METAL WORKING

Beginner's Workshop

By GEOMETER

THE DUCTILITY of most metals and alloys is one of their most useful characteristics, enabling many operations to be performed that would otherwise be impossible. For without stretch and flow in metals there would be no simple operations like riveting and bending, nor manufacturing processes such as rolling, wire-drawing, forging, panel-beating. Equally, however, there are occasions when it is undesirable for metals to change their shape, if no more than because subsequent rectification will be necessary; and with recognition of such cases a considerable amount of trouble and wasted effort may be avoided.

Common processes where pressure is (inadvertently) put on the metal are shearing and chiselling. Thus, in cutting a strip from a piece of sheet, as at A, using shears, there is always a tendency for the strip to bend, because of the wedging action of the blades B (left). This is in addition to the curling which occurs.

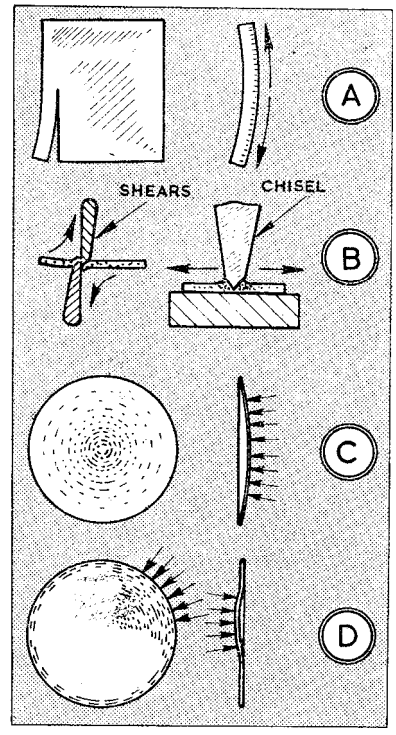
In chiselling, a similar wedging action is involved, B (right), when the sheet is laid flat on a metal block for cutting. Again, the strip is bent, though this time without curling. Tapping down the ragged edges can also stretch the metal along the cut edge, increasing the curvature; and this operation on the edge of the sheet may render it wavy or unstable.

From this it will be seen that, to minimise the effects, shears and chisels should be sharp, and chisels slender at the end. To maintain metal in really good shape, however, it should be sawn, if necessary gripping or clamping thin sections between wood with the strip projecting, using a blade with fine pitch teeth, and slanting it so that they cannot dig in.

Even with sawing, bending sometimes occurs on strips cut from rolled bar sections, due to release of internal strains; the writer once had this occur with material for the rack of a small lathe. Usually, it is effective for mild steel to heat the bar red and cool out slowly, relieving the strains.

Hammering metal on a surface results in thinning and stretching, which can be helpful or the reverse. When a strip or bar is bent, it is helpful to hammer along the edge of smallest curvature to straighten it by stretching, and usually this is preferable to attempting straightening in the vice by pulling-which in many instances introduces a reverse bend or kink.

Hammering can cause difficulty with sheet metal through either of two effects. Taking a disc as an example, hammering and stretching in the central area C initially produces an



"oil can bottom," when if the perimeter is held the centre can be pushed one way and the other. Hammering the edge, however, particularly if not all round, renders this unstable, ***D,*** and laying the disc on a flat surface shows the edge to be upstanding in places. Pushing these down causes spring-up in other places

Rectification to flatten the disc consists for the domed centre C, of hammering the edge with diminishing blows to the centre, and for the unstable edge ***D*** of hammering the central zone, though experience must guide as to weight and location of blows.

When sawing is impracticable, drilling round a perimeter is best, ***E,*** then the metal between the holes can be safely cut with a chisel, and the edge file-finished, avoiding hammering.

Flanging a tube is an instance of extremes required in metal working, ***F.*** For an outer flange, stretching to the larger diameter is necessary, and for an inner flange the metal must be compressed. The latter is the more difficult since ruckling tends to occur and only a small flange is practicable.

The diameter of a tube can be increased by hammering round on a mandrel G, and a flare produced by inclining the tube and hammering round, ***H.*** This should also be done in producing an outer flange, for the metal must stretch gradually, otherwise splits appear. Final flanging can be done in a ring, I, but only when the flange has been initially well formed. Naturally, the need for annealing should not be overlooked, as hardening occurs with hammering. ❑