pressure only is to be borne. Fig. 233 shows a *framing-joint* used in the construction of a principal rafter. Such joints are made on the principle of a *tenon* and *mortise*, in which one of the pieces to be joined is cut away so to leave a small projection or tenon, while a corresponding cavity or mortise is made in the other piece to receive the tenon.

There are many other particulars which might be given respecting floors and partitions, &c.; but enough has been said to show the nature of the house-carpenter's work. The various tools used by him are represented in the figures, not very accurately indeed, but they are all so well known that the defects of the figures may be supplied by the experience of the reader. In carpenters' work the timber remains rough, as left by the saw; but in joiners', it is brought to a smooth surface by means of the plane, wherever it is exposed to view. The chief cutting tools used by the joiner consist of saws, planes, and chisels. There are various kinds of saws, distinguished by their shape and the size of the teeth: thus the *ripper* has 8 teeth in a length of 3 inches; the *half-ripper* 3 teeth to the inch, the *hand* saw (fig. 239) 15 teeth in 4 inches, and the *panel* saw 6 teeth to the inch. The *tenon* saw (fig. 218), which is used for cutting tenons, has about 8 teeth to the inch, and the blade is prevented from *buckling* or bending by means of a thick piece of iron at the back. The *sash* saw has a brass back, and 13 teeth to the inch, while the *dove-tail* saw has 15. The *key-hole* saw (fig. 200) is used for cutting out small holes There are also various kinds of planes; those used for bringing the stuff to a plane surface are called *bench* planes, and of these the *jack* plane is used on the roughest work, while the *trying* plane (fig. 223) is used after the jack plane for *trying up*, or taking off shavings of the whole length of the stuff. There is also the *long* plane, 2 feet 3 inches in length, the *jointer*, 2 feet 6 inches in length, and the *smoothing* plane, 7½ inches in length, used for cleaning off finished work There are also various *moulding* planes for forming or *sticking* mouldings, as it is called. Chisels (figs. 215, 229) are also of various forms and uses, such as the *paring chisel*, which is used by the pressure of the hand only; the *socket-chisel*, used with the *mallet* (fig. 211). The *gouge* (fig. 227) is only a curved chisel The boring tools are the *brad-awl* (fig. 214), the *gimlet* (fig. 216), the *brace and bit* (fig. 236), the latter admitting into the handle or *stock* a variety of *steel bits* of different bores and shapes for boring and widening holes in wood and metal. The joiner also uses the *screw-driver* (fig. 220), the *pincers* (fig. 228), the *hammer* (fig. 208), the *axe* (fig. 219), and the *adze* (fig. 225). It may be remarked that the *glue-pot* (fig. 238) is not used by the house-carpenter or joiner, but belongs rather to the cabinet-maker.

HAWES' STEAM TRAP.

We give on page 220, from *Engineering*, views of an ingenious arrangement of steam trap designed and patented by Mr. Loring P. Hawes, of New York. The apparatus consists of an outer shell formed of two pieces, which are held together by suitable screws, which can be removed to repair or clean the inside of trap. B is an expansive vessel made of thin sheet metal, and supported in its position by the outer shell A, A, and adjusted by the stem C and wheel H. This vessel contains alcohol or other easily vaporised liquid combined with or standing on any thick or gummy substance like resin, this gum filling the vessel above the central joint and thus preventing any waste of alcohol at this joint. When the steam strikes the vessel the expansion of the liquid or the formation of vapour is sufficient to press out or expand its elastic top and bottom and stop the flow of steam by bringing one of its flat sides against the opening G from which the steam escapes.

When the accumulation of water of condensation allows the parts to cool sufficiently for the vessel B to collapse or lessen in thickness by the diminished pressure within it, the top of the expansive vessel which has formed the valve is drawn away from the steam inlet and the water is allowed to run out until the heat is sufficient to again expand or boil the alcohol, and produce a pressure in the vessel B, which again springs out its top or sides and then closes the opening as before. P is a cylindrical block of wood which is secured in its place by wires O, O, which are soldered to the sides of the expansive vessel, this block is of sufficient length to prevent the sides of the expansive vessel from being injured by collapsing by the external pressure, or from the face of the regulating stem C being screwed down upon it. E is the outlet pipe; F is the inlet pipe, G is the inlet valve or opening, and is composed of soft metal, being secured in its place by the concentric ring b, b. H is a hand wheel for turning the spindle or stem C; I is a stuffing nut; K, K, shows the top of the gum; and L, L, the top of the alcohol.

This trap is very compact and simple, and by a proper adjustment of the screw spindle C, water of any temperature from 100 deg. Fahr. to 212 Fahr. may be retained or discharged as desired, a certain temperature produces a certain pressure in vessel B, to which is due a corresponding expansion of said vessel; so if the screw spindle is so adjusted that it requires 200 degs. Fahr. to close the valve, the trap will continue to discharge water as fast as it accumulates at that temperature; if the water becomes hotter the valve closes, while if it cools the valve opens. The advantages of this feature are obvious. This trap will operate equally well either side up.

THE LATHE.

In the opening lecture, given before the Manchester Society for the promotion of Scientific Industry, Dr Anderson, discoursing of Tools, said:—To select for an example the familiar tool called a lathe,—it is chiefly intended to impart to materials true circles, straight lines and flat surfaces, and all of these conditions must first exist in the tool. The bearing surface of the spindle neck must itself be absolutely round in the strictest sense, otherwise the article operated upon will not derive a true circle from the revolution of the spindle. The mathematically true circle here referred to is practically very difficult to attain. There are many tools in the world that are supposed to be round, but which are not so in reality An examination of the Whitworth gauges will best convey the idea of what is meant by mechanical truth and a true circle, each part fitting accurately into the other, yet perfectly free in every position. Then again the lathe has to afford absolutely straight lines of movement for the guidance of the cutting instruments, whereby the true circle derived from the spindle and deadcentre point is developed into a true cylinder, but not so unless the parent circle and straight lines are correct in themselves If a perfectly flat surface is required from the lathe, the cutting instrument must pass in a straight line transversely to the axis of the revolving spindle, and if the two are set absolutely at right angles to each other, a correctly flat surface is the result. If, however, any of the conditions of accuracy are wanting, then imperfection in the produce will follow, as a matter of course. If the lathe is intended to afford screws, it must first have a perfect screw within itself to copy from, for if there is any imperfection in the screw copy, or in the divisions of the teeth of the wheels by which it receives collateral motion, the screw produced will contain a transferred copy of each imperfection. It will thus be seen that the lathe is simply a tool to transfer its own character to other things; hence the paramount importance of having the lathe perfect in itself. But unfortunately, the world, as a rule, does not sufficiently appreciate the difference between perfect tools and tools nearly perfect, but in the government of this portion of the world it is so arranged that those who do not are invariably punished, because the want of truth and accuracy entails greater cost in their production, both at the present time and hereafter.

Mr. John Adams, of Canboro, informs the Monck *Reform Press* that he has a receipt for keeping the potato bugs from doing damage, and says that since using it not a bug has been seen in his potato patch. He took about four pounds of coal tar and boiled it in three or four gallons of water, afterwards sprinkling the solution on the vines with a brush. The four pounds suffice for one acre, and the effect was all that could be desired.

The Ottawa *Times* says:—"We are glad to learn that the miscellaneous writings of the late Charles Dawson Shanly are about to be collected for publication in one or more volumes, accompanied by a suitable memoir, written by his brother, Mr. Walter Shanly, C. E, who has undertaken the editorship. We feel quite sure that this collection, forming as it will a most desirable *memento* of one long connected with the public service of Canada, as well as with its nascent literature, will be gladly welcomed throughout our country."