mark to the length of plumb post, using inches for feet and twelfths for inches. Now, where the tongue crosses the straight edge will be the spread, and the distance from where the tongue crosses to the point where the blade crosses will be the length; therefore, getting spread and length with the same operation. *Example*: We will now frame a bent with a 3-inch batter, and the length of plumb post it 21 feet 5 inches. We take 12 on blade and 3 on tongue and mark along blade, then slide blade to the length of plumb post—21 5-12 inches; the tongue will cross at 5 4-12 inches, which gives a spread of 5 feet 4 inches. Now, from 5 4-12 across to 21 5-12 inches is the length, which is 22 feet 1 inch, nearly.

A more accurate way to get the spread and length is by using figures. In this way the length of plumb post is multiplied by the gain of the batter post and the product added to the length of the plumb post for length of batter post. The following is the gain of batter posts in decimals and common fractions, and this gain is added to each foot of height of plumb post for getting the length of batter post. For 1-inch batter the gain is .04; for 2-inch it is .16; for 3-inch, .37; for 4-inch, .65 and for 5-inch batter the gain is 1 inch to every foot of height of plumb post. In common fractions 1-inch batter is a little over 1-32 of an inch gain; 2 inch is nearly 1-6 inch gain; 3-inch is nearly ⅜ inch gain; 4-inch is a little over ⅝ inch gain and 5 in batter is exactly 1 inch gain to each foot of height of plumb post.

I have prepared the following table, giving the aliquot parts of 10 and 100.

ALIQUOT TABLE.

OF 10			OF 100			OF 100		
1¼	is	⅛	6¼	is	1/16	53⅓	is	8/15
1⅔	"	⅙	6⅔	"	1/15	56¼	"	9/16
2	"	⅕	8⅓	"	1/12	58⅓	"	7/12
2½	"	¼	12½	"	⅛	62½	"	⅝
3⅓	"	⅓	13⅓	"	2/15	66⅔	"	⅔
3¾	"	⅜	16⅔	"	⅙	68¾	"	11/16
4	"	⅖	18¾	"	3/16	73⅓	"	11/15
5	"	½	25	"	¼	75	"	¾
6	"	⅗	26⅔	"	4/15	81¼	"	13/16
6¼	"	⅝	31¼	"	5/16	83⅓	"	⅚
6⅔	"	⅔	33⅓	"	⅓	86⅔	"	13/15
7½	"	¾	37½	"	⅜	87½	"	⅞
8	"	⅘	41⅔	"	5/12	91⅔	"	11/12
8⅓	"	⅚	43¾	"	7/16	93⅓	"	14/15
8¾	"	⅞	46⅔	"	7/15	93¾	"	15/16

We will now get the spread and length of the batter post with figures and use the same bent and spread as before, which is 3 inches spread to every foot of height of the plumb post. The total spread of the batter is the length of the plumb per foot, 3 inches, multiplied by the spread per foot, 3 inches. Thus: 21 5-12 ft.×3=64¼ inches, or 5 ft. 4¼ in., which is the spread. Another way is to use 42 in place of the 5 inches. (See Decimal Table.) Then 21.42×3=64 26-100 inches, or 5 feet 4¼ inches, as before. The decimal .26 is just 1-100 over ¼; this is caused by using the decimal .42 for the correct decimal, for 5 is 41 2-3. (See Aliquot Table.) When we frame to the hundredth part of an inch we are close enough.

Now, the length of batter is gotten by multiplying the length of plumb post, 21.42, by the gain per foot of rise, which is nearly .37, and throw out the two right-hand figures of the answer. Thus: 21.42×.37=7.9254, or 7.92, which shows a gain of 7 inches and 92-100 inches, or 7 15-16 inches is near enough; then, 21 ft. 5 in.×7 15-16 in.=22 ft. 15-16 in., the length of batter. Another way is to multiply 21.42 by 12.37 and divide by 12 (See Rafter Table No. 2) for gain of 3 inches rise per foot of run. Thus: 21.42 ×12.37=264.96 inches, or 22 ft. 15-16 in. as before. I know of no quicker way to get these spreads and lengths than with the square, as first explained, when a straight edge can be had. The decimal table will come handy for getting the lengths of rafters where the run is feet and inches. Thus: A building 37 feet 10 inches wide would have a run of 18 feet 11 inches.

Now, we will give the roof 1-3 pitch: 11 inches in decimal table is .92 and the length of a third pitch rafter is 14.42. Now, 14.42×18.92=272.82 inches, or 22 feet 8¾ inches.

To get the length of hips and valleys, multiply 18.92 by 18.78, which is the hip length.

DECIMAL TABLE.

The hundredths parts of a foot is equal to the following inches:

Decimal of	Decimal of	Decimal of	Decimal of
Ft. In.	Ft. In.	Ft. In.	Ft. In
.01= ⅛	.26=3⅛	.51=6⅛	.76= 9⅛
.02= ¼	.27=3¼	.52=6¼	.77= 9¼
.03= ⅜	.28=3⅜	.53=6⅜	.78= 9⅜
.04= ½	.29=3½	.54=6½	.79= 9½
.05= ⅝	.30=3⅝	.55=6⅝	.80= 9⅝
.06= ¾	.31=3¾	.56=6¾	.81= 9¾
.07= ⅞	.32=3⅞	.57=6⅞	.82= 9⅞
.08=1	.33=4	.58=7	.83=10
.09=1⅛	.34=4⅛	.59=7⅛	.84=10⅛
.10=1¼	.35=4¼	.60=7¼	.85=10¼
.11=1⅜	.36=4⅜	.61=7⅜	.86=10⅜
.12=1½	.37=4½	.62=7½	.87=10½
.14=1⅝	.39=4⅝	.64=7⅝	.89=10⅝
.15=1¾	.40=4¾	.65=7¾	.90=10¾
.16=1⅞	.41=4⅞	.66=7⅞	.91=10⅞
.17=2	.42=5	.67=8	.92=11
.18=2⅛	.43=5⅛	.68=8⅛	.93=11⅛
.19=2¼	.44=5¼	.69=8¼	.94=11¼
.20=2⅜	.45=5⅜	.70=8⅜	.95=11⅜
.21=2½	.46=5½	.71=8½	.96=11½
.22=2⅝	.47=5⅝	.72=8⅝	.97=11⅝
.23=2¾	.48=5¾	.73=8¾	.98=11¾
.24=2⅞	.49=5⅞	.74=8⅞	.99=11⅞
.25=3	.50=6	.75=9	100=12

When using the decimal table, and the hundredth parts of an inch is used instead of feet, then the answer will be twlefths of inches instead of inches. Thus: If we wish to know how much 47-100 of an inch is, we turn to decimal table and find .47, which equals 5-12 inches and 5/8 of another twelfth, etc.

The decimal table will be found very handy when getting the length of rafters, braces or batter posts by figures, for there are nearly always a decimal part of a foot or an inch remaining, by turning to table we soon find what the fraction is equal to in inches or twelfths, as shown in directions for square root tables. When calculating with decimals in getting the length of rafters, braces, batter posts, etc., see Decimal Table. Thus: We have a building with a run of 19 feet 7 inches and wish to give the roof 8 inches rise per foot. For 8 inches rise the rafter length is 14.42 and for 7 inches, which is that much over 19 feet, we use the decimal .58. Now, 19.58×14.42=282.3436, or 282 34-100 inches. In 282 inches there are 23 feet 6 inches and 34-100 equals 4 1/8 twelfths (see Decimal Table) making a length of 23 ft. 6 in. and 4 1/8 twelfths of an inch. When multiplying with decimals always point off as many figures to the right as there are decimals in both the multiplier and multiplicand. Always remember that the figure on the right of the decimal point is tenths and the first two are hundredths and the first three are thousands and the first four so many ten thousands, etc.

When any measurement is so many inches over the even feet, use the decimal equal to the same.

For 1 inch use the decimal .08.

For 2 inches use the decimal .17.

For 4 inches use the decimal .33, etc.

See Decimal Table and under the inch heading you will find same.

DIRECTIONS FOR TRESTLE TABLES.

On the following pages I have given a few tables which will likely come very handy to the trestle or bridge builder. There are three tables giving the spread or batter for 2, 3 and 4 inches to each foot of height of the plumb post. Now, these tables will give the correct length to the sixteenth of an inch. Thus: In the first column find length of plumb post in feet and to the right of this length you will find the spread and length of batter post. If the plumb post is any amount of inches over the even feet, then find the number of inches in first column and find the answer in the second and third columns in inches and twelfths instead of feet and inches and add same to the first answer, and you have the correct length, even if you use ½ inch.

Example: We will now get the length and spread of a batter post when the height of plumb post is 21 feet 5½ inches and a 3-inch batter. For 21 feet the spread of batter post is 5 feet 3 inches, for the 5 inches it is 1 3-12 and for the ½ inch the spread is 1½ twelfths or 3-24 inches (see table); then the total spread is 5 feet 3 in.+1 3-12 inches.+1½ twelfths=5 feet, 4 inches, 4½ twelfths, or 5 feet 4⅜ inches. The length of the batter post for the 21-foot plumb post is 21 feet 7¾ in. and for the 5 inches it is 1 5-6 twelfths, which we will call **2-12** inches. For the ½ inch the length is 6 3-16 twelfths, which we call ½ inch; then the total length is 21 feet 7¾ inches+5 2-12 inches+½ inch =22 feet 1 5-12 inches.

Now, this way is a little roundabout, so are interest tables. We first have to find the interest for the amount of years, then the months and also the days. But there are several ways of getting the length and spread of batter posts by using this little book. Another way to get the length of batter is **to multiply** height of plumb post by the gain and add the **product** to the height of plumb, which will also give the length of batter post.

Example: We will now get the length of batter post with the above way and use the same height plumb post and the same batter as before (3 inches). The plumb post is 21 feet 5½ inches long; for the 5½ inches we use the decimal .46, which is much handier and quicker and the most accurate way that I know of. See Decimal Table and you will readily see that 46-100 of a foot is equal to 5½ inches; therefore, 21.46 feet × ⅜ (the gain)=8.04¾ inches, which we will call 8 inches. Now, 8 inches+21 feet 5½ inches= 22 feet 1½ inches.

Another good way is to multiply the height of plumb by the decimal at top of trestle tables and add the product to the plumb post. Thus: 21.46×37=7.9402 or 7 inches and 94-100 of another inch. Now, .94 inches is equal to 11¼ twelfths (see Decimal Table), then to 21 feet 5½ inches add 7 11-12=22 feet 1 5-12 inches.

There is yet another way, which is to multiply the height of plumb by 12.37 and divide by 12. Thus: 21.46×12.37=265.4602. In 265 inches there are 22 feet 1 inch and 46-100 inch, which is equal to a little over 5-12 inch, and makes a total length of 22 feet 1 5-12 inches, as before. To get the spread of this batter post or any other, simply multiply the height of plumb by the number of inches spread per foot of height of plumb and divide by 12. Thus: 21.46×3=64.38 inches or 5 feet 4⅜ inches. In using ⅜ gain for the 3-inch batter it always gives a fraction too much and the .37 in also a little too much, but nearer correct than ⅜ is. (See Aliquot Table.) 37½=⅜ and 16 2-3=1-6. Now, the spread can also be gotten by taking 1-6, ¼ or 1-3 the height of plumb and call it inches. The gain of 2 and 12 is .165, of 3 and 12 is .369 and of 4 and 12 is .649. These figures are correct to three decimals.

TRESTLE TABLE

2 inches or .16 spread to each foot of height of plumb post. Nearly $\frac{1}{6}$ gain

Height of Plumb Post	Spread of Batter Post		Length of Batter Post		Height of Plumb Post	Spread of Batter Post		Length of Batter Post	
Ft.	Ft.	In.	Ft.	In.	Ft.	Ft.	In.	Ft.	In.
$\frac{1}{2}$	"	1	"	$6\frac{1}{12}$	23	3	10	23	$3\frac{11}{16}$
1	"	2	1	$\frac{1}{6}$	24	4	0	24	$3\frac{5}{6}$
2	"	4	2	$\frac{5}{16}$	25	4	2	25	4
3	"	6	3	$\frac{1}{2}$	26	4	4	26	$4\frac{1}{6}$
4	"	8	4	$\frac{5}{8}$	27	4	6	27	$4\frac{5}{16}$
5	"	10	5	$\frac{13}{16}$	28	4	8	28	$4\frac{1}{2}$
6	1	0	6	$\frac{15}{16}$	29	4	10	29	$4\frac{5}{8}$
7	1	2	7	$1\frac{1}{8}$	30	5	0	30	$4\frac{13}{16}$
8	1	4	8	$1\frac{1}{4}$	31	5	2	31	$4\frac{15}{16}$
9	1	6	9	$1\frac{7}{16}$	32	5	4	32	$5\frac{1}{8}$
10	1	8	10	$1\frac{7}{12}$	33	5	6	33	$5\frac{1}{4}$
11	1	10	11	$1\frac{3}{4}$	34	5	8	34	$5\frac{7}{16}$
12	2	0	12	$1\frac{11}{12}$	35	5	10	35	$5\frac{7}{12}$
13	2	2	13	$2\frac{1}{12}$	36	6	0	36	$5\frac{3}{4}$
14	2	4	14	$2\frac{1}{4}$	37	6	2	37	$5\frac{11}{12}$
15	2	6	15	$2\frac{5}{12}$	38	6	4	38	$6\frac{1}{12}$
16	2	8	16	$2\frac{9}{16}$	39	6	6	39	$6\frac{1}{4}$
17	2	10	17	$2\frac{3}{4}$	40	6	8	40	$6\frac{5}{12}$
18	3	0	18	$2\frac{7}{8}$	41	6	10	41	$6\frac{9}{16}$
19	3	2	19	$3\frac{1}{16}$	42	7	0	42	$6\frac{3}{4}$
20	3	4	20	$3\frac{3}{16}$	43	7	2	43	$6\frac{7}{8}$
21	3	6	21	$3\frac{3}{8}$	44	7	4	44	$7\frac{1}{16}$
22	3	8	22	$3\frac{1}{2}$	45	7	6	45	$7\frac{3}{16}$

TRESTLE TABLE

3 inches or .37 spread to each foot of height of plumb post. Nearly ⅜ gain

Height of Plumb Post	Spread of Batter Post		Length of Batter Post		Height of Plumb Post	Spread of Batter Post		Length of Batter Post	
Ft.	Ft.	In.	Ft.	In.	Ft.	Ft.	In.	Ft.	In.
$\frac{1}{2}$	"	$1\frac{1}{2}$	"	$6\frac{3}{16}$	23	5	9	23	$8\frac{1}{2}$
1	"	3	1	$\frac{1}{8}$	24	6	0	24	$8\frac{7}{8}$
2	"	6	2	$\frac{3}{4}$	25	6	3	25	$9\frac{1}{4}$
3	"	9	3	$1\frac{1}{8}$	26	6	6	26	$9\frac{5}{8}$
4	1	0	4	$1\frac{1}{2}$	27	6	9	27	10
5	1	3	5	$1\frac{5}{6}$	28	7	0	28	$10\frac{3}{8}$
6	1	6	6	$2\frac{1}{4}$	29	7	3	29	$10\frac{3}{4}$
7	1	9	7	$2\frac{11}{16}$	30	7	6	30	$11\frac{1}{12}$
8	2	0	8	$2\frac{15}{16}$	31	7	9	31	$11\frac{1}{2}$
9	2	3	9	$3\frac{1}{3}$	32	8	0	32	$11\frac{11}{16}$
10	2	6	10	$3\frac{11}{16}$	33	8	3	33	$\frac{3}{16}$
11	2	9	11	$4\frac{1}{16}$	34	8	6	34	$\frac{9}{16}$
12	3	0	12	$4\frac{7}{16}$	35	8	9	35	$\frac{15}{16}$
13	3	3	13	$4\frac{13}{16}$	36	9	0	36	$1\frac{5}{16}$
14	3	6	14	$5\frac{3}{16}$	37	9	3	37	$1\frac{11}{16}$
15	3	9	15	$5\frac{9}{16}$	38	9	6	38	$2\frac{1}{16}$
16	4	0	16	$5\frac{11}{12}$	39	9	9	39	$2\frac{5}{12}$
17	4	3	17	$6\frac{5}{16}$	40	10	0	40	$2\frac{13}{16}$
18	4	6	18	$6\frac{2}{3}$	41	10	3	41	$3\frac{1}{6}$
19	4	9	19	7	42	10	6	42	$3\frac{1}{2}$
20	5	0	20	$7\frac{3}{8}$	43	10	9	43	$3\frac{11}{12}$
21	5	3	21	$7\frac{3}{4}$	44	11	0	44	$4\frac{1}{4}$
22	5	6	22	$8\frac{1}{8}$	45	11	3	45	$4\frac{5}{8}$

TRESTLE TABLE

4 inches or .65 spread to each foot of height of plumb post. A little over ¾ gain

Height of Plumb Post	Spread of Batter Post		Length of Batter Post		Height of Plumb Post	Spread of Batter Post		Length of Batter Post	
Ft.	Ft.	In.	Ft.	In.	Ft.	Ft.	In.	Ft.	In.
½	"	2	"	6 5/16	23	7	8	24	2 15/16
1	"	4	1	5/8	24	8	0	25	3 7/12
2	"	8	2	1 3/16	25	8	4	26	4 1/4
3	1	0	3	1 15/16	26	8	8	27	4 7/8
4	1	4	4	2 7/12	27	9	0	28	5 9/16
5	1	8	5	3 1/4	28	9	4	29	6 3/16
6	2	0	6	3 7/8	29	9	8	30	6 5/16
7	2	4	7	4 9/16	30	10	0	31	7 1/2
8	2	8	8	5 1/2	31	10	4	32	8 1/12
9	3	0	9	5 5/8	32	10	8	33	8 13/16
10	3	4	10	6 1/2	33	11	0	34	9 7/16
11	3	8	11	7 1/8	34	11	4	35	10 1/12
12	4	0	12	7 13/16	35	11	8	36	10 3/4
13	4	4	13	8 7/16	36	12	0	37	11 3/8
14	4	8	14	9 1/12	37	12	4	39	1/16
15	5	0	15	9 3/4	38	12	8	40	11/16
16	5	4	16	10 3/8	39	13	0	41	1 1/2
17	5	8	17	11 1/16	40	13	4	42	2
18	6	0	18	11 11/16	41	13	8	43	2 5/8
19	6	4	20	1/2	42	14	0	44	3 5/16
20	6	8	21	1	43	14	4	45	3 15/16
21	7	0	22	1 5/8	44	14	8	46	4 7/12
22	7	4	23	2 5/16	45	15	0	47	5 1/4

WINDOW AND DOOR OPENINGS.

When windows are to be hung with weights, the rough opening should be 7 inches wider and 5 inches higher than the size of sash. Where weights are not used the opening should be about 3 inches wider than sash size. The rough openings for doors should be 5 inches wider and 3 inches higher than door. The following proportions should be given in lighting rooms: About ⅛ of the wall surface should be windows, or the area of glass should be about 1-10 of the floor area, one square foot of glass should be allowed to 100 cubic feet of interior space. The bevel for door and window sills should be 2 inches in 12 inches.

STAIRS.

I will now say a few words about stair building. I do not intend to go through all the details of stair building, for stairs are built and finished in so many different ways that it would take a book larger than this one to explain it all. What I want to deal with is the proportion of treads and risers, which should be the same in all stairs, even if they are winding stairs. Stairs, as well as any other framing, have some kind of a base to work from, and it has been proven long ago that the average step of a person is 2 feet on a level, and when lifting the foot vertically would be one-half of that horizontally; therefore, the width of the tread added to the height of two risers should equal 24 inches. Now, the way to determine the width of tread, when the height of riser is given, is to double the height of riser in inches and subtract it from 24; the remainder will be the width of tread in inches. To find the riser, the tread being given, subtract the tread from 24 and take half the remainder for height of riser.

Example: The riser is 7 inches, then the tread is $7 \times 2 = 14$ inches, then $24 - 14 = 10$ in. for the tread. Again, the tread is 14 inches, then the riser equals $24 - 14 = 10 \div 2 = 5$ inches for the riser. Some stair-builders use a 23-inch base instead of 24. Now, the first thing to do in building stairs is to get the correct height from one floor to he top of the other floor in inches; then, after selecting a suitable height riser for the stairs, divide the height of story by the height of riser and the quotient will give the number of risers. If there be a remainder left over in this first division, then we divide the height of story by the quotient and the second quotient will be the correct height of the riser.

Example: Suppose the height of story is 10 feet 9 inches or 129 inches and we wish to have about a 7-inch riser;; we divide 129 inches by 7, which is equal to 18 3-7. Now, as we cannot have 18 risers and 3-7 of another riser, we can readily see that when there is a remainder left over the 18, that the risers will not cut exactly 7 inches and come out all alike; if the story height was changed to 126 inches, then 18 rises 7 inches, each would cover the height.

As I said before, when there is a remainder left, we divide the story height from floor to floor by the quotient. Thus: 129÷18=7 1-6, showing that the risers will cut 7 1-6 inches instead of 7 inches.

Now, again, if we wish to have about a 6-inch riser with the same height story, then 129÷6=21 and a remainder of 3. Now, we divide 129 by 21, which gives 6 1-7 for the height of risers, and the 18 and the 21 gives the number of risers. But remember that there are always one less tread or step than the amount of risers, as the floor always answers for one step. In the first example the amount of treads would be 17 and in the second example 20, which is 1 less than the amount of risers. When I am figuring the height of risers I never divide but once, for, if nothing remains, I have it at the first operation, and if there is a remainder I just put it over the top of the quotient and make a common fraction out of it and add it to the divisor for the height of riser. In the first example 7 is contained in 129 18 times with 3 over; just put the 3 over the 18 and that will show the riser to be 7 3-18 or 7 1-6 as before. If at any time the riser should figure higher than you wish to make it, make your divisor one less. Thus: We will now take a height of 5 feet 2 inches or 62 inches for a pair of steps and we wish to give them about a 7-inch riser, then 62÷7=8 with a remainder of 6; then 62÷8=7¾ inches, which would be a little more than we would want; therefore, we cut the 7 down 1 and call the risers about 6 inches, then 62÷6=10, with a remainder, then 62÷10=6 1-5 for the height of risers, and 10 risers instead of 8, as before. Now, if this last riser is not as high as we wish, we could divide 62 by 6½, which would give us 9 risers and with a height of 6 8-9 inches each.

Now, when the height of risers are gotten, the next thing to do is to proportion a tread to suit the riser, using the 23 or 24-inch base, which I have given. Thus: The rise above is 6 8-9 inches; what would be the tread, using a 23-inch base? Then the width of tread equals the riser, 6 8-9, doubled and subtracted from 23, which is 9 2-9 inches. With a 24-inch base the tread would be 10 2-9 inches. By most stair-builders the 5½-inch riser and 12-inch tread is considered the best stepping and could be used as a standard. When the riser and tread has been figured out, then take the steel square and lay it on the stringer to be cut with the width of tread on blade and the height of riser on the tongue and the heel or point of square pointing from you, and step along the edge of stringer as many times as is needed to get the amount of steps, using the same figures on the square each time.

There are several ways of laying out these steps. One way is by using a contrivance called a steel square fence which is clamped on blade and tongue by a set screw. There is another contrivance which consists of two slotted buttons to fit on the outer edge of the square and fasten with thumb screws at the figures to be used. Without these tools I think the best way is to cut out a pattern of some light stuff just the size the notch is to be in the stringer. In other words, lay the square on a straight edge board with the tread on blade and riser on tongue and mark along both and cut out the piece and tack a small piece on the long or diagonal edge and have it project over one edge so as to be used as a templet along the edge of stringer. The edge of stringer should be made straight when the templets are used. When the square alone is used, a chalk line could be drawn along the side of stringer near its edge, then the square is placed along the line instead of the edge. All stair stringers are not notched out, as above stated, in first-class stairs the stringers are generally plowed or grooved out on their inner sides, so the treads and risers can be glued into these grooves. These kind of stairs are usually called a housed stair, their name being taken from the housing out of stringers to hold the treads and risers. In cutting out stair stringers be sure to cut the first riser of the stairs where it rests on the floor the thickness of tread less than all the others.

It does not make any difference how many landings there are in a set of stairs, the figuring of risers are the same as one flight stairs, so long as the different flights are to have the same height risers. When one or more landings are used between the two floors each flight should have the same height riser and the same tread, a landing is simply a tread, no matter how large it may be.

A flight is a series of steps without a landing or a resting place.

A Landing is a resting place or platform where the flight below ends.

A Winder is a tread wider at one end than at the other.

A Quarter Space is a landing extending half across the width of stairs.

A Half Space is a landing extending right across the width of stairs.

Cylinders or Well Holes are semi-circular or quarter-circular openings around which the stairs are carried.

Newels are posts or columns turned or built up, and are placed at the foot of stairs to hold the handrail.

Balusters are small posts, either turned, square or made of iron and are to support and give strength to the handrail.

The following is the proportion of risers and treads, using a 24-inch base on one and 23-inch on the other.

24-in. Base.		23-in. Base	
Tread Inches.	**Risers** Inches.	**Tread** Inches.	**Risers** Inches.
5	9½	5	9
6	9	6	8½
7	8½	7	8
8	8	8	7½
9	7½	9	7
10	7	10	6½
11	6½	11	6
12	6	12	5½
13	5½	13	5
14	5	14	4½
15	4½	15	4
16	4	16	3½
17	3½	17	3
18	3	18	2½

MITERING RISERS WITH STRINGERS:

Sometimes it is desired to miter the risers with the stringer, as an open-string stairs. Well, this cut on the stringer is simply a hopper cut, and can be gotten more than one way. One way to get the miter across the edge of stringer is to lay the square on the stringer as if you were going to lay out the steps and risers, using the inches of tread on the blade, and the height of riser on the tongue; then mark along both blade and tongue. Now, the diagonal distance from the point of tread to the height of riser, used with the width of tread and cut on the diagonal will give the proper bevel across the edge of stringer to fit the miter of the riser. Thus: The cut on a stringer is 7 and 10, then the diagonal of 10 and 7 is 12¼ and 12¼ on blade and 10 on tongue cut on blade is the bevel, and by setting a T bevel to this it can be used for all the risers. The cut on the riser board is always a regular miter cut or 45° angle.

Another good way to get the bevel across the edge of stringer is to lay off the riser mark on face of stringer, then square over from this mark the thickness of stringer and carry this mark square across edge of the stringer; then draw a diagonal across edge to riser mark, same as for side cuts of jack and hip rafters.

I wish to say a little more on proportioning the rise per foot. Sometimes we have a certain rise and a certain run, and we wish to know how much the rise is per foot. Thus: A brace or rafter has a rise of 19 feet and a run of 27 feet. Now, what is the rise per each foot of run? Multiply the rise 19 by 12 and divide the product by the run, 27. Thus: $19 \times 12 \div 27 = 8$ 12-27 inches, which is the rise per foot of run.

Now, again, the rise is 27 feet and the run is 19 feet, what is the rise per foot? $27 \times 12 \div 19 = 17$ 1-19 inches per foot.

Now, if the batter or spread of a wall is 20 inches and the height of wall is 14 feet, what is the batter to each foot of height? $20 \div 14 = 1$ 3-7 inches to each foot of height. Again, the batter is 9 inches in 14 feet, then the batter per foot is $9 \times 12 \div 14$, which is 7-12 inches and 5-7 of another twelfth, or 27-42 inch to each foot of height.

RAKE CORNICE AND PURLIN CUTS

On the following page I will give table giving the figures to be used on the square for getting the correct cuts for Roof Boards over hips and valleys also cuts of Facia Boards for rake cornices, purlins and shingle cuts.

Plancier Board cuts for rake cornices are same as roof boards.

Shingle cuts in valley are same as side cuts of jack rafters at bottom of Rafter Tables.

Purlin cuts, the plumb cut of purlins are same as face cut of facia boards, and the side cut is same as edge cut of facia board.

Rake Cornice Miter Box. The cut across top of box is same as edge cut of facia boards. The cut down the side is same as face cut of facia boards. In the following table the first column gives the rise per foot of run, now if a roof has one-third pitch it would have eight inches rise per each foot of run, if we wish to get the face cut of roof boards for a roof of 8 inches rise per foot, then we run down first column to 8 and to the right, under face cut we find the figures 12 and 10⅛, then using one set of these figures on the blade or body of square and the other on the tongue and cut on the side that the word cut appears, at top of column, in this case the cut would come on 10⅛, etc., always cut on the figures marked (cut) at top of table.

CORNICE TABLE

Face and Edge Cuts of Facia and Roof Boards

See previous pages for other cuts

Rise per Foot of Run	Face Cut of Facia Boars at Hip or Val.		Edge Cut of Facia Boards at Hip or Val.		Face Cut of Roof B'rds over Hip or Val.		Edge Cut of Roof B'rds over Hip or Val.	
In		Cut		Cut		Cut		Cut
1	12	1	12	11⅞	12	11⅞	12	1
2	"	2	"	11¾	"	11¾	"	2
3	"	2⅞	"	11½	"	11½	"	2⅞
4	"	3¾	"	11⅜	"	11⅜	"	3¾
5	"	4⅝	"	11⅛	"	11⅛	"	4⅝
6	"	5⅜	"	10⅞	"	10⅞	"	5⅜
7	"	6	"	10½	"	10½	"	6
8	"	6⅝	"	10⅛	"	10⅛	"	6⅝
9	"	7⅛	"	9¾	"	9¾	"	7⅛
10	"	7¾	"	9⅜	"	9⅜	"	7¾
11	"	8⅛	"	8⅞	"	8⅞	"	8⅛
12	"	8½	"	8½	"	8½	"	8½
13	"	8¾	"	8⅛	"	8⅛	"	8¾
14	"	8⅛	"	7¾	"	7¾	"	9⅛
15	"	9⅜	"	7½	"	7½	"	9⅜
16	"	9⅝	"	7⅛	"	7⅛	"	9⅝
17	"	9⅞	"	7	"	7	"	9⅞
18	"	10	"	6⅝	"	6⅝	"	10
19	"	10⅛	"	6⅜	"	6⅜	"	10⅛
20	"	10¼	"	6⅛	"	6⅛	"	10¼
21	"	10⅜	"	5⅞	"	5⅞	"	10⅜
22	"	10½	"	5¾	"	5¾	"	10½
23	"	10⅝	"	5½	"	5½	"	10⅝
24	"	10¾	"	5⅜	"	5⅜	"	10¾