Beginner's Workshop

CASE-HARDENING

GEOMETER explains the process and its applications

BECAUSE of its low carbon content, ranging between about 0.1 and 0.2 per cent., a mild-steel, unlike a carbon steel, will not harden merely by heating to bright red and quenching in water. The process of case-hardening, however, increases the carbon content at the surface of mild-steel and, on quenching this layer, hardens in the same way as a carbon steel, though the core of the mild-steel remains soft.

The obvious advantages of case-hardening are that parts like shafts, gears, gudgeon pins, brake rod pins, screws, etc., are rendered resistant to wear. On the other hand, it is not always realised that special cutters and small tools for aluminium, brass, copper can at a pinch be in mild-steel case-hardened-which in the larger sizes may be more conveniently and cheaply obtained than cast steel. Small blade type springs, too, if not highly stressed,. are successful in case-hardened mild-steel.

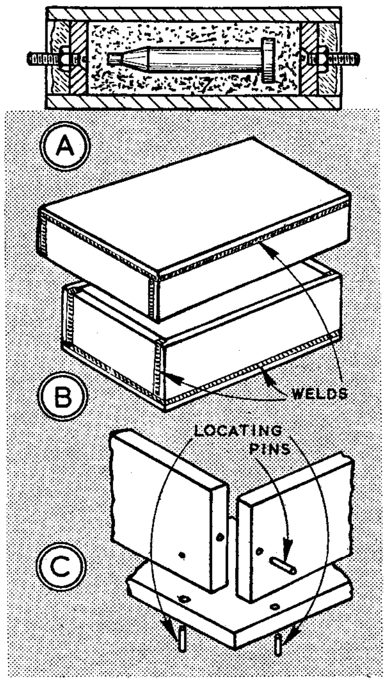
Depth of casing

The depth of hard casing depends largely on the period during which the mild-steel is at red heat and in contact with the case-hardening compound.

A simple method, yielding a casing a few thou. thick, is to heat a component red in a blowlamp flame or fire, sprinkle on the case-hardening compound or roll the component in it, reheat to bright red for about two minutes causing the compound to run over the surface and burn, then quench in water. Rubbing on a file reveals the surface is hard, though if the component is held in a vice and the file used vigorously, the casing can be cut through.

For greater depth of casing, a component must be packed in case-hardening compound in a steel box, so as not to be nearer the sides than about l-1/2in. Maintained at red heat for four to five hours, the depth of casing is then about 3/64 in. This method is essential when the component is to be ground to size after case-hardening.

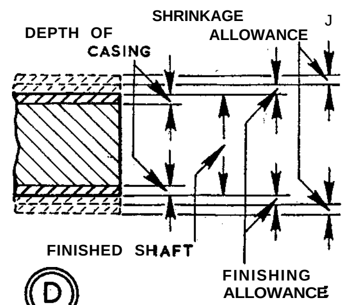
Small parts like screws, nuts, washers, and components on which distortion may be small or not important, can be case-hardened singly or in numbers by laying on a piece. of sheet iron, heating to red, covering with compound, reheatmg, then quenching the lot. A shaft or spindle, however, on which distortion can occur, should be lifted off by pliers, plunged vertically and kept moving.

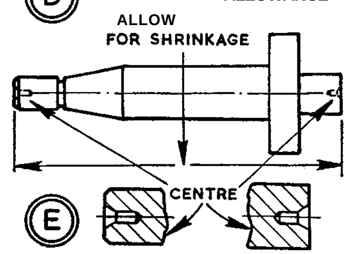


For a deep casing on a special shaft, a box can be made from round mild-steel tubing with discs at the ends, sealed with fireclay, A. The case-hardening compound should be packed tightly round the shaft and the whole maintained red in the domestic fire (failing other means) for one to two hours, or longer. After cooling, the ends can be extracted, (countersunk screws shown are convenient for gripping), the shaft removed, reheated to bright red, then quenched vertically.

For flat or odd-shaped parts, a box can be in mild-steel plate, with welded corners. For a small box, thickness can be 5/32 in. or 3/16 in., or 1/4in. for fairly large ones. A flat fitted-in lid or a fit-over type, B, can be sealed with fireclay. Welding being done out, location can be as C, otherwise clamping is sufficient. Thicker than 3/16 in. plate, edges of joints should be chamfered for welding.

For hardening, parts should be polished with emery cloth, and any areas to be kept soft covered with a mixture of fireclay and pulped asbestos (sheeting or string), allowed to dry completely. After hardening, the surface is a light grey or mottled





colour, and can be repolished with emery cloth-sufficient in most cases. On a shaft where size is important, however, allowance should be made of about 0.001 in. per inch of diameter for shrinkage, and 0.004 in. to 0.008 in. for finishing by grinding-the larger dimension also taking care of slight distortion. Several thou. depth of casing should then remain, *D*.

Allowance as for diameters should be made on lengths *E* and for finishing, centre indentations can be cleaned and trued on brass or mild-steel points, using fine grinding compound.