

No. 105

APRIL 2005

MODEL ENGINEERS' WORKSHOP

THE PRACTICAL HOBBY MAGAZINE

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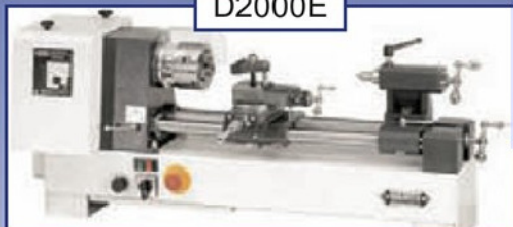


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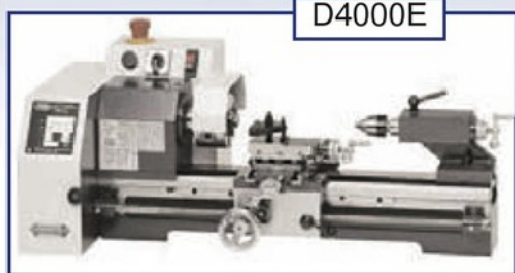
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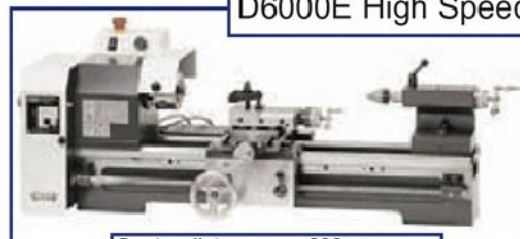
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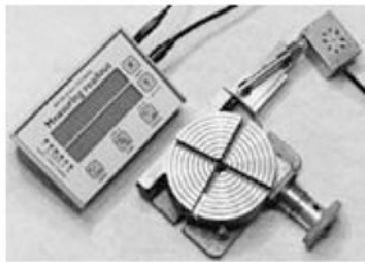
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Front Cover



The Tapping Stand
described by Harold
Hall incorporates axial
guidance and pitch
control. See page 12

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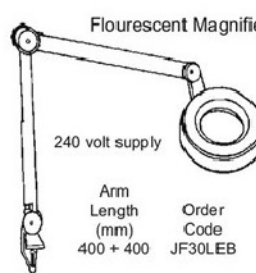
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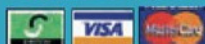
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Hauser 3BA Jig Borer, 3ph £2000.00
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Clarkson Radius Grinding Attachment £275.00
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A4	5/16 x 1/2 - 3/4 - 1 - 1.1/2.	14.75	
A5	3/8 x 1/2 - 3/4 - 1 - 1.1/2.	15.55	
A7	1/2 x 3/4 - 1 - 1.1/4 - 1.1/2.	23.20	

B.M.S. ROUNDS

B1	1/8 - 5/32 - 3/16 - 7/32 - 1/4 - 5/16 - 3/8.	04.92	
B2	1/4 - 5/16 - 3/8 - 7/16 - 1/2 - 9/16 - 5/8.	10.55	
B3	5/8 - 3/4 - 7/8 - 1.	17.45	
B5	3/8 - 1/2 - 5/8 - 3/4 - 7/8 - 1 EN8M	23.52	

B.M.S. HEXAGONS

C1	5/32 - 3/16 - 1/4 - 5/16 - 3/8	06.05	
C2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8	11.58	

B.M.S. SQUARES

D1	5/32 - 3/16 - 1/4 - 5/16 - 3/8	05.15	
D2	7/16 - 1/2 - 5/8 - 3/4	11.58	

BRASS ROUNDS

E1	1/8 - 3/16 - 1/4 - 5/16 - 3/8 - 1/2	11.65	
E2	1/16 - 3/32 - 5/32 - 7/32 - 9/32 - 7/16 - 9/16 - 5/8	17.70	

BRASS SQUARES

F1	1/8 - 3/16 - 1/4 - 5/16 - 3/8	09.90	
F2	1/4 - 5/16 - 3/8 - 7/16 - 1/2	20.20	

BRASS HEXAGONS

G1	5/32 - 3/16 - 7/32 - 1/4 - 9/31 - 5/16	08.20	
G2	1/4 - 9/32 - 5/16 - 3/8 - 7/16 - 1/2 - 5/8	23.05	

BRASS ANGLE

H1	1/4 x 1/4 x 1/16	5/16 x 5/16 x 1/16	
	3/8 x 3/8 x 1/16	1/2 x 1/2 x 1/16	09.00
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	20mm x 20mm x 3mm	25mm x 25mm x 3mm	£14.22

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J2	3/16 x 22g - 1/4 x 20g - 5/16 x 20g	04.95

STAINLESS STEEL ROUND 303 F/C

K1	3/32 - 1/8 - 5/32 - 3/16 - 7/32 - 1/4	10.92
K2	3/16 - 7/32 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2	28.32

BA STAINLESS STEEL HEXAGONS 303 F/C

L1	.152" - .193" - .220" - .248" - .275" - .324"	18.18
----	---	-------

BA BRASS HEXAGONS

M1	.152" - .193" - .220" - .248" - .275" - .324"	09.00
----	---	-------

BA STEEL HEXAGONS

M2	.152" - .193" - .220" - .248" - .275" - .324"	04.30
----	---	-------

BRASS FLATS

N1	1/16 x 1/4 - 3/8 - 1/2 - 3/4 - 1	09.00
N3	1/8 x 1/4 - 3/8 - 1/2 - 3/4 - 1	15.50

ALUMINIUM ROUND F/C

P1	3/16 - 1/4 - 5/16 - 3/8 - 7/16 - 1/2	10.25
P2	5/8 - 3/4 - 1	17.70

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S2	3mm - 4mm - 5mm - 6mm - 7mm - 8mm - 9mm - 10mm - 12mm	18.00

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R2	3/8 x 1/2 - 3/8 x 1 - 3/8 x 1.1/2	11.87

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R4	1/2 x 2.1/2 - 1/2 x 3	21.15

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5"G	King John	4-6-0	3.1/2"G	Heilan Lass.	4-6-2
5"G	Dean Goods	0-6-0	3.1/2"G	Rob Roy	0-6-0
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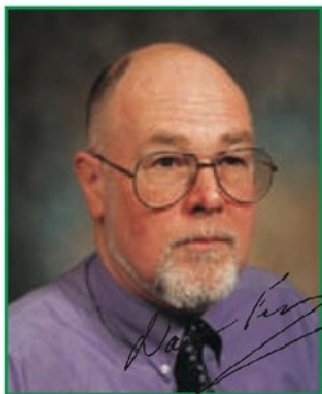
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ON THE EDITOR'S BENCH

New electrical regulations

I am indebted to Tony Skinner of Glasgow for drawing my attention to the new regulations intended to improve domestic electrical safety. The rules, which came into force on 1st January 2005 bringing England and Wales into line with Scotland, require that anything other than the most basic changes to wiring are undertaken by "a competent person", or checked by building control. This clearly has implications for anyone wiring up a workshop, as this is likely to involve added circuits. Thus the advice has to be "check before proceeding".

While this change is no doubt driven by well meaning politicians, yet one more step has been taken towards the day when we will all require a PhD to change a plug. I suspect that many of the electrical cowboys will simply work away as before. After all, when the job is complete, potential problems may be well hidden from view.

Many years ago, shortly after buying my first house, I wanted to run power out to the garage. Money was tight, and not wishing to incur the cost of a professional electrician, my solution was to lay a suitable buried cable between house and garage, going to a distribution box in the garage, and fed from a 13 amp plug inserted in a spare socket in the kitchen. The load was obviously limited to 13 amps, and as far as I was concerned

this was nothing more than a glorified extension cable. For those wishing to remain safe and within the spirit of the rules, but unwilling to spend hard earned cash on professional electrical involvement, this philosophy may still be valid, but does impose a fairly low limitation on power (13amps or about 3Kw).

In the workshop

It was coincident that at the time of receiving the article from Brian Warner, "VMC Slow Speeds", published in issue 103, I had already started to undertake a similar modification to my own Myford VMC mill. The simplest solution would probably have been to fit a variable speed inverter drive, but the machine already looked a bit like a Christmas tree with bits of electrical gear hung on for lighting and power traverse. On top of that, a DRO is still to come. I did not have a set of large and small pulleys available from a defunct washing machine, but did have a couple of the small poly vee pulleys picked up during a visit to a washing machine factory, way back around 1983. The scrap box also yielded a lump of steel, which cleaned up at between 5 and 6in. dia. to form a larger pulley. Measurement over the two pulleys with a piece of string determined the length of belt required. This arrangement does not give the extremes of low speed afforded by Brian's design, but does offer a minimum spindle speed of about 65rpm, which in turn allows effective use of 6inch diameter slitting saws, also fly cutters and boring heads.

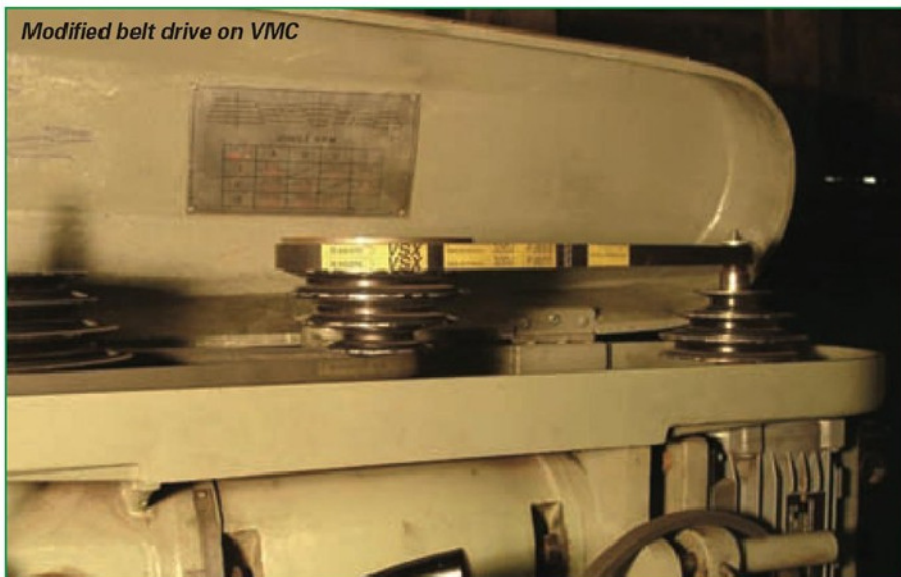
As with Brian's arrangement, there is a safety downside in that the belt cover

cannot be closed. However, since my machine is mounted some additional 3-4inches up off the floor, I feel that the exposed belt is sufficiently out of the way of my fingers. (Being follically challenged, the dangers associated with long hair are very much a thing of the past.)

Work on Bentley BR2 components continues as and when time permits. I now have a set of pistons with gudgeon pins, and have made a start on the connecting rods. The technique for working on the master rod may interest others. To cut the 10mm wide x 11mm deep groove in the 44mm dia. bobbin, the bored blank was mounted on an expanding mandrel held in a collet chuck. This assured acceptable concentricity. The cutting tool would be a 2.5mm wide parting tool, ground with a square end, (slightly radiused corners) mounted in the rear toolpost. Two saddle stops were then set, one conventional, the second arranged back to front, acting on the right hand side of the saddle, between them permitting saddle movement of about 7mm. This, added to the tool width, gave close to the required 10mm groove dimension. Final tweaking to size was achieved by using the screw adjusters on the stops.

When attempting to ream the holes in the bobbin to take the wrist pins, I came upon what may be the reaming equivalent of the difficulty in drilling clean holes through thin sheet. Here the holes had to pass through the two flanges, each being 2mm thick. After working with a normal hand reamer, the pins could not be fitted, and when turning the reamer, a cyclic resistance could be felt, which suggested that the holes were not, in fact, round. The solution adopted was to make a "Toolmaker's" reamer from silver steel - filed, hardened, tempered and ground, and this did indeed shave out a little more material giving a light push fit.

The set up used in profiling the central length of each rod was similar to that noted for the bobbin. Here, saddle movement was again limited by two stops, and the material removed by a Greenwood tool with 6mm dia. tip.

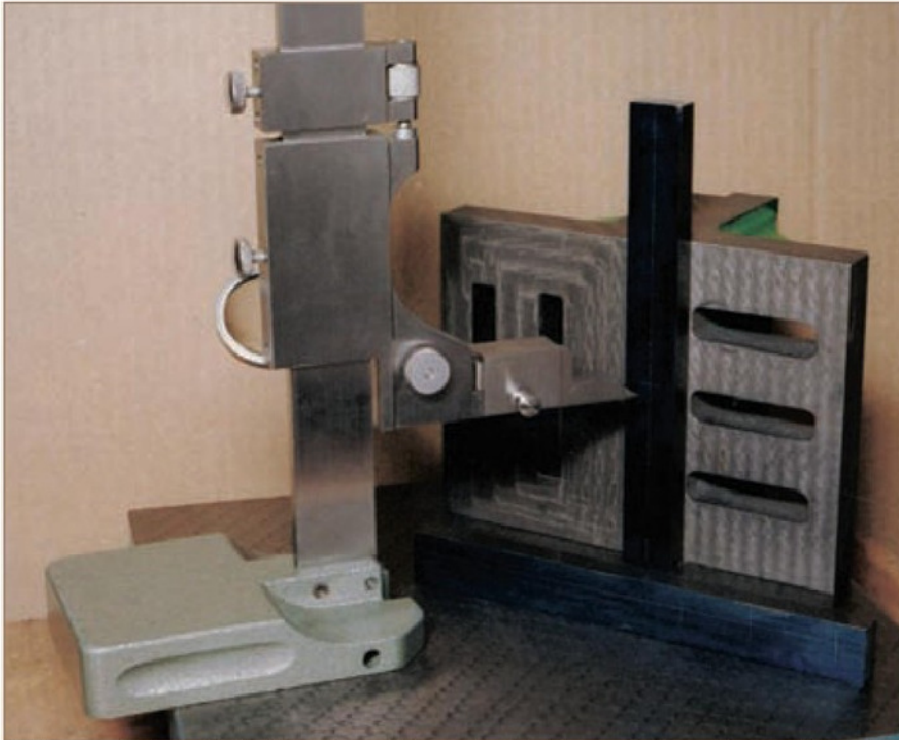


Modified belt drive on VMC



Conventional hand reamer below and home made toolmaker's reamer above

TAPPING STAND



1. Two angle plates bolted together with one face just forward of the other enable parts to be accurately stood upright for marking.

In my article in the last issue regarding producing internal and external threads I dealt with many aspects of the task. One, of these was the problem of tapping holes axially in line with the drilled hole. The tapping stand in this article seeks to overcome the problem.

Tapping stands have appeared on various occasions in the past, both in MEW and ME. I cannot claim to be conversant with all the published designs, but those that I do remember have not included feed or pitch control. This feature, included in the design of this stand, automatically feeds the tap at the correct rate. The operator therefore has only to rotate the tap. Many of the more expensive "professional" tapping

machines manufactured in Switzerland have this feature, which avoids problems getting the tap to bite at the first thread or two. A result of including the characteristic in the design is an increase the number of components required as a feed screw and nut are needed for each pitch to be cut. These are though independent of the diameter of the thread being cut so in some cases the lead screw and nut will suffice for a number of differing threads. Should you consider that this is an unnecessary complication, then designing out the feed arrangement to give a simplified device should be quite straightforward.

Whilst the aim of the device is to ensure that the tap approaches the hole to be tapped axially in line, construction of it requires no abnormal precision. Only concentricity is marginally important in the make up of some components.

Design considerations

The general concept can be deduced from the General Arrangement drawing shown as Fig 1. In an effort to make manufacture that little bit easier, the device has been built without the use of castings, being assembled from commercially available sections. Thus the head assembly has been "fabricated" using three main components joined with two part epoxy adhesive. In my experience this is more than adequate for the task, and carries the benefit of zero distortion. However others of more traditional leaning may wish to silver solder or even weld. The base

Keep those threads in line with this accessory described by Harold Hall.

assembly again is constructed from standard sections bolted together. The spaces between bars may be used for clamping, should that be desirable for some tricky jobs.

Base

This comprises parts 4, 5, 6, 16 and 17. Do, before cutting the individual pieces, make sure that the bar is not bent in any way as this will result in the base not being sufficiently flat. Otherwise, these should present no problem. **Photo 1** shows the parts being marked out for drilling. Using two angle plates bolted together with one face just in advance of the other, makes it easy to set the part vertically for marking out. The fourteen M4 blind holes were tapped using a guide block and only a plug tap as suggested in the previous issue, **Photo 2**.

Rear column (parts 2 and 18)

Cut the parts and finish to size. Drill and tap holes in the bottom of part 18 but leave the two holes C as these must be precisely at the same centres as those in part 14. This will be easier to control later. Leave also the two M5 tapped holes A until those for the column bars have been drilled.

Head assembly (parts 12, 13 and 14)

Cut two lengths of 40mm x 20mm a little over length and machine ends to 70mm dimension. Alternatively, as I did, cut this from 40mm square, sawing it in half and machining the cut faces resulting in a size of 40mm x 18mm. This approach enabled me to use 230M07 free cutting steel, which is not available in rectangular sizes. Mount a vice on the machine table using a dial test indicator (DTI) to ensure that it is located squarely, **Photo 3**. Place the first of the two parts in the vice and a 6mm end mill in the chuck and produce the 6mm deep slot as seen in **Photo 4**. Make this marginally deep, say plus 0.05mm maximum, so that part 13 eventually sits on the outer face and not the base of the slot. Do not make it too deep however as the face is required to assist eventually with the adhesive bond. Endeavour to make the slot central, but not moving the cross slide between the first and second part will ensure that any error is consistent between the two. Taking note of the hand of each part on assembly will eliminate any problems with part 12 and 14 being out of line.



2. Hand tapping using a plug tap and a guide block.



3. Setting the vice accurately in line with the axis of the table.

Cut material for 13 a little over length and mount it on the milling machine table using a little packing to raise it off the table. This will enable the ends to be machined without fear of the cutter coming into contact with the table. Use an engineer's square set from the front face of the table to accurately position the part. Without removing the part from the table machine both ends to give the 82mm dimension thus ensuring that the end faces are parallel.

Mount a fence (6mm thick) on the machine table at right angles to the table axis, again using an engineer's square off the front of the table. Place the machined end of the head centre piece against this and machine the first recess making the width accurately 6mm, not over, **Photo 5**. First, make the depth a little on the shallow side, turning the part over and repeating the cut on the second side will create the two recesses accurately in line.

Measure the thickness of the resulting web and adjust the down feed to reduce its thickness to 5.9mm by repeating the cut on both sides, as a result making sure the web is central. The reason for making the web a little under 6mm is to provide a space for a film of adhesive. However, first check the width of the mating slot, as this may be oversize if the 6mm cutter was not running true. Having completed the first end, remove, turn end on end, and repeat the process. Doing this without altering the down feed, or the position of the table lengthways, will ensure the same result as the first end.

Place the three parts together, checking that the 2mm wide face of the recess in part 13 mates with the outer faces of parts

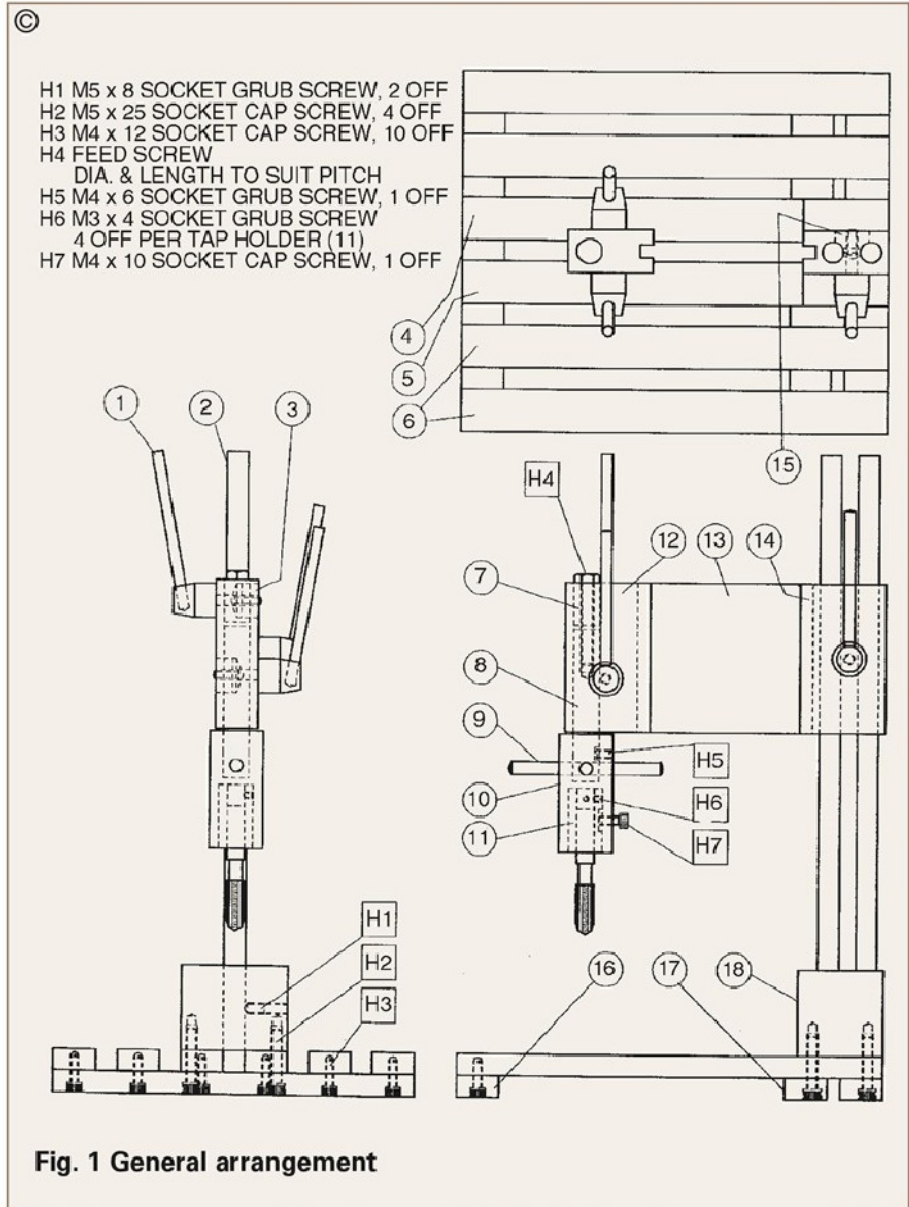


Fig. 1 General arrangement

12 and 14. If it is found that the web bottoms in the slot then it will be necessary to reduce its length a little. Application of a file should be adequate.

Mix up some two part resin adhesive, clean and degrease and add some adhesive to the mating surfaces and assemble under pressure of a suitable

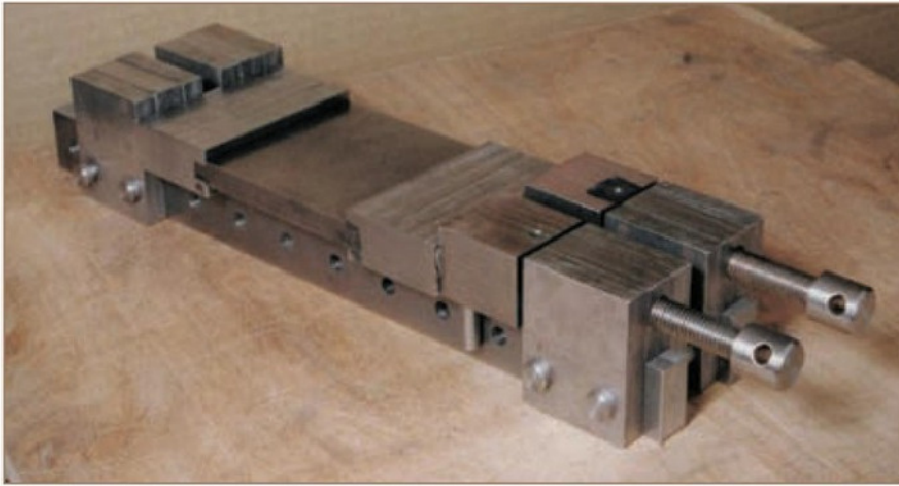
clamping arrangement, typically as seen in **Photo 6**. These clamps featured in the Drilling Projects for Beginners articles, which appeared in MEW issues 98 and 99. Using the slow setting adhesive, rather than the rapid, and placing the assembly on or near a gentle heat source for 24 hours will achieve maximum strength.



4. Milling the slot to take the head centre piece.



5. Commencing to machine the webs on the end of the centre piece.



8. Drilling the two 10mm holes in the head assembly.

When set, lightly machine the underside of the assembly so that the three faces are level. The top faces could also be similarly machined for appearance's sake. **Photo 7** shows how the assembly was held between two angle plates necessitating a hole to be drilled in part 13. The hole is not included in the drawing for the part but can be seen in a number of the photographs. Using two angle plates in this way can often suffice in the absence of a large milling vice.

Mark out and drill the 16mm and 5.2mm holes for the clamping pieces prior to drilling the 2 x 10mm and 1 x 12mm holes as follows. Make and fit the clamp pieces (3 and 15) using three suitable screws. Using socket head screws will help to hold the clamp pieces securely during drilling.

Clamp the column base on the milling machine table with the 50mm edge at right angles to table traverse and the eventual position for the 10mm holes above a T slot. Place also on the table a piece of the 40mm square bar from which the column base was made. Mount on these the head

assembly with the rear end accurately positioned on the column base as required by the dimensions on the drawings and then clamp in place. **Photo 8** shows that the additional hole in item 13 was again put to use. Do set the assembly axially in line with the table. Use the table traverse dials for positioning the three holes, first with a centre drill and then a 10mm or 12mm drill as required. Make sure that the milling machine head is high enough to eventually accept the 10mm and 12mm drills without raising the head. You may like to use a smaller drill first prior to drilling the final hole size.

Drill first the two 10mm holes drilling into the column base by about 10mm, photo 8. Follow this by drilling the 12mm hole stopping just short of the packing to avoid drilling into this, allowing it to be saved for use on another project. The hole can be eventually extended with the assembly held in a vice. Now remove the head assembly but leaving the column base still clamped to the table and extend the two 10mm holes.

The two M5 tapped holes A can now be made in the column base (18). Incidentally, this is a good instance of where the first portion can be opened up, (say 10mm deep) to act as a guide for the tap.

The turned items

These are relatively simple and need little comment. The Tap Carrier (10) does need a little more care than the remaining parts as concentricity between the two bores is important though absolute accuracy is not called for as clearance between the spindle and the head will enable the stand to cope with small concentricity errors. Bore first 16mm end and then drill and tap the first of the two M4 holes. Turn a close fitting mandrel for the 16mm bore and fit the part using an M4 screw and bore the 12mm hole. Drill and tap remaining holes as per drawing.

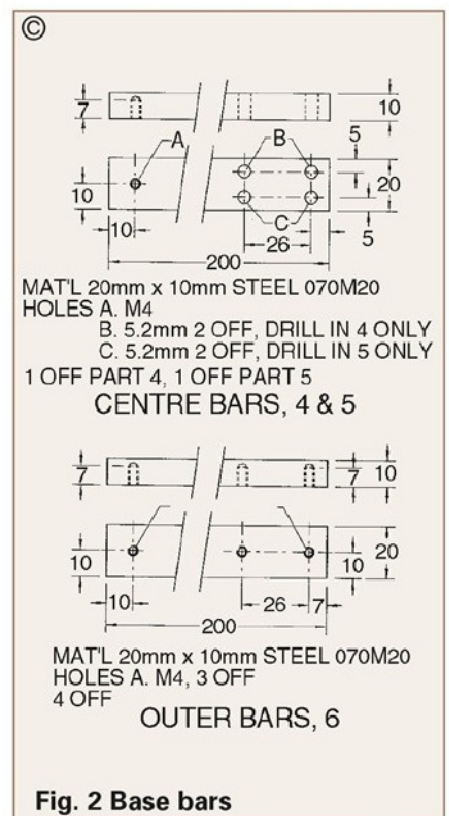
The Tap Carrier Spindle (8) and Feed Screw Carrier (7) require the tapped holes to be concentric with the outer diameter. Again using the four jaw chuck do set the material to run true, say to within 0.01mm total indicator reading should suffice. Use part 10 to act as a jig for drilling the two 5.2mm holes in part 8. Mill the flat to take the end of the fixing screw. It will be necessary to make one of each for each pitch to be cut.



7. Levelling the bottom and top of the head assembly. See how two angle plates can in some cases be used in the absence of a large vice.

Concentricity is also required for the Tap Holders (11) with one holder being required for each tap diameter. Using the four jaw chuck as above should suffice, but using a larger diameter material and turning the outer diameter and the bore whilst still in the chuck would ensure the two diameters are precisely concentric and is probably a better approach to take. I was surprised however to find larger variations in shank diameters than I had anticipated, typically between 6mm and 6.2mm for the M6 taps that I had. Because of this I worked to the larger diameter and have found no problem when using taps with the smaller shanks.

Photo 9 shows that a dividing head was used for drilling the four clamping screws for the square on the end of the tap. As the



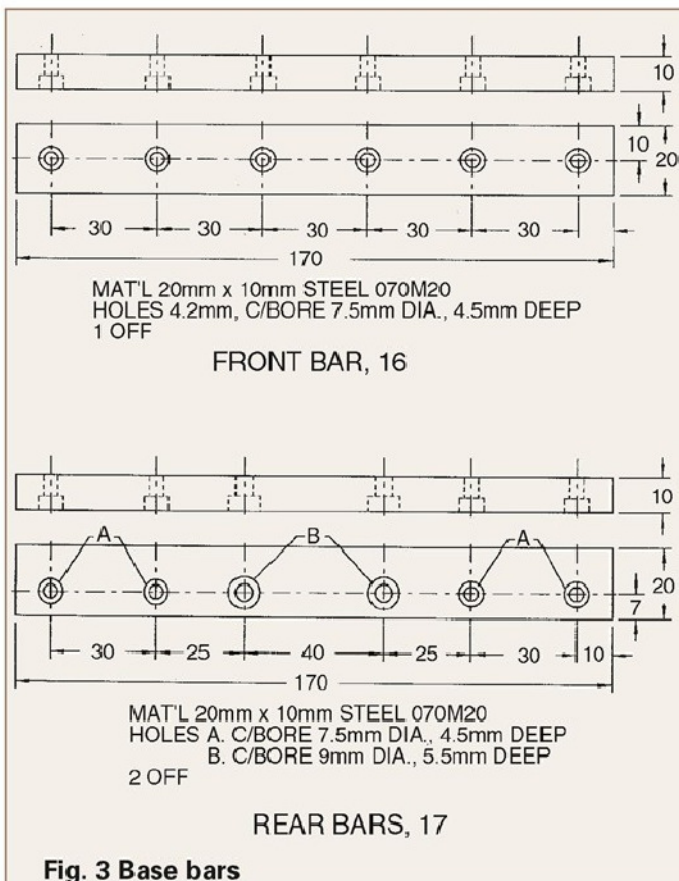


Fig. 3 Base bars

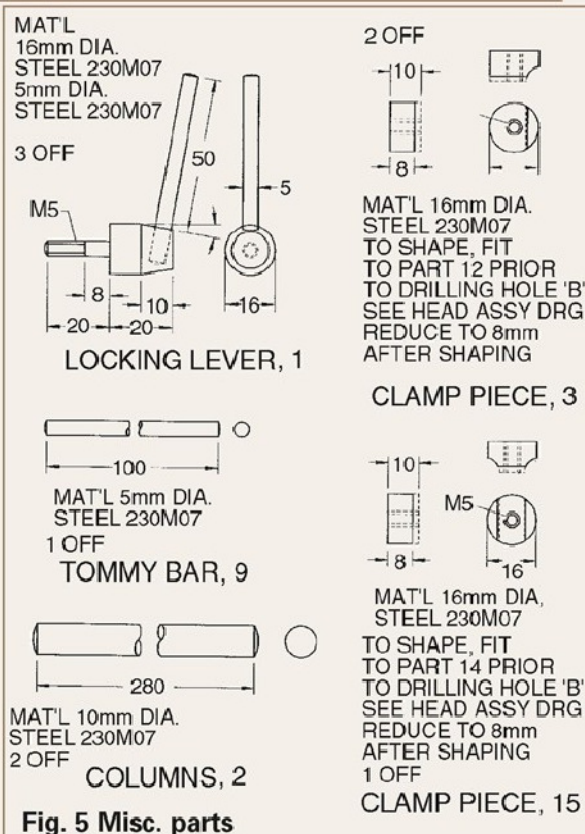


Fig. 5 Misc. parts

length of the square will vary with size of tap make the position from the end so that the screw is approximately central along its length. Mill the flat to accommodate the end of the fixing screw.

Photo 10 shows completed Feed screw carriers (7), Tap carrier spindles (8) and Tap holders (11) for threads M3 to M8.

Making the Locking Levers (1) is an easy operation but do drill and fit the levers after assembly so that they finish up in a convenient position. This will almost certainly mean that each lever is tied to the Clamp Piece and position it was first drilled for. A short length of 5mm steel will suffice as a Tommy bar.

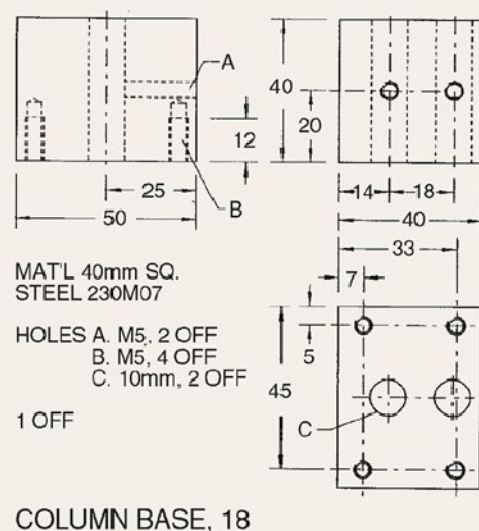


Fig. 4

Assembly

Generously chamfer all edges of the rectangular parts and clean up the faces and assemble as per drawing. Check that the stand's table surface is reasonably level, against a surface plate if available, if not the surface of the milling machine table.

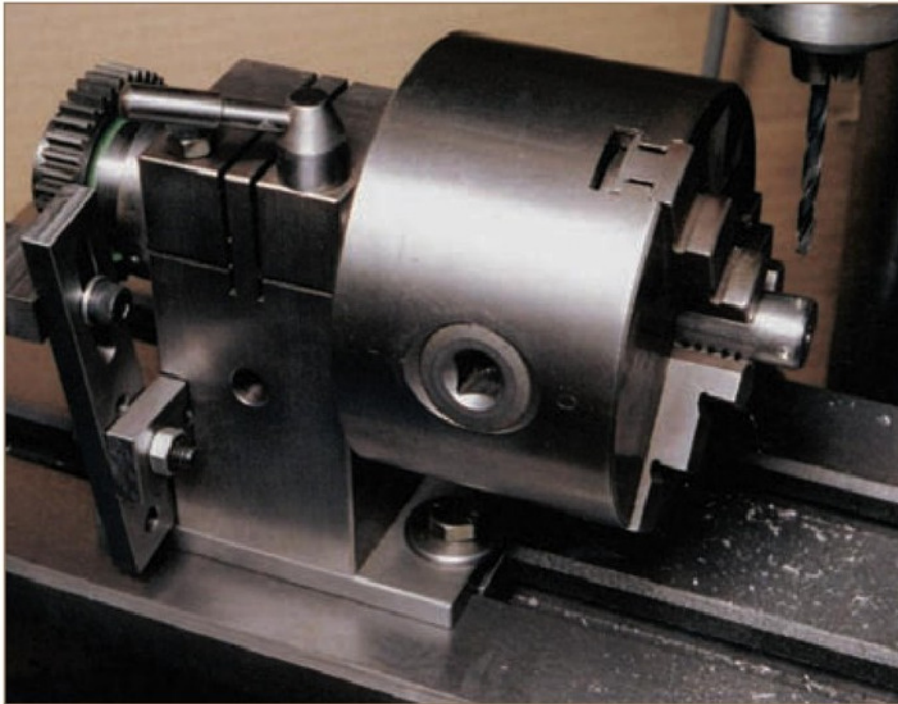
Photo 11 shows that before final assembly I did put the stand to the test to tap the M3 holes (If you think the tap looks larger than M3, it is. I had a quantity of M4 grub screws that I wanted to use up) in the tap holders using only a plug tap. The feed arrangement worked perfectly and I was well pleased with the result so continued with the project. On completion I also put the stand to the test using the Roll taps and Spiral point taps mentioned in the last issue and with equal success.

Using

To use the stand, lower the head until the tap almost enters the hole to be tapped and clamp in place. Rotate the Tap Holder by hand till the tap locates in the hole and then using a Tommy bar tap the hole required. Do use a tapping compound and lightly oil the feed screw. As the feed screws may have slight pitch errors, not being precision screws, I chose to loosen the feed screw carrier once the tap had completed a few pitches allowing the tap to take over from there. This avoids any possible conflict due to pitch differences between tap and screw, but feel probably that I am being over cautious. It is though an intriguing operation being able to tap a hole without the need for any manually applied pressure, just rotating the tap.

You may question the purpose of the lower locking lever. As I consider the stand will sometimes be put to use without a feed screw this enables the spindle to be held in place whilst it is being set up.

I also found that when tapping M4 size threads, even with a plug tap, that the tap can be turned by hand using the tap carrier only, that is without the use of a Tommy bar. This leads me to consider that adding a larger diameter knurled ring to



9. Using a dividing head to position the four holes in the tap holders.

this, say 50mm diameter, would permit larger threads to be achieved without the Tommy bar being needed.

An assembly problem

It is probably worthwhile that I share with you a problem that I encountered

on assembly as you may also encounter the same situation. To give scope for errors in concentricity the design relies on the 12mm material for the tap carrier spindle to be undersize and for the 12mm drill to produce a hole that is oversize. These are both what one would expect in normal circumstances and was so in my case. However, as the drill had had to simultaneously drill the head and clamp pieces (3) this had caused the hole to wander a very little and I found that the spindle would not pass fully through hole. What was surprising was that if entered from the top it passed to within a few millimetres of the

bottom when it appeared to hit a solid stop. When though entered from the bottom it only managed to get about half way when it tended to seize up, why the difference?

I have on many occasions in my articles warned that a drill when it breaks through, a normally oversize hole will locally reduce to drill diameter creating a problem if it is mounted on a taper stub mandrel. This was what had happened to the 12mm hole as the drill broke through at the bottom creating the problem. Why it performed differently from one end to the other I have not fully worked out but after opening up the bottom 4 - 5mm of the hole with a scraper the problem was totally solved.

The situation could have been avoided by clamping a piece of scrap on the underside of the head so that the drill did not break into fresh air on completion of the hole. The choice is yours.

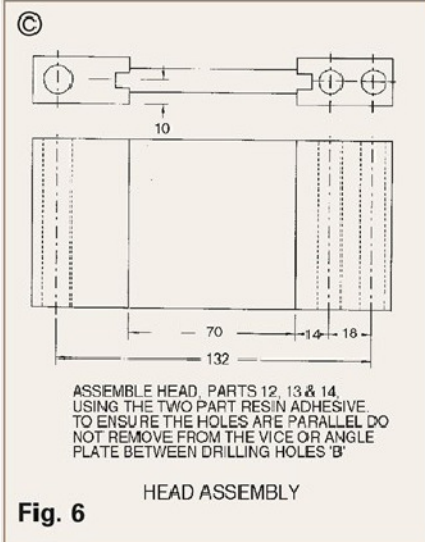


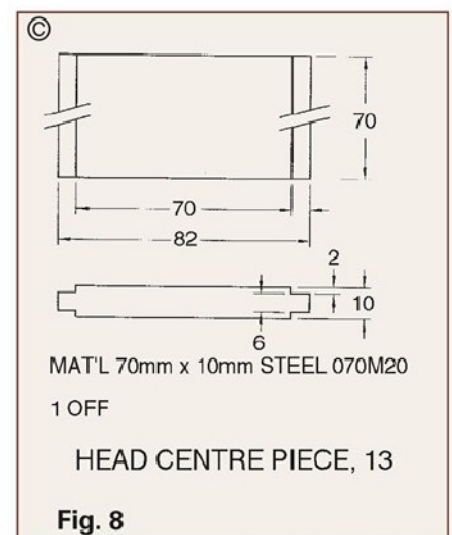
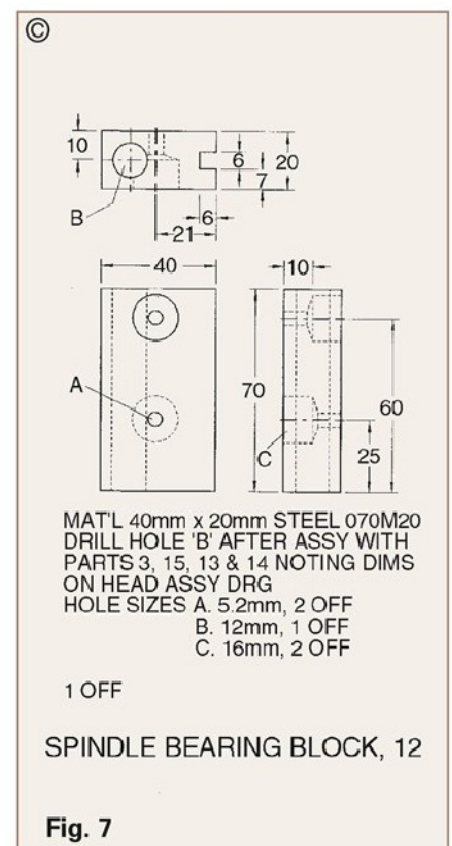
Fig. 6

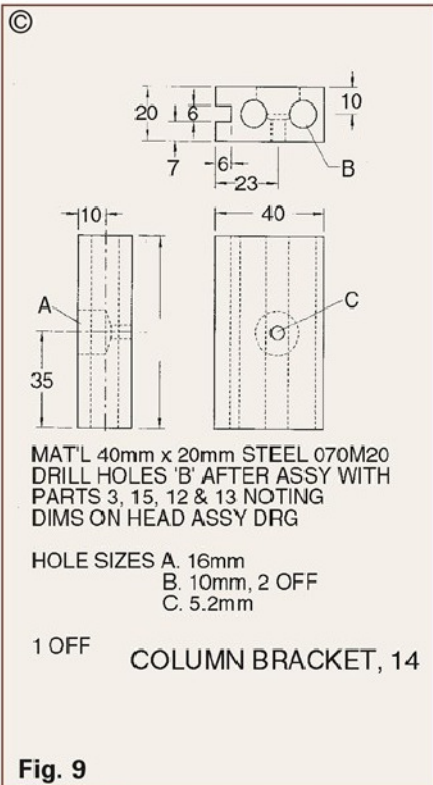


10. The spindle assembly parts for 5 sizes of threads.



11. Putting the stand to the test before final completion by tapping the holes in the tap holders, again using only a plug tap.



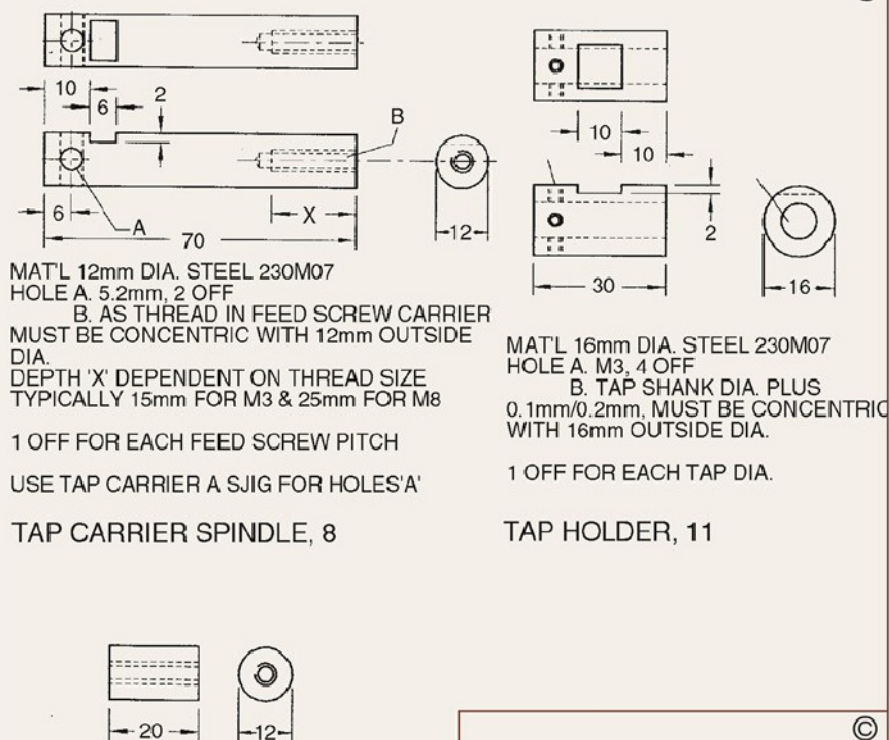


12. As an alternative to the tapping stand in this article a drilling machine can be used, in this photograph the hole and spindle are being aligned.

A manufacturing consideration

I mentioned that the clearance between the spindle and the hole in the head assembly gave some leeway regarding the need for concentricity. I indicated whilst detailing the feed screw carrier that the part should be set up to run true before drilling and tapping for the leadscrew. This would seem a reasonably acceptable approach. However, when assembled and clamped in position by means of parts 1 and 3, this will force the part to one side due to the clearance between its outer diameter and the drilled hole. As a result the leadscrew will not be central in the bore.

Providing the drilled hole is not unduly oversize, as in my case, there should be no problem. To be totally sure though, especially if the hole is appreciably oversize, it would be of benefit to turn the feed screw carrier from larger material making its outer diameter a close sliding fit in the hole as drilled. The outer diameter of the spindle and hole diameter in the head would then more easily cope with any remaining errors in concentricity.



MAT'L 12mm DIA. STEEL 230M07
HOLE TO SUIT PTCH REQ'D
1 OFF FOR EACH PITCH

NOTE THREAD DIA. DOES NOT
HAVE TO BE THE SAME AS THE
THREAD BEING MADE
TAPPED HOLE MUST BE CONCENTRIC
WITH THE 12mm OUTER DIA.

FEED SCREW CARRIER, 7



13. A tap wrench and tap have now been inserted to tap the hole.

MAT'L 16mm DIA. STEEL 230M07
HOLE A. M3, 4 OFF
B. TAP SHANK DIA. PLUS
0.1mm/0.2mm, MUST BE CONCENTRIC
WITH 16mm OUTSIDE DIA.

1 OFF FOR EACH TAP DIA.

TAP HOLDER, 11

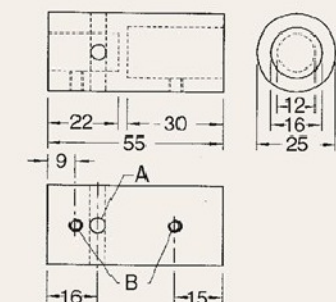


Fig. 11

An alternative

If making the stand is considered too large a task you may consider the method shown in **Photos 12 and 13** using a mill drill or a drilling machine. Photo 12 shows the machine spindle being lined up with the hole to be tapped using a tapered spindle mounted in the machine drill chuck. With this done the machine spindle is raised and the tap and tap wrench interposed with the tapered spindle now locating in the centred end of the tap wrench. The tap can then be rotated by hand and gentle down feed applied using the quill until the tap gets started.

I do hope that these two articles will have increased your knowledge of creating threads in the home workshop as they have undoubtedly mine.



YOU'D LIKE IT FI



1. A selection of scrapers

Just a touch of nostalgia

It was interesting to see, in the 100th issue of the magazine, that scraping is still alive and well in the capable hands of Mr. McKechnie of Myford. Geoff Sheppard's visit was most interesting. Looking at the photographs of the lathe saddle underside being scraped, took me back to when I was taught to scrape. These days, when there is a lot more grinding done on machine beds and parts,

Bob Loader explains the secrets of a skill, historically essential for accuracy.

there isn't the same demand for scraping which there used to be. Perhaps in the future, with developments like synthetic resin coatings for beds and slides, the demand will be even less. That is in the future though and it was very pleasant reading Geoff's article and indulging in a little nostalgia.

Where I worked, it was the management's view that senior apprentices would be more useful if they could scrape. I was one of the first to be ushered through the hallowed portals of the tool room for a month to do it.

The task was to scrape a small surface plate, 12in.x 10in. and about 3in. thick, with a step at each end for fingers to get hold of and lift it. When finished, it would be mine to keep. It was supplied as a rough, well weathered casting, so the first job was to machine it flat, parallel and square on the Butler shaper, which was kept for such work. This machine was able to get thoroughly under the casting skin. I was told to use a broad flat tool at a large feed rate, a process I was told, which was ideal for starting to scrape, that's what the tool makers said, smiling quietly as they said it.

An expert instructor

I was taught by Charlie, a man who had done the job for a living at Archdales, the machine tool makers. He was also an expert at oxy-acetylene welding, so he was quite a useful man to have in what was a medium sized workshop. Charlie saw to the making of the scraper, none of the nonsense of going to the stores and booking one out, it wouldn't have been

right. He found a clapped out 10in. hand file and we took it to Steamboat the blacksmith who forged the tip to shape and hardened it. **Fig. 1** shows what it should look like and I rough ground it to shape, remembering to grind the teeth off the edges and radius them a bit, so that it would not cut my hands when I was using it.

Charlie then showed me how to sharpen it, quite a complex operation, more about that later.

Types of scrapers.

The different shapes are shown in **Fig. 1**. and **photo. 1**. There may be other shapes and variations but these are the ones mostly used. They can be bought ready-made, but it is cheaper and more fun to make them from old files, the steel is the same and it is a good way of re-cycling files, which are past their best.

Three square.

The simplest of the lot, just find a suitable three square file, grind the teeth off the first inch or so and stone it to a nice fine finish. It is mainly a de-burring tool for taking off the sharp edges from holes and curves. I have two sizes, a favourite, made from a double ended saw file with sides of about $\frac{1}{4}$ in. The other one is much smaller, made from a broken three square Swiss file and used for removing burrs from holes too small for the other one to reach into.

Half round

Making one of these needs a bit more work. For a useful size, an old 6in. or 8in. half-round file is just the job. First, soften the file by heating it to bright red, waiting till it starts to scale, with brighter patches appearing on the surface, give it a couple more minutes to soak and then walk away and leave it where it was heated, so that it cools as slowly as possible. When it is completely cold, file the teeth off and put the relief slot in the bottom, it is there so that it is easier to stone the flat surface. To bend it to the curved shape, heat it to orange and gently tap it round a convenient shape to form the radius.

Fig. 1 gives an idea of the finished shape, the radius is not critical; it can be scaled off the drawing. Harden as normal, quenching in oil or water vertically and temper to the palest straw colour. Stone to a fine finish on a fine oil stone. It is only necessary to stone the flat side. Half round ones are used for picking off high spots from large bearings or bores in which shafts have to fit, like the arbor bushes of horizontal milling machines, or plain lathe bearings. They can also be used for de-burring large curves.



2. An oilstone fixed to the 'Bench' (photograph by Pauline Loader).

FLAT? – SCRAPE IT

Flat

Making a flat scraper is a bit more work because to do the job properly, it should be forged and thinned to the shape in **Fig 1**. When making one for my own use, I harden it a bit differently to recommended practice. Because the cutting edge has to be dead sharp and very hard, I do not temper it. If only the first 1/8in. or so is hardened it will need no tempering.

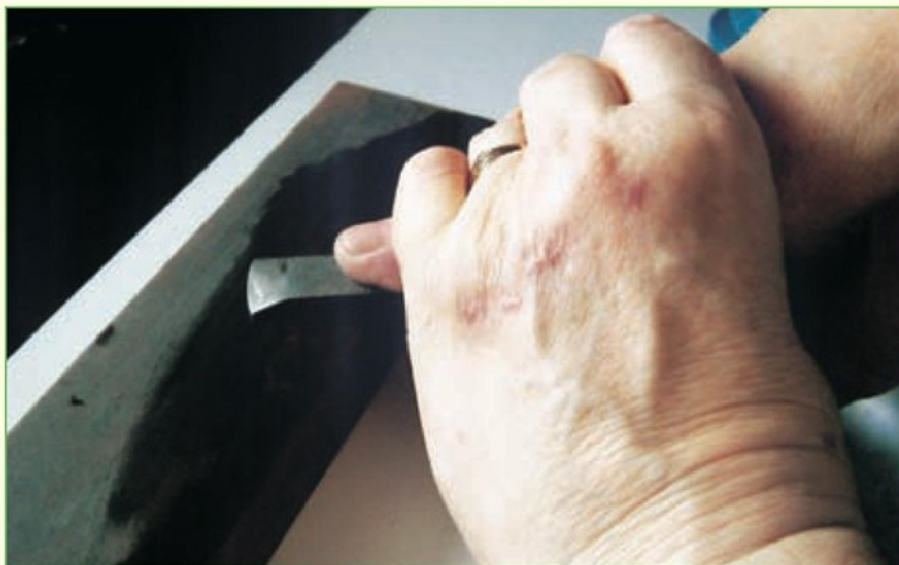
Photo 1 shows two sizes of flat scraper, the large one made in the usual way, the smaller one just thinned by grinding and curved on the cutting edge. The curve is important and is there so that the scraper cuts in the middle and the corners do not dig in.

The technique of flat scraping

How the scraper is held, (**Fig. 2**) is different from filing. The 20° angle is approximate and if the knuckles of the left hand are almost, or actually just, rubbing the work it is about right.

Sharpening

Sharpening a flat scraper is vital, see **Fig. 3** for details. The grip is how I was taught by Charlie and is done by laying the fore finger along the scraper and gripping round it. It makes a solid lump of scraper and finger which, is easy to keep straight and level. The stone must be a fine one. The reference I have quoted may be out of date, the important thing is that it is really fine. The stone must be securely held and my solution is shown in **Photo. 2**. Because, nowadays, I am seriously short of working space, my bench is a piece of melamine faced chipboard laid across the kitchen sink. The stone is kept in place by the two wooden strips fastened tight to each end. It does the job and with the draining board on the left, I have a drawing office too with ample room for my Rotring A4 drawing board. **Photo. 3** shows the flat side of the scraper being sharpened and **Photo. 4** the radiussed edge getting the treatment. Some light oil like 3 in 1 or some paraffin is very good for the lubricating. **Photo. 5**



3. Stoning the flat side of the scraper (photograph by Pauline Loader).

shows the flat scraper in action and **Photo. 6** is a typical de-burring done by the three square one. There are probably other methods of sharpening, but I stick to the one I was taught.

Making a start

Going back to the historical bit. With the scraper well and truly sharp, to Charlie's liking, he started me off on the bottom surface, where it wouldn't show. He stood over me for the first hour or so, to make sure that I had the hang of it. It was genuinely one to one tuition. He also passed on any short cuts and dodges which were useful, like using a file where it could shift a stubborn high patch. One most important thing he warned me about, was to resist the temptation to try the cutting edges with my fingers to see how sharp they were. It takes the edge off. Mostly it is a patient process, the plate to be worked on is smeared with white lead to make the spots show up well, then the master plate is lightly blued and the job rubbed lightly over it. The high spots show up and are scraped off. Then the rubbing

and scraping starts again and again and again. At first it seems as if it will be never ending but gradually the high patches become spots and they get smaller and more numerous. Eventually I was let loose on the proper plate surface and the more I did the better it got.

After many hours, I got to the magic condition of 20 spots per square inch, an acceptable standard. There was no lack of volunteers to do the testing. The toolmakers were only too happy to supervise, ritually marking random square inches and counting spots.

The sting in the tail

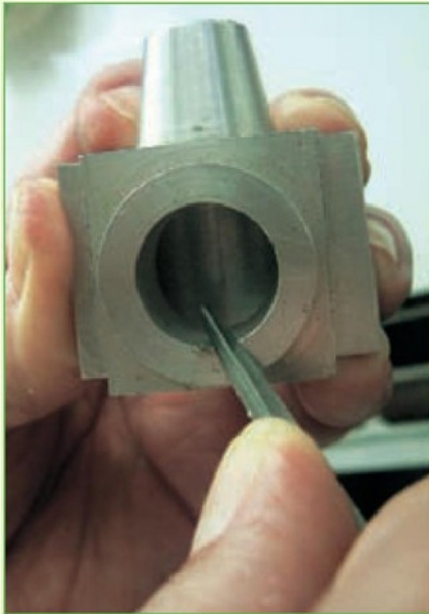
I thought I had won, with a day or so in hand. I looked forward to getting rid of the remains of the ache from shoulder to finger tips and cleaning the cocktail of white lead, cast iron dust and engineers' blue which was well ground into my hands. I had reckoned without one of the seasoned toolmakers, a pragmatic chap to whom an idle apprentice was a challenge. His philosophy was that you didn't keep a dog and do your own barking.



4. Stoning the scraper edge (photograph by Pauline Loader).



5. The small flat scraper being used.



6. De-burring with the three square scraper.

His surface plate, a larger one than mine, needed re-scraping and I was in the driving seat, so away I went again. That was my introduction to what is a very good method for flattening a surface accurately. It isn't a skill which you would use every day and sometimes very much less frequently but it is a useful skill to be able to call on. Should I want to do some scraping, I would have to spend a bit of time getting the feel of it back again, especially the sharpening, but I could still do enough to make a surface flat.

Reasons for scraping

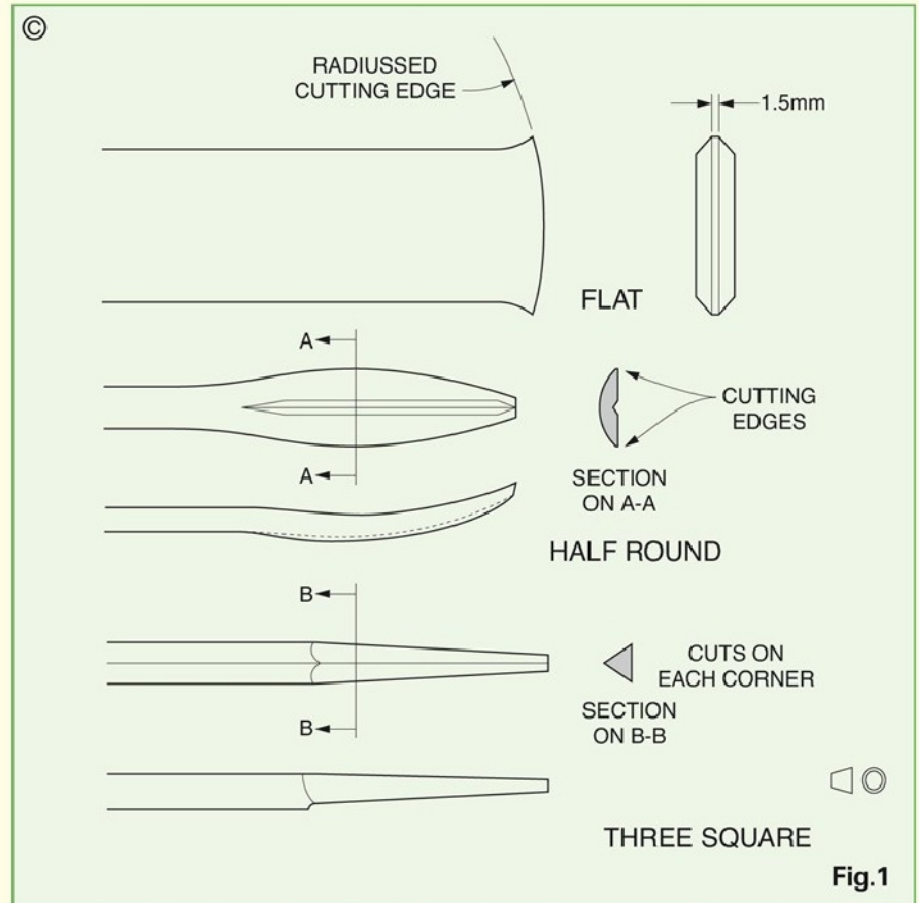
Surfaces are scraped mostly for accuracy and flatness where machining is not accurate enough.

This is especially so when one part must slide over another. Machine slides, flat bearing surfaces and gib strips can all be scraped and high spots picked off. Another effect is that it can break up a surface, which could be 'sticky' by being too flat, like a ground one. The very shallow pockets produced act as oil retainers, a useful feature for machine slides.

Finishing

Scraped surfaces can be quite decorative, Fig. 4 shows the two which look the best, crescent, sometimes called feathering or fettling, depending on who you are talking to and which part of the country they live in, and chequer. Feathering is done by using a corner of the scraper as a pivot and wobbling it over the work so that the radiussed cutting edge makes a crescent shaped mark. It is not an easy thing to describe, the best I can do is to compare the movement to the dipping flight of a small bird.

If the movement is diagonally across the work with another row crossing at right angles, it looks very hand wrought. The scraper must always cut on the centre of the radius, so that the corners do not dig in. It is easier said than done and needs considerable practice. I can no



longer feather and would need a lot of time to get the touch back. A smear of blue helps to see where the crescents are and perhaps keep them regular. I can, however, still manage to do chequering, a much easier option.

It makes a chess board pattern and the way to do it is to mark out a grid on the work with a soft pencil and scrape every other square, filling in the others at right angles. If it is done accurately, it looks good and when the light catches it at certain angles, there is a now you see it, now you don't, effect. There is also a case for leaving well alone because by the time a lot of high spots have been scraped off, in different directions as happens, there will already be a pattern.

Photo. 7 shows three examples, the large plate was my working surface plate and the smaller one the milling/drilling table I made for my Unimat. The third piece was a disc of cast aluminium alloy put in to

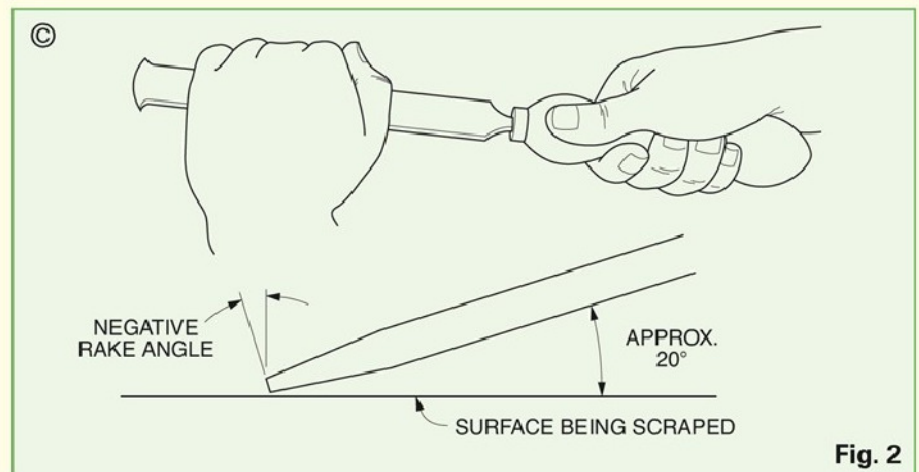
show that cast metals, even softer ones, will scrape quite well, although the same cannot be said for the very hard ones. The best scraping metal is cast iron but cast bronze and the harder brasses are good. Mild steel is reasonable and a sharp scraper will cut it satisfactorily as it will most of the wrought metals.

Although I have used the word 'cut' it is not quite the cutting action we usually see and the negative rake angle is rather different to what we normally think of as a cutting tool.

Things to remember

The scrapers must be always dead sharp and kept that way, so continual stoning is necessary.

It is best to start a job in the furthest corner and work towards you, the small shavings are less likely to get under the edge and dull it. The amount a scraper will





7. Three scraped articles, see text for details.

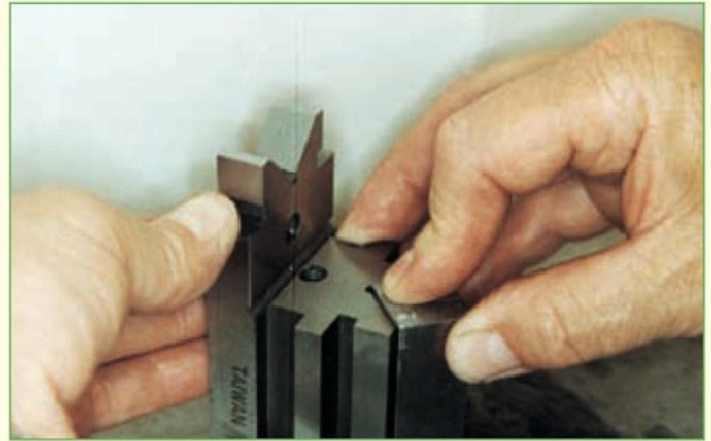
remove in a pass is miniscule, so if you are thinking of shaving off a thou or so, forget it, it would take a long time.

Another use for scraping is making sure that a datum surface is truly flat and at right angles. A good way is to blue a surface plate or other reference and gently rub the work on it with an accurate Vee block to support the work and keep it upright and square,

photo 8 is an example of the technique.

Do not waste money by forking out for genuine engineers' blue, there are many good substitutes, one of my favourites is my wife's navy blue shoe polish, (with permission of course). It is nice to be able to take a nice flat surface and decorate it, like the milling table in photo. 9.

Photo. 10 is a look at the business end



8. Checking a surface for accuracy ready to scrape off the high spots.

of a flat scraper. Notice how the sides have been forged out thin and the slight curve to the edge. To sum up, scraping is a worthwhile skill to develop, more so if your workshop does not have the luxury of grinding facilities. It takes a bit of time and trouble, the right tools, a nice sharpening stone and some patience, time and trouble well spent.

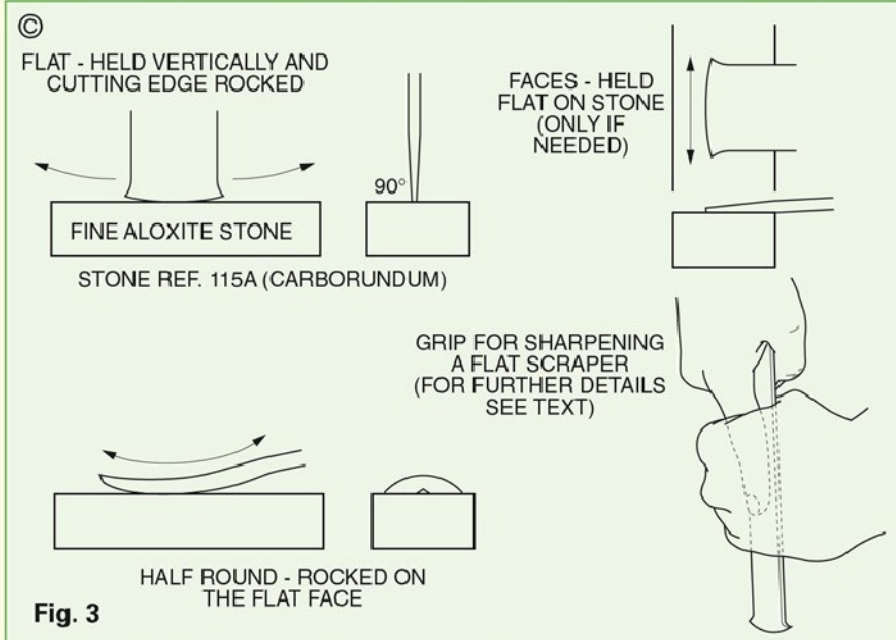


Fig. 3

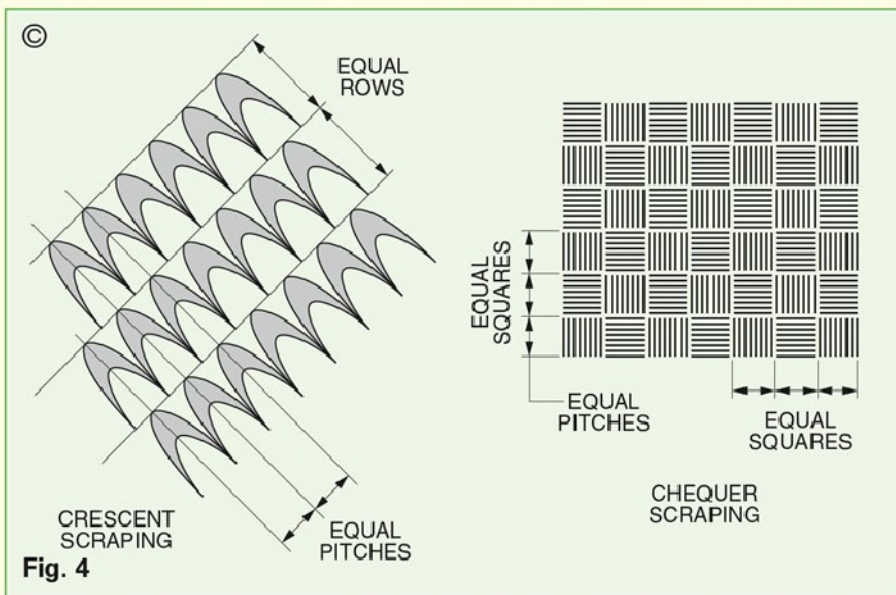


Fig. 4



9. A nice finish for a milling/drilling table for a small lathe, the pattern is a result of random scraping in different directions.



10. The cutting edge of the small scraper.

MICROMETERS FOR SOUTHPAWS



1. Typical right-handed use of micrometer.

Dissassembly

To convert to left-handed use, first slacken off the micrometer. You shouldn't have left it with the spindle in contact with the anvil because this encourages corrosion of the faces, but if you did, don't do it again. Hold the thimble firmly between the fingers of one hand and, using the small end of the spanner provided, loosen the ratchet body a turn or two (**Photo 2**). If you can't find the spanner, borrow someone else's. On no account use a pair of pliers.



2. Loosen the ratchet body using the correct spanner.

Bill Morris takes a sinister view of a dextrous instrument.

Background

British magazines take about three months to reach newsagents in New Zealand so it was only then, on the first day of the southern autumn that I have received the Christmas edition of the Model Engineer. David Lewin's article Something Sinister Afoot, about being left-handed in a right-handed world, reminded me that one of my brothers is left-handed, cack-handed, a southpaw or, more technically, a sinister. He was good at cricket, perhaps because he bowled left-handed and batted right, but academic work at school was always a trial, as the legibility of his hand-writing left (and leaves) something to be desired. Nowadays, one can get left-handed scissors, potato-peelers and nibs, but how, I wondered, does the left-handed engineer get on when handling a micrometer? Held left-handed, the fiducial line is out of sight on the back of the instrument. This led me to produce a pictorial guide to converting a micrometer to left-handed use, without resorting to reversed photographic negatives. This should be of interest to about ten percent of readers. Of the other ninety percent, some, new to the hobby, may find the comments on general dismantling useful for future cleaning and adjustment.

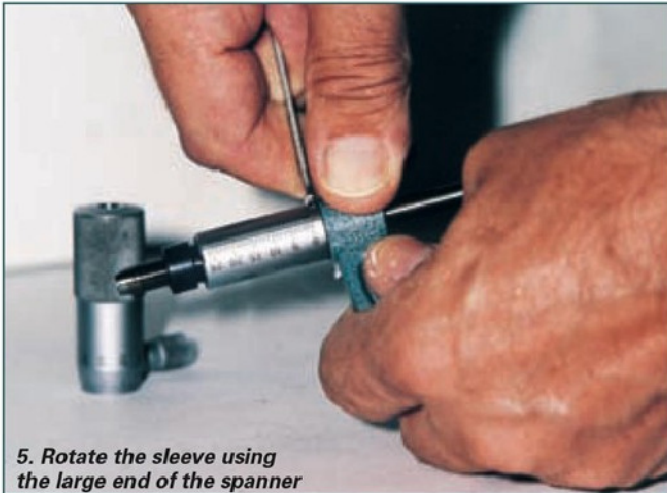
Photo 1 shows one way of holding it right-handed. The ring finger holds the frame against the heel of the hand and the little finger stops it slipping, while the index finger and thumb do the twiddling.



3. A gentle tap with a soft mallet.



4. Ratchet assembly unscrewed and thimble removed



5. Rotate the sleeve using the large end of the spanner



6. Clean the faces of the anvil with paper.



7. Advance the spindle to contact the anvil.

Holding the thimble firmly, give a gentle tap to the end of the ratchet assembly with a soft mallet (**Photo 3**). A lump of copper serves the purpose for me. This should loosen the thimble from the taper on the end of the spindle, so the ratchet assembly

can now be unscrewed completely and the thimble removed (**Photo 4**).

Using the large end of the spanner, rotate the sleeve so that the fiducial line now lies at the back of the instrument, unless you are left-handed, in which case it

now lies at the front for the very first time (**Photo 5**). Clean the faces of the spindle and anvil by trapping a piece of note paper gently between them and sliding it out (**Photo 6**), followed by a gentle blow to get rid of any paper fibres. Rotate the spindle until it gently contacts the anvil and replace the thimble upon its taper with the zero against the fiducial line. Replace the ratchet assembly, but do not lock it against the thimble until you have backed off the spindle by rotating it between your fingers.

Resetting

Now advance the spindle until it touches the anvil (**Photo 7**). I always advance the spindle slowly by means of the ratchet until it gives one click. In my hands, advancing slowly until it gives three clicks, as recommended by some authorities, results in an extra movement of 2 microns and advancing rapidly, an extra and unpredictable 3 to 5 microns. It doesn't matter how many clicks you prefer. As long as you advance the spindle slowly and use the same technique every time, you should get consistent measurements if the instrument is otherwise in good order.

Finally, adjust the sleeve to set the fiducial line against the zero and recheck (**Photo 8**). Yes, I know the numerals are upside down if you use the micrometer left-handed (**Photo 9**), but as the fox in St Exupery's Little Prince sighed, "Rien n'est parfait" (Nothing's perfect).

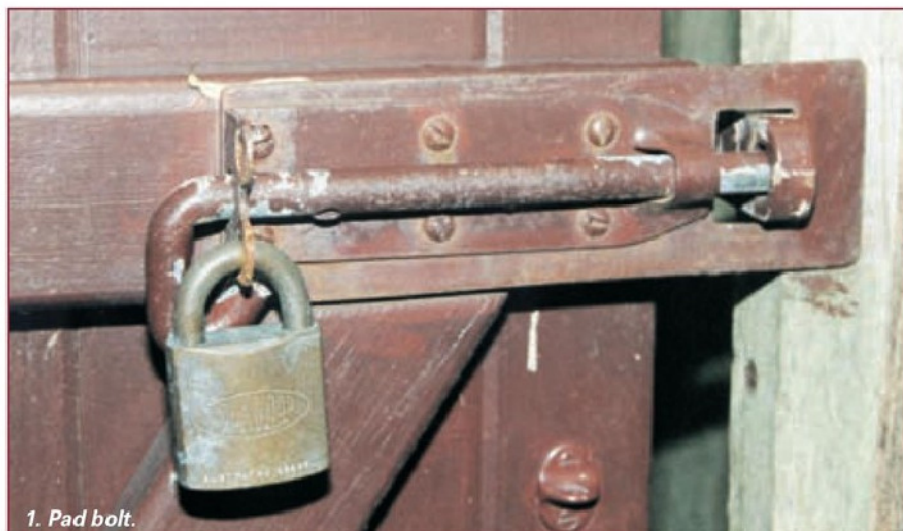


8. Adjust the sleeve.



9. Now set for left-handed operation.

TEMPORARY or Latches, Catches,



1. Pad bolt.

Introduction

This article is not about handcuffs and straight jackets; rather it relates to devices and arrangements that retain two parts in a particular relationship until released. These include bolts, pins, plungers, latches, catches, pawls and toggles amongst others, and their uses are described below. Some are taken from a decidedly agricultural context, however many will find a variation with relevance to the workshop situation.

Definition

(Macquarie Dictionary)

Latch - device for holding a door or gate or the like closed, consisting basically of a bar falling or sliding into a catch, groove or hole.

Operating means

The operation of a latch may be manual, by gravity, by spring, electrical, magnetic,

pneumatic or hydraulic means. In some cases one means is employed to secure the catch, while another is employed to undo it.

Manual operation

(i) Bolt

The simplest means of preventing relative movement between two components is the bolt or pin, arranged transverse to the direction of movement. The commonest manifestation is probably the gate bolt (or pad bolt) found on gates and doors and as shown in **photos 1 & 2**. This usually has some form of handle projecting at right angles to allow operation, and indexing open or closed. For cupboards and boxes barrel bolts (or tower bolts) fulfill a similar function on a smaller scale - see **photo 2**.

For double gates or doors a sliding bar or bolt, carried in saddles or hooks, and passing across both gates provides a strong constraint as shown in **drawing 1**. Much used in ancient times to hold shut the gates

A review of devices compiled by Philip Amos

of towns, castles and fortresses. All of the above require manual operation to engage or disengage the securing means.

At a smaller scale, pin arrangements such as the Lynch Pin, "R" Clip, or well known Split or Cotter Pin may be encountered. In the case of the Lynch Pin, the pin is inserted through a hole in the shaft, and then retained by the loop, which springs over to the "closed position". To operate correctly, it must be located close to the end of the shaft. The type shown in **photo 3** is used to retain a cutter assembly on a large grass cutting machine. The "R" clip, (**photo 4**) also shown, is retained by its own shape, which gives spring retention, and may be positioned at any point along the shaft.

(ii) Stirrup

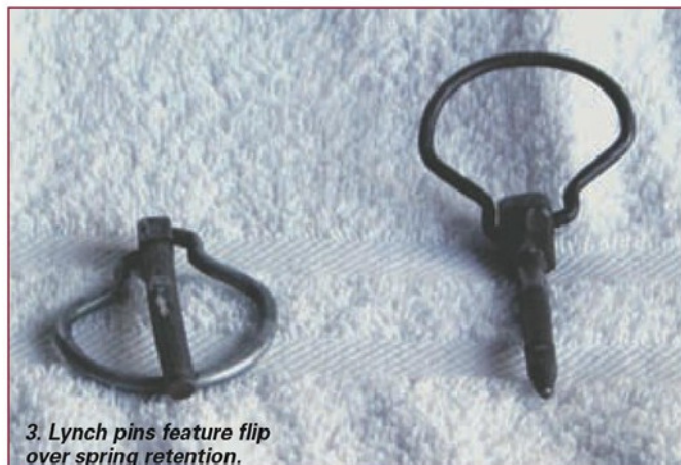
Another simple means is the stirrup, usually of metal strip as shown in **drawing 2 (a)** but can even be just a piece of wire. It is effective but must be operated manually. A variant is the bow catch shown in **drawing 2 (b)** often used in connection with tubular steel gates.

(iii) Semi-automatic engagement

The pipe post catch as shown in **photo 5** and **drawing 2 (c)** has widespread use in garden gates and similar situations. The moving gate first pushes the catch aside and then back again to hold it in position. It requires operation of the hand lever to release it. Frequently used in conjunction with a gate closing spring, which tends to hold it in engagement; if the gate is left free swinging, wind action can rattle the catch undone.



2. Top: pad bolt. Middle: barrel bolt. Bottom left: spring loaded cupboard catch. Bottom right: spring loaded plunger.



3. Lynch pins feature flip over spring retention.

RESTRAINT

Pins, Bolts & Bars

(iv) Chain, ring & hook

All the earlier manual catches find use for normal garden gates and the like. However cattle are inquisitive beasts and can often flick open such catches, releasing them to "fields afresh and pastures new". So cattle gates are frequently secured by chain, ring and hook arrangements as in **photo 6** which are beyond the capabilities of a beasts mouth to undo. The keyhole slot feature of the ring will also be found on other devices e.g. door security chains and wall mountings.

(v) Cabin hook

This device shown in **photo 7** is more often used to hold a door or gate open rather than closed.

(vi) Sash fastener

To secure window sashes in position relative to one another, the sash fastener shown in **photo 8** was developed. It has a cam action allowing tight engagement of the sashes. It has been in use for centuries. Various improvements in recent times allow positive locking for added security.

(vii) Box catch

A most useful closure means for small workshop boxes, usually comes packaged with a screw eye as in **photo 9**. However it often works better when set to engage the parallel part of the stem of a round headed screw as shown in **photo 10**. The small protrusion intended for its operation is best bent forward for ease of use.

(viii) Strap catch

An effective but rapidly openable arrangement is shown in **photo 11** as fitted to the belt ammunition box for a Vickers



4. Typical applications of R clips.

machine gun (latterly a tractor tool box). Manually engaged and released. Historically a leather straps were also sometimes used to secure car bonnets.

Gravity operation

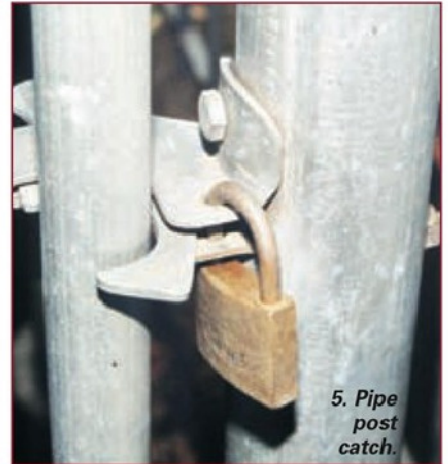
(ix) Bar

The gate latch and striker depicted in **photo 12** and **drawing 3(a)** are probably the simplest of the gravity operated catches. The movement of the striker deflects the catch up out of the way, and after it passes, the catch drops back under gravity action, securing the striker in the closed position. It must be manually released.

The arrangement shown in **drawing 3(b)** is similar but more complicated - it appears to present no advantages over the simpler type.

(x) Lift latch

When it is necessary for access to operate the latch from both sides of a gate or door the lift latch depicted in **drawing 4 (a)** can be employed. The thumb on piece A lifts the latch bar, as will a finger under the



5. Pipe post catch.

hook B on the opposite side. Again this device has been in use for centuries.

Much the same result can be obtained by rotary motion with the action as shown in **drawing 4 (b)**.

(xi) Two way catches

The arrangement shown in **photo 13** is intended for use with tubular gates. There are two independent leaves each of which can be pushed up out of the way by a closing gate and then fall back under gravity to hold the gate in a closed position. The type shown in the photo was cast and was popular in the 1920's but these days they tend to be formed in sheet metal.

Spring operation

(xii) Plunger

A spring loaded plunger engaging a hole is a most positive form of latch - see **drawing 5 (a)**. This is widely employed in machine tools, to index parts in relation to one another, and to hold them firmly in position. If the pin is tapered, highly

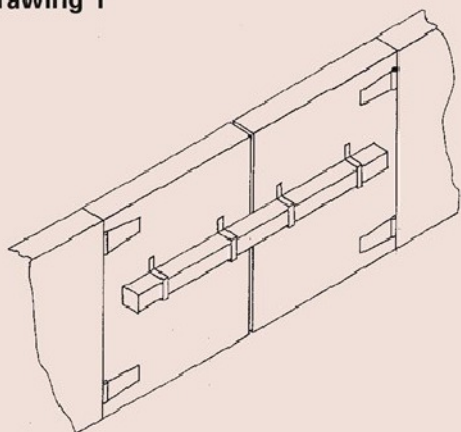


6. Chain, ring and hook.

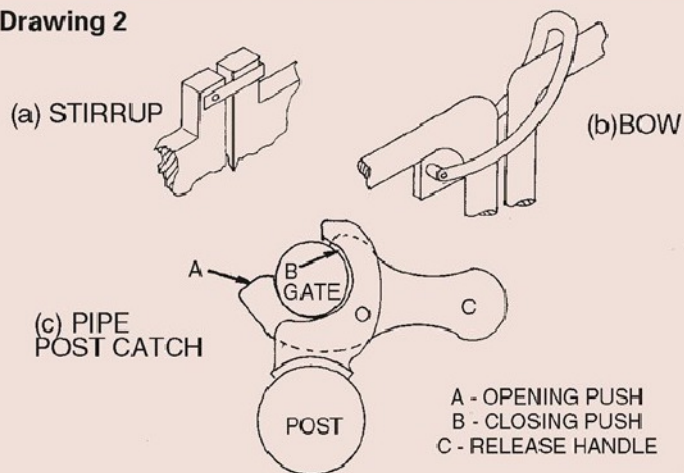


7. Cabin hook.

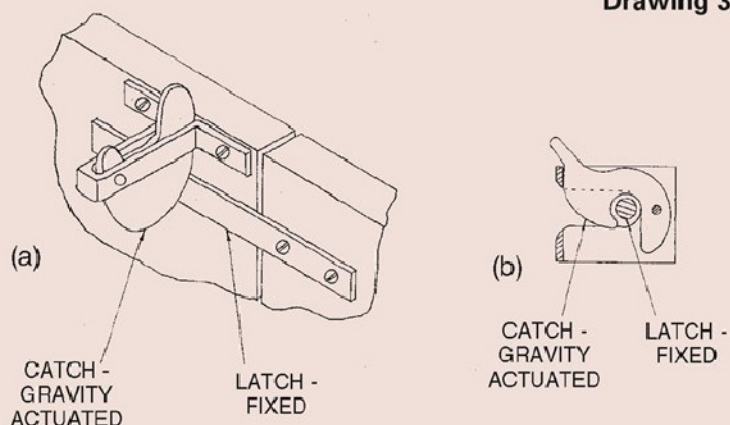
Drawing 1



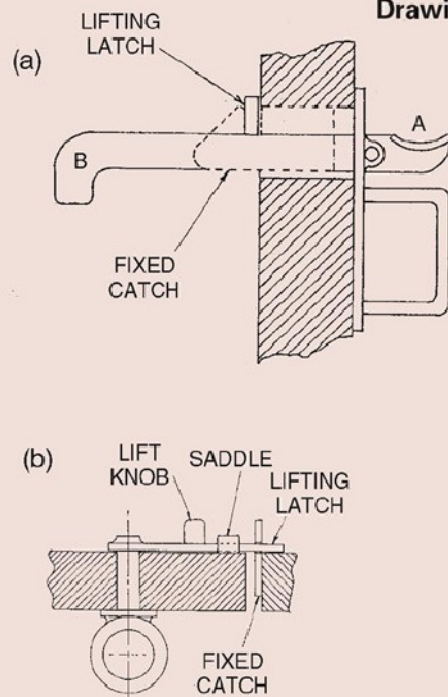
Drawing 2



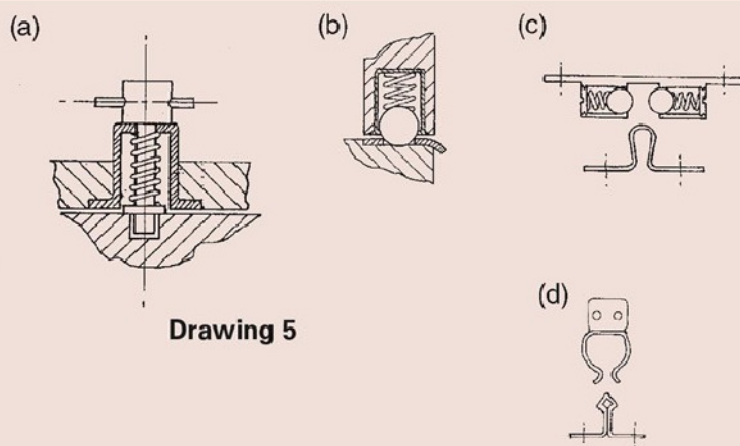
Drawing 3



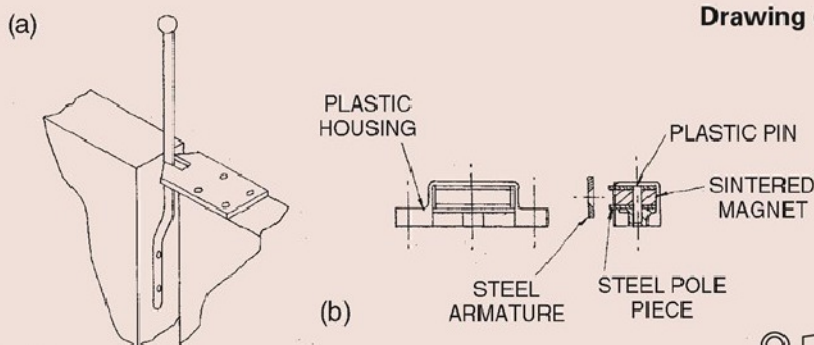
Drawing 4



Drawing 5



Drawing 6



accurate positioning can be achieved. **Photo 14** shows three examples of spring loaded plungers on my lathe - upper left for engagement of the backgear in the headstock; centre for right or left hand rotation of the leadscrew; and bottom for Norton gearbox ratio selection.

(xiii) Ball catch

Perhaps the most common form of temporary restraint known, - see **photo 9** and **drawing 5(b)**. Combined with a curved striker plate (which deflects the ball) the spring returns the ball to partially lodge in a hole in the striker plate, and holds the parts in fixed relation to each other. Added manual effort transverse to the ball axis, causes the ball to retract against the spring, releasing the catch.

(xiv) Double ball catch

A more sophisticated arrangement is shown in **drawing 5(c)** having two spring



8. Sash fastener.

loaded balls, acting on opposite sides of a rounded striker, but otherwise similar in action to the simple ball catch.

(xv) Simple spring catch

A less sophisticated arrangement shown in drawing 5 (d).

(xvi) Riding gate catch

The device shown in drawing 6 (a) relies on the springiness of the vertical bar on the gate, which engages in a slot in the metal plate attached to the top of the post. It is very convenient for horseback riders, but may not be cattle proof.

Magnetic catch

Shortly after World War II the magnetic door catch depicted in photo 15 and drawing 6 (b) appeared on the market, and found great popularity (at least in Australia). However despite its components being electroplated, it still was found to rust easily in humid or salt laden air, leading to marking of fabrics and so was supplanted by other types of catches for new installations. Thousands at least are still in service however.

More recently magnetic gaskets have been introduced on domestic refrigerators and freezers. They are made from soft plastic material incorporating magnetised powder, and act both to hold the door closed and to seal it against air movement. Such arrangements seem to provide greater



11. Strap catch.



9. Top: ball catches. Second row: ball & cylindrical catches. Third row: spring catches. Fourth row: magnetic catch, box catches. Bottom: sash fastener.

security against long term failure than mechanical latch devices previously used.

Sliding latch

This is mostly used to release the energy in a compressed or extended spring, but sometimes for that in pneumatic or hydraulic cylinders. The classical example is the rat trap - see drawing 7 (a). Slight downward pressure on the bait A moves the latch plate B anticlockwise so that it disengages the end of the latch pin C thereby allowing the spring loop to unwind anticlockwise and break the rat's neck.

Roller latch

When the spring forces get larger, so does the friction restraining the latch from sliding. By substituting a roller latch these forces are reduced by an order of magnitude, so extending the application. See drawing 7 (b). Movement of the roller to the left continues until the point of contact is to the right of the line of centres of the roller lever, at which stage the latch flies clear under the influence of its spring.

Toggle

(a) Case latch

Photo 16 and drawing 7 (c) show a lever A



12. Gate latch.



10. Box catch.

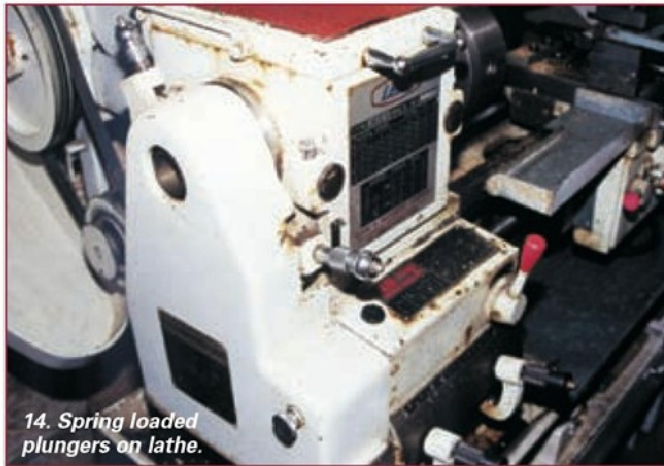
pivoted at P, and having an extensible bridle beyond its pivot, looping around a fixed post C. If the lever is forced down against its mounting surface the bridle passes beyond the support point P and the device locks in place i.e. it has gone "over toggle". If the lever is raised the bridle extends slightly and unlocks releasing the part bearing the post C from that bearing lever A. These latches are widely used on tool boxes, machinery cabinets and suitcases.

(b) General use

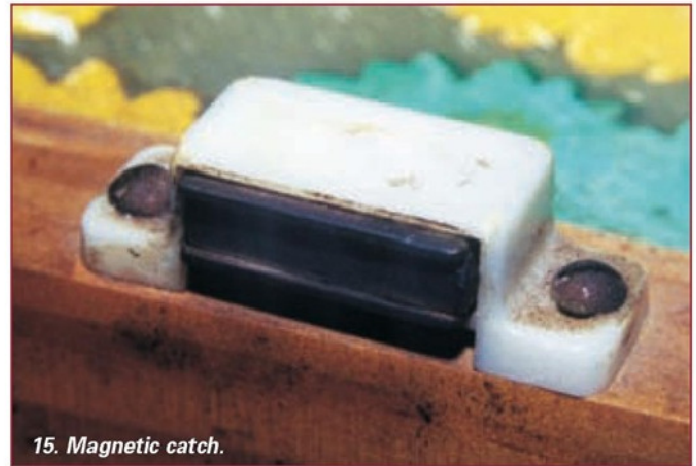
Quite apart from its use in hardware the toggle is one of the most widely employed mechanical arrangements in machine tools, as it is the essence of toggle punch presses, and many press brakes and guillotines. Some commentary on its use for guillotines is given in reference 1. In fact it is a force multiplier as shown in drawing 8 (a) (from reference 2). The multiplying force coefficient depends on the angle between the linkages as shown in drawing 8 (b) (from reference 3). If the point happens to go over toggle then the device becomes locked, so this must be prevented - usually by a locked adjusting screw in line with force F. Likewise there can be no allowance for any clearance or play in the mechanism joints or this over toggle condition may occur as a result. While theoretical mini angles yield enormous force magnification, practical considerations for stability probably mean a linkage angle of say 1deg. This still gives a multiplier coefficient of 28.6 which, for a spring force P of say 500 kg (in a 33 kV oil circuit breaker) would require a latch force



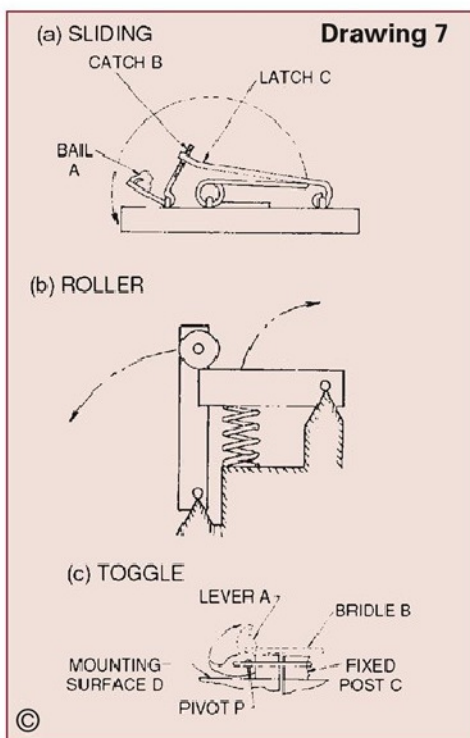
13. Two-way catch.



14. Spring loaded plungers on lathe.



15. Magnetic catch.



Drawing 7

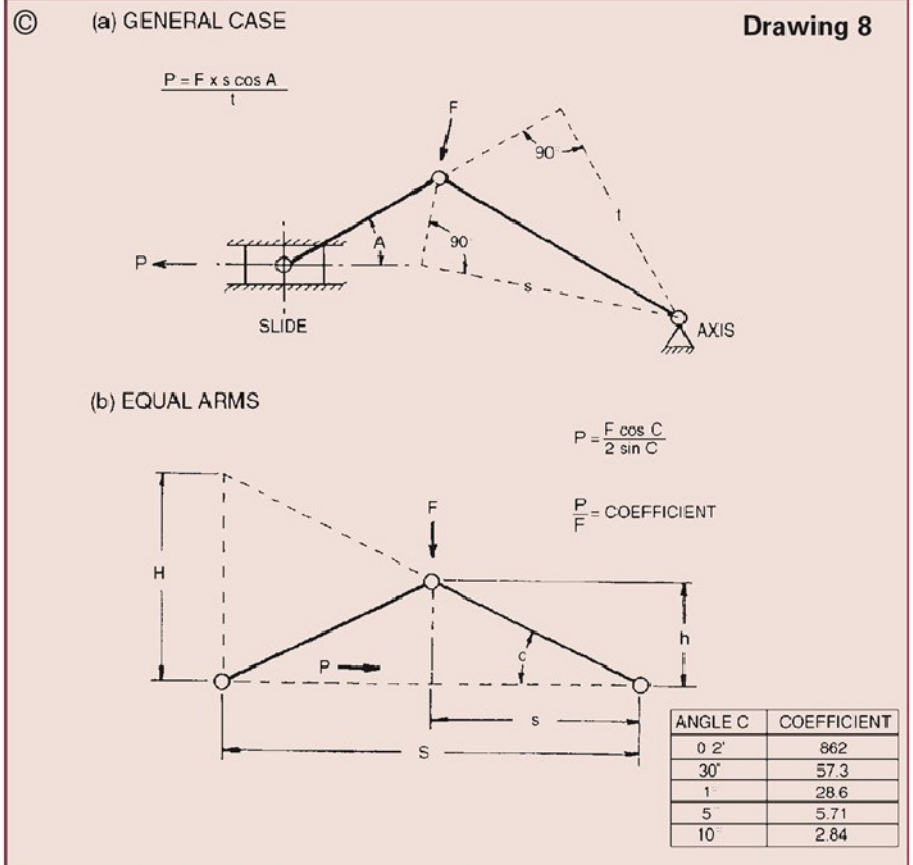
F given by:
 $F = \frac{500}{28.6} = 18 \text{ kg.}$
 which is entirely manageable.

(c) Toggle clamp

The force multiplication characteristic of a toggle linkage has been noted above. If the arrangement is permitted to go marginally over toggle, then it can be used for quick action clamping. Toggle clamps of various sizes are commercially available, and one fitted to a small fixture is shown in **photo 17**. Another application of the principle is illustrated in **photo 18**, in this case a quick action milling vice.

Ratchet

By the use of a "gear" wheel having radial tooth sides it is possible to produce a multi position latch with a prop or catch (the pawl). The concept is commonly applied to control a winch drum as shown in **drawing 9 (a)**. Such crank operated winches found wide use in cranes on railway sidings over the last century and a half in this country, and probably elsewhere as well.



Drawing 8

Such a ratchet gear can also be rotated with another pawl on a manipulating lever as shown in **drawing 9 (b)**. The pawls are spring loaded in engagement and slip over the wheel teeth as the ratchet is revolved, but prevent rotation in the opposite direction. Means are usually provided to disengage the holding pawl to allow the ratchet to unwind under the control of the manipulating lever. By the use of several holding pawls each slightly displaced from one to another around the circumference of the ratchet it is possible to move the ratchet positively by less than one tooth space.

The form of ratchet and pawl shown in **drawing 10 (a)** is really more of an indexing feature used in machine tools. The pawl must be disengaged before the wheel can be rotated, but will re-engage automatically by gravity – or perhaps spring assisted.

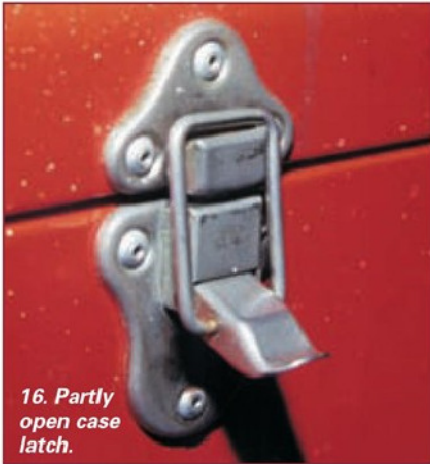
In some machine tools a ratchet also finds a place in progressively feeding a

tool automatically across a work piece – notably in the shaping machine. Where feed is required to be available in either direction a "flop over" pawl as shown in **drawing 10 (b)** is used. Reciprocating motion of the operating lever will drive the wheel clockwise (position A) or anticlockwise (position B).

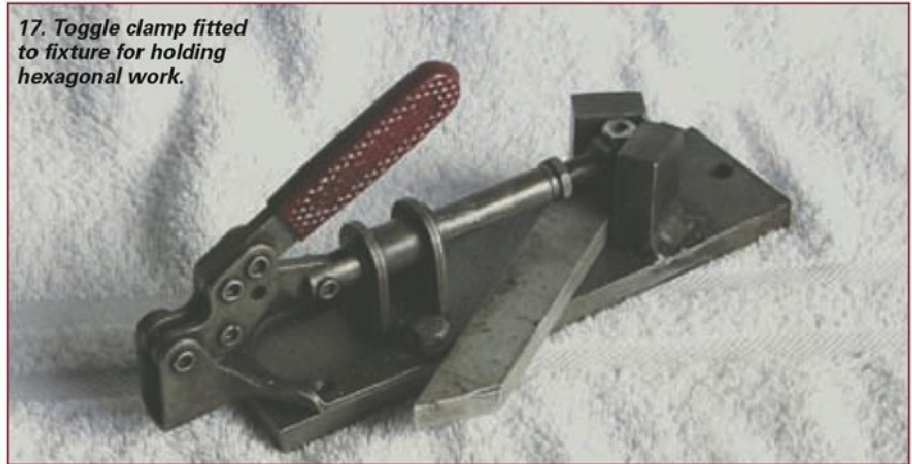
Indexing using a spring loaded pin, engaging slots or holes in a gear or disc might be thought of as an extreme form of ratchet. The ratchet is not confined to circular forms, and a ratchet rack as depicted in **drawing 10 (c)** is often found in vehicle jacking equipment, and also as a floor board clamp.

Conclusion

Most latches used for gates, doors and windows have been commonplace for hundreds of years, and this is reflected in the seemingly infinite numbers of styles and variations to be found available in the

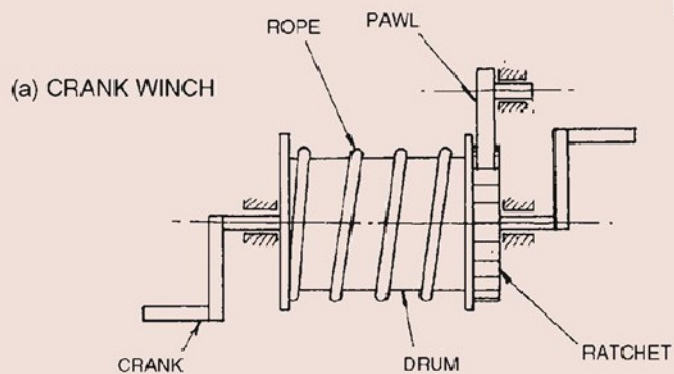


16. Partly open case latch.

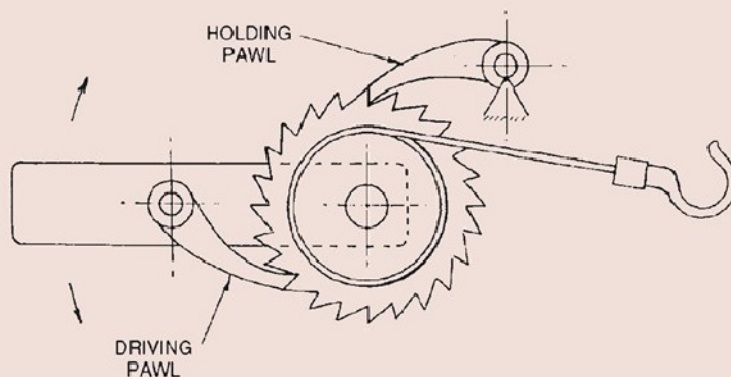


17. Toggle clamp fitted to fixture for holding hexagonal work.

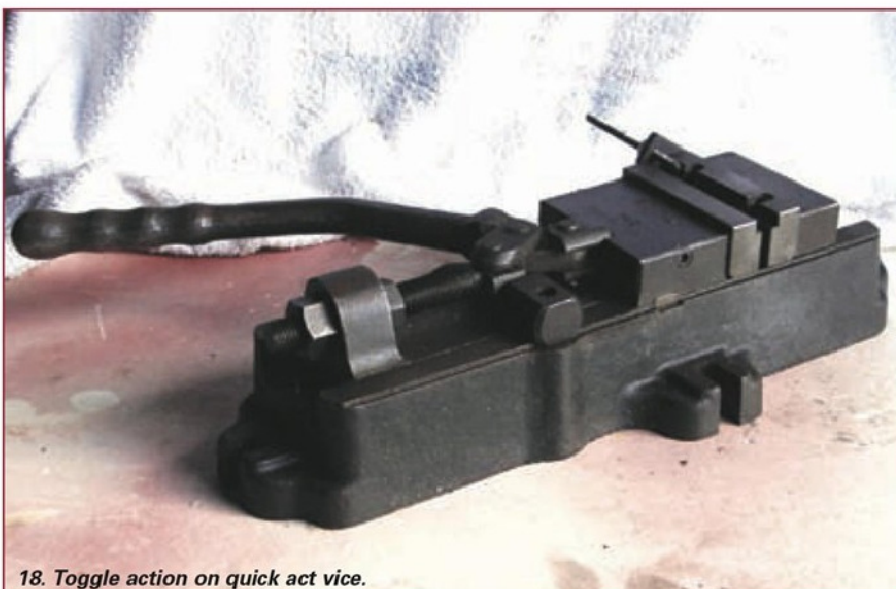
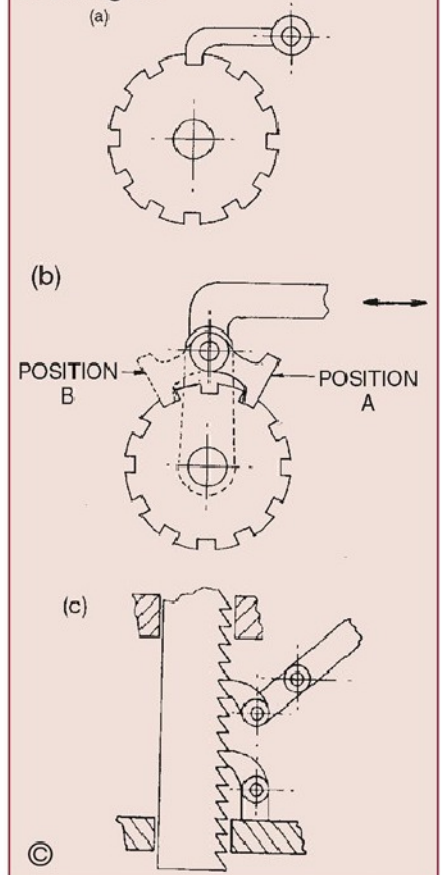
Drawing 9



(b) RECIPROCATING WINCH



Drawing 10



18. Toggle action on quick act vice.

local DIY shop. See **photos 2 & 9** for some. The choice in a particular case is thus highly individual and may well depend on aesthetics, convenience or just personal preference.

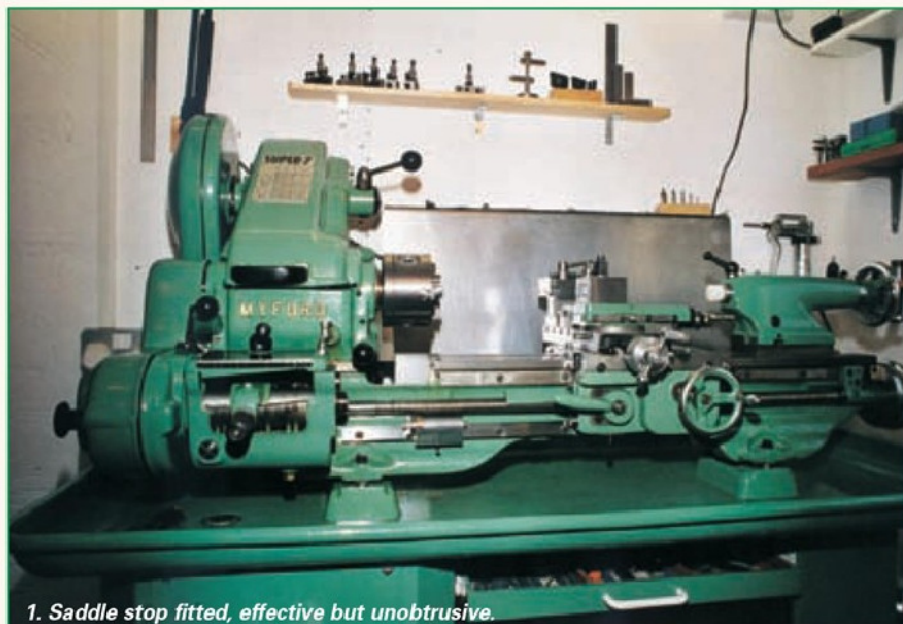
It is quite a different case with latches included in machinery of one kind or another, where specific technical performance is required, and correct design with accurate manufacture are essential. Hopefully this article draws attention to the latter concepts with sufficient emphasis.



References

1. **Shear** - Philip Amos MEW 70 Dec 2000.
2. **Mechanical Engineer's Handbook** - L.S.Marks 1941.
3. **Machinery's Handbook** - Revised 21st Edition 1982.

ADJUSTABLE SADDLE



1. Saddle stop fitted, effective but unobtrusive.

Rationale

Many and varied have been the designs for saddle stops, which have been published over the years in both Model Engineer and MEW. Some have been delightfully simple, being little more than a movable clamp fitted to the bed. Some cannot allow full movement of the saddle towards the chuck, some do not feature micro adjustment and some are not compatible with the optional quick change gearbox. The design presented here, attempts to address some of these criticisms. It has been kept fairly straightforward, and does not provide automatic half nut release. As the stop is easily viewed, timely manual release of a feed does not cause a problem. The device shown in context in the heading photo, does not take many hours to construct, and will, it is hoped, be viewed by readers, as an accessory well worth the time taken to make.

Photo 1 shows the Myford lathe with the device fitted.

Design concept

The principal sub assemblies of the Saddle Stop are the body and the rail. The rail is mounted on the lathe bed in such a position that it clears the back of the apron and the lower half nut. The body slides along the rail and can be clamped at any position. When the body is parked fully to the left it allows full movement of the saddle to the point where the leadscrew cover meets the side of the gearbox. The body carries a stop rod which can be adjusted by the collar, graduated to indicate thousandths of an inch travel of the stop rod. The full travel of the stop rod is $\frac{3}{4}$ in. My lathe is imperial and I decided to keep to this for the saddle stop, however, the drawing dimensions are all metric. The stop rod is rotated inside the threaded portion of the body by the collar which has a pin engaging with a slot in the stop rod. The collar is retained in the body by a ball, held in place by a spring. Any axial load is taken by the threads of the body and stop rod and nothing is transmitted to the collar, so the ball is adequate for retention. I keep the saddle clear of the stop rod during adjustments. Obviously, if whilst the stop rod is being extended, it has to push the saddle along, there will be some load on the ball and the pin. In use the

stop rod engages with a button mounted on the edge of the apron. **Fig. 1** shows the general arrangement, and **photo 2** the various components.

Fig. 2 shows the position of the Rail behind the apron. Although the profile of the bed changes along its length, the portion on which the Rail is mounted remains constant. My lathe is a Super 7 Serial Number SK 151178 and Myford tell me that there has not been any change in the bed profile. However, as this is an as cast surface, and therefore potentially more variable than a tightly toleranced machined surface, you should check the clearance on your own lathe, and adjust dimensions if necessary.

Materials required

Body, Rail and machined components – mild steel
Index Shoulder – brass
4 off M5 x 25 mm countersunk socket screws
1 off 4BA x 15 mm cap screw
2 off 9BA countersunk brass screws
1 off 3 mm ball
1 off 3 mm spring
Spot Face Cutter – silver steel

Tony Stauber presents a version which overcomes some shortcomings of other designs.

Manufacture of main components

Rail (Fig. 3)

The length of the rail is very much up to the individual builder. So far, 300mm has worked fine for me. Having been cut to length, the bar for the rail should first be normalised. Heat to dull red and then allow it to cool slowly. Mill out the 3 x 5 channel and leave the bar for a few days to relieve any stresses. The machining is straightforward, I used $\frac{3}{4}$ x $\frac{3}{4}$ bar but if you can get 18 x 14mm stock, so much the better. I used four mounting points for the Rail but in fact three would be plenty. Drill the four (or three) holes for the mounting screws, initially 3mm dia.

Body (Figs 4 & 5)

I made my body from 40mm square stock. Cut to length and then face the ends square to the sides. I then milled out the area where the rail goes, starting with the easy, square lower section and then the diagonals at the top that sit on the rail. After machining the diagonals I had to make small adjustments to get really good seating on the rail, due I expect to my poor setting up and/or machining. With the rail to hand (not yet mounted on the bed) it is very easy to get a good fit.

I then machined the body to shape. My design here was entirely personal. The body can of course remain square or any shape you wish as it doesn't have to clear anything except the leadscrew. First, mark out the 9.5mm radius and position of the sloping front on one end and drill 5mm, on centre, right through where the stop rod will go. Insert a 5mm bar and use this to suspend the body between the vice jaws on the mill. By gripping the body on the ends it can then be rotated to machine a series of small flats which can then be filed to produce the curve between the top and the front. The sloping front face is milled at the same time. Whilst this curve does not have to be a constant 9.5mm radius it will help with the manufacture and fitting of the brass shoulder. Then mount the body on the faceplate with the 5mm hole centred and open up to 7.8mm. Turn the seating for the adjusting collar 13.8mm diameter and then ream 14.0mm. Remove the 3mm runout at the end of the thread and drill the portion to be threaded 8.3mm. Tap $\frac{1}{2}$ BSF and clear the inside of the thread to 8mm. Finally, ream the end section 8mm.

Drill the 3mm hole for the retaining ball and spring and tap the bottom M5 for the retaining screw. If you follow my body shape then this hole will have to be at an

STOP FOR MYFORD 7

angle. This is not critical so long as it enters the Collar seating in line with the centre.

Finally drill and tap M6 at the bottom for the Clamp.

Small parts

Adjusting collar (Fig. 6)

This is straightforward, with a knurl, graduations, an annular seating for the ball and a threaded hole for the Pin. Keeping the bar stock in the chuck, I first of all produced the knurl then machined the rest of the collar and finally cut the graduations. The collar needs to be a good sliding fit in the body which means machining it to fit or machining it undersize by 0.01/0.02 mm. The same applies to the stop rod. I do not have a dividing head but I have a spring loaded detent that I can mount either to engage with the bull wheel or the change wheels. It was simple to put the 50 tooth gear on the change wheel sleeve and graduate (not forgetting to tie a piece of string with a weight round the chuck to eliminate backlash).

I prefer my graduations with the longest for 0.010in., a shorter length for 0.005in. and the shortest for 0.001in. My respective lengths being 4.5, 3.75, and 2.5 mm. I numbered the major ones 1, 2, 3, 4 and 5 as opposed to 0, 1, 2, 3, and 4, in order to remind myself that one revolution is only 50 thou and not 100.

Pin (Fig. 6)

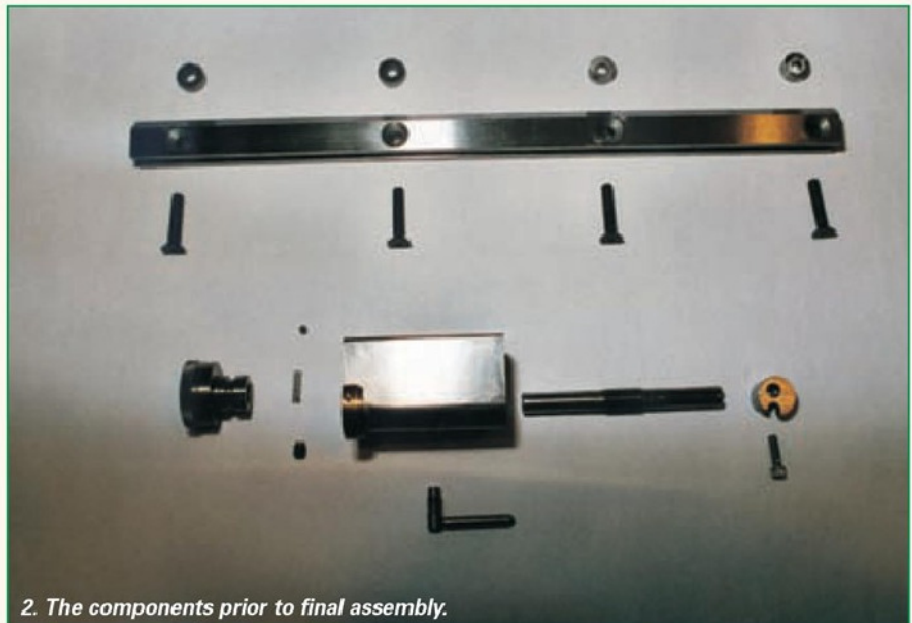
The only comment here is that the Pin should be good sliding fit in the slot of the Stop Rod with no play.

Stop rod (Fig. 6)

I screwcut the $\frac{3}{16}$ in. thread to be a good fit in the body and the end of the Rod needs to be a good sliding fit in the reamed portion. Obviously any play in the pin/slot or threads will lead to inaccuracy. I did not harden the end of the rod or the pin but this would undoubtedly be an option for those who make heavy or semi commercial use of their equipment.

Brass shoulder (Fig. 7)

As the graduated part of the collar has a larger radius than the body I decided to make a shoulder to bring the index mark level. I must admit that I did not realise the effect of this difference in diameter until well into the job! I could have made the body larger or the collar smaller, but this would have made the graduation/number portion very cramped. I think the brass shoulder looks good but it is more work. I turned a brass ring and then cut a section out as shown in the drawing. With a nice curve on the body this fits well and is secured with two 9BA countersunk brass screws. An index mark should be made



2. The components prior to final assembly.

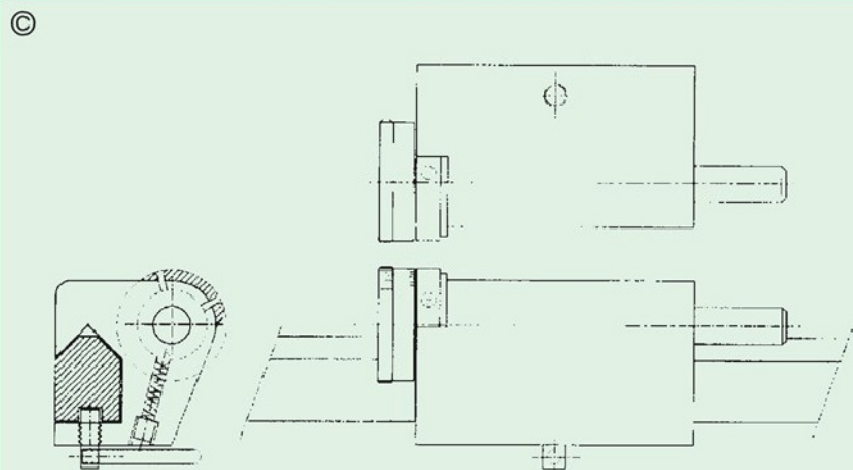


Fig. 1 General arrangement

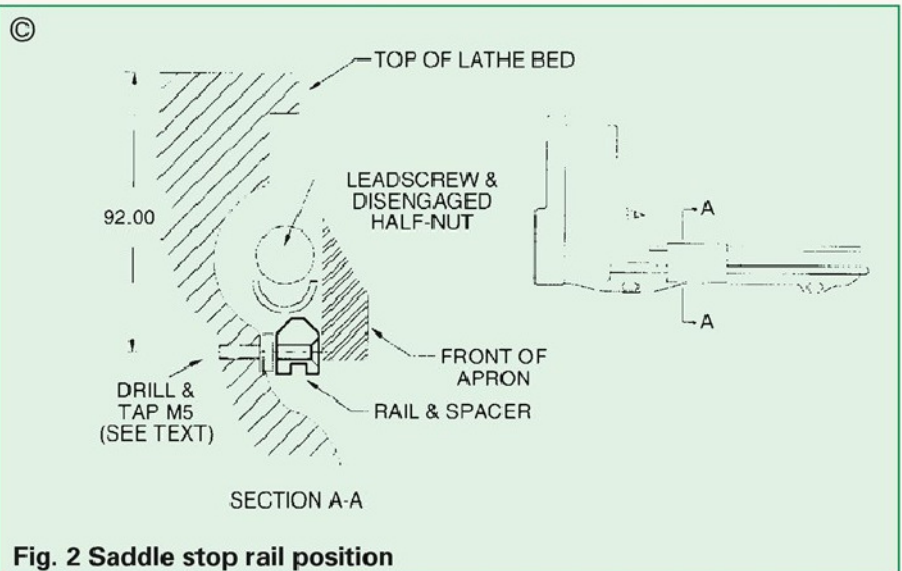
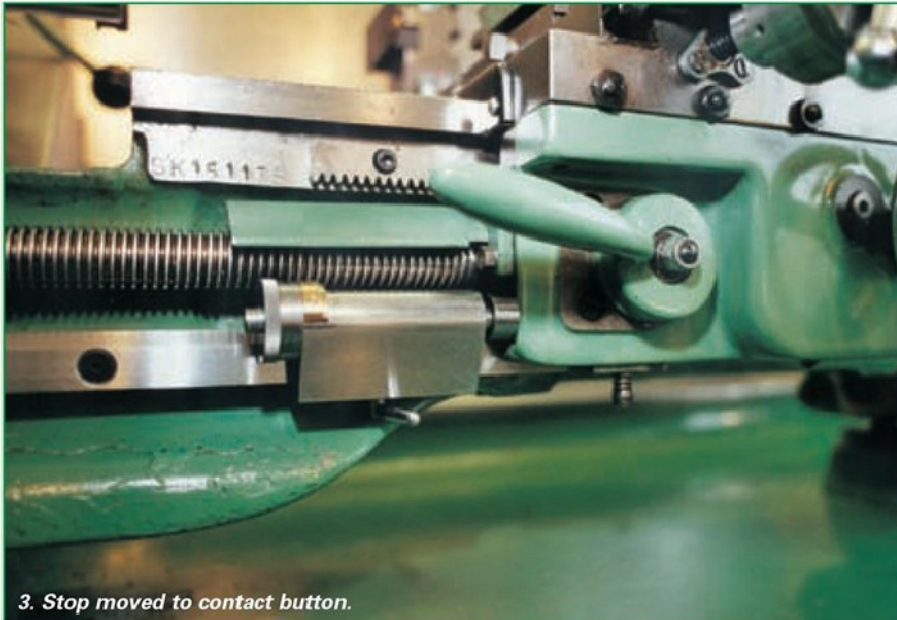
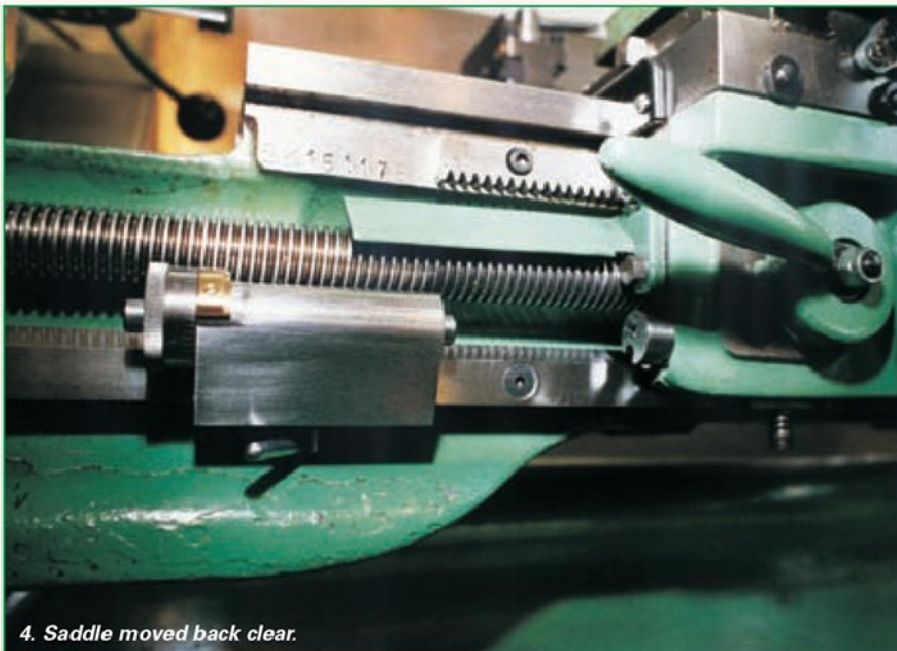


Fig. 2 Saddle stop rail position



3. Stop moved to contact button.



4. Saddle moved back clear.

slightly towards the front where it is easy to see. I filled this and the graduations and numbers with black paint then cleaned the surrounding areas afterwards.

Clamp (Fig. 7)

You can do this now or wait until the rail is fixed to the bed. In either case, having made the stem of the clamp, sit the body on the rail, screw the clamp in finger tight and mark the front of the stem. This can then be drilled and tapped for the lever which will be accessible when the body is clamped.

Spot face cutter (Fig. 7)

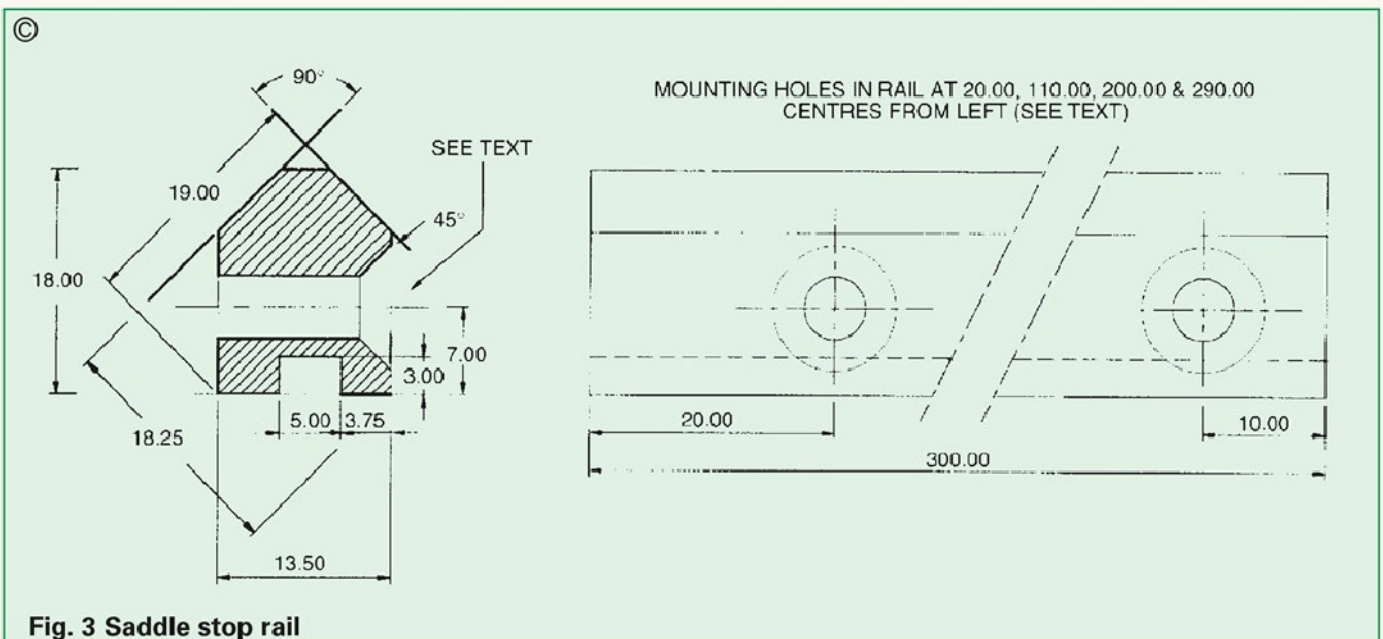
I made a 13mm diameter spot face cutter with a 3mm pilot spigot and used this to just clean up the bed so that the spacers would have machined vertical faces, on which to locate.

Use silver steel rod and machine to size: - a 3mm spigot, a 13mm section and a section to fit in your hand drill. Chamfer the end of the pilot spigot. Grind down part of the 13mm section to form a flat with a thickness of 3mm. File or grind the top of the flat on both sides at an angle of about 5deg to make the cutting edges. Then harden and temper. Heat the part with the cutting edges to bright red and quench in water. Clean and polish, then reheat to pale straw. Heat from the bottom and watch the colours travel up to the cutting edges then quench in water. This should suffice for the amount of work we want this tool to do. I am not an authority on hardening and if you want more precise details for a better tool, there are books and many articles on the subject. Finally sharpen the cutting edges with a small stone.

Mounting and assembly

Rail

Setting up the rail to fix to the bed is a bit fiddly. I did consider making some sort of



device to hang it from the bed slideway but finally opted for simply raising it to the correct height with blocks on the suds tray. I spotted through to mark the end hole on the right. I drilled this 3mm with a hand drill. I thought this might be difficult but with care to make sure you are holding the drill at right angles and horizontal it is not a problem. I drilled right through the bed, it is less than 10mm at this point. With a piece of 3mm rod through the rail and into the bed it is easy to support the rail level and mark for the other holes. Drill these 3mm. Use the spot face cutter to clean up the bed at each location.

Drill and tap the holes in the bed M5. Open up the holes in the rail to M5 clearance and countersink for M5 socket screws. It is now necessary to make spacers for the number of mountings you are going to use. Mount the rail using the

screws and measure for the spacer at one end. Manufacture and fit this spacer, it is then fairly easy by adjusting the screws to set the Rail a constant distance from the back of the apron and measure for the rest. My four spacers vary in thickness from 4.18 to 4.83 mm due I suppose to the shape of the bed and also a difference in depth of the spot faces.

Assembly of the body is straightforward. Apply Loctite to the pin and screw it into the collar sufficiently to get a good sliding fit on the stop rod. Oil the stop rod and feed it into the body from the collar side and screw partway into the thread. Slide the collar onto the rod, engaging the pin in the slot. Screw the collar/rod assembly into the body until the collar is fully in it's seating and then insert the ball and spring followed by the retaining screw. Slide the body onto the rail.

Button (Fig. 7)

This is fixed to the side of the apron with a 4BA cap screw. Position the button with the cut outs over the gib strip adjusting screw and locknut and make sure it is in the correct position for the stop rod. Then mark through for the cap screw position, this should be in the centre of the side of the apron. Drill and tap 4BA. Once again I drilled this with a hand drill without difficulty.

Using the saddle stop

For a simple stop, position the tool where you want the cut to finish, slide the saddle stop up until it engages with the button and clamp it, as shown in **Photo 3**. In **Photo 4**, the saddle has been moved away from the stop giving a clearer view of the button. If you have to make a series of cuts to reduce a diameter that will end with a shoulder, set the saddle stop index to a number and position it where the shoulder will be and clamp it. Advance the stop rod by, say, 5 thou and make your cuts to reduce the diameter. When it is the correct size, back off the stop rod by the 5 thou and make a facing cut to form the shoulder. When facing, make sure the stop rod is extended sufficiently for the amount you are going to take off, clamp the saddle stop and then back off the stop rod by whatever depth you want to make each facing cut. The saddle stop can be used on many occasions when you would use the top slide index or the leadscrew and hand wheel and the fact that it can be instantly moved and set makes it a very useful addition to the lathe.

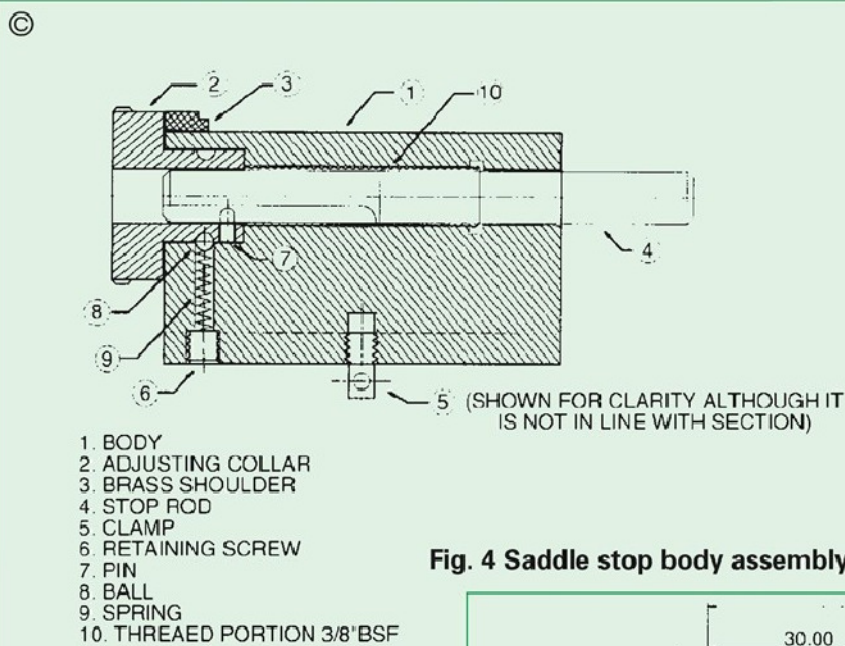
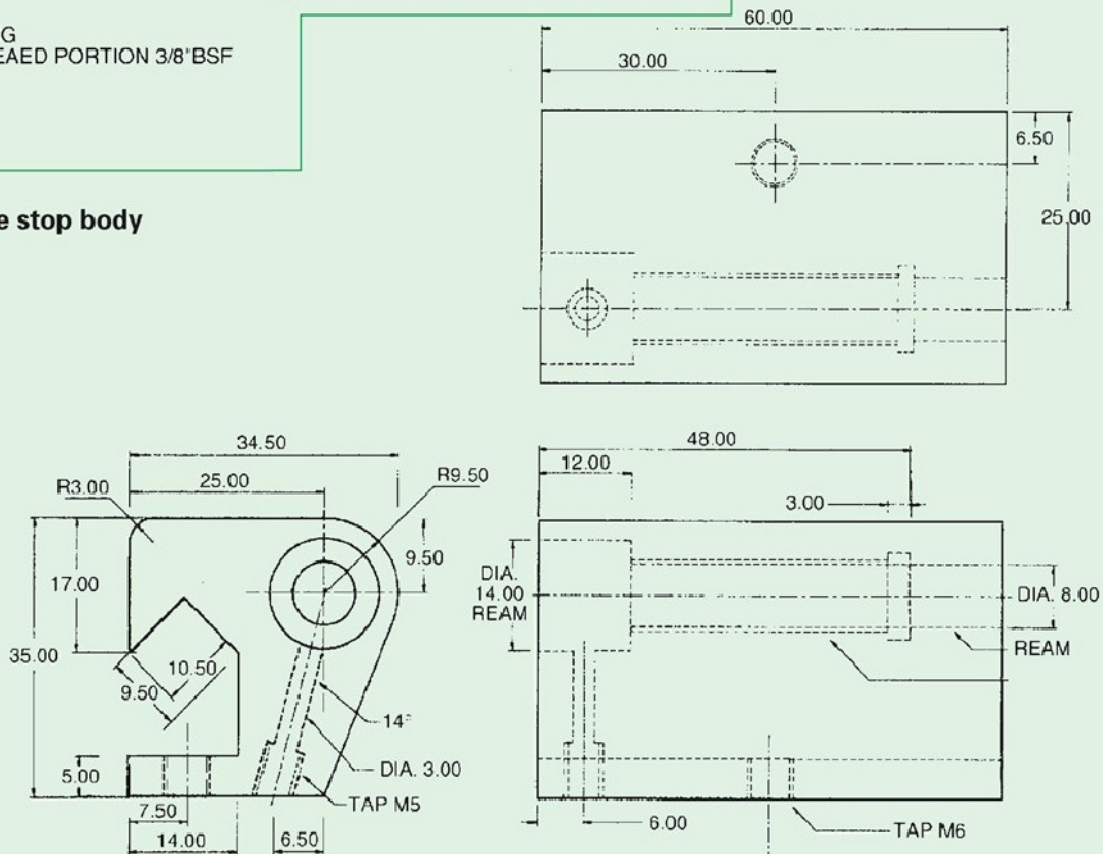


Fig. 4 Saddle stop body assembly

Fig. 5 Saddle stop body



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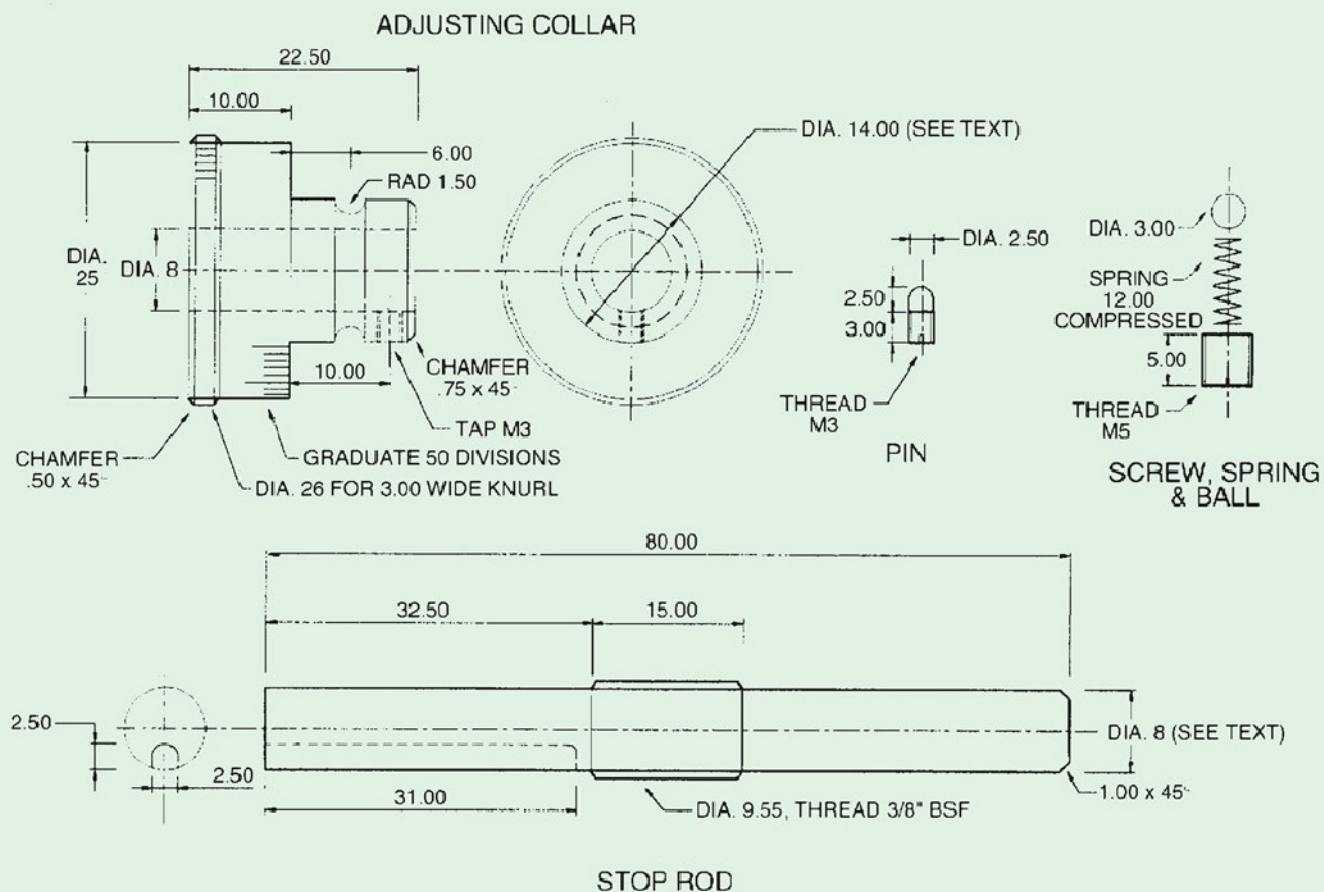


Fig. 6 Saddle stop body components

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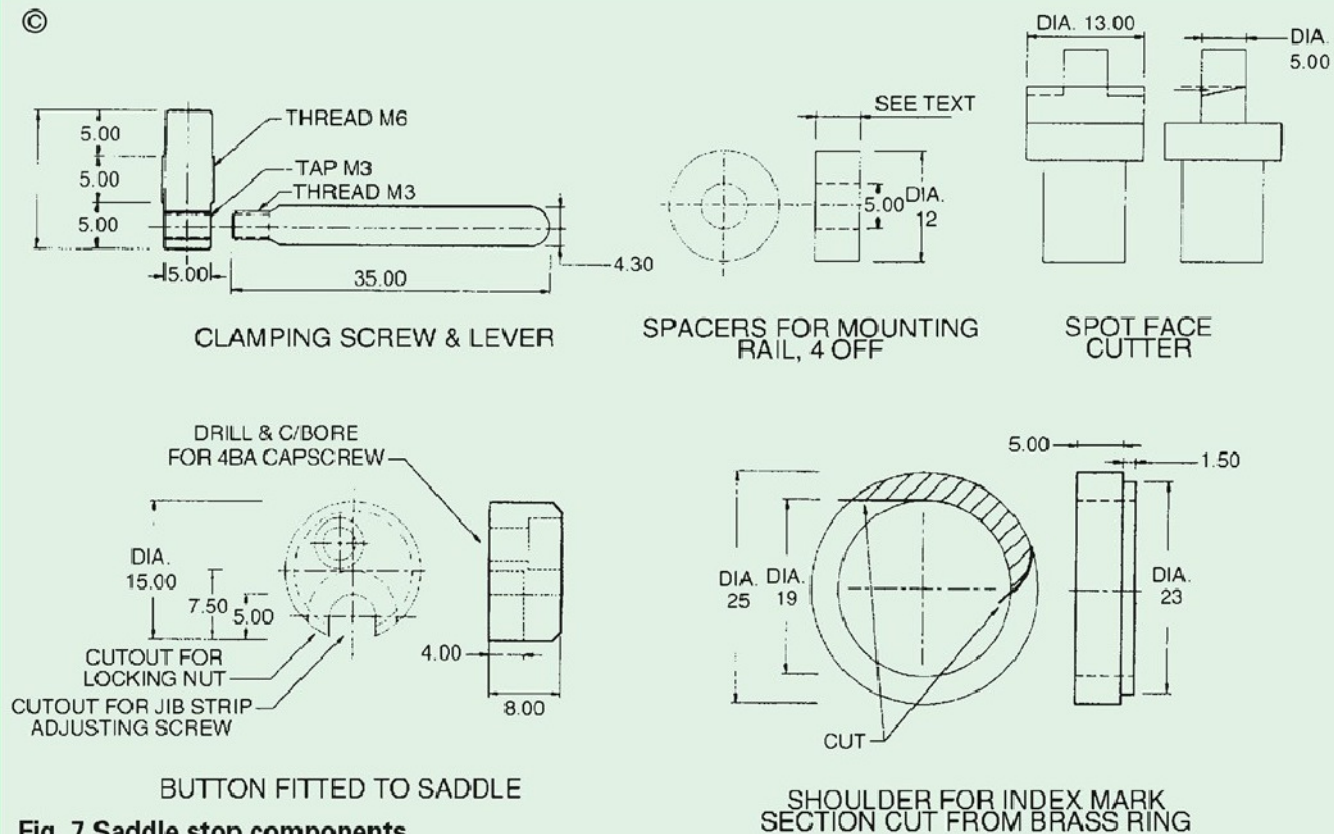


Fig. 7 Saddle stop components

INCONCLUSIVE EXPERIMENTS

Dave Fenner reports partial success with manufacturing trials

Background

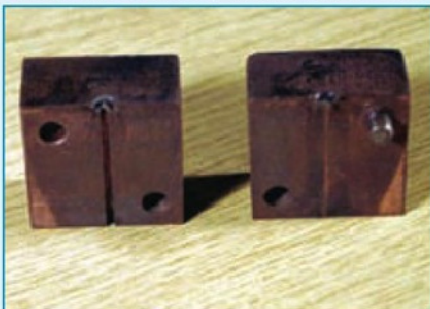
I mentioned in a recent editorial note that in making the centre electrodes for Bentley spark plugs, I had eventually resorted to machining from solid, taking the material down from 0.25in. dia. to 0.0625in. dia. in one pass, then drawing the material further out for a second bite. A 10BA thread was cut with a tailstock mounted die, and the head diameter of 0.165in. turned before parting off. Using the dead length collet chuck accessory in the Myford Super Seven concentricity was assured, even though the bar was moved and re-clamped. This method follows the practice that would be adopted on industrial sliding head CNC lathes. A finished spark plug is shown in photo1.

As this was going to take a fair bit of time, I felt it might be worthwhile investigating whether other methods might work, and two avenues were indeed explored. In each case a degree of success was achieved, and I believe that with further perseverance, viable production methods would result, which might also be applied to other components having a long slim section and a larger diameter head. I should perhaps add that I had earlier searched many hardware stores to see if a common or garden nail of appropriate size could be found.

Casting method

It had occurred that it might be possible to produce the large diameter head by melting down a length of 0.0625in. dia. wire. For the experiments, lengths of ordinary welding rod were used, the heat being applied by a TIG torch set on very low power. It is likely that the same effect could be achieved by either an oxy acetylene flame, or one of the old twin carbon arc torches powered from a stick welding set.

Some means had to be devised to hold the wire, to give shape to the head and to make the earth connection. My solution was the pair of copper dies shown in **photo 2**. A groove was machined in one half only, and for simplicity, this was cut to a rectangular shape 0.0625in. wide, and a few thou less in depth so that when clamped together the wire would be tightly held in position. A recess of about $\frac{3}{16}$ diameter and $\frac{1}{8}$ in. deep was then machined on the top surface to coincide with the wire centreline. On the basis that the larger diameter has an area of nine times the smaller, trials proceeded with about half an inch of wire protruding, as in **photo 3**. The method then adopted was to locate the dies in a small vice with the earth lead connected, then melt down the



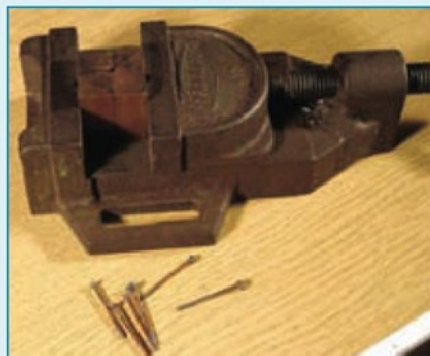
2. Two copper dies, that on the left features the location groove.

wire with the torch (held in the left hand), and finally quickly smack with a small hammer (right hand).

A number of parts were knocked out using this system, but subsequent machining of the head threw up a flaw, in that a significant proportion suffered blowholes. Discussions with my friendly metallurgy guru, Jim Brown have since suggested that it could be better to shape the recess more like a hemisphere, and thus improve the flow of molten metal

Welding method

A second line of thought was to make the disc for the head by punching out from sheet steel and then to weld this on to the wire. The punch parts in the Roper-Witney device each feature a small spike probably intended to locate on a centre punch mark. Centre punching heavily and then punching out the blank yielded a disc with a depressed centre, which in turn could be located on the end of the wire. The same copper dies were used for wire location again, ensuring good electrical contact. However, this time they were used inverted (the recess being unnecessary) and clamped by a G clamp, with a piece of



3. Wire clamped in dies ready for application of welding torch.



1. Completed spark plug showing centre electrode in place.

perforated cardboard being used as an insulator under the disc. The assembly was then manipulated between the electrodes of an automotive spot welder, set (after one or two abortive efforts) to minimum current and just one pulse. A satisfactory joint was achieved, but the combination of force and plasticity meant that the end of the wire deformed sideways as in **photo 4**. I believe that with more time spent developing a restraining jig-cum-insulator, this system could well have borne fruit.

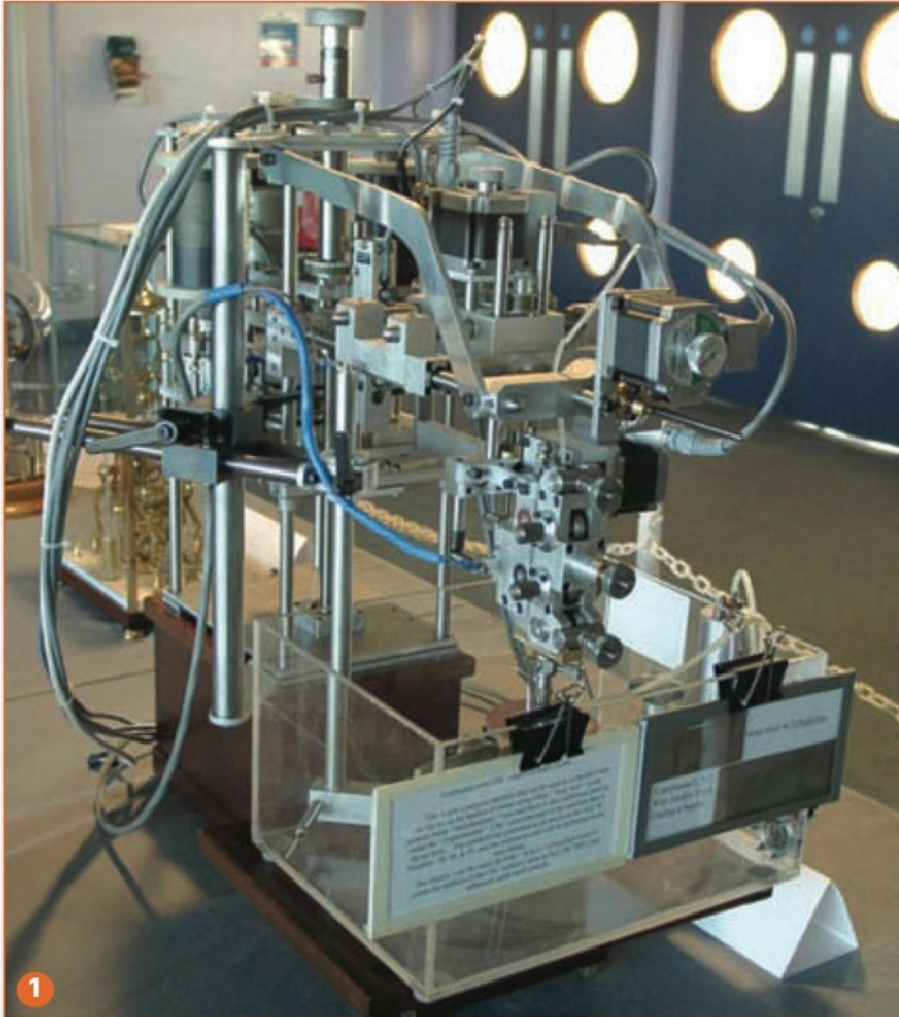
For the future, should any reader continue these lines of experiment, I should be extremely interested to hear of the outcomes.



4. Spot welded assembly has deformed sideways.



74TH MODEL ENGINE AT SANDO



Judging from the warm reactions from trade/club exhibitors and paying visitors alike, the 74th Model Engineer Exhibition was a resounding success. To cater for junior interest, train rides on indoor the 7½ gauge line were arranged in a first floor hall alongside the Whiteleaf Garden railway layout. An outdoor track had also been established, and on this, Tim Coles gave regular demonstrations of his gas turbine locomotive.

The smooth running of the event was due in no small part to the efforts of the stewards working under the guidance of Norman Phelps, and of the judges directed by chief judge Ivan Law. A vote of thanks goes to both groups, without whom such an event would not be possible.

The standard of models was as ever, extremely high, notable examples being the superb model of a 1936 747cc Twin Cam Austin Racer by Arthur Bodily, and in the loan section, the 1857 Blackburn Agricultural Engine Patent No 414 by Cherry Hill. It is understood, that to build the Austin model, Mr. Bodily borrowed the original prototype, dismantled it and measured the components.

Whilst casually looking over a 7½ gauge B1 steam locomotive, I was directed to have a look at the oil lamps. It was only on

1. **Peter Rawlinson's Continuous Wire Erosion machine – winner of a Silver Medal and the Bowyer-Lowe Challenge Cup**
2. **The hand tooling section of Integrated Lathe Tooling by Peter Clark**
3. **The second section of Peter Clark's entry**



ENGINEER EXHIBITION DOWN PARK

close inspection that it became clear that the lamps were not only well modeled but that the light emanating was not reflection. The lamps contained oil and had been lit.

Workshop Equipment

Competition entries

Class A5 consisted of seven entries and taking them in catalogue order, they were:-

A5/1 Continuous Wire Eroder – CNC Controlled by Peter Rawlinson

Regular readers will be familiar with this machine (photo 1) as it was described in detail in *MEW* issues 95 to 99. The erosion process is often associated with the more simple electrode downfeed arrangement for removal of broken taps. In contrast, here, the wire passes through the work piece, immersed in electrolyte, a little like a horizontal bandsaw blade. Stepper motors then move the wire position along orthogonal axes to effect a cutting action.

The machine clearly embodies a sizeable commitment in research and development effort, and the judges were duly impressed. Peter was awarded a



silver medal and the Bowyer-Lowe Challenge Cup. This is the second occasion on which Peter has won this prestigious silverware (previously for his CNC milling machine) and I understand that this feat has only been achieved by one other competitor, none other than the late great George H. Thomas. The trophy was donated by the late Mr. A.E. Bowyer-Lowe to be awarded for the best example of craftsmanship and design in the Tools and Workshop Appliances class.



A5/2 Integrated Lathe Tooling by Peter Clark

This was a two part entry, comprising a hand turning system, and an interchangeable toolholder system. The

4. Gary Wooding's "Yet another knurling tool"
5. Ian Cornish displays a simplistic approach with his Engraving Pantograph
6. Modified and improved Stent tool and Cutter Grinder entered by Mr P. Glenister





were shown for Schaublin, Lorch and Harrison M300 lathes.

The judges awarded a "Very Highly Commended"

A5/3 "Yet Another Knurling Tool" by Gary Wooding

I have come to look forward to seeing an entry from Mr. Wooding. Last year he displayed a bandsaw blade soldering jig, simple in concept and effective in use. This year he showed his straddle knurling tool. As his title suggests, not especially novel but again, conceptually straightforward, and eminently useful. The device is shown in **photo 4**.

A5/4 Engraving pantograph by Ian Cornish

This entry showed how a relatively complex piece of machinery may be simplified for home construction and use (**photo 5**). Presumably built for a specific application, the reduction ratio was fixed, thus avoiding the complication of arm adjustment. Spindle power came from a 240volt mini tool, so that relatively few components had to be manufactured in order to achieve the result.

A5/5 Stent Tool and Cutter Grinder by Peter Glenister

Based on the well known design, the device (**photo 6**) incorporated a number of modifications which included:-

Vertical slide leadscrew extended to increase the height adjustment by 1.25in. and the vertical slide itself drilled with three mounting holes to extend adjustment.

Spindle assembly being fabricated from stock and drilled with four mounting holes allowing horizontal adjustment and 180deg. rotation of the spindle as the motor is double ended and reversible. The spindle is machined with a 20deg. internal taper and draw bar to allow grind wheels to be changed with minimum dressing.

Two toolholder knurled nuts are available with 24 and 30 divisions, with plunger assembly.

The judges awarded a bronze medal.

A5/6 Improvements to a 90 x 325mm bench lathe by Derrick Crossland

The various improvement aspects were displayed on a mock up of the lathe bed, and can be seen in **photo 7**. At first glance



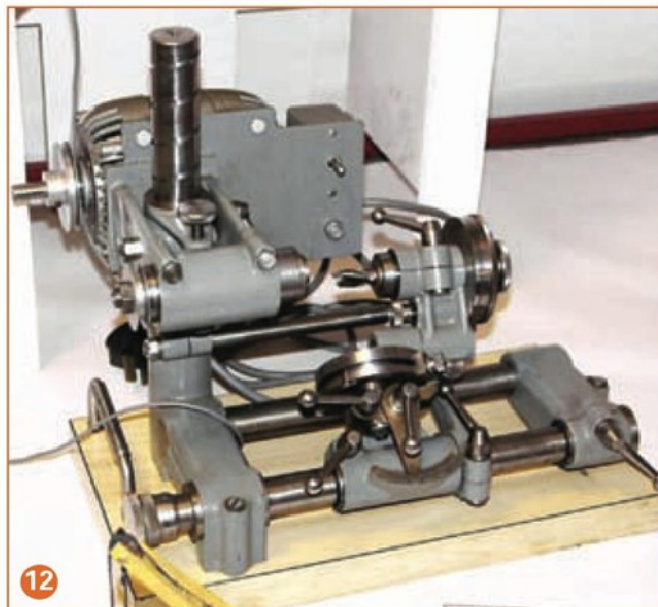
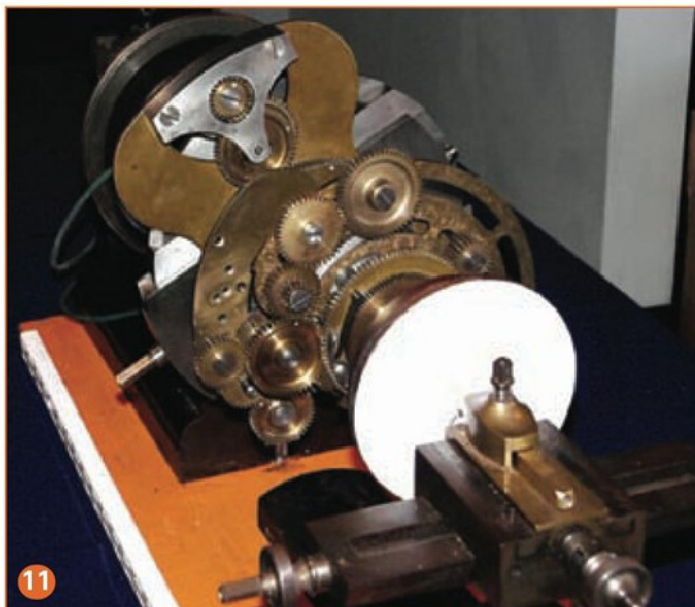
accompanying notes indicated that the hand system (**Photo 2**) was developed from one made earlier for a Cowells 90 lathe, and as exhibited was intended for a Lorch Junior horological lathe.

A hardened steel plate is fixed to the lathe bed. Individual toolholders also with hardened bases may be held in the fingers and slid anywhere on the plate. Various small tool mounting blocks with round shanks and screws for height adjustment are clamped on the bases. For heavier cuts, some of the bases are fitted with handles. Freehand turning of complex shapes is easy and a fence with micrometer adjustment facilitates the making of long parallel or taper cuts. Raising blocks were displayed for Lorch KD50, Schaublin 70 lathes.

The second part (**photo 3**) demonstrated the adaptation of the hand turning blocks for use in conventional turning. Adapters

7. *Derrick Crossland's "Improvements to 90 x 325mm lathe"*
8. *Alan Wragg's unusual Vertical Polishing/Honing Machine*
9. *Copying Attachment for Warco 300/2 lathe/mill*
10. *Cutting frames and chucks on the S.O.T. stand.*





this appeared to be a section cut from a machine bed. Only on close examination did it become clear that the "bed" was a composite construction. Tailstock improvements included a clamp lever and set over screw. Nearer the headstock, friction dials had been added for both cross and top slide, saddle movement could be controlled by a stop with micrometer adjustment, and a Dixon type toolpost had been fitted.

The judges awarded a "Highly Commended"

A5/7 Vertical Polishing/Honing Machine by Alan Wragg

While the relatively small motors fitted might be pushed to undertake honing in the industrial sense, this appeared to be just the sort of tool to finish cylinder bores for model i.c. engines. The second motor powered the up/down motion, and speed controls were fitted. The machine is shown in photo 8.

The judges concluded that the machine merited a "Highly Commended" award.

Loan Entry

Copying Attachment for a Warco 300/2 Lathe/Mill

This was an interesting piece of equipment shown by Alan Barrett. For those who may not be familiar with such equipment, hydraulic copying attachments were readily available for larger tool room lathes, and gave a cost effective method of turning repetitive parts. The growth in popularity of CNC machinery means these are nowadays less frequently encountered in commercial work. In operation, a follower is kept in contact with a master profile by a small hydraulic ram, and the turning tool follows the required path. Mr. Barrett's device, shown in photo 9 looks very much less complicated, with the follower being driven by an "Inverse" master template.

Club Stands

As one might expect, a wide variety of workshop related items was on display. Taking just a few, photo 10 shows a

selection of cutting frames and chucks displayed by the Society of Ornamental Turners, while photo 11 indicates just how complex some of their kit can be.

Tool and cutter grinders continue to be a popular build it yourself item and several were in evidence. Photo 12 shows a Quorn to the D H Chaddock design shown on the Guildford stand. This one was built by the late Ed. Pitkethley and loaned by Alan Jensen. Photo 13 is of a Worden viewed on the Reading Society stand.

As part of his run up to retirement as Editor of *Model Engineer*, Mike Chrisp had set up a personal display entitled the Mike Chrisp Collection comprising a variety of steam models and workshop items. Mike's versatile bending rolls are shown in photo 14.



11. Demonstration set up by S.O.T.
12. This well made Quorn was typical of several displayed by clubs.
13. A fine example of the Worden grinder displayed on the Reading stand.
14. Versatile bending rolls shown by Mike Chrisp.



LONG BOLT BOX

Faced with making a large number of long, small diameter bolts, Howard Harvey designed this effective solution

Back to the Beginning

Not being used to public writing I was at something of a loss as how to start. I have been told that the best place to begin is at the beginning. So I set to thinking where the beginning had actually been and found that not at all easy to decide. Perhaps it all originated when I was a toddler and I used to go with my mother to the Celynion South Colliery, to take my father's dinner to him, when he had to work on late. He was a wagon repairer and I found the wagon shop an intriguing place, with a monstrous 5 or 6 foot circular saw, pillar drilling machine and a hand held machine driven by a blast that put a 2in. hole through an oak headstock as if it were butter. Wagon springs, axle boxes and wheel sets all over the place. I probably would not be let within a mile of it with today's Health & Safety regulations, but I came to no harm there and quickly knew what would cut or injure you.

So now I am a few years older and have a bit of spare time, I thought it would be a good thing to build a railway wagon and soon came across the need of a fair number of long bolts. The prospect of supporting these to turn them in the lathe was a bit daunting and my mind started off in the direction of a capstan roller box. The outcome was the little fakey which is the subject of this article. In essence, one tool mounts in the tailstock, combining the support feature of a roller box, with the added facility to rapidly index the die into position for easy threading and a length stop for repeatability.

In these days of universal metrication the method of dimensioning the drawings may appear to be a bit antiquated, but it is the way I have worked all my life and still seems to possess certain advantages in manufacturing. Decimal dimensions need to be held to close limits to obtain the necessary fit, while fractional dimensions

are not so important and do not need as much care. As we used the system, running, push and drive fits were indicated by applying limits. However I do not think this would be appropriate for many model makers who come into the hobby without tool room or drawing office experience, and would be put off by such apparent difficulty. When making one offs we can achieve the necessary fits by taking extra care when approaching finished size.

I should also record my thanks to Phil Bridgeway for his conscientious effort in checking the drawings.

Manufacture

Start off by turning up detail 4 and 5 (OK but that is the way the numbers come out on the GA). Get an old drill shank for detail 5 if you can, but if not then you can have a lot of practice turning a No.2 Morse taper. Make sure that the $\frac{1}{16}$ in. diameter is parallel and is a good tight press fit in detail 4.

Progressing backwards, we come to detail 3, which requires the most attention. Rough turn the O.D. then face off to a good smooth finish and tap the 5/16in. B.S.F. thread for the pivot screw taking care to get it perfectly square with the face. Now mill out the four $\frac{1}{16}$ in. x $\frac{1}{16}$ in. deep locating slots. Make and fit the pivot screw detail 6 taking care that the 0.437in. diameter is a good fit in detail 4 and the length of the shoulder is such that when it is screwed firmly home in detail 3 it allows it to rotate with the minimum of end float. Finish turn OD.

Now make the detail 2 getting it a snug fit on detail 3, drill four holes on 2.125in. P.C.D. tapping size for 4 B.A. Assemble detail 2, 3 with 4 holes in line with locating slots in detail 3. Engage one of the locating slots with latch detail 13. Assemble to lathe tailstock and clamp in with $\frac{1}{16}$ in. B.S.F. drawbar if you have a through bored

tailstock barrel. If not make sure that the Morse taper is really securely engaged. Centre and pilot drill for four holes on 1.5in. P.C.D. using latch in locating slots in detail 3 to position holes exactly on centre.

Clamp detail 2 and 3 together and spot holes through into detail 3 $\frac{1}{16}$ in. deep. Remove detail 2 and open up holes in detail 2 to $\frac{1}{16}$ in. diameter. Tap four

holes in detail 3 to 4 B.A. Now reassemble details 2, 3 and 4 and secure detail 2 with 4 off 4 B.A. capscrews.

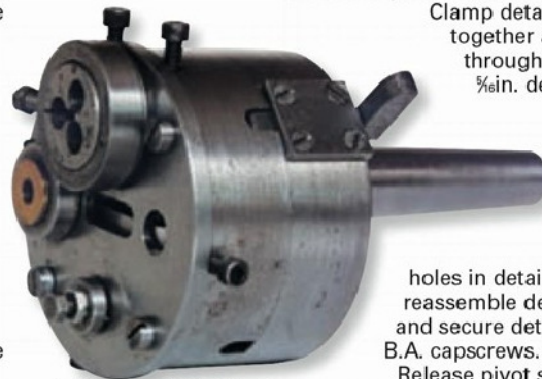
Release pivot screw detail 6 and remove details 2 and 3. Pick up accurately on pilot holes, drill and ream $\frac{1}{16}$ in. diameter $\frac{1}{16}$ in. diameter and $\frac{1}{16}$ in. diameter holes on 1.5in. P.C.D. in details 2 and 3. Dismantle detail 2 and drill and ream $\frac{1}{16}$ in. diameter hole on 1.5in. P.C.D. It is important to ensure that these last holes are lined up accurately on pilot holes and that they are in their correct sequence. Failure to do so means a scrapper.

The 120° x $\frac{1}{16}$ in. swarf clearance cut out can now be made and the $\frac{1}{16}$ in. x $\frac{1}{16}$ in. deep tool bit slot milled out to $\frac{1}{16}$ in. dimension. It will be best to check the size of the tool bit material and if necessary alter the 0.250in. dimension to bring top edge onto centre line.

Make guide bush detail 9 a tight press fit in detail 2 with $\frac{1}{16}$ in. dimension a bit short so that it does not protrude outside the backface of detail 2, which would prevent the latter seating square and firm on detail 3. Get stop detail 7 a good press fit in detail 2 but ease the projecting part to a nice slide fit in detail 3. One off steady bush detail 8 will be required for each size of bolt to be made. They can be clamped into detail 9 with a 6 B.A. grub screw. If you can make some bushes with square holes then square headed screws can be produced. A fair number of these are needed for a wagon.

Operation

To use the tool secure it at a convenient angle in the tailstock and set the tailstock barrel on the 1in. graduation. This is to make sure you do not eject the tool when



1. The completed tool.



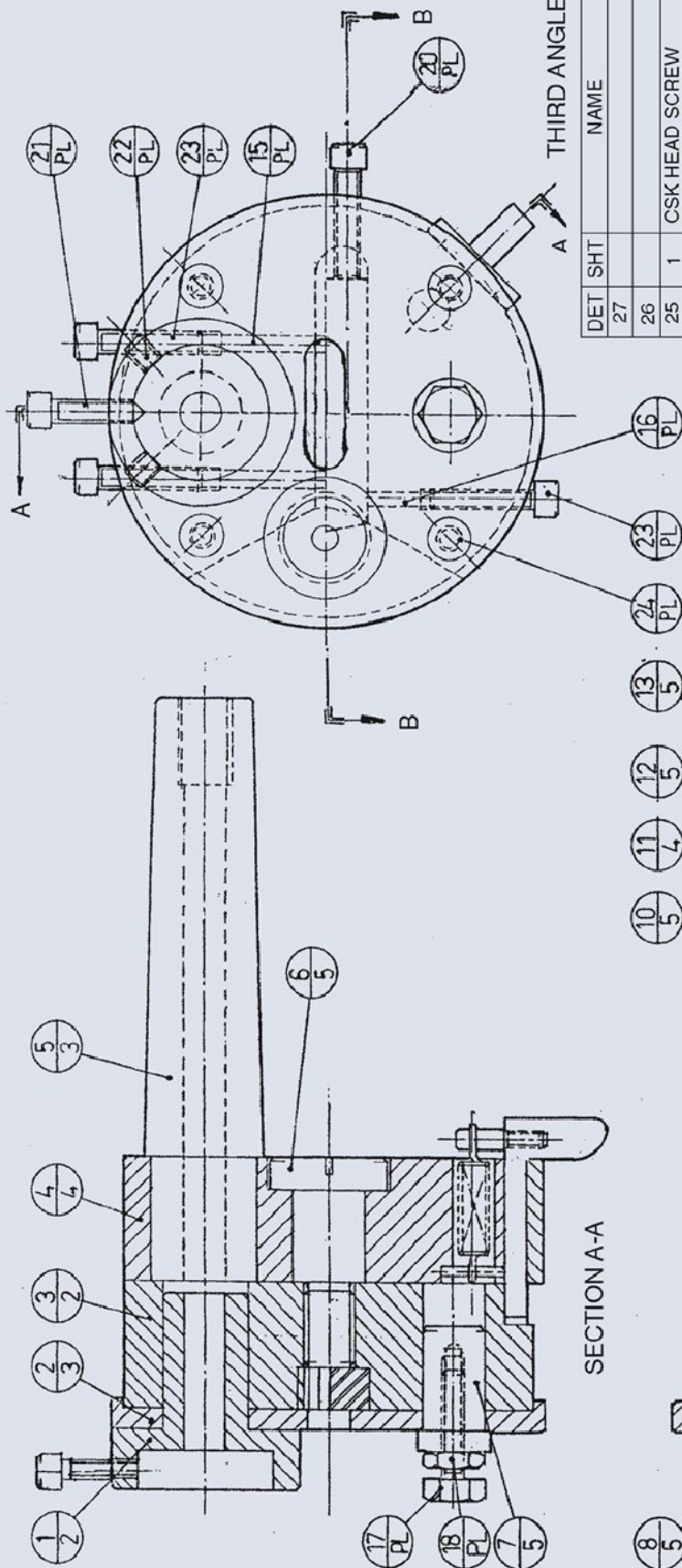
2. Body, shank, and indexing trigger.



3. Guide bush plate removed, showing cutter bit.

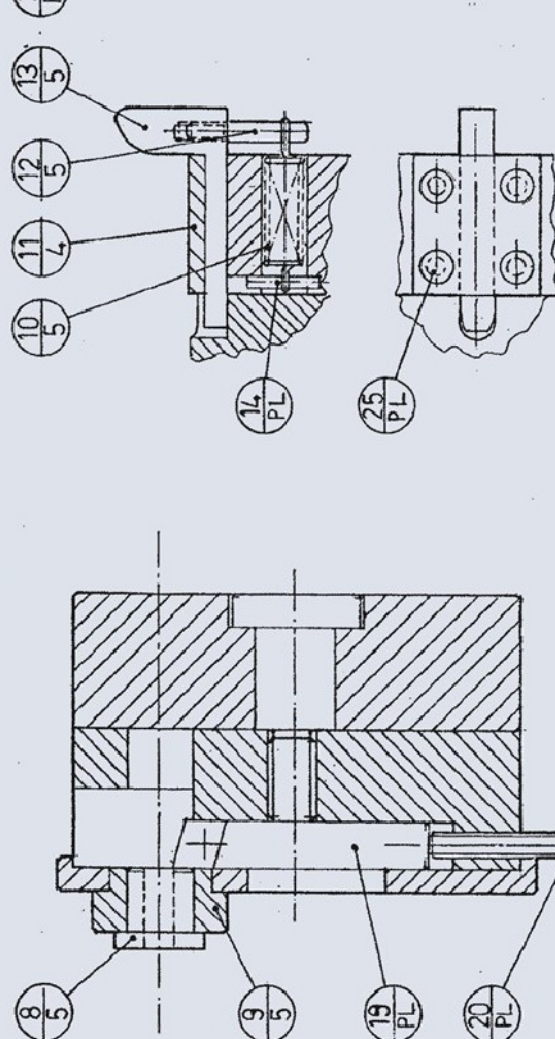


4. Cutter holder, also showing indexing slots.

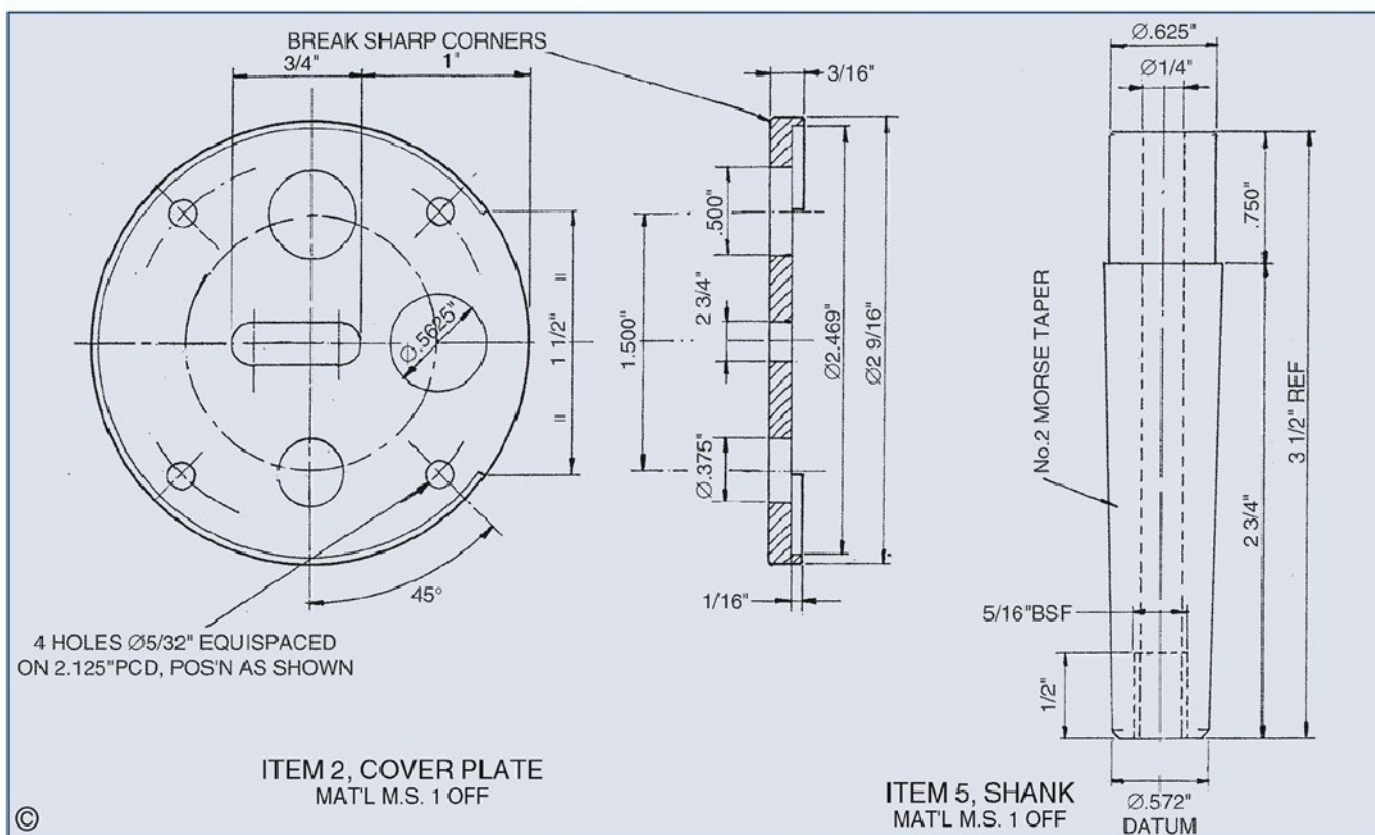
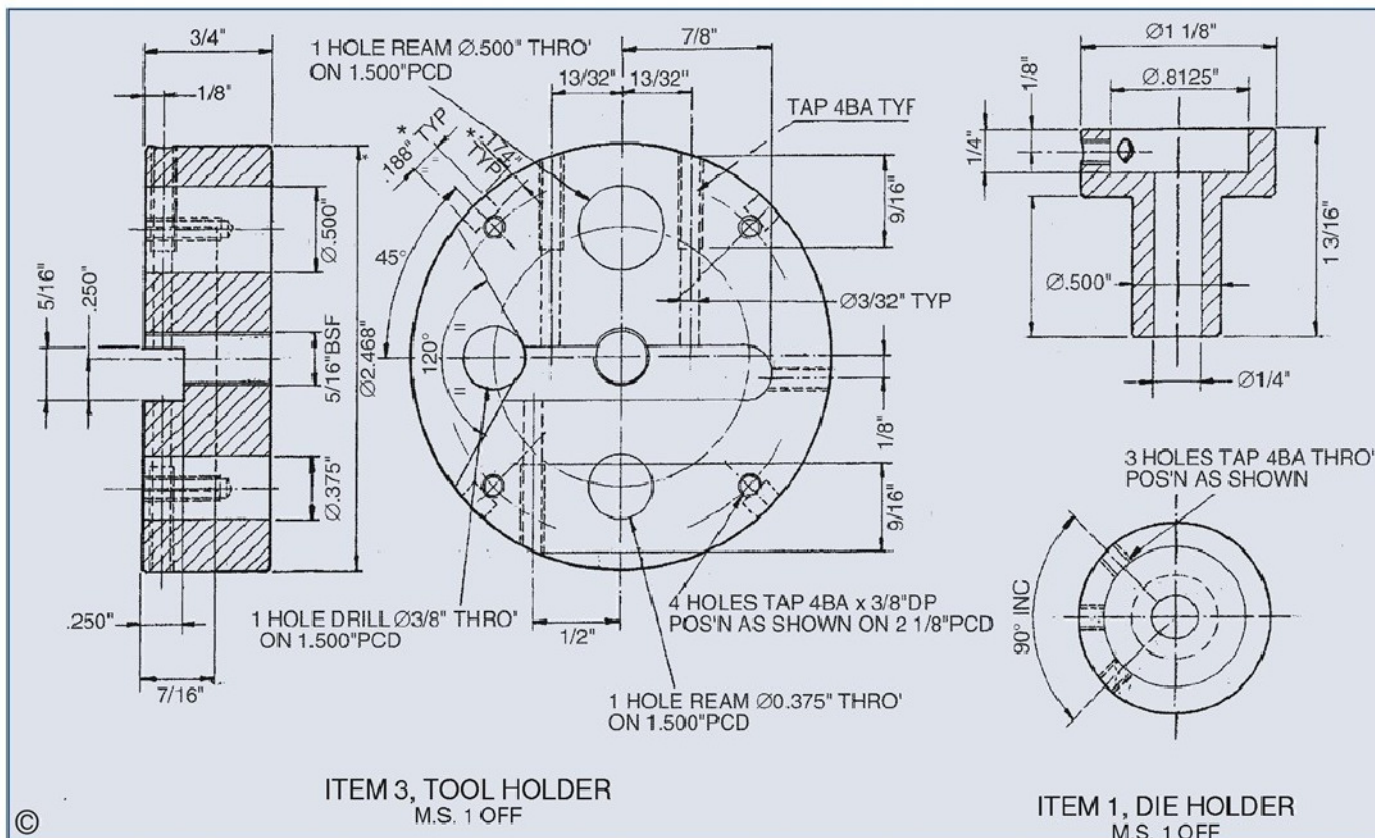


THIRD ANGLE PROJECTION

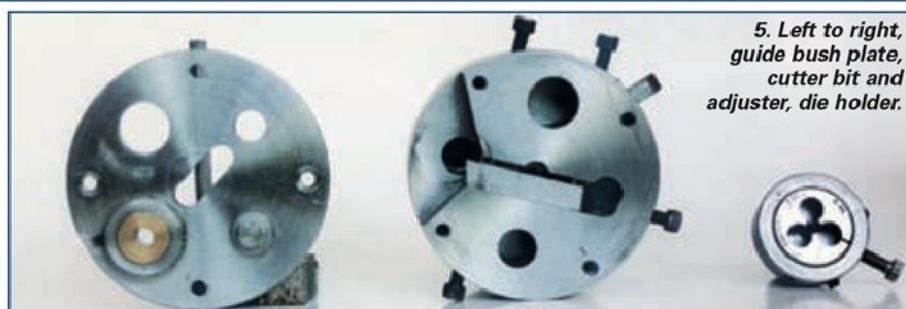
DET	SHT	NAME	MAT	SIZE	No.
27					
26					
25	1	OSK HEAD SCREW	STL	6BA x 1/4"	4
24	1	CAPSCREW	STL	4BA x 1/4"	4
23	1	CAPSCREW	STL	4BA x 7/16"	3
22	1	GRUBSCREW	STL	4BA x 3/16"	2
21	1	CAPSCREW	STL	4BA x 1/4"	1
20	1	SOCKET CAPSCREW	STL	4BA x 1/2" LG	1
19	1	TOOL BIT	TSTL	1/4" SQ	SUIT
18	1	LOCKNUT	MS	4BA	1
17	1	HEX HEAD SCREW	MS	4BA x 1/2"	1
16	1	CLAMP PIN	MS	DIA 5/64" x 7/32"	1
15	1	CLAMP PIN	MS	DIA 5/64" x 1/2"	1
14	1	ANCHOR PIN	MS	DIA 3/64" x 3/8"	1
13	5	LATCH	SSTL	3/16" x 3/4" x 1 3/8"	1
12	5	SPRING POST	MS	DIA 1/8" x 5/8"	1
11	4	CAP PLATE	MS	3/32" x 1" x 3/4"	1
10	5	SPRING	SPST	SEE DETAIL	1
9	5	GUIDE BUSH	MS	DIA 7/8" x 1/2"	1
8	5	STEADY BUSH	BR	DIA 3/4" x 1/2"	SUIT
7	5	STOP	MS	DIA 1/2" x 1"	1
6	5	PIVOT SCREW	MS	DIA 7/8" x 1 7/16"	1
5	3	SHANK	MS	DIA 3/4" x 3 3/4"	1
4	4	BODY	MS	DIA 2 1/2" x 7/8"	1
3	2	TOOL HOLDER	MS	DIA 2 1/2" x 7/8"	1
2	3	COVER PLATE	MS	DIA 2 5/8" x 5/16"	1
1	2	DIE HOLDER	MS	DIA 1 1/4" x 1 3/8"	1



AUXILIARY VIEW OF LATCH



retracting the barrel and also to give a clear starting point for measuring the length to be turned. Now set stop detail 17 so that when the tool holder detail 3 is rotated, the end of the bar material will clear the dieholder. Extend sufficient material from the chuck to produce a bolt. Bring the tailstock up to engage stop with end of material, clamp tailstock to bed. So away you go making long bolts by the dozen. Hope this provides interest to you all.





COMP-U-GUIDE 2

This set up using a Wolcraft assembly illustrates the large easy to read digits on the display



Richard Bartlett gives details on how to use the budget "intelligent programmable DRO system"

Once you have TABbed (using the TAB key) to the UNIT required, the SPACE bar can then change the units in the sequence: mm, inch, degrees, blank, rpm.

As an example: to change the Y-axis units from mm to degrees.

From the main display click on OPTIONS then TAB 13 times, then press SPACE twice then left click on SAVE SETTINGS. This configuration is saved and will be re-loaded each time until you change it.

In the descriptions which follow, the type of transducer used will be down to the user's preference. However, using linear scales for linear movements and rodents for rotary movements is probably the best choice of input device. Where 'rodents' are used it is assumed that the SCALE parameter has been set in the OPTIONS menu with regard to number of slots in the encoder wheel and any gearing involved. Also the channel must be enabled as a MOUSE device rather than a SCALE.

When powered up the system will display random numbers. Move the machine slides to your choice of datum and press the CONTROL key together with an axis identifier chosen from X, Y, Z or R. For example, Ctrl (extreme bottom left of keyboard) and X will zero the X-axis display, pressing Ctrl and Y will zero the Y-axis etc. Clicking the mouse on the axis identifier button also clears the axis.

Mode 1 DRO

MODE 1 is a relatively straightforward application of the system as a digital read out. When using MODE 1 it is likely that the user will choose a WORK datum rather than a MACHINE datum. For example, a bar is chucked in the lathe and a sliding cut is taken to true the diameter and the Y-axis is zeroed. A surfacing cut is taken to clean the bar-end and the X-axis is zeroed. This assumes that the work was drawn as it would be viewed in the machine with its axial centre line along the X-axis of the plotted sheet. I am aware that this is not the conventional assignment of CNC axes, but is entirely appropriate for users working from their own CAD drawings via plot files. (Note that for lathe work in industry, the normal CNC convention would use X and Z axes for saddle and cross slide movements respectively.)

The DRO system is now referenced to a WORK datum which might be represented on the component drawing as the extreme bottom right of the work piece.

Any movements of the saddle or cross-slide will now be shown on the DRO. The displays will show actual slide movements and hence will be independent of any backlash in the lead screws. Fine cuts can

This article describes the operation of the Comp-U-Guide system, exploring some of the opportunities afforded by the "Intelligence" which results from utilizing the computational power of a PC. To be strictly fair, many up market DRO systems will give some of these facilities, but generally at a typically "Professional" price range, whereas that under discussion, can be put together with a flexible mix of sensors for amateur type expense.

The previous article, covered building the system, and gave an overview of its capabilities. This continuation looks in more detail at some of the possible applications. It assumes you have successfully constructed the kit, and have fitted and connected the necessary sensors (scales or modified mouse devices) for the axes you wish to work with.

Load the Comp-U-Guide program and select OPTIONS by left clicking the mouse on the legend or TABbing through until the

OPTIONS box is activated and pressing SPACE or ENTER. If the OPTIONS box display is too wide for your screen and the UNITS column is obscured then change your screen size to 1024*768 pixels or higher resolution.

If you do need to change the resolution and are not sure how, then the procedure is as follows: work through from the Win START > SETTINGS > CONTROL PANEL > DISPLAY > SETTINGS. Click on the horizontal slider and move right until the resolution shows 1024*768 then click on APPLY, then follow prompts as the system updates.

If your monitor / graphics adaptor cannot manage this resolution then you can TAB 'blind' through the menu noting that the X-port button is active as you enter the options menu. Pressing TAB will activate the options in an X, Y, Z, R sequence through: PORT settings, AXIS settings, SCALE FACTORS, UNITS, MOUSE / SCALE input selection, DIAMETRAL ON/OFF option, REVERSE ON/OFF option.

be put on the cross-slide by working to the Y-axis display and fine adjustments to length can be made by working to the X-axis display.

Having core-drilled for a bored hole and set the boring bar to the X-datum it is very convenient to observe the display of current tool depth as the boring progresses.

That's about it for MODE 1, it is simple to use and as accurate as the scales.

As you only need regular access to the axis ZERO functions, a mouse type pointer can be dangled from the tailstock or anywhere out of the way and then used to point to the large (over 30mm square) axis identifier on screen from where a quick click will give a zero of that channel of the display. There are a wide range of pointers such as roller nibbed penlike devices and Trackballs all of which mimic a standard mouse. As they are cheap enough to be considered expendable, a remote pointer, keypad or keyboard could be fixed to the machine thus completely protecting the workshop PC in this mode.

Mode 2 preset

MODE 2 introduces the first stage of "added intelligence", offering the facility to preset any of the channels of display thus allowing the setting of targets. Continuing the lathe example, The Y-axis is set to DIAMETRAL units in the OPTIONS menu. The reference sliding cut is made to establish the Y-axis datum and the diameter is measured. This size is entered directly into the Y-axis display box. From here in, the diameter actually turned will be that shown on the screen Y-axis display. An interesting practicality here is that (as with any DRO system) tool slide movement is indicated on the DRO but spindle or work deflection is not, so the usual practice of making measuring cut depth similar to finishing cut depth must be maintained.

A variation on the Mode 1 boring depth measurement described above, would be to use Mode 2 presetting of the X-axis to required depth rather than a zero. Numerically of course the techniques are the same, but on a 'simplicity equates to less scrap' basis the repeated cuts down to a length displayed as zero are almost foolproof, whereas the user had to remember the actual depth dimension on each cut when working in Mode 1.

Each axis may be individually preset by:

Moving the mouse cursor to the Edit window. Zero the axis, then type in the target value such as, x-50. Click on Start and the Start/Step/Stop menu will go red and the X-axis display will change to 50. Note that multiple clicks on Start will each add 50 to the X-axis display.

Zero the Y-axis then click the Edit window cursor down to the next line and type y34. clicking on Step will change the Y-axis display to -34. Clicking Step again will cancel the Stepping mode and the red area will go back to normal.

All axes can be pre-set by first zeroing the axes using Cntrl + Z (XYR) or by left clicking the axis buttons. Then click the mouse cursor into the top of the Edit window and clear the window by Right clicking to bring up the mouse sub-menu then left click on Select All to highlight all text in the window. Now press DEL to clear or select the Delete option from the Right click menu.

Now type in your new targets:

x-50

y-100

Click on Start then on Step until all values are displayed. Further Stepping will terminate the Step procedure.

If there is no mouse on your system, press the TAB key several times. As the TAB is pressed it will activate the screen buttons, keep pressing until the X-axis button is active (the grey button surround shows in 3-D).

Subsequent keying of TAB will make the other buttons active in the order of Y-axis, Z-axis, R-axis, EDIT window cursor, R-axis, Z-axis, Y-axis, X-axis, Options, Load file, Save file, Exit, Start, Stop, Step. When an axis button is active pressing Enter will zero that axis.

Since Mode 2 requires numeric inputs we must type on the PC's default keypad. This will not suit all laptop users but most of the keyboard commands can also be made from a small external numeric keypad as sold for laptops. The exceptions are the four 'Zero an axis' keys making a mouse pointer essential when using these small numeric pads.

Macro routines

Operations which are required on a regular basis can be made the subject of dedicated routines - "Macros". These macros can be incorporated into any job as required by calling up the routine and adding a list of specific parameters. An obvious choice is the need to drill holes on a pitch circle diameter. This will usually entail three operations, the first to set the spindle to the pitch circle radius and then to rotate the work around the centre to the start position, then to make the required number of angular moves. Fixtures such as dividing heads and rotary tables allow these divisions to be made fairly easily providing the work can be clamped with the centre of the PCD on the centre of rotation of the fixture. An alternative approach is that discussed by Harold Hall in MEW Issue 100, whereby the X, Y coordinates for the various positions would be calculated, and this is essentially the method used here.

When we call the 'B' (bolt pattern) macro, CompUguide calculates the radius and all angular movements required then resolves these into rectilinear co-ordinates relieving us of the need for rotating fixtures. This often makes work holding easier by allowing the work to be clamped down solid to the table.

For example, let's say we require to drill 17 holes equi-spaced on a 183mm PCD, the first hole is at 10degrees. Note, 0 degrees is taken as 12 o'clock or North relative to the centre. Also note that the 'B' command adds a final move to finish back at the centre of the pitch circle, which was the starting position.

The syntax is: B p183, h17, a10; signifying a BOLT pattern on 183pcd of 17holes starting at 10degrees.

The work piece is bolted down on packing to the table of the mill. We decide on the datum from which to find the centre of the B pattern, this could be the outer rim or a bored hole in a round workpiece sharing a centre with the bolt pattern or an XY position from X0Y0. We will assume

the B pattern is to be concentric with an existing bore.

Using the 'C' macro first, will allow setting the machine spindle on the centre of the B pattern. The syntax is: C;

To execute a C macro the user must have fitted a dowel into the chuck and moved the spindle into the bore at approx 12 o'clock then lowered the spindle to allow a 'feel' onto the bore using a feeler gauge. CompUguide puts prompts onto the screen at each stage of the operation.

So, the work is bolted down and the dowel fitted in the chuck and positioned within the bore and lowered below the surface.

Press TAB until the EDIT window cursor is active. (a black vertical line will be flashing), back space away any characters in the window and then type C;(upper case) and then Enter. On the next line type B p183, h17, a10; then Enter

To execute your macro list press Ctrl and T to START or click on the START button. This will put a prompt on the screen to move your probe (dowel) to a 'feel' on the bore at 12 o'clock (the prompt says "Move anywhere on the bore" but for best accuracy use points at approx 120 degrees for your probe points) When ready press Enter or click on OK.

You will be prompted again to move, so move to approx 4 o'clock and obtain a 'feel' on the bore. Press Enter when ready and repeat for the final probe, on pressing Enter this time the TARGET co-ordinates will displayed on the DRO and the user can then drive the targets to zero by moving the X and Y machine slides.

Now execute the next step in your command list by pressing Ctrl and S or clicking on the STEP button. The B macro will now execute by calculating the XY coordinates equivalent to the angular moves required and prompting the user with TARGET positions in X and Y on the display. Drive these targets down to zero, drill the hole and when ready press Ctrl and S for the next step in the list. The sequence can be terminated at any time by pressing Ctrl and T for STOP or clicking on the STOP button.

The requirement to obtain a 'feel' on the bore using a feeler gauge can also be met by insulating the dowel in the chuck and using an electrical circuit to give a buzz or light an I.e.d.

The 'Mx' macro finds the MID point between locations in any axis. As with the C command it needs a dowel in the chuck and the user is prompted to move to the first location, typically the vice jaw and obtain a 'feel' then press Enter. The user is then prompted to move to the opposite location, in this case the other vice jaw and set to the feeler. The target is then displayed allowing the user to drive down to zero for the mid point. Syntax is Mx, My or Mz.

That's about it for the universal 4-axis Linear / Rotary positional digital readout system. A further article to be published in the future will look at how data may be extracted from CAD drawing files and used with the Compuguide system in Mode 3 to give "Virtual jigs". Working in this way can give some of the advantages of CNC machining, but for those who like to be in total control of what the machine is doing, those all-important machine handles remain in the hands of the operator not the computer.

I wish you much fun.



TRADE COUNTER

Please note that, unless otherwise stated, Trade Counter items have not necessarily been tested. We give news of products and services which have been brought to our attention and which we consider may be of interest to our readers.

Model Engineer Exhibition – Sandown Park

The recent exhibition afforded an opportunity to meet up with a number of trade suppliers, and to have a chat about recent developments which form the basis of the notes below.

Home and Workshop Machinery

The display of well prepared pre-owned machinery, accessories and tooling again lived up to expectations, with excellent examples of Myford and Boxford lathes along with rather larger equipment. One interesting item spied (following the correspondence in recent issues) was the Taylor chuck fitted to one Boxford CUD Mk.111 lathe. **Home and Workshop Machinery** are located at: 144 Maidstone Road, Fooks Cray, Sidcup, Kent. DA14 5HS tel 020 8300 9070 or see their website www.homeandworkshop.co.uk

Taylor chuck seen fitted to lathe on Home and Workshop Machinery stand



Tilgear

Unfortunately, the winter offers promotion leaflet arrived too late for inclusion in the last issue, but if you move quickly, (before the end of March) then bargains are there for the taking. A few specific items that caught my eye were: 6inch digital caliper for £19.50, a hand sheet metal punch set for £17.50, two packs (of ten) Eclipse bimetal 24tpi hacksaw blades with an Eclipse 20T hacksaw, all for £29.00. Prices exclude VAT, but carriage is free on orders over £50.00. **Tilgear can be contacted by phone on 01707 873 434 or by post to Tilgear, Freepost NW5014, Potters Bar, Cuffley Herts EN6 4BR**

Folkestone Engineering Supplies

John Bridges has augmented his range of materials with a range of small fasteners aimed at the model engineer. Made in Switzerland these are high quality items conforming to BS 57, in sizes going down to 16BA. On the materials front, during 2004, John installed an Edwards Trucut guillotine and is now able to offer a cut to size service on sheet metals. A further recent development was the addition of a muffle furnace allowing the introduction of a heat treatment service for customers. Folkestone can be contacted on 01303 894 611 or at 62 Canterbury Road, Hawkinge, Kent, CT18 7BP. Their website is www.metal2models@btinternet.co.uk

Smaller Pips from Greenwood Tools

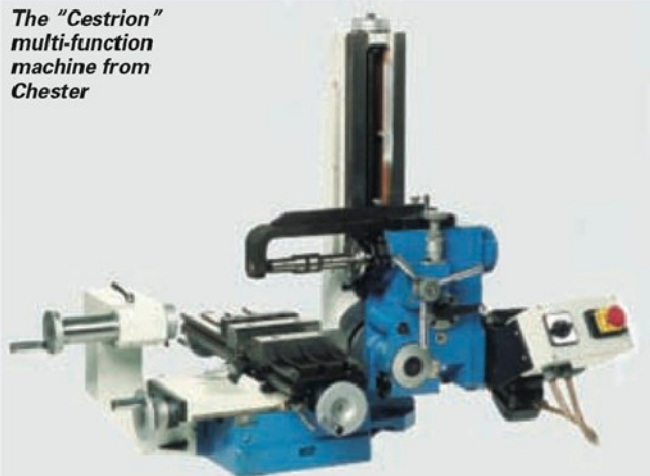
Following requests from customers, Greenwood Tools have announced the arrival of a 5 deg. angled cutting insert to suit their KIT-Q-CUT parting tool. This insert helps to reduce the size of 'pip' left on the workpiece being parted off. The price is the same as for the standard, neutral insert, and Greenwood Tools have both types in stock. **For further details, telephone 01527 877576 or visit the Greenwood Tools website, www.greenwood-tools.co.uk**

Chester UK

The most notable new machine on display was the Cestrion multi-function machine which aims to give great versatility within a small footprint. Machines similar in concept, have been produced in the past, notably by at least one Swiss manufacturer, but have been outwith most amateur budgets. The Cestrion can be configured as a lathe or a mill, and in the latter guise, as horizontal, vertical, or angled. Power comes from a 0.55Kw variable speed motor and is fed through a geared head to the roller bearing mounted MT2 spindle. For milling purposes it comes supplied with a designed in table clamp system allowing good use of the table size without losing a great deal of height. As a lathe, capacity is 150mm dia. x 260mm bc. and as a mill, table travel is 350mm x 160mm

with spindle/head travel of 330mm. The machine with its set of standard accessories is priced at £1995-00 including VAT and UK delivery. Chester can be contacted by phone on 01244 531 631 or at Chester UK Ltd. Clwd Close, Hawarden Ind. Park, Hawarden, Chester, CH5 3PZ. Information is also available on their website: www.chesteruk.net

The "Cestrion" multi-function machine from Chester



Magnifiers from Norville Group

For anyone working in small scale, or to tight tolerances, increasing age frequently brings with it some imperfections of eyesight, and hence the need for some form of optical aid, or magnifier. Norville is not a name that will be familiar to many readers. They are however a business which specializes in the supply of a wide range of quality magnifiers available either via your local optician or by mail order direct from Norville.

Magnification factors extend to a maximum of 20 times, and the range of types includes: hand held, neck mounted, head mounted, desk mounted, battery operated illuminated, even lightweight opera glasses, and a sheet magnifier. The catalogue section entitled "Occupational magnifiers" lists not only the expected watchmakers eyeglasses, but also a linen tester, and tweezers with integral magnifier.

For more details call Norville free on 0800 328 1864

Warco



The WMT300/2 is just one of the machines available from Warco with variable speed drive.

Historically, quality machines (notable lathes and mills) would be driven through multi speed gearboxes giving perhaps eight or more spindle speeds. The developments which have taken place, over the last few years in variable speed electronic drives, now mean that users can enjoy the benefits of continuously variable speed at significantly lower cost.

Warco is taking a two pronged approach to variable speed. Firstly, a selection of four lathes is offered ranging in size from the WM180 to the WM280.

The smallest gives 3.5in. centre height and can be supplied with stand for under £600-00 while the

largest gives 5.5in centre height for under £1600-00. All models in the range are factory fitted with a variable speed DC motor driving through a two speed system which gives control ranges of 0-1250 and 0-2500rpm. Standard equipment includes 3 and 4 jaw chucks, fixed and traveling steadies, coolant tray and splashguard.

The second avenue is an application of the systems developed by George Newton of Newton Tesla. A number of Warco machines can now be supplied fitted with Newton Tesla inverter drives specifically designed for the particular application.

Warco may be contacted by phone 01428 682 929 or at Fisher lane, Chiddingfold, Surrey, GU8 4TD

Chronos



Chuck and backplate designed for direct fit to Vertex rotary table.

As ever, Mark Smith had quite a number of new tooling items on display. The Vertex and Shobha rotary tables have proved to be very popular with customers, and so it is logical to introduce a dedicated chuck and backplate assembly (ref. VO) designed specifically to fit the four slot versions. The chuck is an 80mm four jaw independent and is mounted on a fitted adapter plate. This in turn has mounting lugs, and a set of Tee nuts to match the rotary table. The introductory price is £49.95 including VAT and carriage.



Set of indexable counterbore cutters.

The principal advantage claimed for carbide tooling is that of much higher machining speed. Indexable tooling conveys the further benefits of avoiding regrinding, and easy replacement of tips. Until recently, however, the high cost of indexable holders tended to keep them out of the amateur domain. The set of four indexable counterbores (ref. SCT133S) priced at £49.95 shows how costs have come down. One standard insert fits all sizes which cover cap sizes $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{8}$.

For gear cutting, two related items may be of interest. Many industrial cutters conform to the one inch bore standard, which may be a bit on the heavy side for small work. Cutters are now available for 0.5 module 20 deg. pressure angle, with 16mm bore, supplied either individually from No1 to No 6 priced at £10.50 each or as a set of six for £58.00. To

mount these cutters accurately, Chronos have introduced Morse taper arbors, (either 2MT or 3MT, tapped $\frac{1}{8}$ BSW) precision ground, and supplied with four spacing collars. Price for either arbor is £48.00 or a set of cutters and arbor is available for £98.70.

For more delicate work, a new parting tool is now available. The holder is half inch square and six in. long and houses a specially made mini blade which measures just 63mm long by 5mm wide, and 1.5mm thick. Price of this is £8.95. All Chronos prices include VAT and carriage, and they can be contacted by phone on 01582 471 900 or at Unit 14, Dukeminster Estate, Church Street, Dunstable, LU5 4HU



Milling arbor for 20mm cutters.



Thin blade parting tool.

POWERED TOP SLIDE



1. Completed unit fitted to lathe.

The Raison d'être

This all came about because I had undertaken the building of a "Wyvern" gas engine to the Edgar T Westbury design published earlier in the M.E. in 1963. This engine features a connecting rod, which tapers over some 3 inches in length. My initial thought was to use an offset turning tool which I built many years ago. This plugs into the number 3 Morse taper of the tailstock and allows the centre to be offset in relation to the fixed tailstock centre.

This set up was initially tried but failed due to the various clearances that are required and which were impossible to arrange, it was therefore necessary to offset the top slide and it was in this way that the connecting rod was machined.

Now three inches is a long way to wind a slide by hand, and it is difficult to get an even finish over the whole length by this method. So a solution was sought which would allow the addition of a powered system, built to be removable so as to avoid getting in the way of regular turning operations.

Please note that for this project, there are no drawings. It was thought that the photos alone should convey the concept and construction, and given that there are many sizes and styles of lathe, the individual will be able to make appropriate modifications to suit his own machine.



2. Boring the pulley using a Rotabroach.

Take the drudgery out of turning that topslide handle with Peter Rawlinson's accessory.

What's in the bits box?

I had at that time a stepper motor and control board, obtained earlier from "Model Motors Direct" and although it had been intended for another project it seemed to be ideal for this power unit. The motor is about the same size as a type 23 stepper but has the added advantage of having an integral inline gearbox with an output spindle of $\frac{1}{8}$ in. diameter.

The next problem was transmitting the drive between gearbox and the top slide handle. The solution proved to be remarkably simple, being a toothed belt drive which used a couple of timing pulleys left over from my C.N.C. Mill project, namely a 12 tooth and a 48 tooth thus giving a 4:1 reduction.

Putting it together

Not only were all the parts to hand, but by good fortune, the 48 tooth sprocket fitted into the hand wheel perfectly. The only item not to hand was a timing belt. I have in my junk box a piece of timing belt that is some 1000mm long and it was this that was used to determine the correct length of belt to be used. (Calculating the correct belt length is one of those things I find a bit tricky, not having the manufacturers tables to refer to.) A suitable size turned out to be 260mm. Some belt suppliers only keep a small range of sizes, but if you go to one of the specialist suppliers, then belts can be obtained in increments of 5mm. This 260mm. belt gave me the required shaft centres, but it is sensible to allow some adjustment by way of slots. The belts that I use are of the Synchroflex type and these have an internal skeleton of steel wires, which will not let it stretch. I understand that in the limit, the teeth will shear before the belt will break.



3. Pulley fitted to handle.

To start with, the topslide hand wheel was removed and the 48 tooth pulley was bored using a Rotabroach cutter, (photo 2) which gives a very accurate bore and an excellent surface finish (see article MEW 37). Some might say I am addicted to their use and if you happen to have these available to you, then I highly recommend their use. The handle was then turned down for a press fit, and the pulley fitted using a little Loctite, just to be sure. The relative sizes worked out very well, as the parts of the original handle that were left, acted as the pulley flanges, as can be seen in photo 3. It was therefore not necessary to include these on the 12 tooth pulley, which in turn, allowed for a simpler mounting arrangement.

Attachment

A quick and simple way was required to fix the power unit to the topslide. It was also necessary to allow for the easy fitting of the belt. After a bit of head scratching, the system depicted in the photographs was finally used. This consists of a sole plate with a vertical front plate to hold the motor/gear box, with two cheek plates positioned on either side to locate it on the topslide. Please note that the motor mounting holes are slotted and also are rebated to provide clearance for the shield.

It was fortunate that the topslide on my machine has a ground finish on its top and side faces, thus providing flat and square location surfaces. The width of the sole plate was machined so that the two cheek plates when fitted to it, were a good sliding fit over the topslide. A pair of $\frac{1}{8}$ in. wide slots was then machined in the cheek plates and these were used as a jig for spot drilling the top slide for a pair of clamp screw holes in the main casting. These holes were then tapped M6, and fitted with grub screws, washers and wing nuts. The items on the inner side must be



4. Slides for guard on end of unit.



5. Removable pulley guard.

removed from time to time to allow the topslide to be used close to the tailstock

After using them as a jig, the slots are then opened out with a slight taper to give easy fitting while the belt is eased on.

To bring out the wiring, I fitted a 10 way chassis plug in the cheek plate, but the cable could equally easily be bought out through a gland. A couple of advantages of the system adopted are first that it does let the control be utilised for more than one motor, and second that you do not have a length of cable getting in the way when fitting the unit.

The top case was then added to save any swarf from entering the motor and wiring area. Make this from any material to hand, I happened to have some 16.swg aluminum. Build to suit, but do consider whether some form of ventilation may be needed, mine has pressed in louvres. The louvre tool was made some time previously and has now been used on six



6. Easing the unit and belt into place.

separate projects. The motor is only rated at 10 watts so it is probably debatable whether even minimal ventilation is actually required.

It was also decided at this stage that some form of guard over the belt was required to ensure that no swarf would be thrown into it. This also acts as a finger guard, which could be further enhanced by a front plate (as would be the case in an industrial application).

This removable shield is made from brass sheet and soft soldered together. It slides into position in two grooves machined into pillars mounted on the front face of the power unit and only requires gravity to hold it in place. It does require to be removable in case the belt requires attention. Photos 4, 5, 6 & 7 illustrate the relevant features.

Control electrics

In my case this was straightforward; the motor that I used came complete with an electronic controller, which only requires a 12 volt DC supply and the following odd components;

- 1 Variable Resistor, (Speed) 5K ohms
- 2 on/off switches, (one for forward/reverse)
- 1 Fuse holder. 5 amp.

With the above it can be run from a car battery charger or a 12 volt battery or built like mine with a purpose built power supply (photo 8). (The one used was originally built for the C.N.C. mill and never used.) Speed variation is achieved via the variable resistor, and is of the order of 20rpm to 200rpm thus giving about



7. Detail of multi-way socket.

5rpm as a minimum at the topslide handle. So far this has proved to be slow enough. If a slower feed rate is required then the ratio of the two timing pulleys will need to be increased.

As an alternative to the stepper motor, a standard DC type motor could equally well be used. Again it would require a suitable gearbox. The control might then take the form of that marketed in kit form by Maplins, or something similar. I have not used their device myself, but, according to their catalogue, it is capable of 5 amps power and would be more than ample for the small motor required. Again, it will still require a 12volt power supply as above. This kit is part number VF59P in the Maplin catalogue; they also have various power supply kits.

To summarise, the device works well, and hope the photographs cover all the main points. As usual I can be contacted by telephone if I can be of help.

Peter Rawlinson, Charing, Kent.
01233 712 158.



8. Power Supply and driver board.

Suppliers

Model Motors Direct

01749 860111
9-10 am is best

Maplins

0870 264 6000

Olympic Chevron (Wyko)

See Yellow Pages for nearest branch

Farnell

0113 263 6311

LINK UP

Would readers wishing to make use of this facility please note that the maximum total value of items accepted for a 'For Sale' entry is £50.

To advertise goods of a greater value, please contact our Classified Advertisement Department. Please indicate clearly if an item is intended for Link Up.

FOR SALE

- For Sale: Ball screw shaft 1425mm x 25mm with matching recirculating ball bearing. As new £50.00 please phone 01723 362 537 (Scarborough)
- For Sale: Pollard Floor Standing Pillar Drill fitted with Brook 2.3 amp single phase motor and a 10mm Albrecht keyless chuck. Spindle speeds 940,

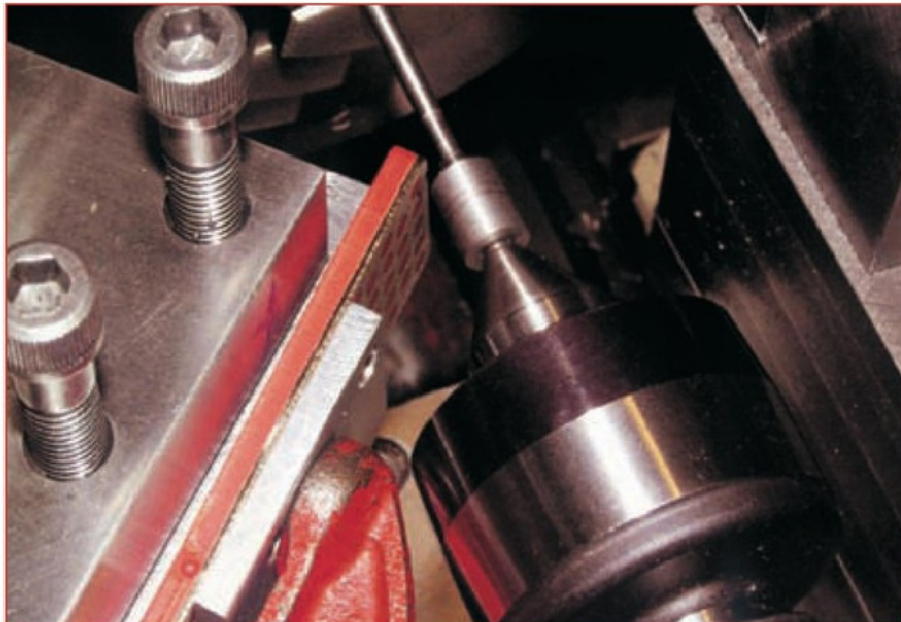
200, 3500, 5400 rpm. Absolutely no play in the spindle bearings. Max throat size 6in. x 30in. Could deliver locally, please phone Richard on 01634 370 167 (Kent)

- For sale: HSS Milling cutters $\frac{1}{8}$ - $\frac{1}{4}$ MT with tang, no draw bar. As new £2.00 each. Hand reamers $\frac{1}{16}$ - $\frac{1}{4}$ little used £5.00 each. Various home brewed cutters mostly countersinks but some very strange shapes. Please phone 01303 267 122

WANTED

- Wanted: For a Denford Viceroy 5.5in. Centre lathe Model TDS/1/1/GB/L, a copy of an Operators/Maintenance handbook,(expenses happily met) also an address from which spares may be purchased. Please phone Mr. John Chambers on 01922 640 731
- Wanted: Rear belt guard (door) for Tom Senior M1 Horizontal Milling Machine. Please phone 01274 815 435 after 8pm (West Yorkshire)
- Wanted: Jabus Small Diameter turning tool complete with steadies. Sensible price offered. Email to mail@woodhaygallery.co.uk or phone 01635 253 680

A TECHNIQUE 1 4-STROK



1. Close up view of operation from above.

With the availability of cheap diamond hones, Shelley Curtis successfully experimented with an unorthodox method to create an improved surface finish.

compound slide setting employed in machining both valves and cylinder head seats.

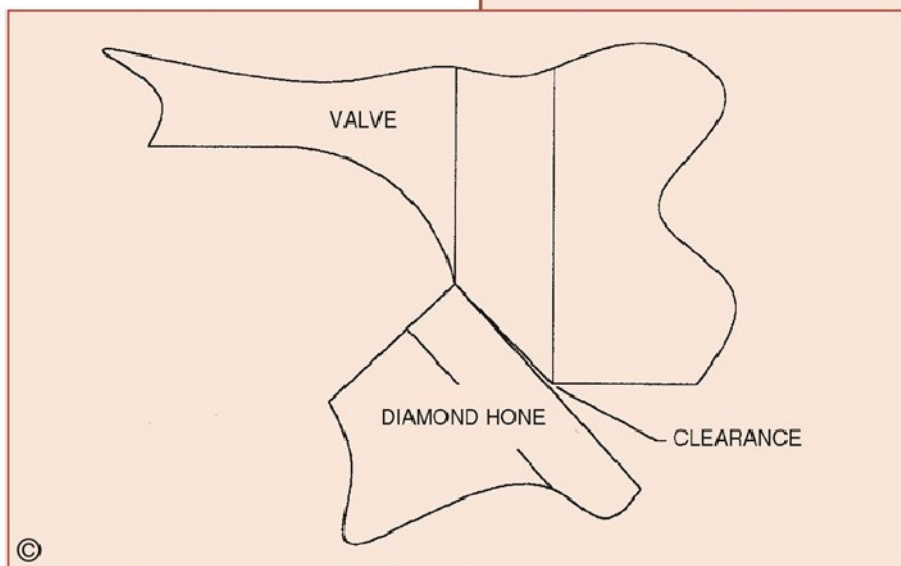
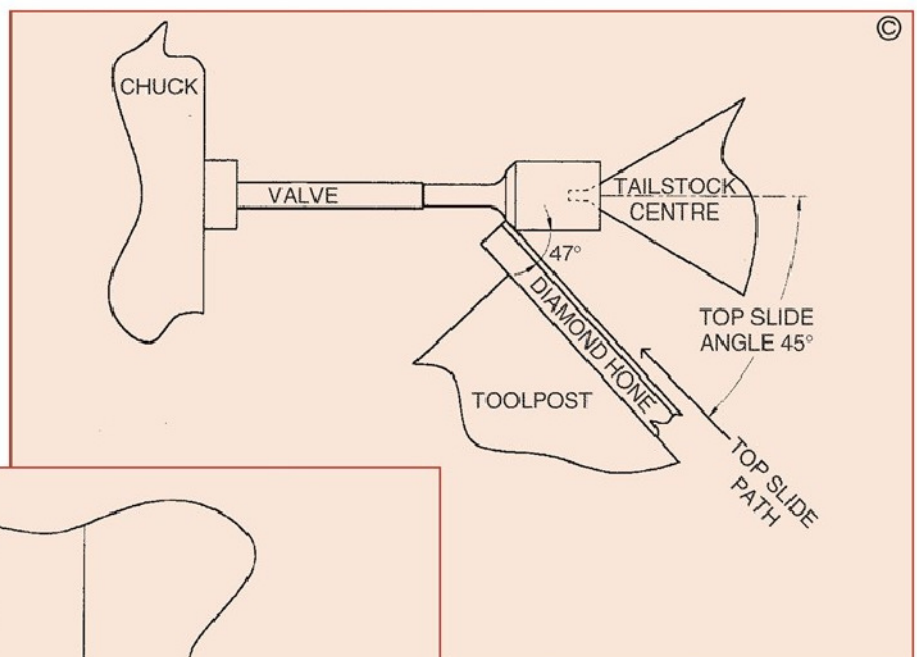
Not owning a toolpost grinder and having an aversion to grinding on my Harrison M250 lathe, another method would have to be found.

The solution

It is said that "diamonds are a girl's best friend" - could they not be also a model engineer's? I clamped a small diamond hone to the tool post (see photos) and angled it so that there was clearance or

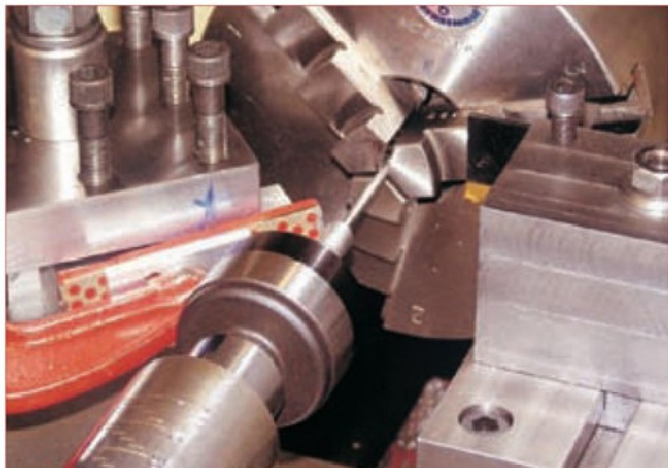
The problem

One of the problems I have encountered in making valves for model four stroke engines is that of achieving a satisfactory finish on the underside bevelled seating area. A well-sharpened and honed HSS tool with a .02mm radius gives a good finish on free cutting stainless steel (303). However, on my current engine I am using EN24T for the valves and this method leaves a lot to be desired. Lapping them in on assembly with the cylinder head (aluminium) will only transfer the imperfections to the softer material. The chamfered face would be better finished by grinding but this would need to be done on the lathe so as to use the same



relief behind the point of contact at the front edge of the hone (Figs 1 & 2). This clearance is necessary to preserve the original 45 degree angle of the valve face as produced by the top slide setting. On the drawing I have shown this difference as being 2 degrees to emphasise the need for clearance. The exact angle is not critical - keep it to the absolute minimum, using a magnifying glass when setting up. The hone will now operate like a single point tool. Pass it across the valve face using the top slide with a cross slide in feed of 0.01mm per pass until a good

FOR FINISHING E VALVES



2. Viewed from rear of lathe, also showing home made rear toolpost fitted with Q cut part off tool from Greenwood.



3 A general view of the front of the lathe also shows the Eurotherm inverter drive, and the Newall DRO system, definitely one of the better life enhancing benefits brought to us by modern technology.

finish is obtained. Care is needed as the depth of diamond coating is shallow but I have not found it to wear away before one valve is completed. Use a fresh

section of the hone for the next one if necessary.

The photographs were taken during experimentation to prove the method. A

valve would not be parted off from stock until this operation was completed.

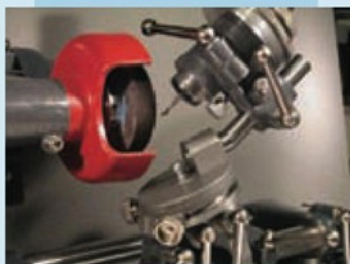
It may be rather unorthodox - but it works!

IN OUR NEXT ISSUE

Coming up in Issue No. 106 will be

Drill Grinding with the Quorn

Prof. Jörg Hugel presents a deceptively simple accessory to improve convenience.



Tee Slot Cutter

Commercially available but at a price. Harold Hall suggests you make your own.



The Beginners Guide - To The Black Arts Of Workshop Acquisition

Peter King offers word of wisdom

Two Heads Better Than One

Will Bells describes two boring heads for light and heavy duty.



Issue on sale 6th May 2005

(Contents may be subject to change)

CHUCK L SCREW-ON LA



1. Set up for brazing.

seem only to use the motor reverse when cutting RH threads from a shoulder, or a blind hole, with metric threads of some length, and when avoiding "climbing" using a milling cutter or slitting saw. Until now, my technique has been to check that the chuck will screw "home" smoothly, back it off about 45degrees, and then send it home with as much angular velocity as I can impart. Removal of the chuck involves clamping a length of 50 x 25 Eucalypt hardwood in the jaws, and fetching the end of the timber a smart whack with a mallet. This method

Necessity being the mother of invention, Derek Cooke describes a useful safety device.

gave good service for 20 years, except for the sad demise of a 3in. slitting saw. Recently I had another disaster, decided that it was probably due to the feebleness of old age, and I'd better do something about it. In a discussion with a fellow TAD (ref.1) volunteer we both eschewed the methods we had met in our reading, and felt that a hollow draw-bar was indicated. It would reduce the mandrel space available, but at least not wipe it out.

A day or two later, and with nothing pressing to do, I put the four jaw chuck nose down on the bench, and with a piece of galvanised pipe with an internal dia. of slightly over 1in. and an external dia. which comfortably entered the 1 $\frac{1}{4}$ in. hole in the mandrel, I considered ways and means. A big nut on the rear of the drawbar was obvious, but ways to connect the other end to the chuck conjured up more and more hare-brained ideas, and then the penny dropped, with the result shown in the photographs.

Hidden opportunity

I suddenly realised that there was a space between the mandrel nose and the back of the chuck when home. Careful measurements showed this to be 10mm in the case of the three jaw chuck, and slightly less in the case of the four jaw. I did not have time to mourn the unnecessary extra overhang, nor the loss of bed length! The thread on the mandrel nose is 2 $\frac{1}{2}$ in. x 8tpi (55deg.), and I had some BDMS of 60mm dia, so I was in business

Machining

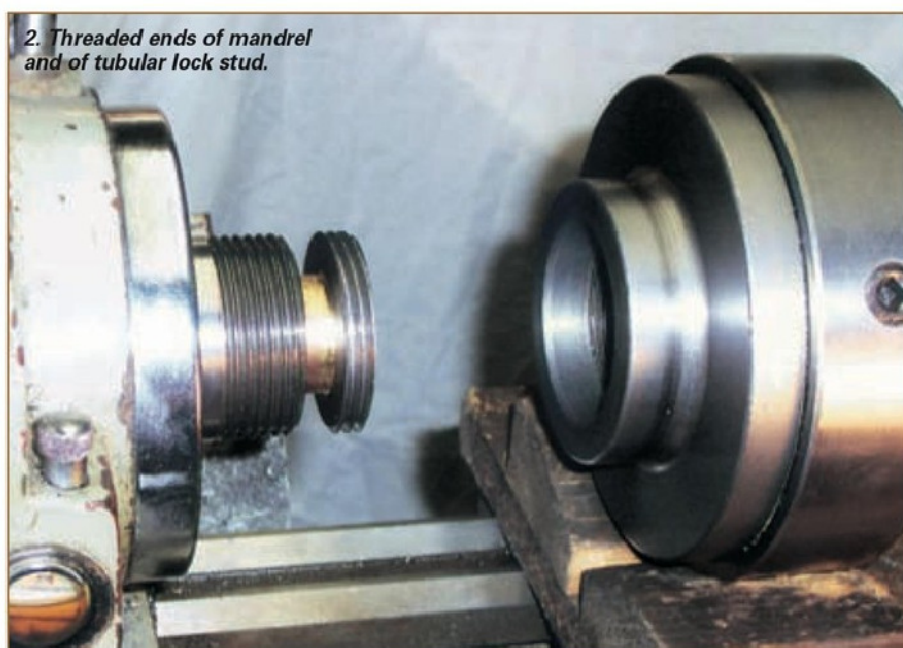
One end of the pipe was skimmed back for a couple of inches to clear the galvanising, and to provide a surface for re-centring. The other was drilled for a 10 mm tommy-bar. The pipe length was chosen to give a good hand's breadth to the rear of the mandrel when assembling the chuck lock. A 12 mm slice was cut from the 60mm BDMS with my faithful cheap oriental bandsaw and bored to give a Loctite fit on the pipe end. Though I have never been let down by Loctite, I then got cold feet thinking of the possibility of the joint breaking down when trying to undo the chuck, and decided to braze weld the disc, and made a further cut of 0.05mm. At each of 90deg. intervals I made 3 pop marks on the pipe end, which gave a fairly tight fit for the disc, and allowed an even annular space. By the time I had tried to manoeuvre the disc to a truly radial position it had become a free fit over the "pimples". I then recalled that I had a couple of brand-new firebricks and placed one on my Cooke "patent" rotating table (ref.2). This, with a stay, brought things under control. I did not feel like using one of the many flux coated rods in the armoury, and found a rod of unknown provenance which I suspected to be of the "Easyflo" type. Lifting the disc, I applied Easyflo flux to the end of the pipe using a spatula, and let the disc drop.

Brazing

Surrounding the disc with odd bits of broken firebrick, I fitted a large jet to the Oxy-Acetylene hand piece. The end of the filler rod was scrubbed using a stainless steel pan-scrub (aka pot scourer), and liberally coated with the flux. When I thought the job hot enough, I applied the rod, and it formed a bead at the junction. A further heating, and the bead disappeared, and I added a little more "for luck". I was pleased to find braze material on the front of the disc when it had cooled off and even more pleased after facing in the lathe to find a thin continuous golden band between pipe and disc. The pipe was centred in the lathe, and both sides of the disc faced, and the disc brought down to 9mm thickness. It was then brought to diameter and threaded.

Operation

In use, it is placed in the mandrel, and screwed into the chuck back plate. The chuck is then screwed onto the mandrel nose, and the lock screwed anti-clockwise



2. Threaded ends of mandrel and of tubular lock stud.

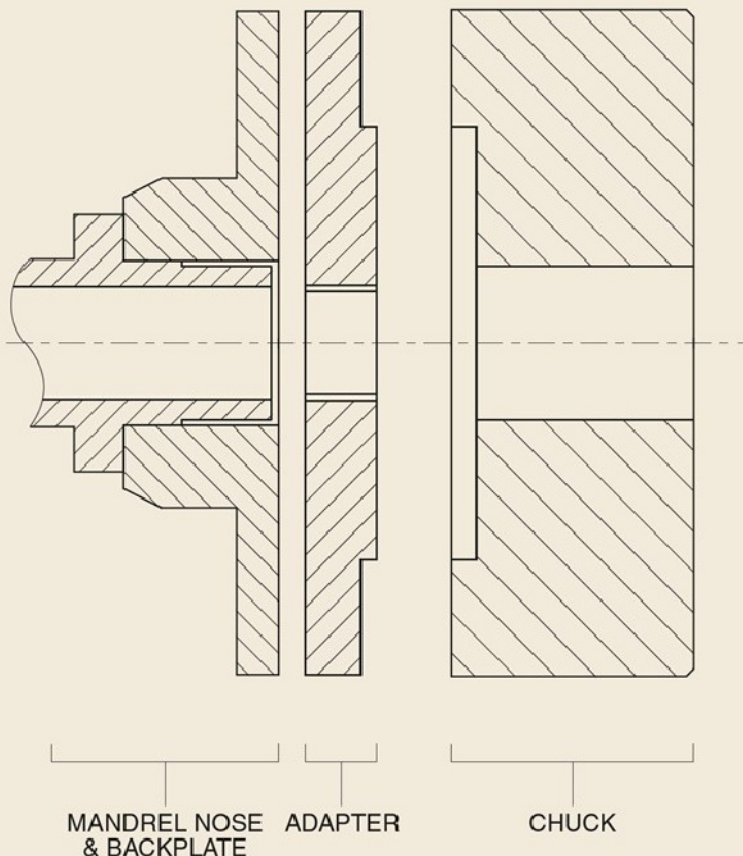
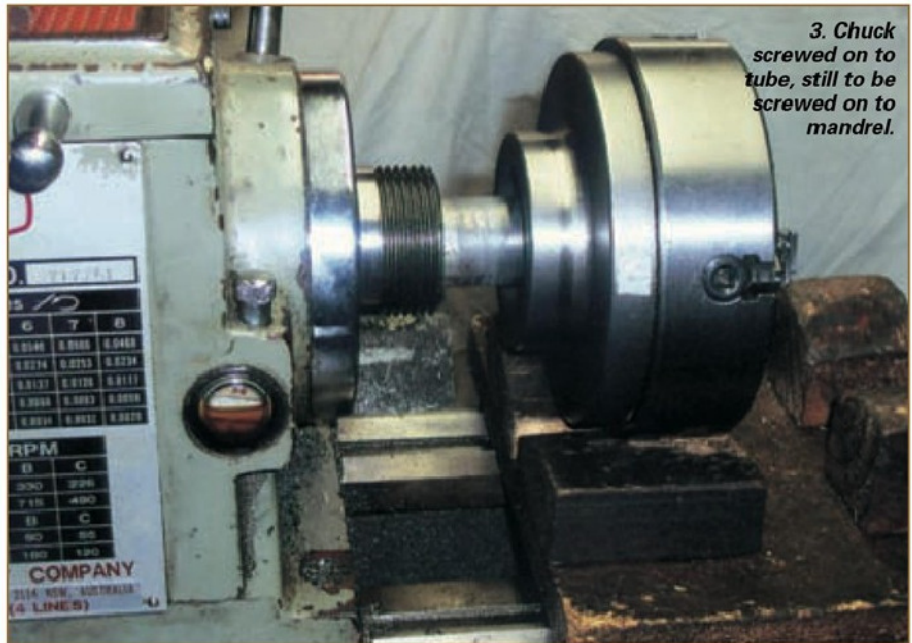
LOCK FOR THE CHUCKS

to lock. No, it is not a lock nut. It is a lock-stud. The mandrel nose is effectively a stud. If it were a real stud, it would be threaded into the mandrel, and the chuck would lock anyway?

Footnote

When it came to my colleague's problem, it appeared that the chuck back plate barely extended beyond the nose of the mandrel, and I suggested the solution in the sketch, using a couple of dowels to engage the adapter plate to the back plate. The "lock stud" obviously must have a major diameter less than the minor diameter of the back plate thread, so it is possible to use a finer thread for the lock stud and for the adapter plate. This should give a better "grip". The "lock stud" will also need a shoulder at its left hand end to locate against the end of the headstock mandrel or to locate in a recess between back plate and adapter.

On discussion we decided it would be better to turn an annular recess into the back plate – either beyond the holes for securing the pieces together, or



encompassing them, and a corresponding positive piece on the adapter. If there be a small gap between the end of the mandrel and the back of the chuck, say 3 or 4 mm, the obvious answer is to make a register of say 3mm depth on the back plate and have the mating projection on the adapter plate. Should these all be turned on the lathe for which they are intended, concentricity will be the reward. One thing about being able to use a finer thread, is that one can cheerfully use Loctite. In the extremely unlikely event of a separation, it will only be necessary to slacken the chuck securing screws to release pressure.



4. Tommy bar to apply locking torque.

References

1. TAD: Technical Aid to the Disabled (= REMAP in UK). In recent years, a similar organisation has appeared in the USA.
2. Foot-powered rotating welding table. ME Vol 180, No 4080, pp 137-139.

Scribe A Line

Dr. Peter Anderson of Horwich writes

Other readers may be amused by classified advert which appeared in one of the "Heritage Motorcycle magazines". The text was as follows:

"For sale a round bed drum and lade, hasn't run for 30 years, in perfect condition etc."

Harold Hall writes:

I am in the process of producing a series for the benefit of the "lathe only" workshop owner and wish to contact a company, should they still exist, who produced tee slotted cross slides for lathes which do not have this facility.

The company was in existence during the short time that I was editor but I have lost any reference to them. This was around ten years ago so they may not now be providing the service. Either way I would like to know their name should any reader be aware of the company.

I can be contacted by E-mail at me@homews.freemove.co.uk or via the editor.

Trevor Palmer writes

In Scribe A Line, Issue 104, Mike Brennan raised several points concerning my modification to the tailstock of the Clarke Metalworker, described in the article published in Issue 102. In answer to the comments, yes it is worth it. I now find the lathe more enjoyable to use. I do not have to obtain or manufacture special tools such as long centres. Incidentally, (as pointed out in the editorial comment which appeared with Mike's letter) a long centre would also increase the loading on the tailstock and, I suspect, provide less support. The extra 20mm of travel is a real bonus, I was constantly running out of travel before the modification.

For me, the reduction in "between centre distance" has not been an issue, but I accept that it may be a problem for some users. As for rigidity, the tailstock casting and barrel are both substantial and

the two supporting screws are M10, which have far greater tensile strength than this lathe could possibly generate

In the approximately 8 years since carrying out the modification I have not experienced any problems due to lack of support. I recently turned down a 30mm diameter EN36 shaft 350mm long with a keyway cut down its entire length. The surface finish was good.

If I do have one regret, it is not re-engineering the 4mm anti-rotation spigot, which I feel is the weakest link, and could shear at any time with a heavy drilling operation.

I hope this has answered Mike Brennan's points adequately.

Peter King writes: Re. Curing A Bandsaw Problem

I pass on the following as it may help someone else whose temperature is rising as the frustration level reaches boiling point:

I have just found a cure for an annoying fault on my band saw; this is one of the common Taiwanese jobs of which there must be thousands in small workshops.

Over the last five or six months there has been a gradually increasing tendency for this machine to 'throw' the band off the driving wheel when cutting, it will run all day when running light with no problems. There was no tendency to throw the band off the idler wheel. In the last three weeks it has become a positive nuisance, there was nothing obviously wrong and careful resetting of the guide rollers had no effect. There is no problem with the wheel bearings, where there is no detectable rocker 'free play'. Last night I decided on drastic action as I had been trying to trim some fabrications freehand on the table with the saw vertical and the band had flipped off about 20 times under load. Thinking that the wheel must have some fault that I could not see I removed the driving wheel and mounted it in the lathe on a mandrel with two conical sleeves to hold it true by the bore. I then set a carbide

tool to take a 0.001in. skim off the diameter (lathe was in Imperial mode), it became immediately clear that the wheel was not truly round as there were several intermittent 'cuts' around the circumference right across the face. The lathe was reset to take a total of 0.005in. off the diameter and the wheel cleaned up nicely. There was no evidence in this operation that the wheel was in the slightest bit conical towards the outside, but perhaps very slightly conical down towards the guide flange. There was no evidence of the wheel being eccentric either. I refitted the wheel and to my delight the band stays in place even with quite heavy pressure on it. The rest of the fabrications were sawn with no further trouble, but why this (wear?) fault should throw the band off I haven't the faintest idea. One might argue that the slight conical shape would encourage the band to ride out to the maximum diameter, but why only under heavy cutting load. Perhaps the lobed effect is one contributory factor, or perhaps reduced frictional effects due to the worn/polished surface are another.

John Wilson of Harlow writes:

With reference to your editorial comments (Issue 102) "And next the information police?" I am afraid they are already here. As a keen amateur photographer, I purchase a weekly photo magazine, which has reported the case of a photographer who was arrested in Trafalgar Square, held in a cell for a day, had his house searched, his computer equipment and photo library removed, but was finally released without charge.

What heinous crime was he suspected of? Taking candid shots of people (amongst whom were children) playing in the fountains in the square. The arresting officer accused the photographer of taking obscene photos of children and therefore being a paedophile.

The fact that none of the subjects were naked did not matter one jot to the arresting jobs-worth. And incidentally this is the second such report of police heavy handedness against a photographer.

Even in Harlow, photographers have been prevented from taking photos of the water feature in front of our new town hall

Just imagine what our police state would make of any model engineer's workshop? Lathe milling machine, drill, grinder, well we must be making or converting replica guns to fire live rounds. Hang on! The boiler shaped thing under the bench - ha ha clearly a bomb casing, the foot of $\frac{3}{4}$ in. BMS - well that must be a cosh.

It is quite frightening to speculate on what these politically correct coppers could interpret as offensive weapons in the average workshop. And by the way, don't photograph your latest effort, particularly if there are any kids about that might get in the shot, you don't want to be accused of being a paedophile as well as a terrorist.

Mr. Len Billinge of Essex writes

As a long term reader of *MEW*, I go back to issue number one, I was a little surprised to read your recent comments about Health and Safety and the "Nanny State". My initial reaction was "why are we suddenly getting all political". But after a little reflection, common sense began to prevail and I found myself agreeing wholeheartedly with your comments.

The way governments enact laws and regulations in knee jerk reactions of late do make one sit up and think seriously about the possible consequences. Only the next day after reading *MEW* there was a case of someone being arrested for carrying a Swiss army knife and of two 13 year olds similarly treated for carrying toy guns purchased that day in a high street shop. Whatever some official or other would infer from some of the materials we keep in our model workshops makes me shudder to think.

Not too long ago our government banned the ownership of almost all firearms following the Dunblane massacre but I wonder just what this has achieved other than the fact that it has put our Olympic sharpshooters at a distinct disadvantage.

Our Health and Safety Executive on the other hand seem to be intent on making every aspect of normal day to day activity absolutely 100 percent "safe" to such a degree that it sometimes becomes impossible to do what we strive to do. It is worrying to discover that many modellers seem to think that the Health and Safety at Work Act even applies to them in their own workshops.

I am diabetic but am blessed with a remarkable specialist doctor who explains everything to me at great length. When he prescribed insulin for me some 18 months ago he explained the dangers quite logically and sensibly. During subsequent discussion he made the surprising comment "if we were trying to invent insulin today as a new drug, we should never get it approved" (because of the

dangers of overdosing etc). On hearing this, my wife, who seldom comments on these things said, "yes, I suppose if we had all this H&S regulation in the past, we would not have had an industrial revolution".

I wonder what Brunel would have had to say about this?

Mr. N Summers from New Zealand writes:

Re Straightening Briggs & Stratton cranks.

I refer to the comments from Richard Wilson - Scribe a Line, *MEW* Issue 103. The thought of a Briggs & Stratton crankshaft breaking after straightening is, I think, highly unlikely, as a friend and I, over about 40 years, must have straightened approx 500 shafts and have never heard of one breakage even in cases of shafts which have been straightened several times. The people who damage them, seem to be rather careless as I have had them returned for repair again, just the day after the previous rework.

There was on the market 40 years ago, a fixture for straightening vertical shaft engines without dismantling the motor. It is still in use today, and I have made a couple for the other service dealers. The device is arranged to fix to the underside of the mower, and apply a straightening force to a substantial close fitting bush placed over the shaft.

Roy Grafton writes:

After reading some of the letters in *Model Engineers' Workshop* about chuck keys flying across the workshop I wondered if readers would be interested in my solution. The basis is a metal box of the type made for a single gang 13amp socket. A paxolin cover was made to fit on the front. Find a piece of tube (I used a section of telescopic aerial) big enough for the key handle to pass through. Drill a

hole in the top of the box and araldite the tube into the hole. Next obtain (lovely elastic word) a microswitch capable of handling the current drawn by your machine and fix it to the inside of the paxolin cover in such a way that inserting the key will close the switch.

Run two cables into the box using proper clamps, place a 13amp plug on one and a 13amp socket on the other. Connect the neutrals with a connector block, most of these boxes have a connection inside for earth wires. Connect the live wires to the microswitch, one to the common terminal and one to the normally open terminal. Fix the box near your machine and pop the key in. Plug the machine into the socket and off you go.

I've found two advantages to this

1. the machine cannot possibly start until the key is in place and
2. its (almost) impossible to lose the darn thing! No measurements are given, it all becomes obvious when you get the bits together.

Roger Hailey of Warwickshire writes:

Further to Mr. B.C.Spick's enquiry in *MEW* issue 101 and Mr. Ted Wale's reply in *MEW* issue 103 about Atlas lathes, the good news is that most parts are available in this country from: Mr. M.J.Kurn who trades as MJK Engineering at 16 Mansfield Place, North Ascot, Berkshire, SL5 8ND. Tel: 01784 434225.

Email: mikekurn@otmservo.com

He used to run the Acorn Machine Tool Co and took over the business when it was sold. He has the agency from Clausing Industries Inc referred to in Mr. Ted Wale's letter. The parts he stocks or can get, also cover most of the UK variations of the Atlas; ie: Sphere, Halifax and Acorn. I was referred to him by Clausing Industries. He is most helpful and this has solved a problem for me and I suspect several others judging by comments I have read in *MEW* over the years.

Norman Atkinson writes:

May I add some information to Harold Hall's interesting article on hardwoods.

I have found that *Lignum vitae* is not difficult to machine. Despite its density, it is one of the few hardwoods which will turn on a small lathe using conventional lathe tools in a fixed holder.

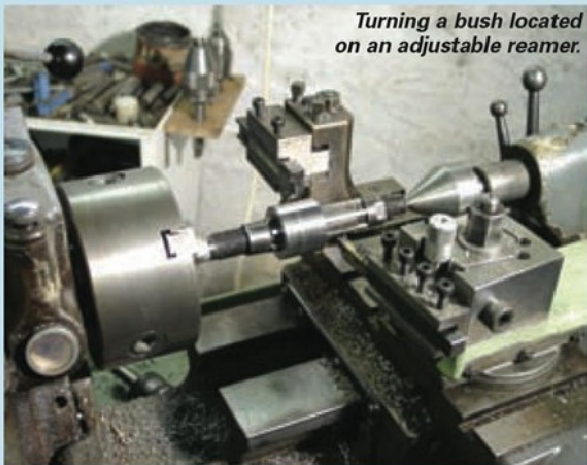
Normal cutting tools with angles for steel are quite suitable but the best results come from razor sharp edges.

The swarf comes off like brown candle wax and can be used for final polishing. I should add that this is one of the better hardwoods for things like Northumbrian bagpipes. My experience rates it far easier to work than rosewood and African Blackwood. The latter woods look better but are far more difficult to turn.

As an interesting aside, my wife is a clarinet player and a brilliant article has just been published on CNC machining of clarinets in the "Clarinet and Saxophone".

Gert Ravnholt of Egaa, Denmark, writes:

Other readers may be interested in this tip which may be applied when a ring or tube has to be turned on the outside, concentric to the previously finished bore. We will assume that there is no suitable mandrel to hand, nor the time or desire to make one. But if you happen to have an adjustable reamer of the right size, it can offer a quick solution.



Turning a bush located on an adjustable reamer.

Chuck the reamer shank, feed the work on to the reamer, and adjust it, without undue force to sit tight. Put a live centre into the tailstock, run it up to steady the end of the reamer, and clamp in position. The outside diameter of the work is now easily accessible and ready to be turned.

If a high level of precision is demanded, the reamer can be set between dead centres using a driving dog, in which case please remember to lubricate the tailstock centre.

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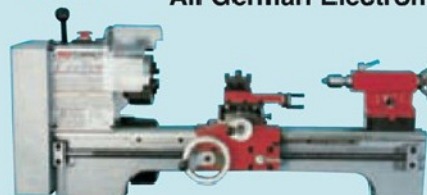
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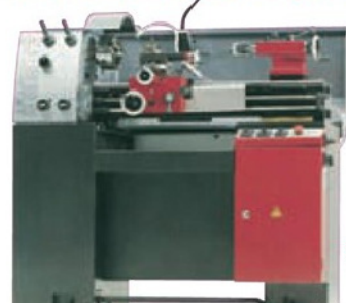
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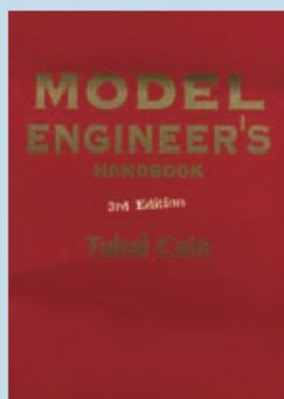
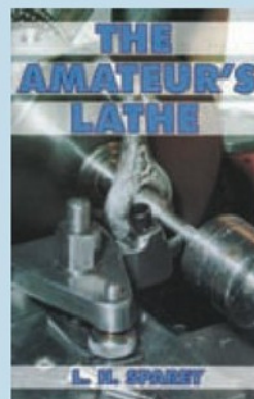
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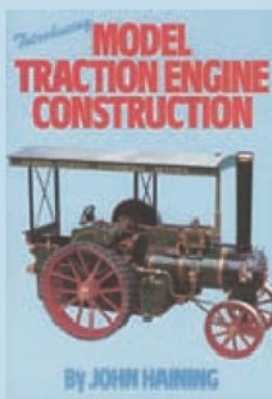
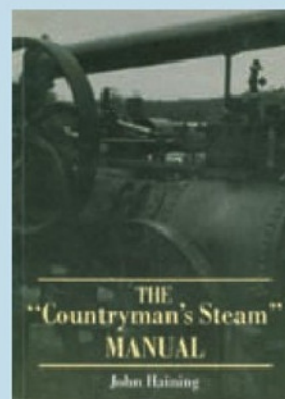
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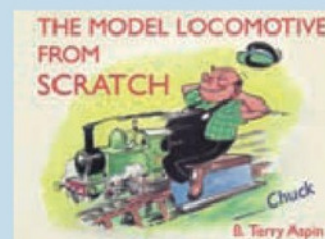
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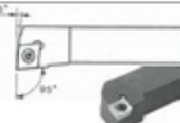
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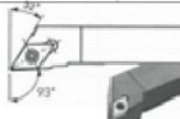
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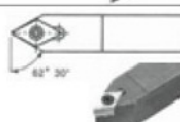
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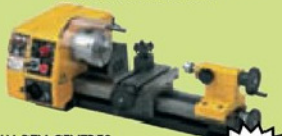
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Myford ML7, 3 1/2" x 19", single phase, equipped.....£595
Harrison M250, 5 1/2" x 30", equipped, almost as new condition.....£2600
Colchester Master 2500, 6 1/2" x 25" gap bed, clutch etc£2450
Colchester Chipmaster, 5" x 20", vari speed, clutch, well equipped.....£1500

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Harrison vertical, 30"x 8" T, power feed, geared spindle, exceptional condition .
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Semco, (bridgeport copy) 48" x 9" T, power feeds, DRO, crome slides£2150
Bridgeport, 48"x 9" T, DRO, crome slides, power feed.....£2450
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.....£2250

Various.

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.....£495
Elliott Progress 2E, 10 speed 2 morse taper pillar drill, 1 phase, quality.....£295
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12" grinder

£425



Worcester
18 ton
power
press,
guarded

£1150
NOW
Special £600



Elliot powered surface grinder "as good as it looks"

£2250



Harrison M250 lathe
with 3000rpm top speed

£2950



A current photo of our
small stock!



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extractor cabinet

£625



Colchester Bantam 2000
(very late model) complete with 3
& 4 jaw chucks

£3750
NOW
Special £3250

Centec vertical head, quill
type fits 2A, 2B and 2C if you
have the adapter



£775

Lockwood quad head
2MT and 3MT die sets,
last few available



£40
each



Myford
VMC
complete
with DRO

£1850



Rolling mills,
120mm very nice

£325

Colchester Student 1800
lathe complete with 3 &
4 jaw chucks



£2950



Tom Senior 'E'
Type vertical
milling
machine

Choice
£2950-£3450

Boxford 1130,
5 1/2" x 30"



£2450

Viceroy precision
screwcutting lathe



£675

Transit smile type body
complete with Hiab 011
hydraulic crane includes legs



£1750

Raglan precision
screwcutting lathe 5" x 24"



£1400

Precision two way table
(size; 12" x 12")



£375

Jafi Jarocin Universal
milling machine, 49" x 12"
powered all ways table,
40INT vertical head, 18
speeds 36 - 1800rpm



£2400

Meddings MB 10, 1/4" high
speed bench
drilling machine



SOLD

Asquith 14-54 001 Mk.2 5MT
radial drilling machine



£3950 Now
special £2950

Kennedy bench type
Hacksaw just in



£175

Equi-Spacer pitch circle
drilling jig



£350

Vanco finisher, 1" wide belt



£245

Meritus
spot
welder
8kva

£425

Fobco Star 1/2" Bench
drilling machine



£375

£2250



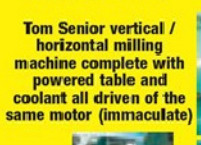
Ajax turret
milling
machine
in very
good order
with
powered
table just
in

Lorch precision lathe
complete with collets



£645

Myford Super 7B long bed
lathe 3 1/2"x31" complete
with cabinet stand



£2750



Viceroy
vertical
milling
machine,
excellent
condition

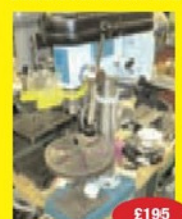
£1625

Lorch rare verticle
slide



£425

Boxford PD5 bench drill



£195

Rishton buffer (The best buffer
in its class)



£345



Edwards
corner
knotcher

£245

Tom Senior vertical /
horizontal milling
machine complete with
powered table and
coolant all driven of the
same motor (immaculate)



£2450

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.0005". Last few available!



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NEW 3/4HP ideal for Myford
& Boxfords etc.



£150
Each



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- Myford fitting kit now available

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920 Lathe
Swing over bed
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MT3 Spindle Taper
Between Centres
500mm
100-1800rpm
PRICE: £599.00



DB10G
Centre Height 125mm, MT3 Spindle Taper
Between Centres 550mm, 130-2100rpm
PRICE: £850.00



Model B Multi Purpose Machine
Centre Height 210mm, MT3 Spindle Taper
Between Centres 520mm
Range of Speeds for Lathe 160-1360rpm
Range of Speeds for Milling 117-1300rpm
PRICE: £645.00



Craftsman Lathe
Centre Height 150mm
MT5 Spindle Taper
Between Centres
570mm
Spindle Speeds 50-
1200rpm
PRICE: £1499.00



Eagle 25
Drilling Capacity 25mm, End Mill Capacity 25mm
MT3 Spindle Taper, Table Working Surface 190x585mm
1hp Motor
Shown with optional oil tray
PRICE: from £699.00



12" Slip Rolls (larger models available)
Diameter of Rolls 25.4mm
Max Thickness 0.8mm, 22swg
Max Width 305mm, 12"
PRICE: £98.95



Champion Mill/Drill
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MT3 Spindle Taper
Spindle Speed Range 400-1640rpm, 1/2hp Motor
PRICE: £545.00



H80 Bandsaw
Max Cutting Capacity at
90°
Round 90mm
Square 90 x 120mm
420w Motor
Power 240volt
PRICE: £115.00



Lux Mill Round Column
Drilling Capacity
32mm
End Mill Capacity
28mm
MT3 Spindle Taper
Spindle Speed
95-1600rpm
1hp Motor
PRICE: £999.00

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