Avoiding assembly cracks

By GEOMETER

BESIDES the acquisition of positive knowledge and skill, a good part of most engineers' experience, if not training, is of a negative variety. Based on the elementary idea of avoiding immediate or subsequent trouble and expense it is none the less useful. From a limited point of view, knowing how to proceed may be quite sufficient-while circumstances remain the same; but in the wide sense they rarely do-and so may set a trap for the inexperienced, the unwary, the too bold, or those ready to take a chance.

As a simple instance, a sharp tap above a certain size may be used with a certain amount of abandon in material like brass or aluminium; but it is otherwise for one which is off-colour, used in a piece of tool steel. Experience would suggest contriving the circumstances before there is any problem, by ensuring the core hole is the proper size, and using good taper or second taps, with lubricant and care. The alternative may be starting again after removing a broken tap or obtaining another piece of material.

Unnecessary force

In ordinary assembly and dismantling where there should be least chance of error, damage can occur through strains or cracks arising from wrong or over-application of force. Use of a thick semi-soft joint on an oval flange, as at ***A,*** results in strain and bending of the flange, and can lead to actual breakage of a lug, though this may be only later should working strain or vibration be added. Thick joints resembling this are commonly used between carburettors and manifolds to provide insulation against heat; but they now consist of a piece of hard insulating material with a thin joint either side. It was not always so; and any other arrangement, as substitute or expedient, may well lead to breakage.

The forcible pulling up of joint faces when they do not meet squarely, as at ***B,*** is similarly to be avoided, and is a condition that may have to be dealt with in the case of an exhaust system and manifold. Even if a satisfactorily tight joint is obtained there is inevitably strain which,. with vibration, may result in the pipe cracking below the flange or at the silencer. Before bolting, the faces should come up squarely by hand; and if they do not, the holding brackets should be slackened and adjusted, though the pipe may have to be removed and reset, heating to red first. Where there is a " built in T strain (and a welding torch is available), it can often be relieved by bolting up fairly hard ***in situ,*** then heating the pipe to red for a few inches, so that it can acquire a natural set.

Sometimes, driving keys in pulleys and wheels results in the cracking of bosses, and there may be several reasons-an inherently weak boss, the keyway in a weak part, an unsuitable key, or a poor fit of the boss on the shaft with constant working loose-when there is a strong temptation to use extra " beef" when driving the key in.

When a keyway is provided in a boss, as at C, in the absence of any strengthening hump (which may be advisable in design), it should preferably pass under a spoke, as at x for a little extra strength, rather than between spokes, as at y. The key should be gradually tapered and fit well into the boss, as a short steeply-tapered key may crack the front end of the boss.

Similar cracking of bosses can occur when a too tight bush is pressed or driven in,. as at ***D,*** and when too much force is used for tightening a banjo union as at E-owing to the bursting effect of the thread. Used for petrol, such a union has a red fibre washer each side, and these can rarely successfully be used again. Also, at times, the banjo needs filing parallel.

Dismantling of taper-fitted parts generally demands pullers, which should be of correct type. Even where there are convenient studs or holes, a thread or groove on the boss, as at ***F,*** may indicate a puller to be fitted there, adjacent to the source of resistance. ❑