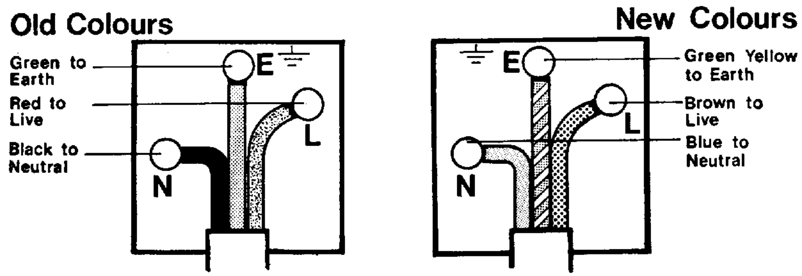


Fig. 5 Diagram of old and new wiring colours and plug connections

cables available for use with portable equipment such as household appliances. As an aid to the recognition of the identification colouring of the individual wires themselves, a leaflet has been issued by the British Government showing the correct cable connections to any plugs to be used. It is assumed of course that the wiring to the sockets themselves will, as they should be, have been made by a qualified electrician.

In Fig. 5, the diagram issued by the Government is reproduced. Here the old colouring is given together with the alternative markings on the plugs themselves. By comparison the new cable colours are shown and also the new simplified marking for the plug connecting pins.

Connecting Plugs Correctly

The following directions should be followed when making connections from electrical apparatus:

(1) Make any connections in accordance with Fig. 5 and see all connecting screws are tight.

(2) If any other colours appear in the cable connected to the apparatus, consult a qualified electrician before attaching a plug.

(3) Never use a two-pin plug to connect to a three-way flex.

(4) Do not use the earth terminal when connecting a two-wire flex to a three-pin plug.

(5) If the apparatus is metal-cased, or has a motor built into it in accordance with some light machine tools, a three-wire flex should be used connected to a three-pin plug. The only exception to this requirement is when the apparatus is marked ⧈ which denotes that it is double insulated and so does not require to be earthed.

CHAPTER 8

Mounting the Work

EXPERIENCE IN USING a shaping machine will very soon reveal that it is a tool of much versatility, and that some work, which at first sight might be thought unsuitable to its abilities, is well within the scope of the performance of any well-designed shaper.

So much can be done with the tool that it is manifestly impossible, in a short space, to list and describe in some detail all the varying operations of which the machine is capable. However, in dealing with some of the standard jobs, with perhaps in addition, a few of the more unconventional ones, it is hoped that the reader, when he comes to use his shaping machine, will be in a better position to exploit its potential more fully. But first of all the subject of holding the work on the machine must be considered.

Holding the Work

As, for the most part, many of the jobs undertaken in the shaping machine by amateurs involve small components, holding them is usually a matter of gripping the parts in an accurate machine vice. Makers of power-driven shapers appear to consider that the provision of an accurate vice is an essential prerequisite to the satisfactory working of their tools, so take steps to see that the equipment includes an accurate vice designed specifically to fit their particular machine.

A very good example of a purpose-made vice is that fitted to the shaper in the author's workshop. This is depicted in the illustration Fig. 1. The vice itself is mounted on a base plate (18) that can be secured to the work table by means of four T-slot bolts. A key (20) is secured to the underside of the base engaging a keyway machined in it as well as registering with the middle T-slot of the table itself. In this way the vice has a datum that will ensure accurate replacement when for any reason, the vice is removed from the table.

The standing jaw of the vice (16) swivels on the base and is secured to it by bolts (22) set in a circular T-slot machined in the base.

The sliding jaw (3) slides on the fixed jaw and is secured by a pair of clamps held in place by screws (8). One of the more important considerations in any machine vice is that the faces of the standing and moving jaws should remain perfectly parallel when work is clamped in place. The moving jaw must therefore be free to slide but must not lift when clamping pressure is applied to it. In the Acorn Tools vice peel-off shims (6) are provided to make any necessary adjustment, to the clamps and to ensure that the jaw remains firm and does not lift.

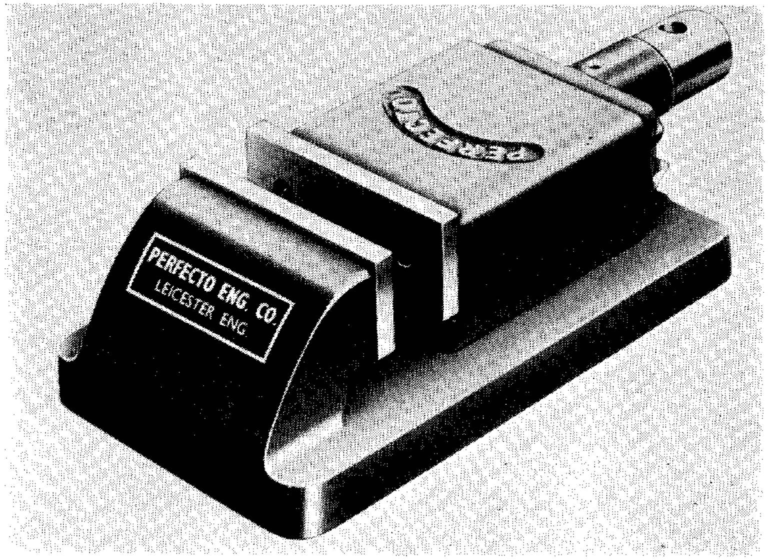
The feed screw (9) for the moving jaw has a square thread and is provided with end float adjustment. It passes through the feed-screw support plate (11) and is supported at the opposite end to the plate by the casting of the vice itself. In conclusion, a word about the jaw linings (3) and (17). These have smooth faces as befits equipment intended for holding partly finished work. The linings are made from unhardened steel.

The Perfecto Vice

The vice made for the Perfecto shaper is illustrated in Fig. 2. This vice has a jaw width of 3 in.

The base is designed for clamping directly to the work table

Fig. 2 The Perfecto Machine Vice



itself using dogs. The sliding jaw moves on a V-slide provided with a gib strip, so any shake in the jaw can be eliminated by tightening the gib strip adjusting screws.

The Offen Vice

The vice seen in the illustration Fig. 3 is a precision component made expressly for toolmakers. It is intended for use on any machine tool to which it can be attached satisfactorily, and to this end is provided with slots all round the base to accommodate any clamping device that may be available. The base is machined from a solid block of steel that is subsequently hardened and ground on all faces

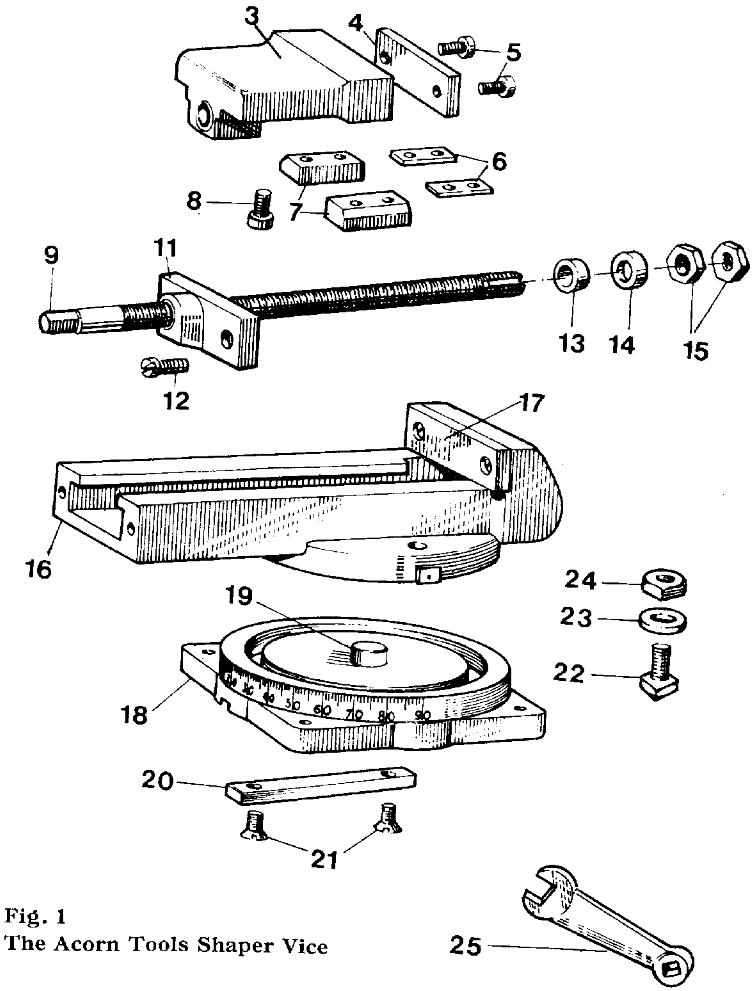


Fig. 1
The Acorn Tools Shaper Vice

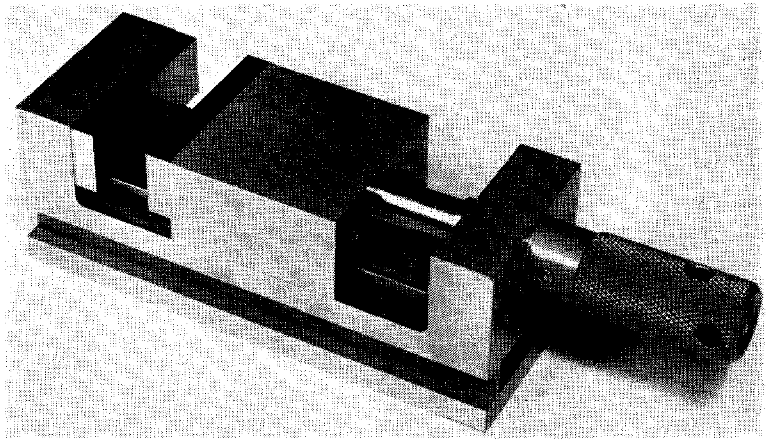
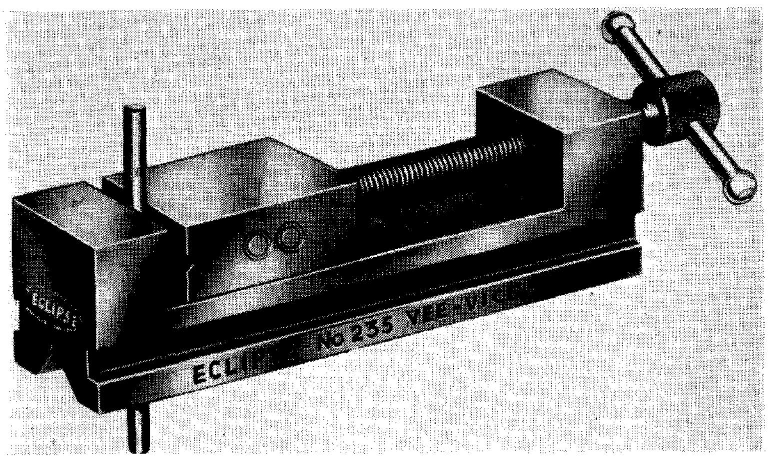


Fig. 3 The Offen Toolmakers Vice

to ensure the maximum possible accuracy. The moving jaw slides on an angled and detachable tenon fitted at the factory to close limits that ensure the moving jaw will not lift when work is clamped within the vice. One interesting point is the protector fitted to the clamp screw itself.

The Offen vice, being of solid construction, is ideally suited for mounting in the actual vice supplied with the shaping machine itself. Securing it in this way enables the user to machine small components gripped in the vice often rather more conveniently than by conventional methods.

Fig. 3A The Eclipse Vee Vice



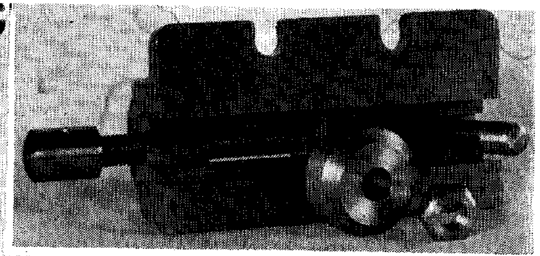


Fig. 4
Underside of the Myford Vice

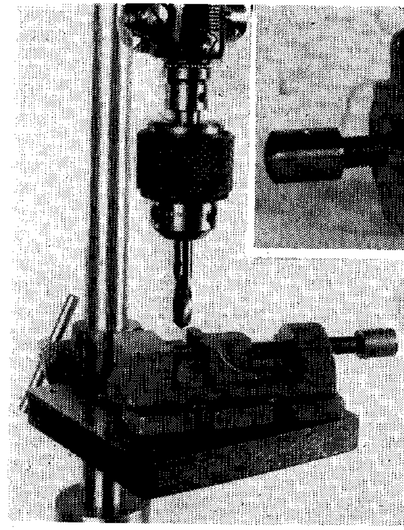


Fig. 4A
The Myford Machine Vice

The Eclipse vice made by James Neill of Sheffield is also suitable for use in the manner described above.

For the small shaping machine the inexpensive but thoroughly practical machine vice marketed by the Myford Engineering Company can be recommended. It was designed for use with the milling slides supplied by that company, and is of substantial but simple construction in pursuance of the policy for the production of practical but reasonably priced fitments. The details of the Myford machine vice will be apparent from an inspection of the illustration Fig. 4.

As it is sometimes possible to obtain suitable machine vices at second-hand, it may not be out of place, at this point, to consider how they may be checked for accuracy. In the first instance any second-hand vice being considered for inclusion in the shaper's equipment should first be examined visually. If it exhibits signs of maltreatment and a generally battered air, the would be purchaser is advised to reject the vice out of hand unless he feels that provided the vice is still accurate it could be restored easily from the appearance point of view.

Assuming that the vice on offer passes this first visual test one may now proceed to check it for the common faults listed and depicted diagrammatically in Fig. 5. In the first place, excessive shake between the feedscrew and the thread in which it works will betoken many hours in service. Restoration, here, could well be outside the capabilities of the prospective buyer. (1).

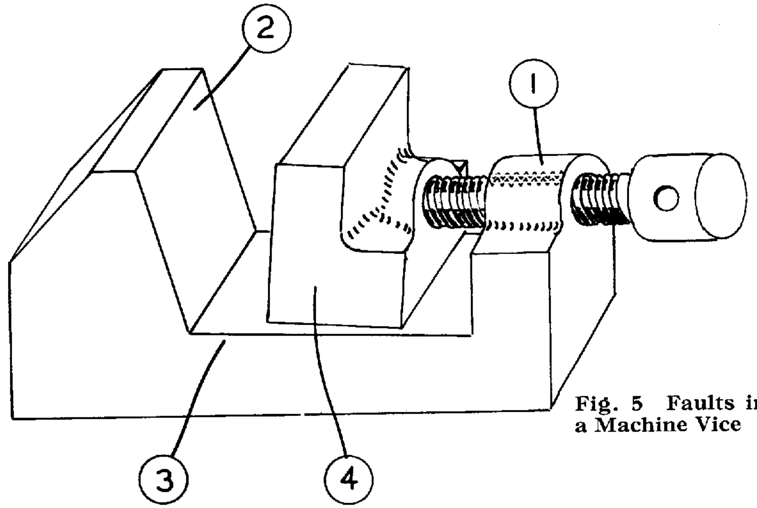


Fig. 5 Faults in a Machine Vice

(2) The standing jaw is out of square with the base of the vice.

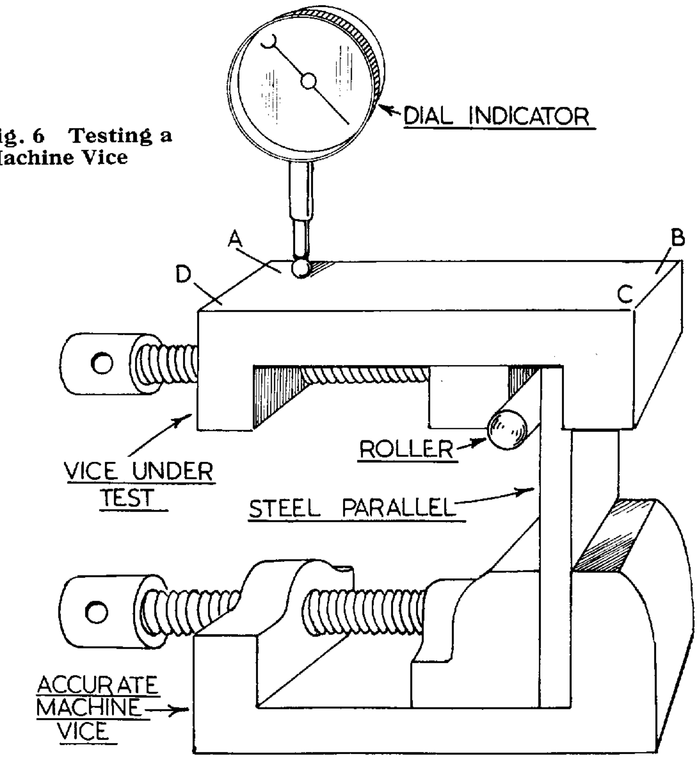


Fig. 6 Testing a Machine Vice

(3) The upper surface of the base on which work may rest is not parallel with the bases under surface. This fault may occur in two places.

(4) There is excessive lift in the moving jaw. A caveat, however, must be entered here. In severe cases the fault depicted at (2) can usually be detected by applying a precision square to the jaw and measuring with a feeler gauge any gap that is revealed between the blade of the square and the jaw face. If error is still suspected it will be necessary to institute a more critical examination.

The set up and the equipment needed to carry out the test is depicted diagrammatically in Fig. 6. A vice of known accuracy is set on the surface plate and a ground parallel gripped in its jaws. The vice to be tested is set on this parallel which it is made to grip, a roller being clamped between the vice's moving jaw and the parallel itself. This procedure ensures that the moving jaw cannot take charge and throw the vice base out of square with the steel parallel. When this set-up has been completed a dial indicator is applied to the base at the points A, B, C and D. It does not signify if the vice has been set true laterally or not. Provided an indicator reading at (A) is the same as that at (B), and conversely a reading at (C) equals that at (D), then the standing jaw can be considered to be square with the base. The fault (3) can be readily detected by applying an indicator to the upper surface of the base as demonstrated in Fig. 7.

An identical indicator reading at all four points would confirm the accuracy of the vice.

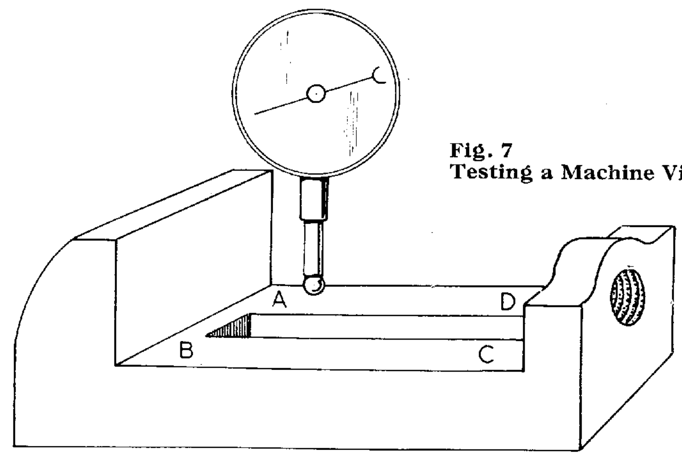


Fig. 7 Testing a Machine Vice

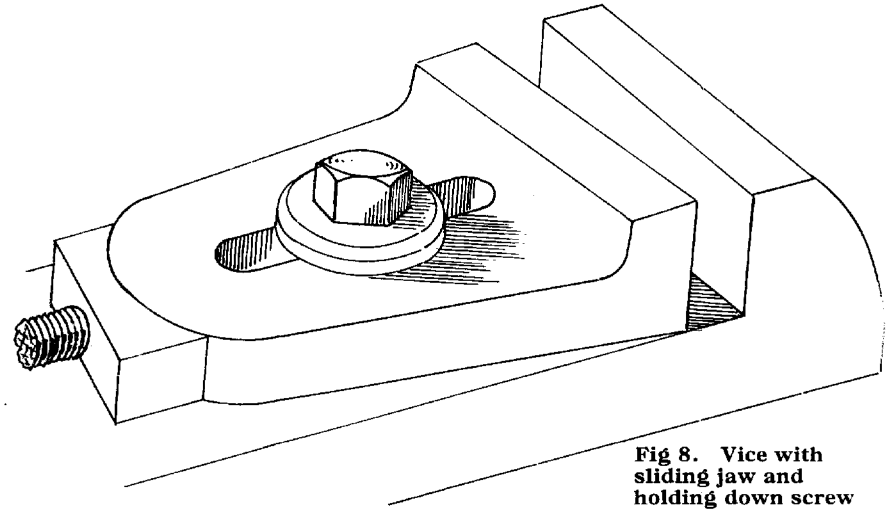
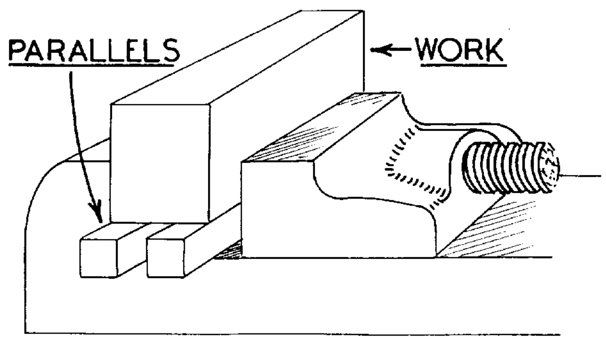


Fig 8. Vice with sliding jaw and holding down screw

Excessive lift of the moving jaws, fault (4), is easily detectable when a test piece is placed within the jaws and gripped firmly. Any lift can then be estimated by eye. However, a word about the caveat referred to earlier. There are some vices that have means of holding down their moving jaw so that it cannot lift. The vice once fitted to the Drummond shaper is an example in point. The moving jaw is slotted and is supplied with a lock consisting of a hexagon-headed screw passing through the jaw into the base of the vice as depicted in the illustration Fig. 8.

This arrangement also takes care of any inequality there may be in the abutment of the faces of the vice jaws themselves. Indeed, it allows work that is not parallel to be gripped firmly.

Fig. 9 The use of parallels in the machine vice



Parallels

Work to be machined is often too shallow to be supported directly on the base of the vice and has to be raised so that it projects above the vice jaws. This is the function of the parallels whose name heads this paragraph. They are lengths of hardened steel of varying cross-sectional measurement that can be set, usually in pairs, on the base of the vice, so that any work resting on these parallels projects above the vice jaws, as seen in Fig. 9.

As shown in this illustration, it is advisable to place strips of paper on the parallels before setting the work in position. In this way, by pulling the strips, one can check whether the work is seating correctly. If not it can be tapped down with a lead or raw hide hammer until the paper strips remain firm. This procedure is carried out, of course, with the work gripped firmly between the vice jaws.

As to the parallels themselves, these can conveniently take the form of the ground steel toolbits obtainable from many merchants. These bits have a wide range of size, both in length and in cross section, and appear to be made to close limits of accuracy which fits them admirably for much of the work undertaken in the shaping machine.

Securing the Work to the Machine Table

In addition to holding work in the vice it is often necessary to mount some parts directly on the work table itself. For this purpose the table is provided with either slots or T-slots, or sometimes a combination of both, through which or into which, bolts are passed to secure the component being machined. T-slots are machined from solid material, sufficient metal being allowed in the casting in order to carry this out satisfactorily. The dimensions of a typical slot as applied to small machine tools is depicted in Fig. 10. Slots machined to these proportions usually have adequate mechanical strength, though some fall short in this respect; nevertheless, it pays to take some elementary precautions to ensure that the slots remain undamaged when pressure is applied to the T-slots bolts. The bolts are commonly machined from bar material with heads large enough to provide an adequate contact area with the underside of the T-slot, without which damage to the slot could easily occur. However it is well to initiate action that will help to eliminate any possible trouble.

If work, or a vice for example, can be secured in the manner depicted at (A) in Fig. 11, T-slot breakage cannot possibly take place because the wings of the slot are help down by the work itself; whereas at (B) the metal is unsupported and is being pulled up locally

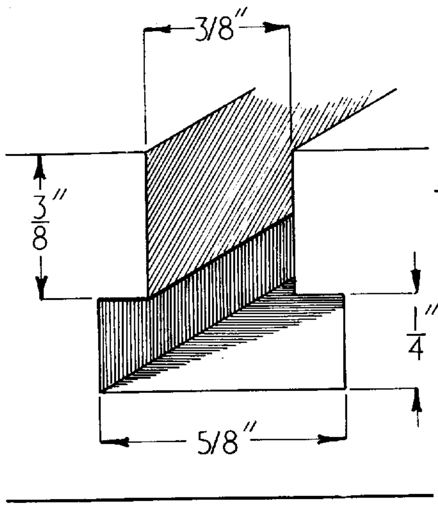


Fig. 10 The T-slot

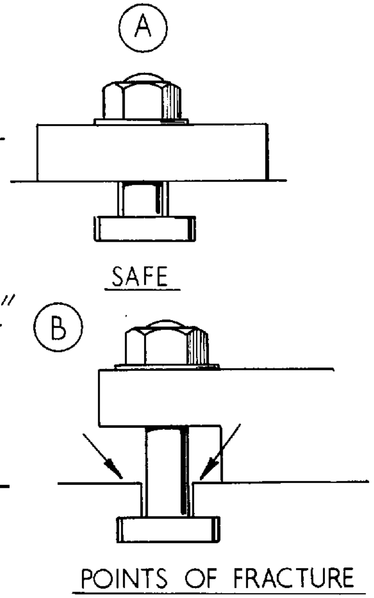
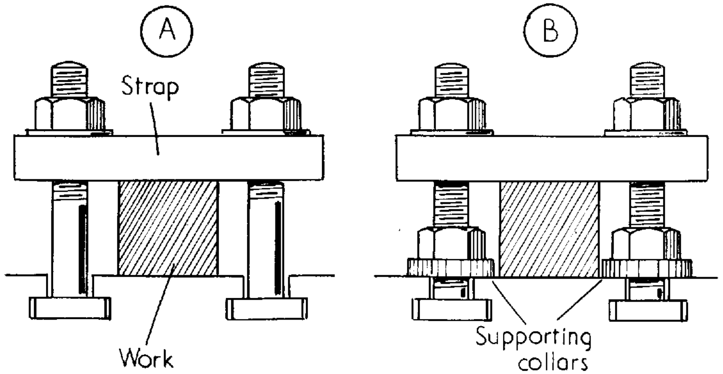
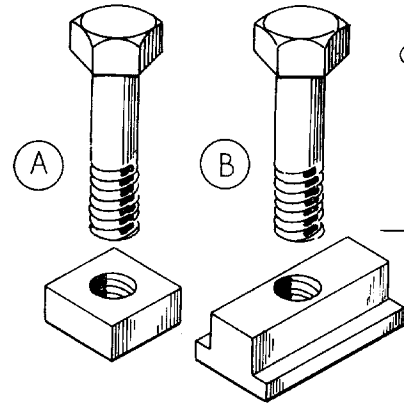


Fig. 11 Securing the T-slot against damage

by the head of the bolt. The same possible source of damage is illustrated at (A) in Fig. 12. Here a strap is holding down the work-piece, but the T-slots are unprotected so there is every chance that both will be damaged. However, all risk of fracture can be removed by fitting collars over the bolts and holding these collars down with the nuts seen in the illustration. The metal between the heads of the bolts and the collars is then in compression and cannot possibly be damaged.

Fig. 12 Possible cause of T-slot damage





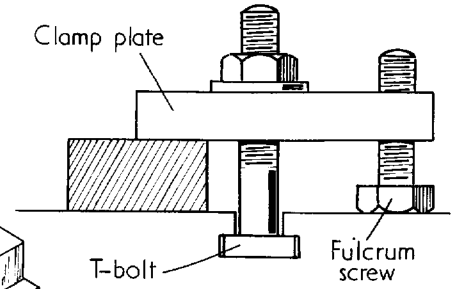


Fig. 14 Clamping device for small vices

Fig. 13 Alternative devices to T-slot bolts

As an alternative to bolts the devices illustrated in Fig. 13 are sometimes applicable. At (A) an ordinary hexagon-head screw is used in conjunction with a square nut placed in the T-slot. But care needs to be taken to see that the screw does not foul the base of the slot, and that there is clearance here when the work is made secure.

A better arrangement which spreads the load on the slot to a greater degree is depicted at (B). The hexagon screw remains but the square nut has given place to a block having considerable contact area and a threaded portion of greater length. These blocks can be of any convenient dimensions, and are often made to take more than one screw. They are very suitable for use in somewhat fragile T-slots and are readily machined in the shaper itself.

Securing the Machine Vice

The fitting of the vice supplied by the makers of the shaping machine itself will have been seen to by its manufacturers. It is the fitment of the smaller vices referred to earlier in the chapter that call for a little comment. For the most part they are provided with wings, with or without slots for the acceptance of bolts, or have slots machined in their bases so that the noses of dogs or clamps may be applied to them.

When clamps are used it may be possible to employ the fitment illustrated in Fig. 14. Its components will be evident from the illustration, but it must be emphasised that the fulcrum screw needs to be used head down, otherwise the point of the screw may well indent the work table as soon as pressure is applied by the T-bolt lock nut. Fittings of this type are of course used in multiple units.