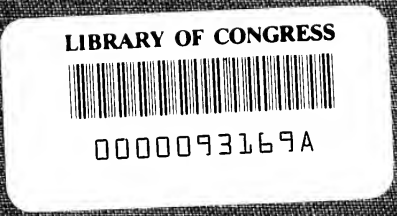


A POCKET MANUAL

—FOR THE—

PRACTICAL MECHANIC;

—OR—

THE CARRIAGE MAKER'S GUIDE.

—BY—

J. B. HAMPTON,

A Practical Mechanic.

INDIANAPOLIS:
Frank H. Smith, Printer,
1886.

PREFACE.

THIS little work is designed as a pocket manual for the mechanic, to aid him in his laudable labors. Only such rules or methods are herein shown as are known, from practical tests and daily application, to meet the wants of the workman, enabling him to accomplish more in a given time and with less labor.

Many years of my life have been spent at the bench, during which time I have endeavored to perfect myself as a mechanic, treasuring up all that experience has taught, and what could be learned from others.

For years I have been contriving to complete a new and simple rule that would teach the craft a shorter and much needed way to work, so that more work might be done in a day than heretofore, thus bringing more wages and satisfaction to the mechanic.

I have met persons who, for years, had tried to learn the French rule for drafting, but gave it up in despair. It was too long and too hard to learn. The French rule is more adapted to architecture and is highly useful, more so than many mechanics can comprehend.

The architect may draw a very fine outline of a house with all its angles, bevels, and curves; but the cuts he leaves for the mechanic to work out, and he generally uses the "try, cut, and fit" rule. In many cases, the architect that draws the plan cannot build the house, nor draw the

bevel cuts, nor make the sweeps for a segment of a sweep. An architect asked me once to call and spend an evening at his office. He desired to ask me many questions about my short mode of working the bevel, for, as for him, he acknowledged that he "never did understand that miserable bevel rule." He asked me all the hard and most difficult questions that he could think of, and just such ones that the best architects had failed to understand. It appeared to him that my answers were so simple and easy of comprehension, that he remarked: "Are you sure that your rules will work in practice?" "I told him that they would, for I used them every day when I did work that required the bevel rule. He said he had no reason to doubt my word, and now he would acknowledge that he had obtained more practical knowledge during the evening than he had acquired in attending the Drafting School, at a cost of $60.

I believe that there is a great mistake made in teaching drafting by persons who are not practical workmen. It was a true statement that Mr. Studebaker, the eminent wagon manufacturer of South Bend, Ind., made in his speech before the Carriage Makers' National Union, a few years ago, when the subject of the Technical School was before that body for discussion. He said that no young man could become a practical draftsman unless he worked out and put into shape the draft that he could draw. The statement is true, and the principle should be practiced by every student in mechanics.

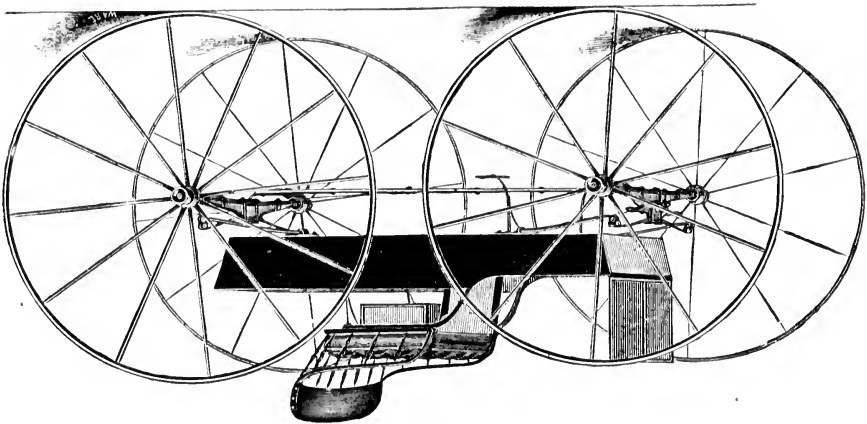
Mr. B. C. Shaw, of Racine, Wisconsin, one of the leading carriage builders of the West, and a very prominent member of the Carriage Makers' National Union, often remarked: "When you make a carriage draft, take the *wagon* all out of it, for a carriage and a wagon are two

different vehicles, and should be built very differently; and to mix, in structure, those two vehicles is something in similarity to a mule."

It is not an easy job to draft and build a first-class carriage, handsome and proportional in all its parts, as well as comfortable to its occupants. There are some very large factories in this country that do good work for the prices they ask, but it mostly looks stiff and "wagonish." There is lack of ease and grace as these carriages move along the street or highway. Something should be taken off here, and a little added on here and there, which would make the cost no greater. The chief need in such factories is a good mechanic and draftsman at the head of the institution.

J. B. HAMPTON.

Indianapolis, Ind., August, 1886.



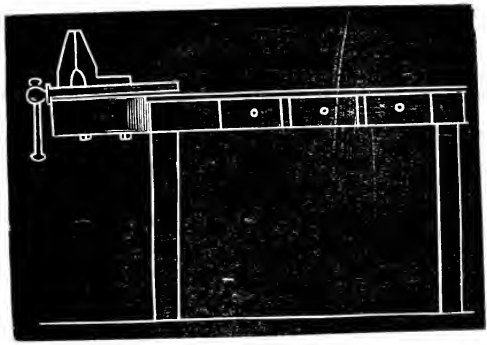


Fig. 1.

A Practical Work Bench.

BEFORE a mechanic begins work in a carriage factory, he should have his BENCH well fitted up, perfectly level, and with a good bench-hook, one that can be quickly placed in position and made to work easily. A piece of three-inch timber, seven inches wide, should be bolted on the under side of the bench, projecting seven inches. Block it up even with the top of the bench, and bolt the vise on it square and level with the bench.

A bench fitted up in this way, with the vise projecting seven inches, makes it more convenient to make seats and bodies.

Put from one to three drawers under the bench, one to have a lock on it for the safe keeping of choice tools and other things not for every one's use or inspection. Be sure to place the key at some convenient place, of easy access to yourself and other workmen in the shop. A work bench for the carriage mechanic, constructed on this plan, is, I think, complete.

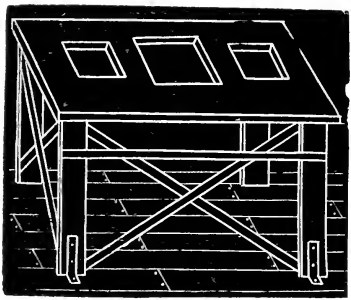


Fig. 2.

THE TRESTLE.

THIS cut represents a shapely TRESTLE. It is fifty-two inches long, twenty-six inches wide, and twenty-eight inches high. The top is made of two thicknesses of ⅞ inch lumber, fastened together with screws, the heads of which should be plugged, to prevent the dulling of tools.

Cut three square holes in the top, making the center one 8x8 inches, and each of the other two 6x6 inches. Brace the legs on the inside, as represented in the cut, so that the braces may be out of the way of hand-screws when clamping your work on the trestle. Project the top two and a half inches all around, to give room for clamping. Bolt irons on the outside of the legs, so that the trestle may be made fast to the floor with screws. Place it about four feet four inches from the work-bench, the front end about eighteen inches back of the vise.

This kind of trestle is the most convenient I have ever seen or used; a body can be clamped on it in any position desired. Mechanics who once become familiar with its many advantages over the old trestle, will never dispense with its use.

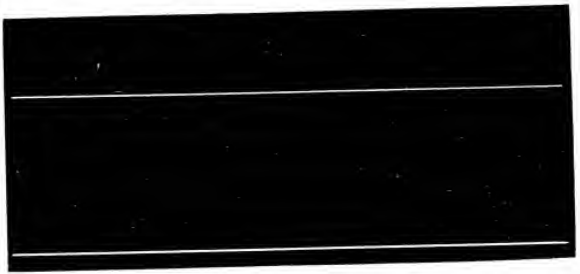


Fig. 3.

THE DRAFT BOARD.

THE above cut outlines a DRAFT BOARD with a base and top line, the base being about one-eighth of an inch from the lower edge, which must be straight, as the bevel and the square are used against it. The top line can be adapted to the length of your bevel and square. Every bevel line, as given in this book, runs from the base line, which is parallel with the lower edge of the draft board and nearly always from a given point; this is to enable the workman to apply the bevel more quickly and with exactness, thus lessening labor and saving time.

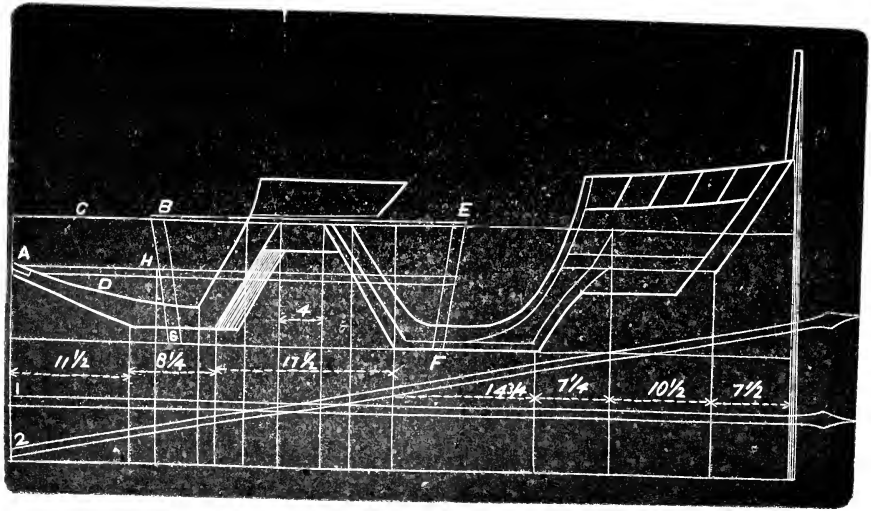


Fig. 4. **The Draft.**

How to Draw a Working Draft.

NEVER draw more lines than are to be used in working, for they frequently lead the bodymaker into error, and delay his work. Everything must be simple, and every line drawn should appear easy and graceful to the eye. Give every curved line a graceful and easy turn, and make every bevel line just enough bevel to look well. To accomplish this work requires practice, and a great deal of it. Some people are natural draftsmen, and can succeed without much trouble; others can never learn.

The cut shown represents two different things; to draw the draft and to draw one longer or shorter than the original, having the same proportion as the one already drawn.

Draw three parallel lines lengthwise on the draft-board twelve inches apart. The middle line to be the base line. Draw lines perpendicular to the lower edge of the draft-board to intersect every angle, as represented in the cut. This body is six feet and six inches long over all. In this draft the distance from one angle to another can be readily seen by the figures in the draft. The rod that is placed across the lines is used to lengthen or shorten the draft, and to keep it in the same proportion. When a draft is to be made shorter, lay the rod No. 1 parallel with the base line, mark across this rod at every angle line of the body; then place the rod beveling across the draft until the desired length is acquired, as represented by rod 2. Now draw lines across the marks on the rod which will make the draft shorter and in the same proportion. To lengthen the draft, lay the rod across angling *first*, mark the lines, and then place the rod on the base line, which adds to the length of each part.

This draft represents the sills leaning out; lines E F and B G represent the sills and width of the body as leaning

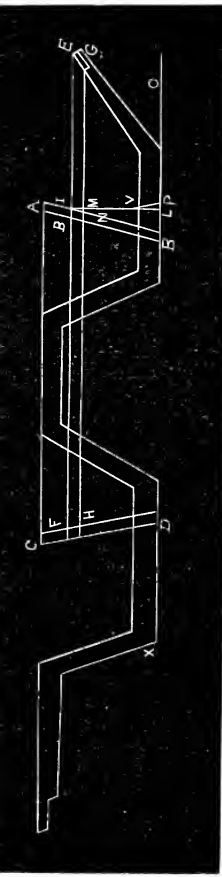
out. The lower line of the draft should be the edge of the draft-board. The rods 1 and 2 with the lines drawn across them, form no part of the working draft; they are merely given to illustrate the drawing and to show how a draft can be made longer or shorter.

In a working draft I never draw half width, for it is not so easy and quick a way to work by a half width as by a whole width; for in all cross rails they can be applied on the width of the draft at once, and get the length, thus dispensing with the middle line and reversing the rail; all of which takes time, and time is a mechanic's capital which should be put to more profitable use.

Every workman that draws his own draft must have something to draw from, both length and width. People are not of the same size, so different carriages must be built to suit and fit such persons. Statistics tell us that the people of Indiana and Ohio measure two inches taller than the people of the New England States, and that the people of Iowa are one inch taller than those of Indiana.

I have found that bodies manufactured in the East have seats ten and a half inches high, while the Westerner builds them twelve and thirteen inches high, and then a full grown Hoosier six feet or six feet four inches says they are too low. This is something that should be looked after. The front seat of a four passenger carriage should be higher than the back one, for the ladies, generally, ride on the back seat, and do not require so high a seat.

I have often received orders to build a four passenger carriage for a small family, the gentleman being about five feet five inches, and the lady still smaller, while the children were about the same height,—all parts proportioned just to suit, so as to be neat and comfortable. In filling such an order I take my draft as the general size of a carriage, and shorten it by means of the rods as represented in the cut.



To Get the Length and Bevel of Shoulder of Cross Rails.

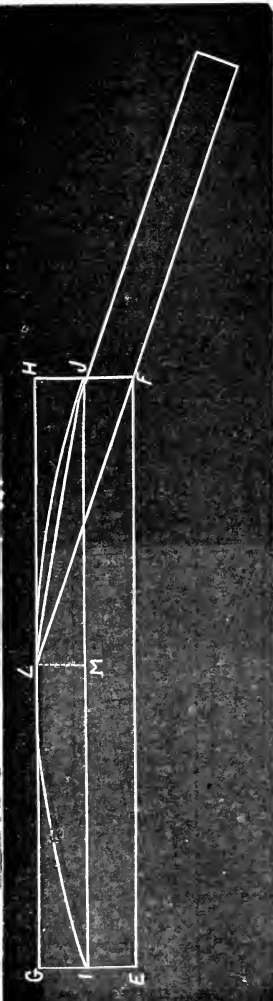
This figure represents the same draft, but is given in order to easily and clearly explain my method of framing the cross rails. In getting the length and bevel of the shoulders of the toe rail, draw lines E F and G H, from the upper and lower edges of the toe rail parallel to the base line O X, across A B and C D, as represented; then draw I L from point I, the intersecting point of A B and E F, perpendicular to line O X. With the compass obtain the distancefrom M to N on G H; place one point on L, the intersecting line I L and O X, which will reach to P. With the compass get width of toe rail, place one point on point L which will reach to point V. Draw P V, which is the bevel across the toe rail for the shoulder, and also across the toe of the side sills where the toe rail laps on the side sill; then on line E F between A B and C D is the length of the rail between the shoulders on the long side, or top edge. Lay

the toe rail on this line and mark it at points R and F; that will be the long corner from which to bevel.

In completing this explanation, I would here say that my reason for giving this additional draft (2), is this: I have been so often asked how to obtain the length and bevel of the toe rail and all other cross rails; for I nearly always frame the toe rail and all other cross rails first, to get them out of the way.

I have often seen the very best of workmen in good shops, where they were building bodies with flared sills, who would set the sills up after beveling by clamping strips across to hold them in the right position, so that they could lay the toe rail and other rails across to get the length and bevel; for they knew no other way to obtain them.

(I did not finish this draft, that is, I did not draw the upper part of the back and did not intend to do so. I intended only to draw so much as would show how to draw one and to draw one longer or shorter, and to get the length of the toe and other cross rails, which I hope will be easily understood.)



A Short and Easy Way to Make a Segment of a Curve.

Take a piece of lumber as long as the segment is required to be, as represented in the cut by E, F, G, H. Straighten one edge and guage from that edge the amount of curve desired, that from L to M, say two inches and drive a nail at I, J and L. Take another piece of lumber the width of the curve wanted, two inches, tapering it from the middle to one end. Place the middle, where the taper commences, against the nail J, as represented in the cut. Hold the pencil firmly at that point (J) and move the tapered piece along holding it firmly against the nails, from point J to point L, and then from L to I in the same way, which will lay off a perfect segment, with a curve of two inches from one end to the other.

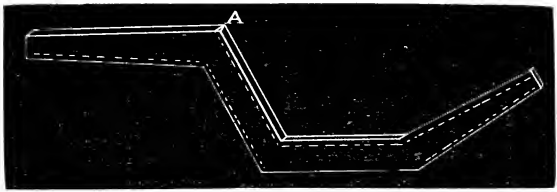
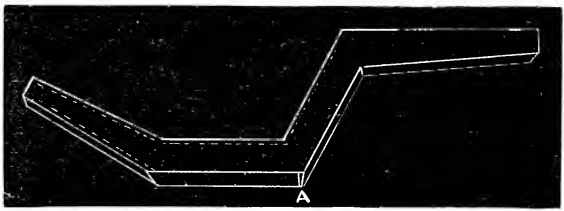


Fig. 7. (1)



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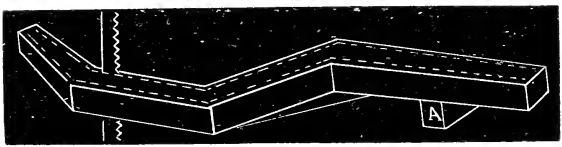

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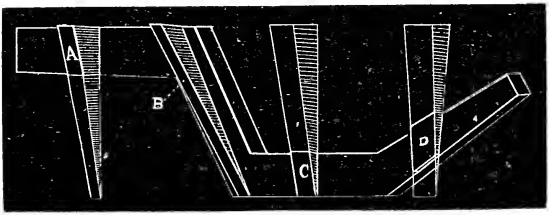


(4)

How to get the Bevel of Flared Sills; and to Saw Out with a Band Saw.

IT is a well established fact in the bevel rule, that all horizontal lines are beveled just the distance which the sill leans out. If the sill of a buggy leans out two inches in twelve inches, the bevel square must be set to that bevel. This will fit to all horizontal lines on the sill.

In figure (1), where the seat rests, is beveled from A to the back end of the sill; the same bevel will fit on the bottom in front, they being horizontal lines. All other lines running up or down from that line are beveled differently, just in proportion to the position they run.

All horizontal lines are base lines; other lines are called oblique lines, except line A which is made with the square perpendicular to the base line, or square across the beveled part of the sill. This line is called a plumb line, or second base line. These two lines govern the bevel in all of its changes. Be particularly careful to keep these two lines in mind; if you do not you will soon be lost; better quit and take a rest, for it is like a man being lost in the woods,—he does not know the road when he finds it.

Laying off a sill to be shaved out by hand is a very fine point, and must be done very accurately. Place the pattern on sill as represented in figure (3), mark all around it as indicated by the dotted lines; bevel the base line exactly to the line laid off by the pattern, as in figure (1).

At A, (1) where the dotted lines intersect each other, square across the bevel part of the sill on top edge with the square as represented at A. Change the pattern over on the other side of the sill, and be careful to keep the point

of the pattern even with this perpendicular or second base line, also even with the bevel part of the sill, as represented in figure (2), and mark all around it as before, except where it has been already dressed off.

The sill being now laid off shave it out exactly with the lines on both sides, and it will be beveled just right in all parts.

To Saw Out with a Band Saw.

In figure (4) A B C D are four wedges bradded on the inside of the sill. The wedges are made tapering to represent the leaning out of the sills,–say two inches to the foot,–with the big end even with the top of the sill as represented in the figure. Lay off the other side with the pattern as indicated by dotted lines in figure (3). The wedges hold the sill in position on the saw table. Saw exactly to the scribe as near as possible, with band saw. This makes every bevel correct, and is very quickly done.

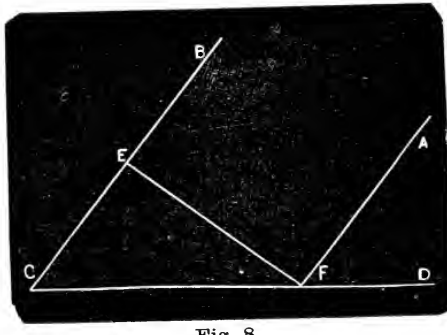


Fig. 8.

To Find a Segment of a Circle to a Given Segment on Any Bevel, as for instance, A Swell Back Seat.

DRAW the base line C D and bevel lines F A and C B parallel to each other. The distance between them must be equal to the amount of curve in the back panel; then draw F E from point F, at right angles to F A and C B. F E is the curve of the back panel, C F is the curve of the frame, and C E is the curve on the lower edge of the back panel. Make sweeps by propositions O, (see segment of circle, figure 6, page 15,) and they will exactly fit, so that the margin on the frame will project equal distances at both ends of the seat.

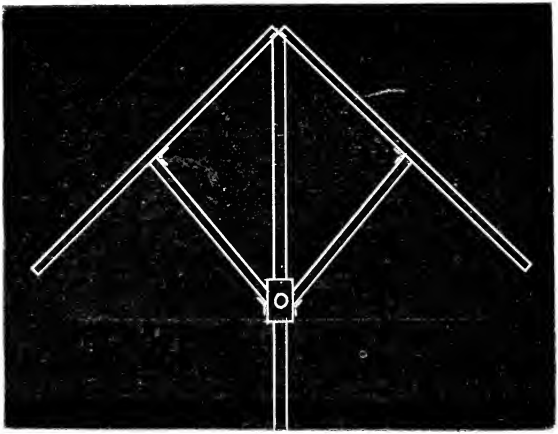


Fig. 9. (1)

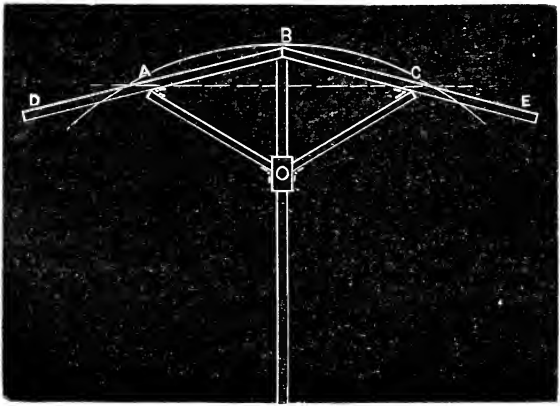


Fig. 9. (2)

The Use of the Tram.

THE Tram is an instrument made use of to draw the segment of a circle. It consists of a staff, two arms, and two braces, with a sliding block on the staff. A set screw is in the block to fasten it at any desired place to suit the segment. It opens and shuts similar to an umbrella.

Figure (2) is the tram in position to lay off a segment, having a nail driven at the points A and C, which represent the length of the curve; put the arms of the tram against the nails with point B as far from edge of the board as you want the depth of the curve,—say two inches,—and is twenty-four inches from A to C. Place the pencil at B, move the tram from A to C, holding pencil at point B on tram, keeping the arms of tram against the nails while moving from A to C, as represented in the figure.

This gives a segment of a circle without a centre, and using a radius, it is much quicker, for the tram is always ready to be placed in any position. It is very useful in laying off patterns for stick and other seats.

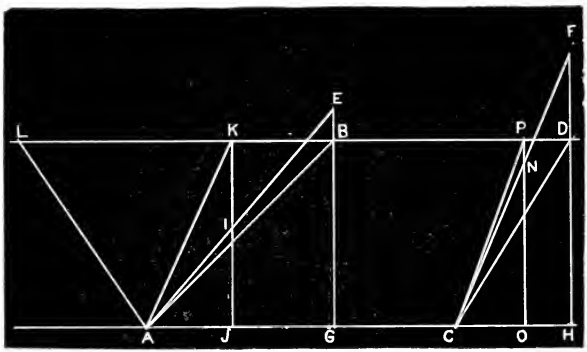


Fig. 10.

Rule for Getting the Bevels, Corner Block, and Miter of a Buggy Seat where the Back Flares Greater than the Side.

DRAW base and top lines, as represented in the cut; draw the perpendicular lines H F and G E; also C D for flare of side of seat and A B for flare of back. With the compass take length of A B, the greater flare; place point of compass on H to F; Draw C F, then with the compass, length of C D, placing point of compass on G to E, draw A E; then C F is the bevel for the end of back panel, and A E is the bevel for the end panel. This finishes the draft for the corners of the seat.

To get the bevel of a block to fit in the corners. Place point of compass on C to H; measure from A, on A E a distance equal to C H which is A I. Draw perpendicular line J K, through point I. Draw line A K, which is the bevel for the corner block.

In like manner, with the compass take A G. Place the point of compass on C to N on line C F; draw perpendicular line, O P, and bevel line, C P, C P is also the bevel for the corner block. It makes just the same on either figure.

For the Miter, place the point of compass on A to K, and the same distance from K to L on top line, then K L is equal to A K. Draw L A, which is then the miter line.

Always keep the bevel parallel with the bevel end of the panel and never on the edge.

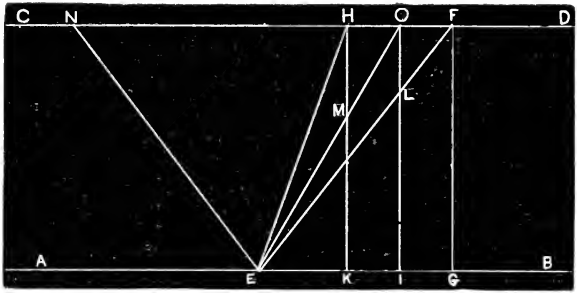


Fig. 12.

Bevel Rule for Hopper Corner Block and Mitre.

DRAW lines A B and C D parallel to each other. Draw the bevel line E F, the flare of the hopper. Draw the perpendicular line G F, and intersect E F at F on C D. With the compass take the distance from G to F, placing point of compass on E, which will reach to L on E F. Draw I O through L; then draw E O, which is the bevel of the end of the panel, which, when put together in the hopper, will flare the same as line E F and fit at the corner.

For the corner block place the point of the compass on E, distance take from E to G, leave point on E, place the other point on E O which will reach to M. Draw the perpendicular line, K H through M, then draw E H; then E H is the bevel for corner block.

For the miter place the point of the compass on points E and H, measure the same distance on C D from H, which gives N, then draw N E, which is the miter. When you cut the miter, always place the bevel on the end of the panel at right

angles with the bevel end, and never on the edge of the panel. See cut No. 2 of figure 11 (page .)

For a stick seat, E H is the bevel for the corner pillar and E E is for the shoulder, that is, when the seat flares E F.

In drawing the draft always draw the base line A B about one-eight of an inch from the lower edge of the draft board—as represented in the draft board—so that the point E will be off the edge of the draft board. This makes it easy to set the points of the compass.

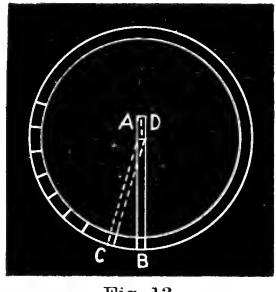


Fig. 13.

How to Curf a Board to Make a Circle.

DRAW a circle as represented in Fig. 9, showing the thickness of lumber used. Take a piece of the same thickness, D B, curf on the side at A. Place curf at the center of the circle at A, fasten the end with screws or nails firmly to the draft-board, move the outer end toward C until the curf is closed. Be careful not to bend the piece; mark the distance on inside circle. The distance it moves, B C, gives the space between the curfs.

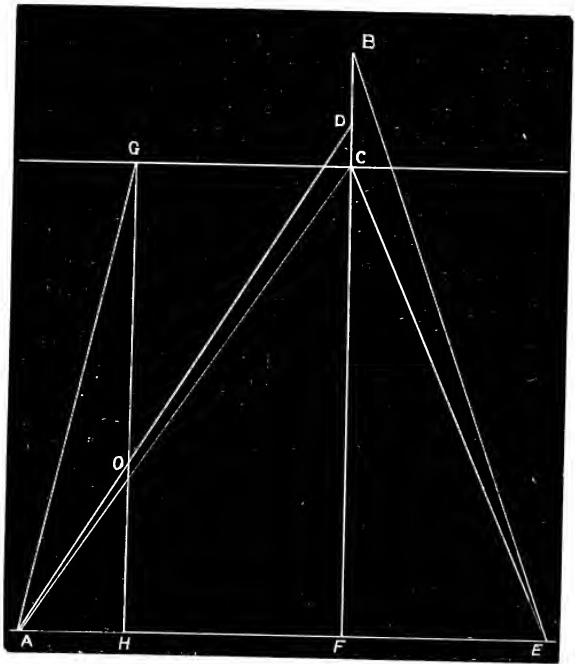


Fig. 14.

How to get the Length and Bevel of Knees of a Sleigh where they are of a Different Flare.

DRAW base and top line, the latter to represent the top of bench, the former the bottom of the runner. Draw perpendicular line F B. Draw E C, representing the leaning in of the knees, and A C the leaning forward of

the back knee, which leans in the same as E C; but E C stands straight the other way; therefore E C is the bevel for the shoulder and mortise of the upper end of the middle knee. But A C is different because it leans two ways. With the compass get the length of E C, place the point of the compass at the intersection of A E and F B, at point F, which reaches to D; draw A D which will be the length of the back knee. With the compass take the length of A C, place point of compass on F B at F, which reaches to B. Draw B E which is the bevel of the shoulder of the back knee and mortise through the bench. In the same manner with the front knee. If it does not lean back as much as the back knee does forward, draw another draft in the same manner.

In getting the bevel of the front and back knee, get length of F E with compass. Put the point of compass on point A, the other point will reach to O on A D. Draw perpendicular line H G through O. Draw A G which is the bevel for the back and front knees, the same as a corner block in a seat, if both lean the same.

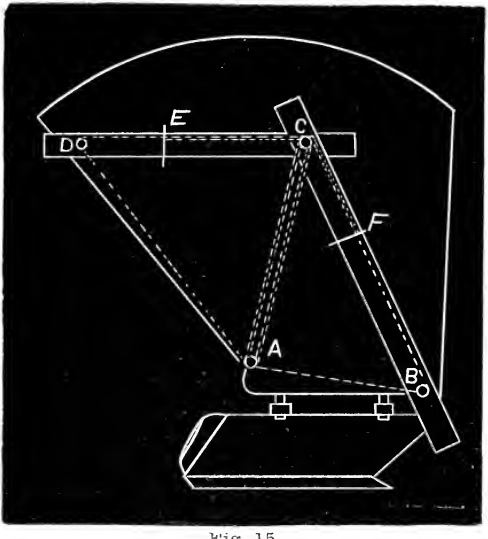


Fig. 15.

A Simple Rule to Find the Place for the Joints in Prop Irons on Buggy Top.

THE object of this is to fold them just right when the top is let down. In the above engraving, A B C D represent the prop irons, A is where the bows are fastened and turn when the top is lowered or raised, it being the centre. B C is where the back joint is fastened to hold the top up in position. In this iron a joint must be put in to let the top down. This joint must be put in between B and C, so that it will close up when the top is let down. To find this exact point has been a great deal of trouble to many

good carriage makers; also the point in the joint, between C and D. This cut represents a top finished ready for the joints.

Take a small twine string, hold one end at A, bring it around C, around B, and back to A; get the exact distance around the three points as represented by the dotted lines. Then double the string, loop it over point A, bring it up over C, down in the direction of B; keep the ends even, and they will reach to F, that being the exact point for the centre of rivet in the joint. This is represented by two dotted lines.

In the same way get the exact measurement around the three points, A C D, double the string, loop it over A, up over C toward D to E,—this being the exact point for the other joint. (See by dotted lines, as before).

By this rule the joints will fold as close together as the bow will let them, and stick straight back out of the way, looking much better. I have seen many joints stand in a very awkward position when the top was let down. Such things should be guarded against. Often they are built in large shops were better mechanical skill should have been displayed.

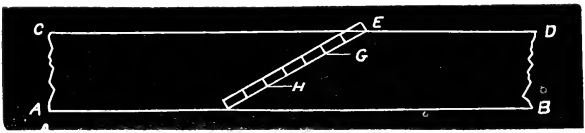
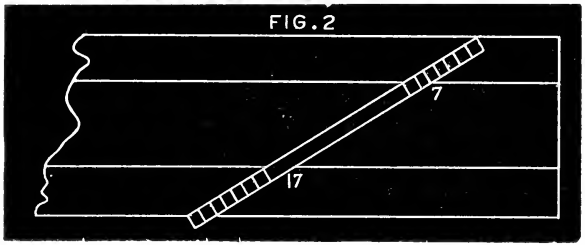


FIG. 2



A Short Way to Lay Off an Eight Square.

LET A B and C D represent the two sides of a four square piece of timber, less than seven inches wide,—say five and a quarter inches wide. Lay rule, E, across the face on an angle so as to make it seven inches wide. Mark at H, which is two inches (on the rule) from line A B, and at G, which is two inches from line C D. Set the gauge to either of these marks, gauging all around on four sides, and cut the corner off to the gauge marks. This will make the piece of timber exactly eight-square.

If the timber is just seven inches square, gauge it two inches from the edge. This rule works only to seven inches.

Figure 2 is wider than seven inches, but, as in the first cut above (1), lay the twenty-four inch rule across the face, and mark at seven and seventeen inches on the rule which will bring the same result. This is a very quick and convenient method to lay off an eight square.

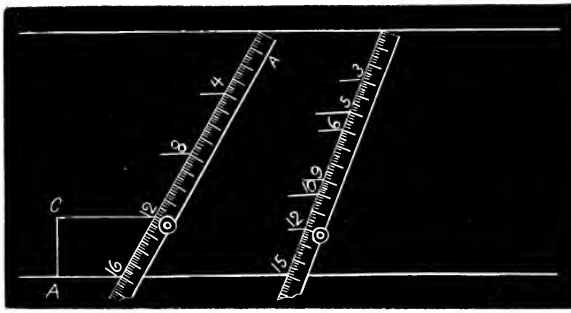


Fig. 17.

To Divide a Space into Equal Parts Without using Fractions of an Inch.

THE figure above represents a board fourteen inches wide. You wish to divide it into four equal parts. Lay the rule, A, angling across the board so as to measure sixteen inches, then mark opposite each four inches on the rule. To get exact width of each part, measure on a line drawn at right angles with the edge of the board, as C A.

If you wish to divide the same space into three or five equal parts, place the rule at an angle that measures fifteen inches, then mark opposite each three and five inches respectively.

This method will be found very convenient in drafting stick seats, etc. By its use a space may be divided into as many equal parts as desired, without using fractions of an inch. By employing this rule a space five and one-fourth inches wide may be divided into six equal parts as easily as though it were six inches wide.

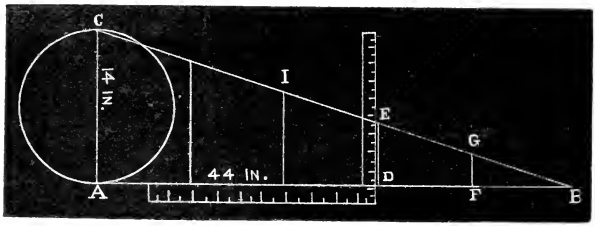


Fig. 18.

To Find the Circumference of a Circle.

DRAW a right-angle triangle, A B C, with the base line, A B, forty-four inches long, and the perpendicular line, A C, fourteen inches long. Forty-four inches is the circumference of a circle which has a diameter of fourteen inches. The line A B is the circumference of the diameter A C. Now, any line drawn from A B to C B, perpendicular to A B, anywhere from A to B, is a diameter; and from where it intersects A B, the base line, like E D, then E D is the diameter, and D B is the circumference; also F B is the circumference of F G.

Place the square anywhere on the base line A B, and the distance from the base to the hypotenuse is the diameter, and from the angle of the square to B is the circumference.

When very large circles are wanted to be measured, use the same draft by employing *inches* for *feet*.

This is a correct and useful rule.

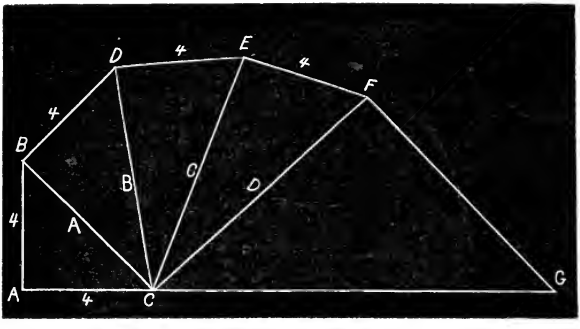


Fig. 19.

To Obtain the Size of a Chimney or Stack.

This method will apply where the flues or pipes are of different sizes. It will also obtain, with exactness and but little drafting, the size of the chimney or stack where the flues are all of the same size. For example take two boilers with twenty filues each, thus making forty flues, the diameter of each being four inches. Draw the right angle triangle, A B C, with right angle at A, the base and altitude to equal the diameter of the flues (four inches); then C B is equal to the sum of A B and A C. Draw B C to equal B A with right angle at B. Draw D C, which is equal to the sum of D B, B A and A C. Extend D to E with right angle at D. Draw E C; then E F, with right angle at E; now draw the line F C which makes the diameter—equal to the sum of the diameters of the five pipes whose diameters are four inches each. Now draw F to G, which will equal F C,—with right angle at F. Extend G to C which will equal the diameters of ten pipes whose diameters are four inches. Since G C is equal to ten flues, if another line, be drawn at right angles at G, equal to G C, the hypotenuse thus formed will equal the diameters of 20 flues. Proceed thus till all the flues in the boiler are represented.

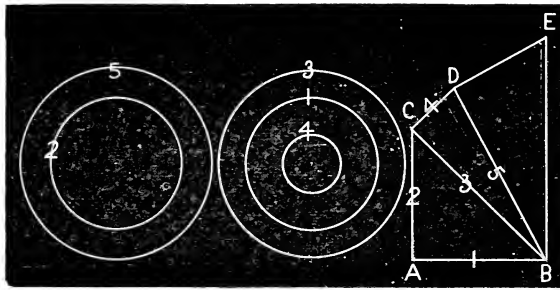


Fig. 20.

To find the Diameter of a Large Pipe which shall be equal in area to any number of smaller pipes.

THE square described on the hypotenuse of a right angle triangle is equivalent to the sum of the squares described on the other two sides; and the area of a circle having the hypotenuse for the diameter is equivalent to two circles having for their diameters the other two sides.

Now, in figure 6, let the triangle, A B C be a right angle at A. Then A B is equal to the diameter of circle 1; A C to diameter of circle 2; and B C, the hypotenuse, is equal to the diameter of circle 3; for the square of the hypotenuse is equal to the sum of the squares of the base and perpendicular A C. Draw line C D, at right angle at C, equal to the diameter of circle 4, then draw hypotenuse D B, which is equal to diameter of circle 5. Then the area of circle 5 is equal to the area of 1, 2, and 4, In like manner, draw line D E, right angle at D; draw line E B;

so E B is equivalent to all the other 4 sides. Continue the draft in this manner for as many pipes as may be required.

This rule is very useful in getting the size of a smoke stack where a boiler has a number of flues. It is obtained by drafting and not by figures. In building a house where a number of pipes discharge the smoke into one flue, the area of the flue must be as large as the areas of all the flues that discharge into it, or it will smoke. In ditching a farm where two or more tiles discharge into one, the latter must be large enough to carry the *underway*, or else trouble will set in, and the farmer cannot conceive what is the matter.

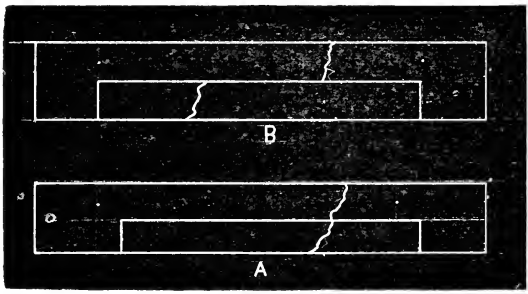


Fig. 21.

To Splice Timber.

TO splice a piece of broken timber without adding any timber to it or making it any shorter: Take piece of timber A, which is broken, saw out a piece, as represented, twice as long on one side of the break as on the other. Reverse the piece and fasten it back solid. The break is spliced without adding more timber or making it any shorter, as represented at B.

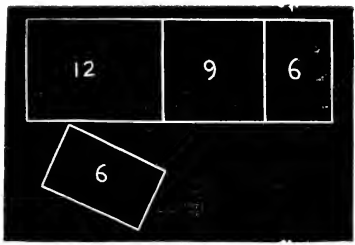


Fig. 22.

How to Cut Lumber Without Waste.

THE outline represents a space to be filled. Put in board 6 first, which is six inches wide—a narrow board; a nine inch board next. You now have a space twelve inches wide to fill, and have no twelve inch lumber, but have a thirteen inch board. Do not cut off that one inch, but take a wide board, eighteen inches or over, and cut off twelve inches to fill the space, and you have six inches or more left; when if you had cut off only one inch, that would have been thrown away. Always use the narrow pieces first, and never cut off a piece too narrow to use.

The old saying is, "One dollar saved is worth two dollars earned." A carpenter can build a house in the same manner. He should never cut off moulding too short to be used; never leave short pieces to go in short places, there is just as much loss in a short piece as in a long one. When your house is built, there are but few scraps left. Small savings, properly cared for, will, in time, make a handsome income.

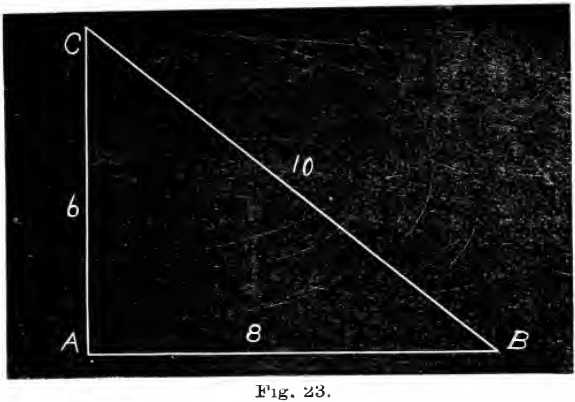


Fig. 23.

The Rule of 6, 8 and 10.

A right angle triangle is a figure that the square of the base and the square of the perpendicular added together are equal to the square of the hypotenuse

For instance, take A B C, which is 6, 8 and 10, as represented in the figure:

$8 \times 8 = 64$, square of base.
$6 \times 6 = 36$, square of perpendicular.

100, square hypotenuse.

Then the square root of 100 is 10=the hypotenuse. If the square of the hypotenuse is 100 which is equal to the squares of the base and perpendicular added together.

These are probably the only numbers that will come out even,—without a fraction. For this reason they have been generally adopted by mechanics for squaring buildings, and is called the rule of 6, 8 and 10.

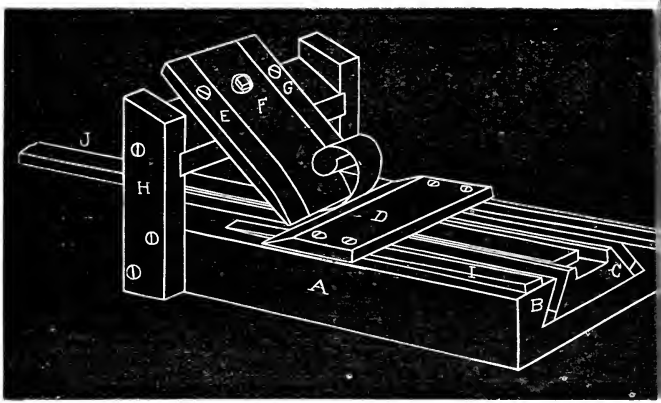


Fig. 24.

A Moulding Machine.

H is a block about ten inches long, five inches wide, and two inches thick. A groove is cut in the middle, one and three fourths inches wide and three-sixteenths deep. This can be narrower or deeper as required. B and C are two grooves cut through the block one-fourth inch wide and about one inch deep, beveling to suit the beveling of the moulding. After the moulding is run through and brought down to the required thickness, it is then run through the bevel grooves under the knife and beveled on the edges. If a narrower one is wanted, put a strip underneath in the groove to raise the moulding up to the knife. The strip underneath the moulding should be beveled to fit the bevel of the moulding. D is a knife two and a half inches wide and as long as the block is wide. It is screwed down on

the block on the outside of the groove. E F G are three wooden springs with the point close to the edge of the knife to keep the moulding down, when cross-grained, so that it may be cut without splitting off. The two outside springs, E and G, hold the moulding while beveling the edges; and F is to hold the moulding when it is run through flat-ways. H is a frame on front part of the machine to hold the springs. I I, represent two long slim wedges, which extend under the knife to raise or lower it to suit the thickness of the molding. J is a piece of moulding run-flatways through the machine.

Mouldings can be made very quickly and cheap by sawing strips off the edge of lumber. Be careful to have it as straight grained as possible. It is much cheaper than to have the lumber dressed down at the mill to the right thickness.

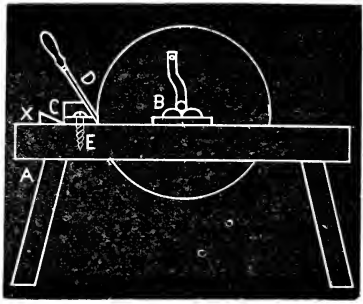


Fig 25.

Easy Way to Grind Tools.

TURN the stone down until it is perfectly round, and the face level, and square with the side. A, represents the bench; B, the stone; C, a block two inches thick by two and a half inches wide, screwed fast to the bench, beveled on the side next to the stone just to suit the bevel of the tool. X, is a wedge. When more bevel is wanted, loosen the screw E, as represented in the cut, and drive wedge X in farther. This will incline the block toward the stone and give more bevel. D, is a tool placed on the bevel of the block. With one hand press the tool firmly against the stone and turn the stone from you with the other. In this way the tools are quickly and easily ground, and always with the same bevel.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