PRACTICAL MECHANISM.

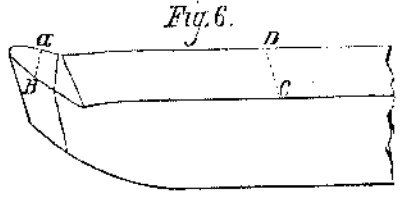
NUMBER II.

BY JOSHUA ROSE.

SIDE RAKE.

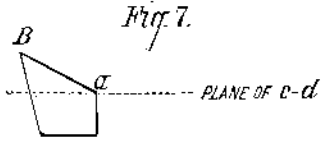
The power required to feed a lathe or other tool, which is moved into its feed at the same time that it is cutting, is considerable when a heavy cut is being taken, unless it possesses what is termed side rake, as represented in Fig. 6.

Fig. 6.



The edge, B, is here supposed to be the cutting one, the face from *a*, to B, being an inclined plane (as compared to the face C D) of which B is the apex, the sectional view at *a*, B, being as given in Fig. 7.

Fig. 7.



This form gives the tool a tendency to feed itself along and into the cut, the cause of which is that the pressure upon the top face, B, *a*, (the result of its having to bend the shaving out of the straight line) is placed, in consequence of the side incline, more upon the side and less upon the top of the face. It has, in fact, followed the direction of the rake, decreasing its tendency to run or spring in (as shown in Fig. 3), with a corresponding gain in the above mentioned inclination to feed itself along, or into, its lateral cut.

When side rake is called into use, a corresponding amount of front rake must be dispensed with, or its tendency to feed itself becomes so great that it will swing round, using the tool post as a center, and (feeding rapidly into the cut) spring in and break from the undue pressure, particularly if the lathe or machine has any play in the slides. So much side rake may be given to a tool that it will feed itself without the aid of any feed motion, for the force required to bend the shaving (in heavy cuts only) will react upon the tool, forcing it up and into its cut, while the amount of bottom rake, or clearance as it is sometimes called, may be made just sufficient to permit the tool to enter its cut to the required thickness of shaving or feed and no more; and it will, after the cut is once begun, feed itself and stop of itself when the cut is over. But to grind a tool to this exactitude is too delicate an operation for ordinary practice. The experiment has, however, been successfully tried; but it was found necessary to have the slides of the lathe very nicely adjusted, and to take up the lost motion in the crossfeed screw.

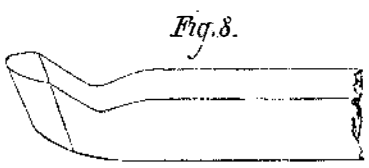
For roughing out and for long continuous cuts, this tool is the best of any that can be used; because it presents a keen cutting edge to the metal, and the cutting edge receives the maximum of support from the steel beneath or behind it. It receives less strain from the shaving than any other; and will, in consequence of these virtues combined, take a heavier cut, and stand it longer, than any other tool; but it is not so good for taking a finishing cut as one having front rake, as shown in Fig. 1.

Having determined the position of the requisite rake, the next consideration is that of the proper form of the cutting edge, the main principles of which are as follows

ROUND NOSED TOOLS,

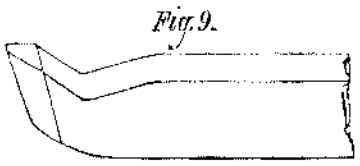
as shown in Fig. 8, have more cutting edge to them (the

Fig. 8.



depth of the cuts being equal) than the straighter nosed ones, shown in Fig. 9, receiving as the result more strain

Fig. 9.



from, and becoming more liable to run into or out from, the cut. If sufficient rake is given to the tool to obviate this defect, it will, under a heavy cut, spring in. It is, however, well adapted to cutting out curves, or taking finishing cuts on wrought iron work, which is so strong and stiff as not to spring away from it, because it can be used with a coarse feed without leaving deep or rough tool or feed marks; it should, however, always be used with a slow speed. On coming into contact with the scale or skin of the metal, in case the work will not true up, it is liable to spring away from its cut. If held far out from the tool post, it is apt to jar or chatter; and unless the work and the tool are both firmly held, it is liable to cut deeper into the softer than into the harder parts of the metal. The angles or sides of a cutting tool must not of necessity be quite flat (unless for use on slight work, as rods or spindles), but slightly curved, and in all cases rounded at the point, as in the tool shown in Fig. 9. If the angles were left flat and the point sharp, the tool would leave deep and ragged feed marks; the extreme point, wearing away quickly, would soon render the tool too dull for use, and the point would be apt to break.

For the finishing cuts of heavy cast iron work, which is not liable to spring, the broad square nosed tool, given in

Fig. 10.

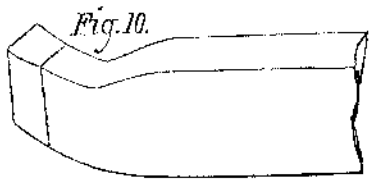


Fig. 10, is the most advantageous.

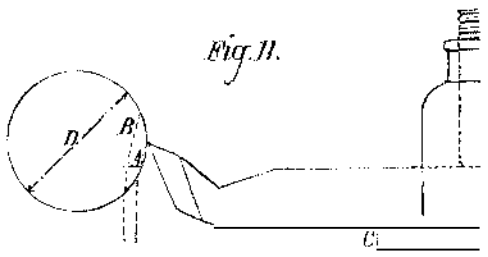
SQUARE NOSED TOOLS.

A feed can be used with this tool almost as broad at a cut as the nose of the tool itself, providing, however, that it is set in position with great exactitude, so that its flat nose or front will be even or true with the face of the work it is intended to cut, and that it is held as close in to the tool post as it can conveniently be, and that, if fed by hand, it be fed evenly, because all tools possessing a broad cutting surface are subservient to spring, which spring is always in a direction (as in this case) to deepen the cut; so that, if more cut is taken at one revolution or stroke than at another, the one cut will be deeper than the other. They are likewise liable to jar or tremble, the only remedy for which is to grind away some of the cutting face or edge, making it narrower. For taking finishing cuts on cast iron, more top rake may be given to the tool than is employed to rough it out, unless the metal to be cut is very hard; else the metal will be found, upon inspection, to have numerous small holes on the face that has been cut, appearing as though it were very porous. This occurs because the tool has not cut keenly enough, and has broken the grain of the metal out a little in advance of the cut, in consequence of an undue pressure sustained by the metal at the moment of its being severed by the tool edge.

HOLDING TOOLS.

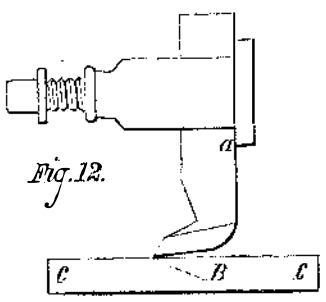
All tools should be fastened or held so that their cutting edges are as near the tool post as possible, so as to avoid their springing, and to check as far as possible their giving way to the cut, in consequence of the play there may be in the slides of the tool rest; but if, from the nature of the work to be performed, the tool must of necessity stand out far from the tool post, we should give the tool but little top rake, and be sure not to place it above the horizontal center of the work. The point or fulcrum, off which the spring of a lathe tool takes place, is denoted in Fig. 11, by C, the

Fig. 11.



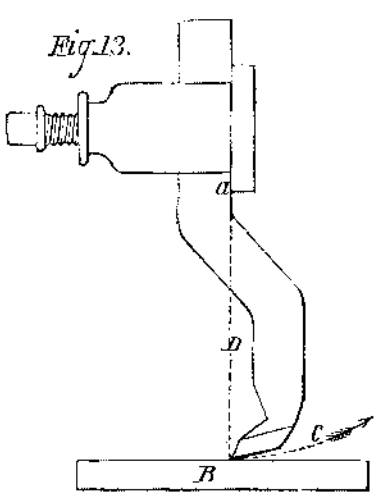
dotted line, A, indicating the direction in which the point of the tool would spring, and the dotted line, B, representing the direction in which it would spring if it stood at B; from which it becomes apparent that, if placed at the point, B, the spring would be more in a direction to run into the cut or diameter of the shaft, D, than is the case when placed at *a*.

Fig. 12.



Cutting tools used in a planer are subject to the same conditions, as represented in Fig. 12. *a* is the fulcrum from

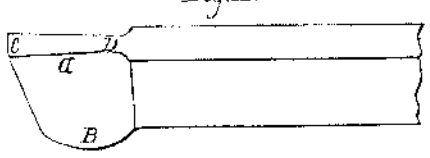
Fig. 13.



which the tool springs, C is the work to be cut, and the dotted line, B, represents the direction in which the point of the tool springs into the work, thus increasing the cut according to the amount of spring, as in the case of a lathe tool. This may be obviated, in a planer tool, by bending its body, as shown in Fig. 13. *a* is the fulcrum off which the tool takes its spring, B is the work to be cut; and the dotted line, C, is the line in which the point of the tool would spring (being in the direction denoted by the arrow) which is not in this case into the cut, but rather away from it, in consequence of the point of the tool standing back from a line perpendicular to the line of the back part of the tool, as shown by the dotted line, D.

Tools that are necessarily straight in form, especially those for use in a planer, are more subservient to the evil effects of spring than those of stouter body; and in light planers, when the tool springs in, the table will sometimes lift up, and the machine becomes locked, the cut being too deep for the belt to drive. The tool most subservient to spring is the parting or grooving tool shown in Fig. 14, which,

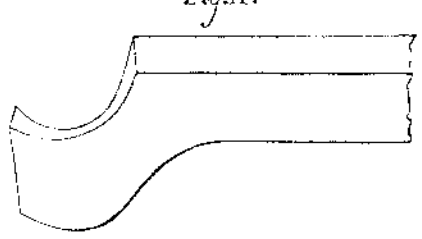
Fig. 14.



having a square nose and a broad cutting surface placed parallel to the depth of the cut, and requiring at times to be slight in body, combines all the elements which predispose a tool to spring, to obviate which, it should be placed at or a little below the center, if used in a lathe under disadvantageous conditions, and bent similarly to the tool shown in Fig. 13, if for use in a planer, unless under favorable conditions.

The point at C is made thicker than the width at D to give clearance to the sides, so that it will only cut at the end, C;

Fig. 14'.



and the breadth at *a*, B, is left wider than other parts to compensate in some measure for the lack of substance in the thickness. An excellent substitute for bending the body of the tool is to set the cutting edge of the tool back, as shown in Fig. 14', which represents a parting tool for wrought iron.

The Value of Oatmeal as Infants' Food.

In a communication to the *Société Médicale des Hôpitaux*, MM. Dujardin-Beaumetz and Hardy make known the results of the employment of oatmeal on the alimentation and hygiene of infants. According to them, oatmeal is the aliment which, by reason of its plastic and respiratory elements, makes the nearest approach to human milk. It also is one of those which contains most iron and salts, and especially the phosphate of lime, so necessary for infants. It also has the property of preventing and arresting the diarrhœas which are so frequent and so dangerous at this age. According to the trials made by M. Marie, infants from four to eleven months of age fed exclusively upon Scotch oatmeal and cow's milk thrive very nearly as well as do children of the same age suckled by a good nurse.

A Beneficent Californian.

We have heretofore published an account of the donation of Mr. James Lick to the public, consisting of a sum of money for the purpose of building the largest telescope ever known, the scheme for which has been much commented on in these columns. We now hear from San Francisco that Mr. Lick has deeded more than a million dollars additional, to be devoted to several most praiseworthy objects. The total amount of these benefactions is $1,780,000, and its distribution is as follows: $700,000 to the construction of the largest and best telescope in the world and for the observatory at Lake Tahoe; $420,000 for public monuments; 150,000 for public baths in his city; $100,000 for the Old Ladies' Home; $10,000 to the Society for the Protection of Animals; $25,000 to the Ladies' Protection Relief Society; $10,000 to the Mechanics' Library; $25,000 to the Protestant Orphan Asylum; $25,000 to the city of San José for an Orphan Asylum; $150,000 for the erection of a bronze monument to the author of the "Star Spangled Banner," in Golden Gate Park; $300,000 for the endowment of a School of Mechanical Arts in California, and the residue to the Pioneer Society. He makes ample provision for his relatives, and reserves a homestead and $25,000 per annum for himself.

Mr. Lick, by this judicious liberality, has the pleasure, perhaps the highest a man can attain, of seeing his wealth do good and fructify during his lifetime, instead of being a bone of contention to his heirs after his death.

To Build a Transverse Sled Body.

W. A. W. says: "The best way to build a traverse sled body is to make the sills out of one inch or three quarter boards, with cross pieces of the same thickness bolted between the sills, which are double. You can make these very light and limber. Now put on your side boards with a bolt down through the rave and sill, which will make it very stiff, and can be made very light, and with all the strength possible. This is the best form I ever saw in practice."