

THE STEEL SQUARE AND ITS USES.

By F. T. HODGSON, ARCHT., EDITOR "AMERICAN BUILDER."

How a rafter can be obtained by the square, when the width of the building to be covered contain odd feet, or a fraction of a foot.

Let us suppose that we have to make up a fraction of a foot, say 8 inches, the half of which would be four inches, or $\frac{1}{2}$ of a foot; then, if our roof is quarter, all we have to do is to place the square, with the 4" mark on the blade, and the 2' mark on the tongue, on the centre line of the rafter, and the distance between these points is the extra length required, and the line down the tongue is the bevel at the point of the rafter. We show in Fig. 1 an application of this method. All other pitches and fractions can be treated in this manner without overtaxing the ingenuity of the student.

Figs. 2 and 3 show an instrument, which, curiously enough, appeared in the *Scientific American* as a patented device. One, George H. Bradshaw, of Fayetteville, Tenn., claims to be the happy inventor. The practical operator will see in a moment that the simple wooden fence used by me, and shown in past numbers, is much more convenient to use than the patented device illustrated. The singularity of the thing, however, exists in the fact that the patented device makes its appearance September 26th, 1876; and my basswood wooden fence is, for the first time, I believe, introduced to the public on or about the first of August, 1876. The coincidence partakes somewhat of "fish," to say the least.

A represents a bar, upon the edge of which is formed a scale of division marks, numbered to represent the length of brace or rafter, and which should be made upon a scale of an inch to the foot to make it correspond with the division marks in an ordinary square. The bar, A, is slotted longitudinally to receive the clamping screws, B, which are screwed into straight bars, C, placed upon the lower side of said bar, A, as shown. In using the instrument, the bar, A, is laid diagonally across the arms of an ordinary square, and is adjusted upon the long arm of the square at a point representing the half width of the building, and upon the short arm at a point representing the desired pitch of the rafters. The bars, C, are then adjusted against the edges of the arms of the square, and are clamped in place by the screws, B. The instrument is now set to give the length of the rafters and the bevel of their ends. The instrument may be used without a square by having lines drawn upon the inner side of the bar, A, to represent the different positions of the bars, C, for different lengths and pitches of rafters.

Fig. 4 shows the plan of a roof where the angles are not right-angles. This is published in compliance with a promise made in a previous number of the *Builder*.

Bisect A D in *a*, and from *a* describe a semicircle A b D; draw *a b* parallel to the sides, A B, C D, and join A b, D b, for the seat of the hip-rafters. From *b* set off on *b A*, *b D*, the lengths *b d*, *b e*, equal to the height of the roof *b c*, and join A e, D d for the length of the hip-rafters. To find the backing of the rafters: In A e, take any point, *k*, and draw *k h* perpendicular to A e. Through *h* draw *f h g* perpendicular to A b, meeting A B, A D in *f* and *g*. Make *h l* equal to *h k*, and join *f l*, *g l*; the angle *f l g* is the backing of the hip.

Any diligent student will see at once that the above method will apply to any hip-roof, no matter what may be the plan of the building.

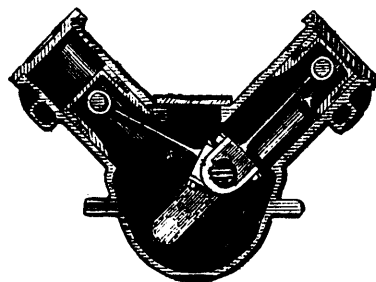
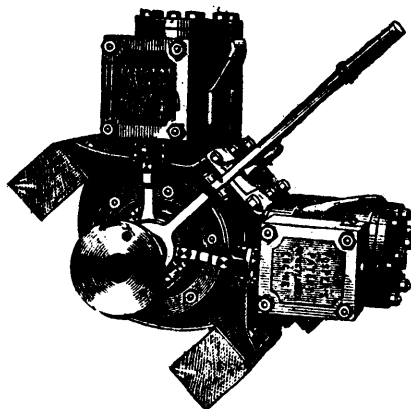
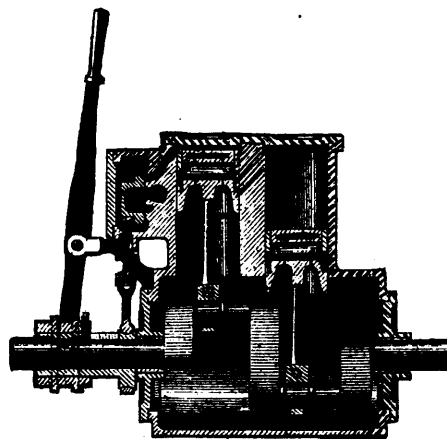
Fig. 5 is taken from Gould's valuable *Carpenter's and Builder's Assistant and Wood-Worker's Guide*, and may be of use to the young mechanic. It shows the method of finding a veneer for a gothic head jamb, splayed alike all round; the spray of the jamb, B, being produced to A, gives the radius to describe the veneer required to cover one side of the circular jamb.

This paper closes the subject, and if I have been fortunate enough to awaken an interest in it in the mind of any mechanic, my efforts will not have been in vain. It is but just to say that I have drawn a great deal of the pith of these papers from many and varied sources, and I may add further, that the subject is far from being exhausted as there are many things that can be performed with the steel square that have not been spoken of here; they may, however, be the subject of future papers.

POTATO BUGS UTILIZED.—Those who like to find "good in everything" will be gratified to learn that it appears from experiments described in the *Journal of Pharmacy* that the fresh powder of the potato bug yields about 13% of pure cantharidin. This is a large product, and no doubt these pests will be increasingly used as a cheap source of this valuable remedy.

THE "VOSPER" FOUR-CYLINDER ENGINE.

There is still an unsatisfied demand in the market for a good fast speed launch engine. The "Brotherhood" three-cylinder engine was one of the first to be put on the market and the next that followed with any special distinguished features was the "Willans," made by Hunter & English. Both of these engines were excellent in their way, and were the forerunners of a large number of similar or approximately similar designs.



What is sought is an engine which in the smallest possible space and of the most simple construction shall keep a pressure as nearly as possible uniform upon the rotating crank. To effect this purpose well, at least three or four cylinders are requisite, and to render them compact the connecting rods are invariably centered on a pin passing through the piston. The advantages of this system are obvious in the matter of reducing the space required, but at the same time the great lateral thrust thus induced on the piston tends to great wear on those parts and considerable friction in the cylinders.

The "Vosper" engine, which we this month illustrate, has most of the usual features common to the multiple cylinder