No. 346

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MODEL ENGINEERS' WORKSHOP

THE MAGAZINE FOR HOBBY ENGINEERS, MAKERS AND MODELLERS DECEMBER 2024 ISSUE 346 WWW.MODEL-ENGINEER.CO.UK

MMEX 2024

We report back from the Midlands Model Engineering Exhibition

INSIDE A WELL-EQUIPPED WORKSHOP

Austin Hughes invites you in for a good look around.

MAKE A COMBINATION BOLT

We have plans to improve your workshop security

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MODEL ENGINEERS' WORKSHOP

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On the Editor's Bench

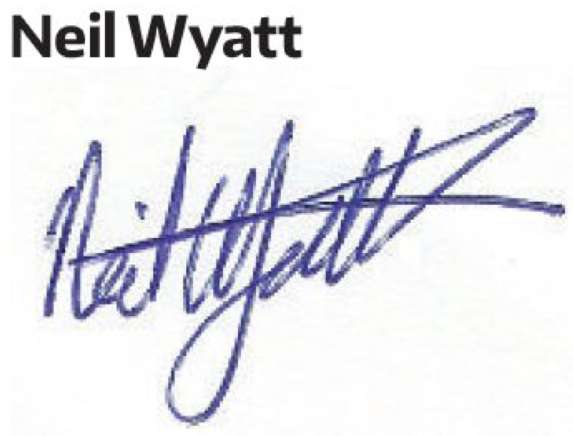
It was great to see you all!

A few days ago I returned from the Midlands Model Engineering Exhibition. I can report that I was able to successfully demonstrate 3D resin printing with the SMEE, although I had a few technical issues. My other responsibility, hosting the MEW Talks programme, went well but we had a few exciting hiccoughs. First most of Roger Froud's first talk had become trapped in the 'cloud', and we had had to rebuild it at short notice – well done Roger! We also had a few things go astray, but they got tracked down and are on their way to their respective owners. I must say a huge thank-you to Mark, Malcolm, Peter, Shaun, Bob, Noel and Roger for their excellent talks; as well as to all the SMEE members for their support, and to Avril and her team at Meridienne Exhibitions for their hard work. It's impressive to see how well all the little issues that arise during such a long and complex event get dealt with. A particular shout out to the parking stewards for remaining cheerful and patient, despite the vagaries of autumn weather.

I'd also like to thank all the people who took the time to talk to me over the Exhibition. We covered an extraordinary range of topics, and I will be chasing lots of you to follow up on suggestions for articles in the future. I also enjoyed discussion of many other topics, including various whiskies, the finer points of PA speaker placement, amphibious lorries, the pros and cons of having sheep graze your club track and the benefits of real gaffa tape versus duct tape. My apologies to anyone I had to rush away from in order to check on the 3D printer, sort out a talk or visit a particular stand.

It's rather like being transported away to a parallel universe for four days, I hope the many thousands of people who attended the show enjoyed it as much as I did, my impression is that you did. Here's to next year!

Neil Wyatt



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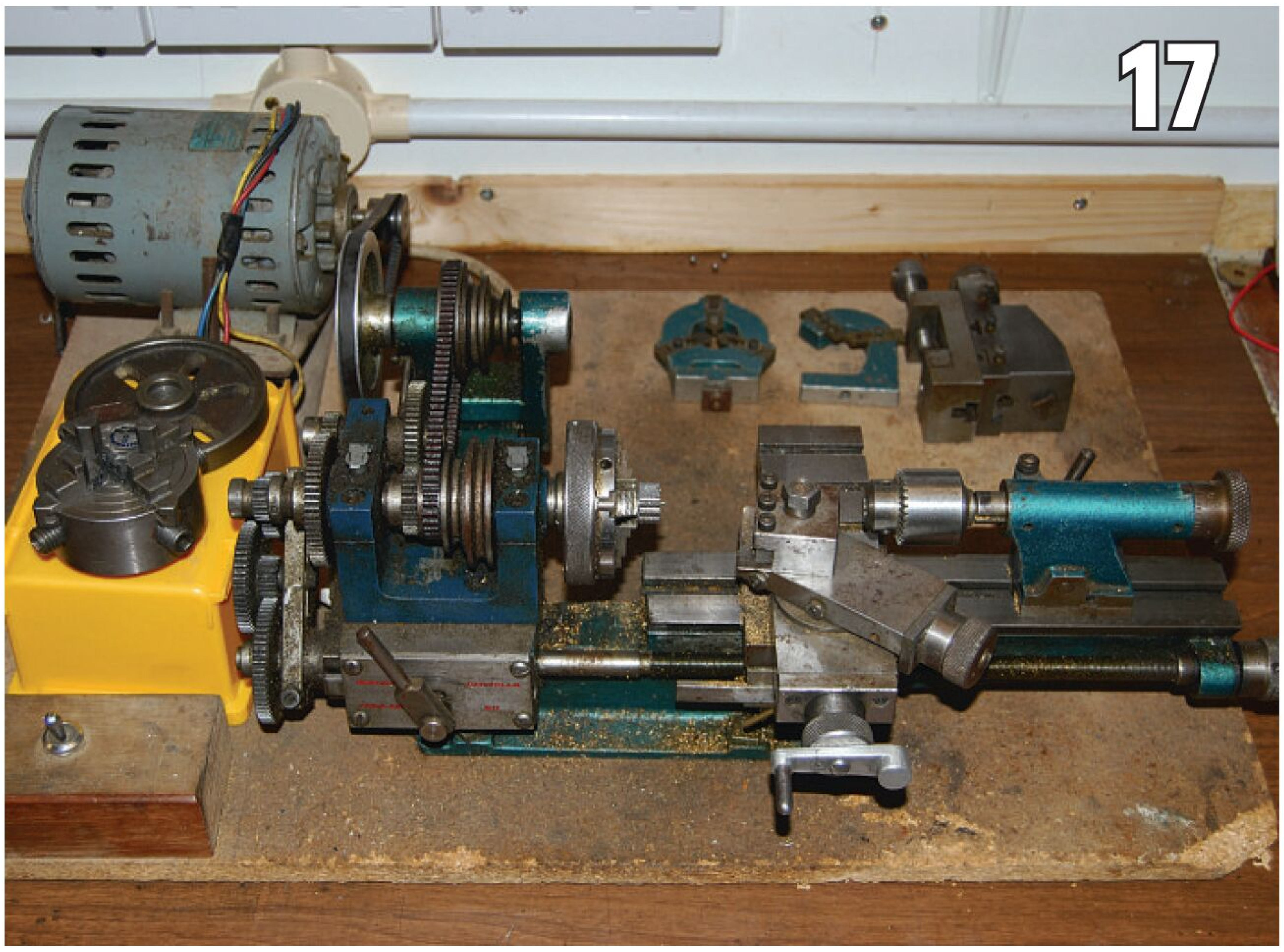

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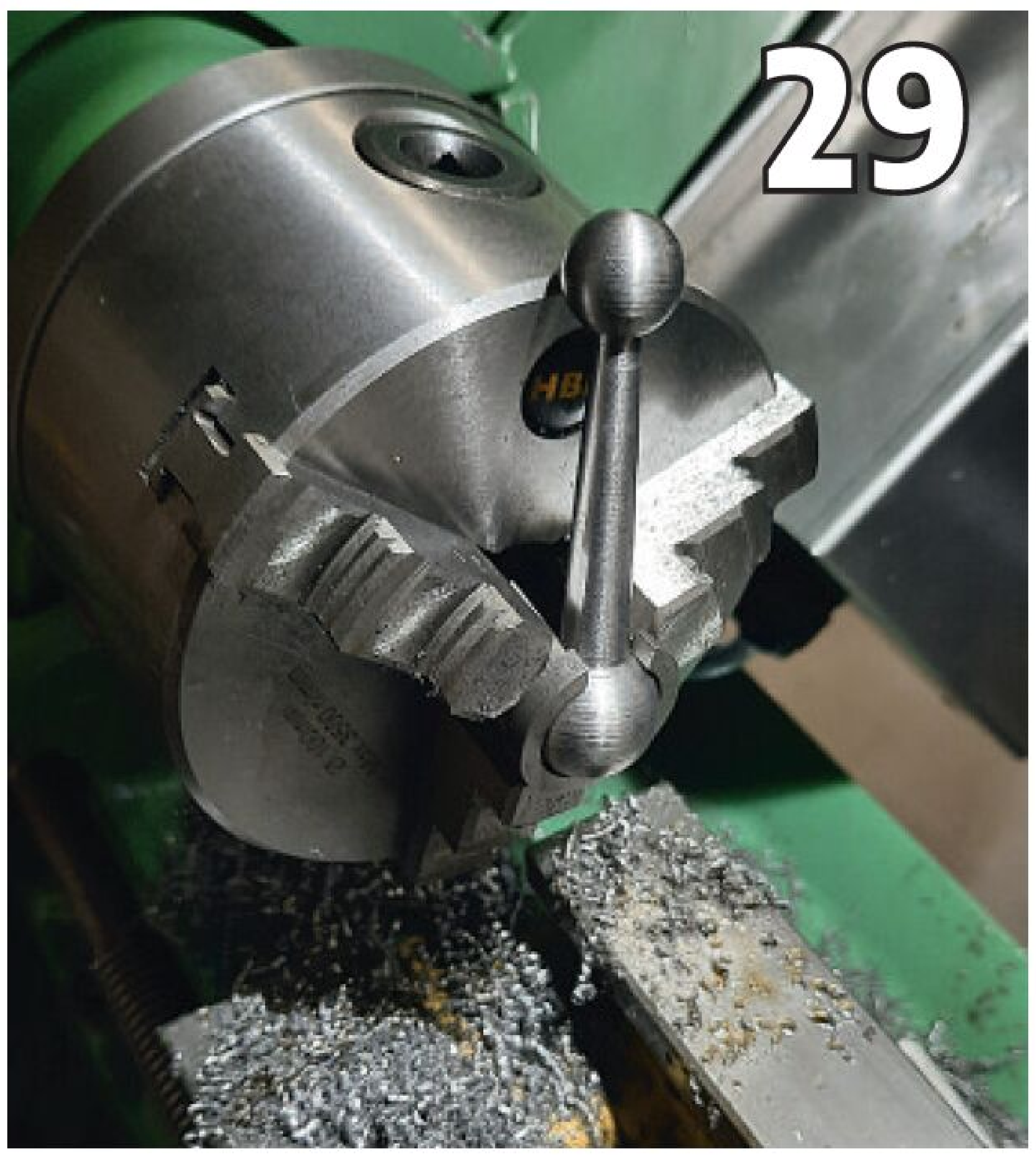

Coming up...
in our next issue

In our next issue Howard Lewis explains how to extend the life of brazed carbide tooling.

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The Editor has just returned from the Midlands Model Engineering Exhibition.

16 Readers' Tips
This month our winner is a tip for those of us whose hand strength isn't what it was. Send your tips to meweditor@mortons.co.uk, you could win a prize.

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This month our postbag has some reader feedback and an important update on our recent Headstock Indicator. We are always keen to hear from you – send the editor your thoughts at meweditor@mortons.co.uk.

64 Readers' Classifieds
This month we have a tremendous selection of readers' for sale and wanted adverts, is it time for you to grab a bargain?

ON THE COVER

Our cover features Alan Haywood demonstrating ball turning on the Society of Model and Experimental Engineers stand at the Midlands Model Engineering Exhibition, for the Editor's report, see page 28.

Combination Door Bolt

Stewart Hart explains how to make a security bolt to add extra security to your workshop.

Workshop security is something we should all take seriously, unfortunately there are bandits around who see garden sheds and outhouses as easy targets, these are just the places where we have our workshops. If you take the time to add up the cost of all the equipment, you'd be surprised at the value of the kit you have. So, it's well worth investing in good workshop security. A few common-sense precautions will help deter them: - Good motion sensor lighting, window bars, cover the windows, don't make it public that you have a workshop, and guard your address from prying eyes on the internet, and if its practical fit an alarm in your workshop.

But none of this will deter a real determined thief; determined thieves are fortunately in the minority, most thieves are lazy so and so's, that are opportunistic: on the lookout for the easy steal. Your first line of defense is a strongly double locked door, but if your anything like me the first thing you do with a bunch of keys is to "mislay them!", the answer to this dilemma is a combination lock. Most combination locks, however, are of the clasp type that are also liable to be mislaid, a solution is a bolt combination lock permanently attached to the door, **fig. 1, General Assembly.** (Bear in mind that if you have workshop insurance it may specify what type and grade of lock(s) you have on your workshop).

As the lock will be outside in the elements it is ideally constructed completely of stainless steel, but less durable mild steel could be acceptable. The base plate is a welded fabrication of 30mm*30mm*1.5mm thick box section with a 16mm diameter bolt with tumblers manufactured from M16 stainless steel nuts. The structure is strengthened with M15 stainless steel washers (see fig.3 in part 2). I obtained all the material for this project from an online supplier. It is drawn using four tumblers, but the design can quite easily be modified to have three or five tumblers, and it can also be easily modified to be mounted in different orientations. I've purposely gone for an extremely robust looking design again

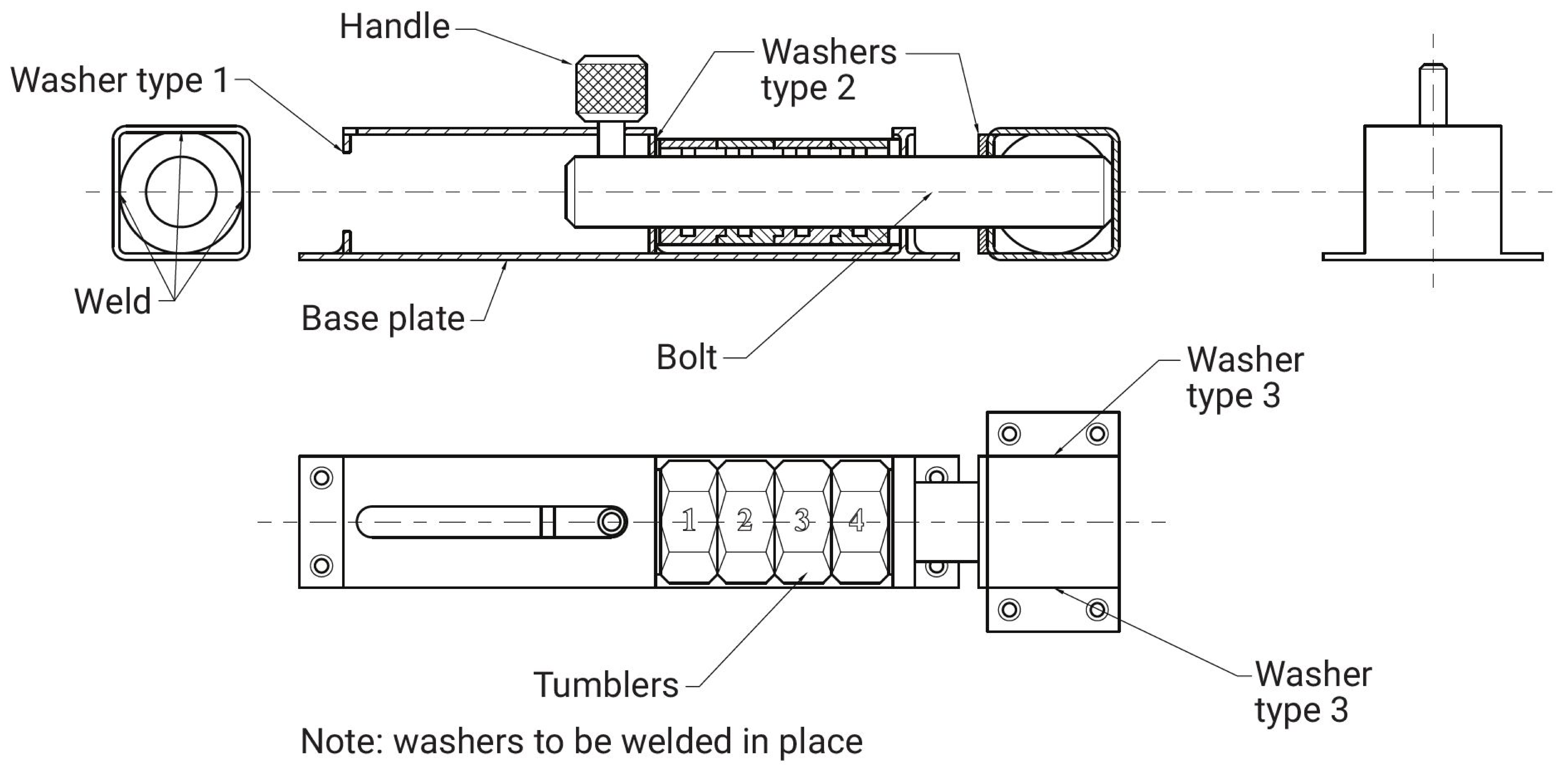
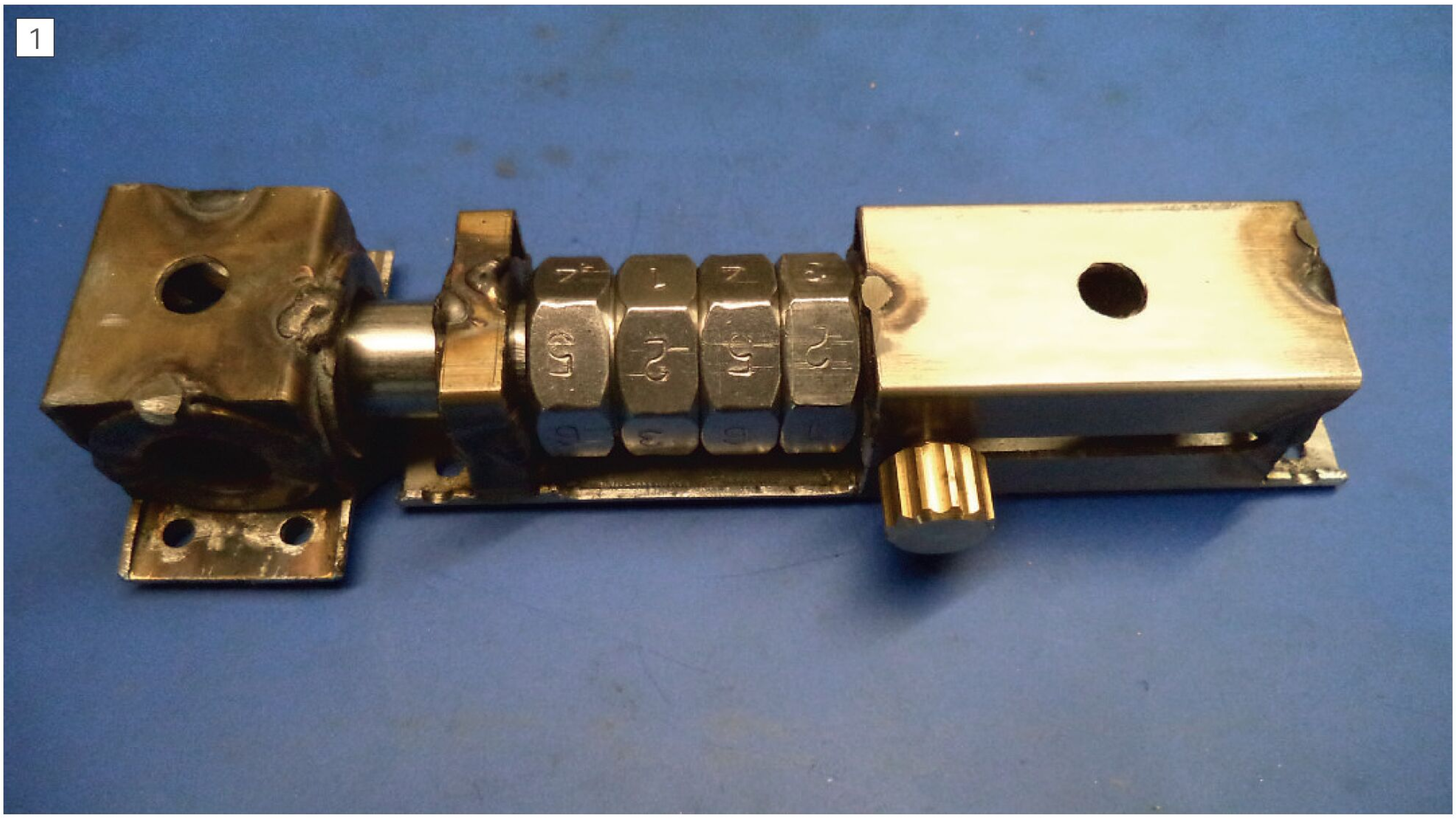


Figure 1



Completed lock.

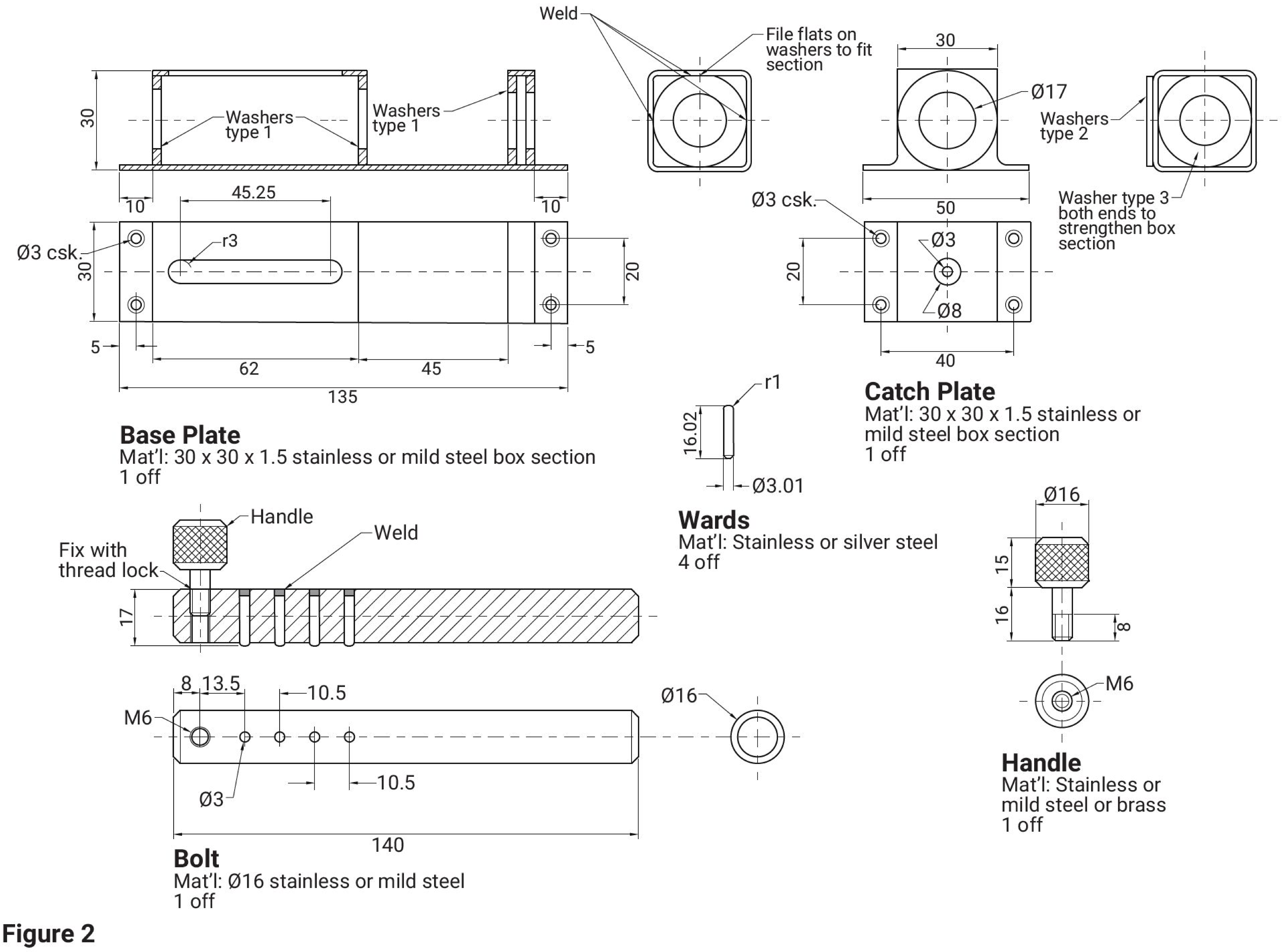
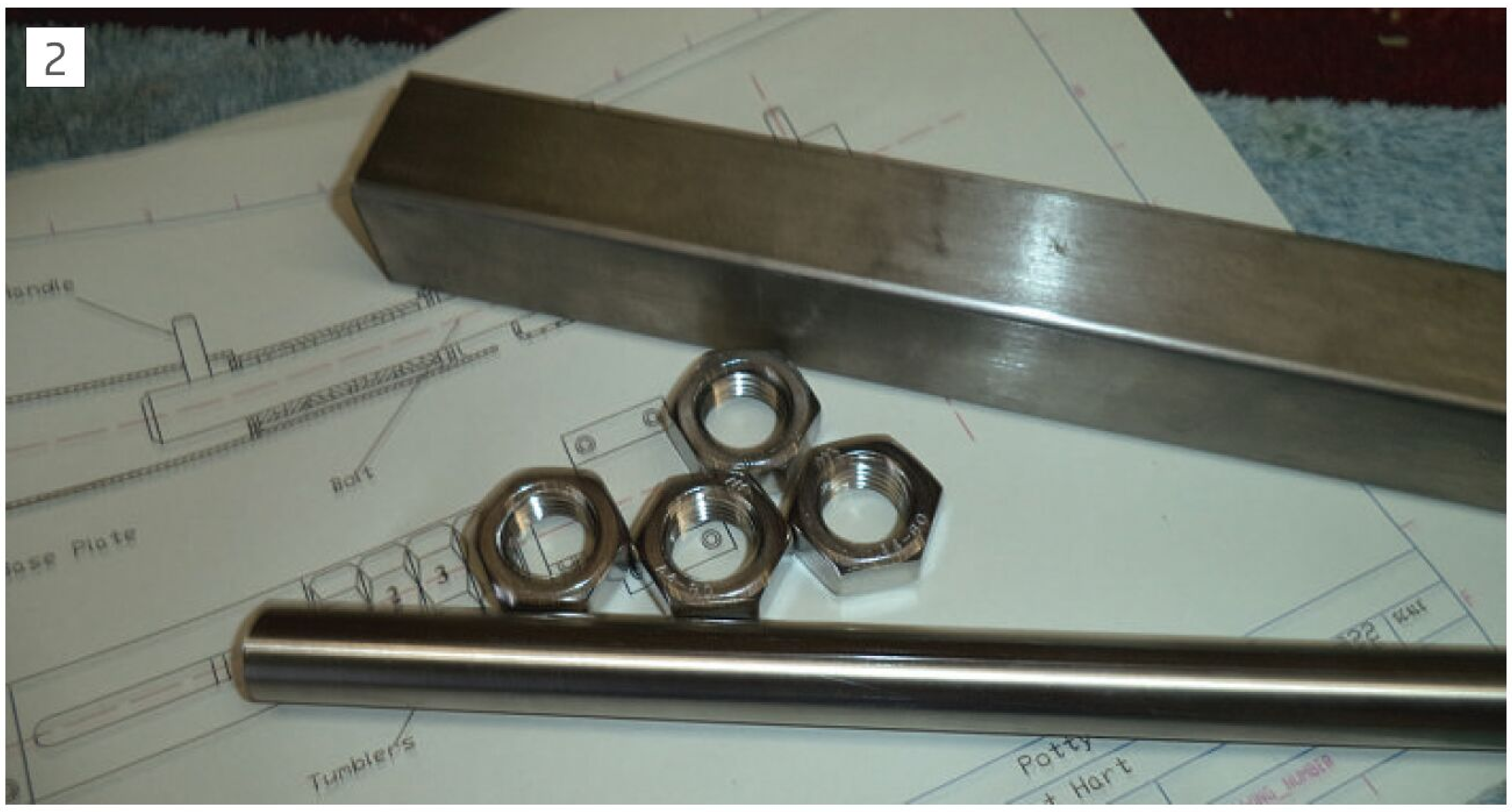


Figure 2



Stainless steel material.

Machining out the base plate.

Machining out the base plate.

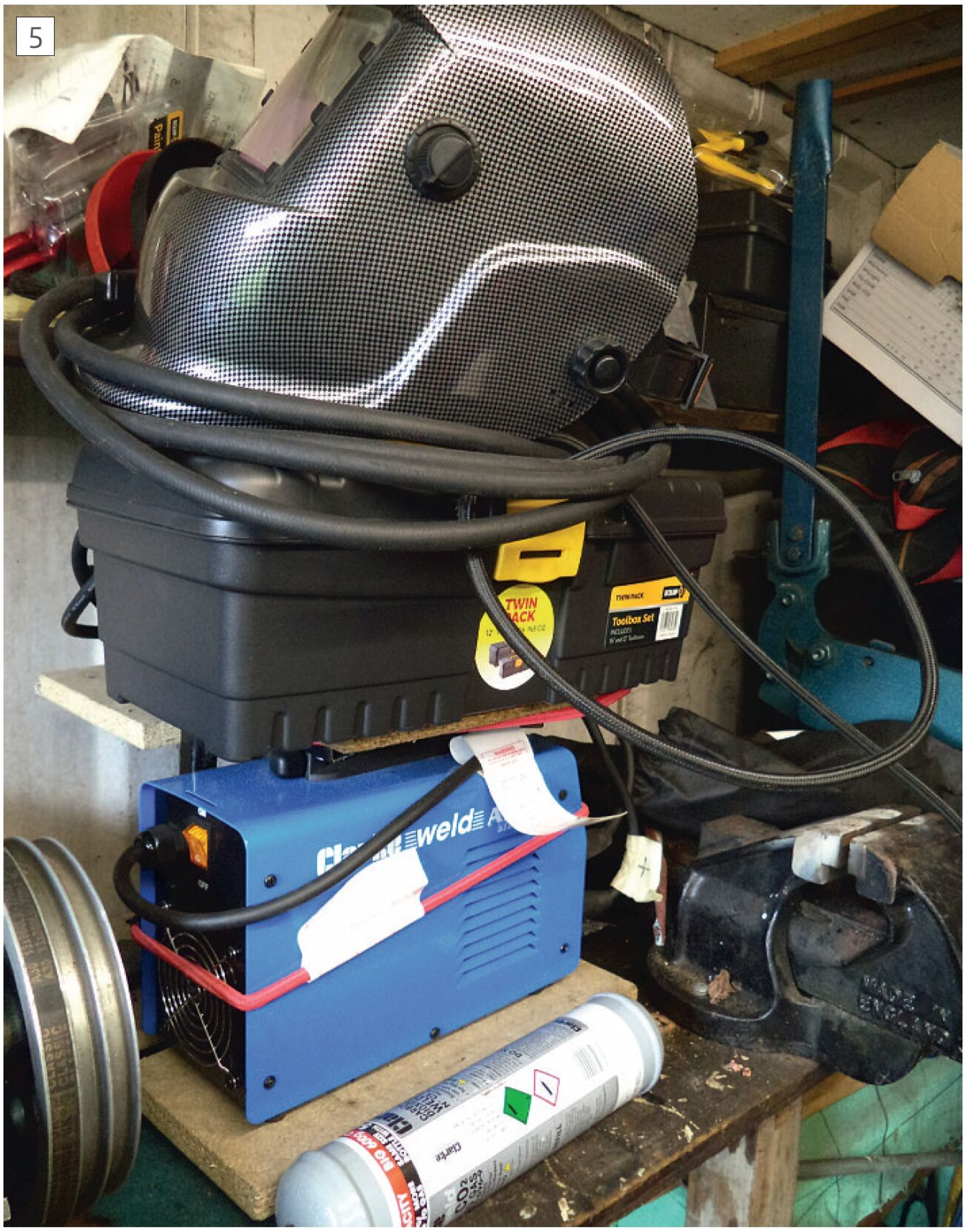
as a deterrent factor, and I've designed in the provision for hidden fixing screws, **photos 1** and **2.**

Stainless steel can be difficult to machine particularly grades used in the food industry for vats and pipe work, it can be tough and springy to cut generating a lot of heat. It's best to use slow speeds and use plenty of cutting oil, you will probably find that the box section is one of these difficult to machine materials. Stainless steel bar for the bolt can be obtained in free cutting grades, S303 is one such grade but these grades are not quite as stainless as food grade stainless, forgive my terminology, but they will serve our purpose nicely.

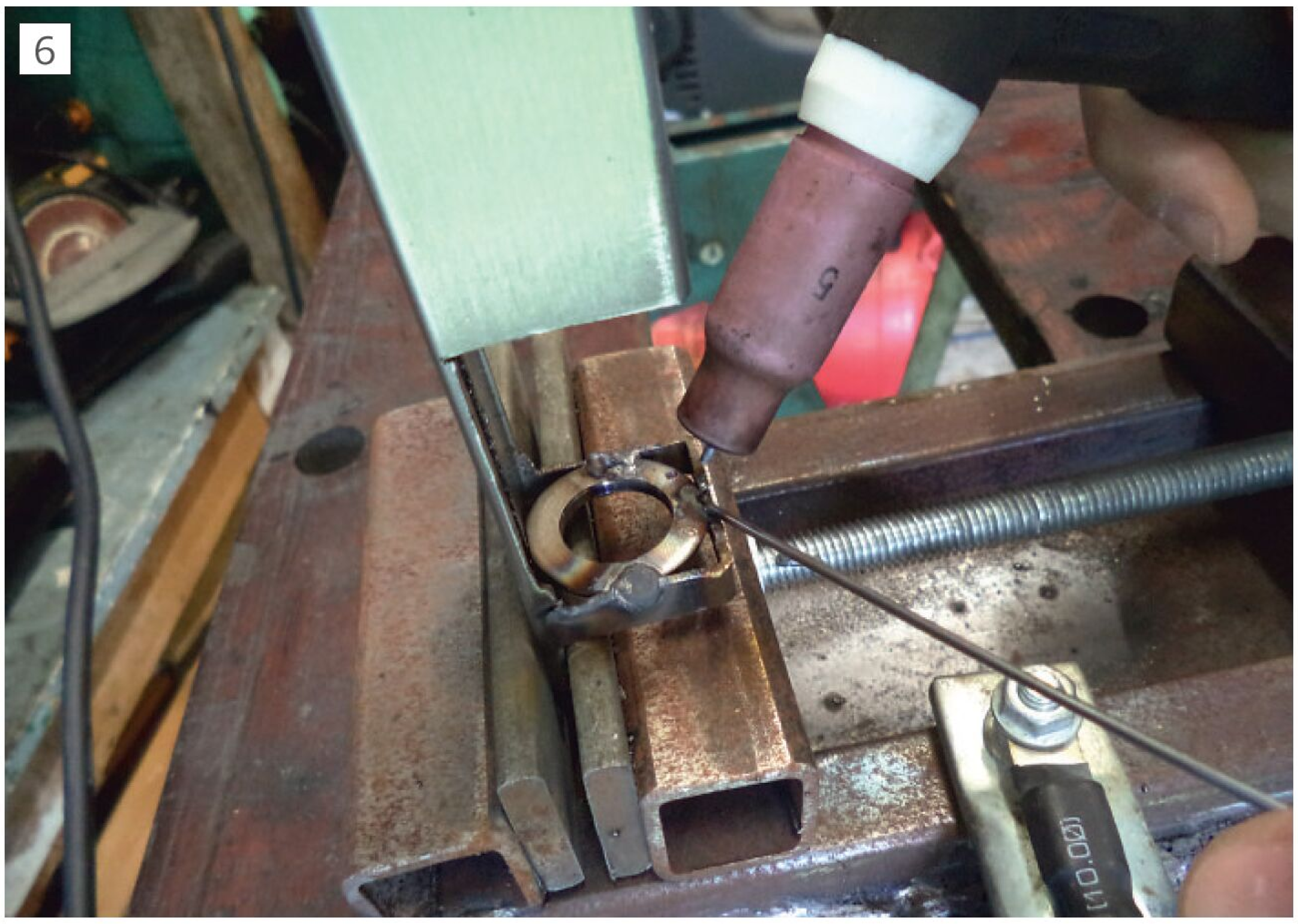
Starting with the base plate, **fig. 2**, manufactured from box section:
Mark out and cut away the unwanted material, this can be quite easily done using a combination of drilling, milling and hacksawing. By changing the face the slide slot is cut in, will allow you to mount the lock in a different way, but this will have an impact on the orientation of other features, more about this later. Next you need to machine out the bore of the M15 washers. Three different bore sizes are used and it's important to get the right size washers in the correct place. The easiest way to machine the washers is in the lathe using a chuck fitted with soft jaws. Just machine the jaws with a shallow step, push the washer up to the step and close the jaws down onto it, then bore out to the desired size, and file flats on them to give a tight fit in the box section.

The catch plate, fig. 2, is made in a similar way to the base plate, so no further explanation is required except to say that it has three washers. The front one acts as a strengthening plate for the bolt interface, **photos 3** and **4**.

The washers are welded into the ends of the box section, this has the effect of strengthening the assembly. I'm far from being an expert welder, machining is my main skill area. I'm a very rough welder, I can stick two pieces of metal together, but the end results look terrible. I don't let that stop me having a try, as I've found that welding equipment is a useful addition to my workshop. So, I'm not going to go into any depth about welding techniques, but I will briefly explain ›



Welding kit.



Tig welding washers in place.

the three main types of welding which are: - Stick, Tungsten Inert Gas (TIG for short), Metal Inert Gas (MIG). All three methods use an electric arc to melt the metal, but they use different methods to shield the weld and to apply the filler rod.

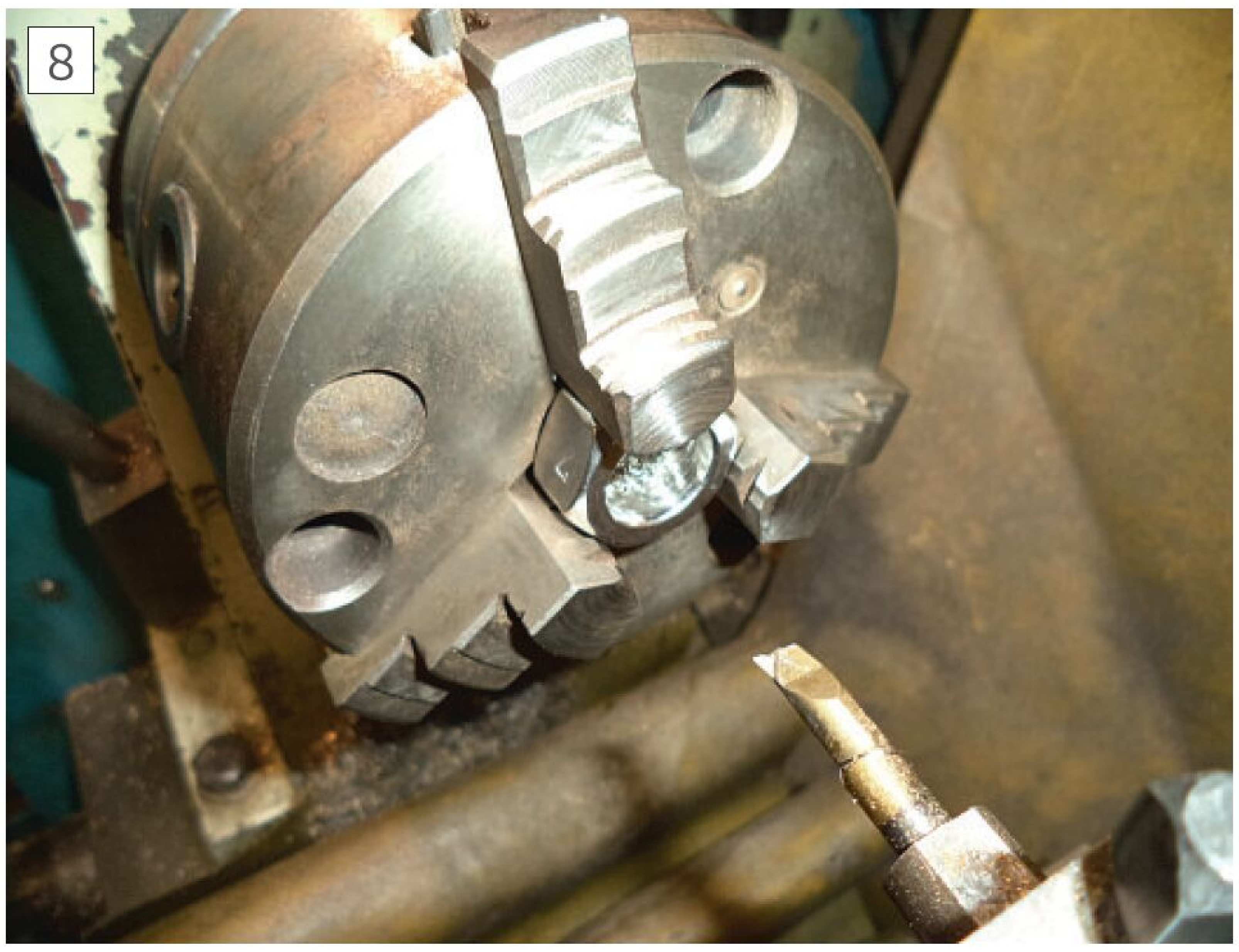
Stick welding is one of the most common welding processes. It uses a filler rod that the arc is struck from, the rod is coated in a flux that melts and shields the weld. TIG has a tungsten electrode that protrudes from a ceramic nozzle through which an inert gas flows, the arc is struck from the electrode and the filler rod is fed by hand into the arc. MIG is similar to TIG but the arc is struck from a filler wire that is fed through the center of the ceramic nozzle. The filler is usually of similar material to that being welded, and the inert gas is argon or carbon dioxide, it's important to set the correct welding amperage for the work, but here I'm getting out of my depth.

Simple welding equipment is readily available and isn't that expensive but anyone contemplating investing in some welding kit must make themselves aware of all the precautions required to carry out the process safely.

I can stick or TIG weld with my welding equipment, it is more difficult to weld thin section with stick weld as you can easily burn a hole in the thin section, so I chose to TIG weld the lock together, **photos 5, 6** and **7**. It's worth noting the use of a home-made welding vice, you don't want to use your precision machine vice for welding, as it will be soon damaged by welding splatter so it's well worth welding together a crude vice to be used solely for welding, but that's another project to write about.

The tumblers, fig. 3 (to follow in part 2), are made from M16 stainless steel nuts, there are three different types of tumblers required, to allow them to nestle together, this is so the inner workings are concealed from any lock pickers. The two inner tumblers are the same and the two outers are different, they need to be machined to a sloppy fit if you make them too tight the lock won't work smoothly. The first job is to machine out the bore to 16mm diameter to give a sloppy fit on the bolt, don't worry if you don't machine all of the

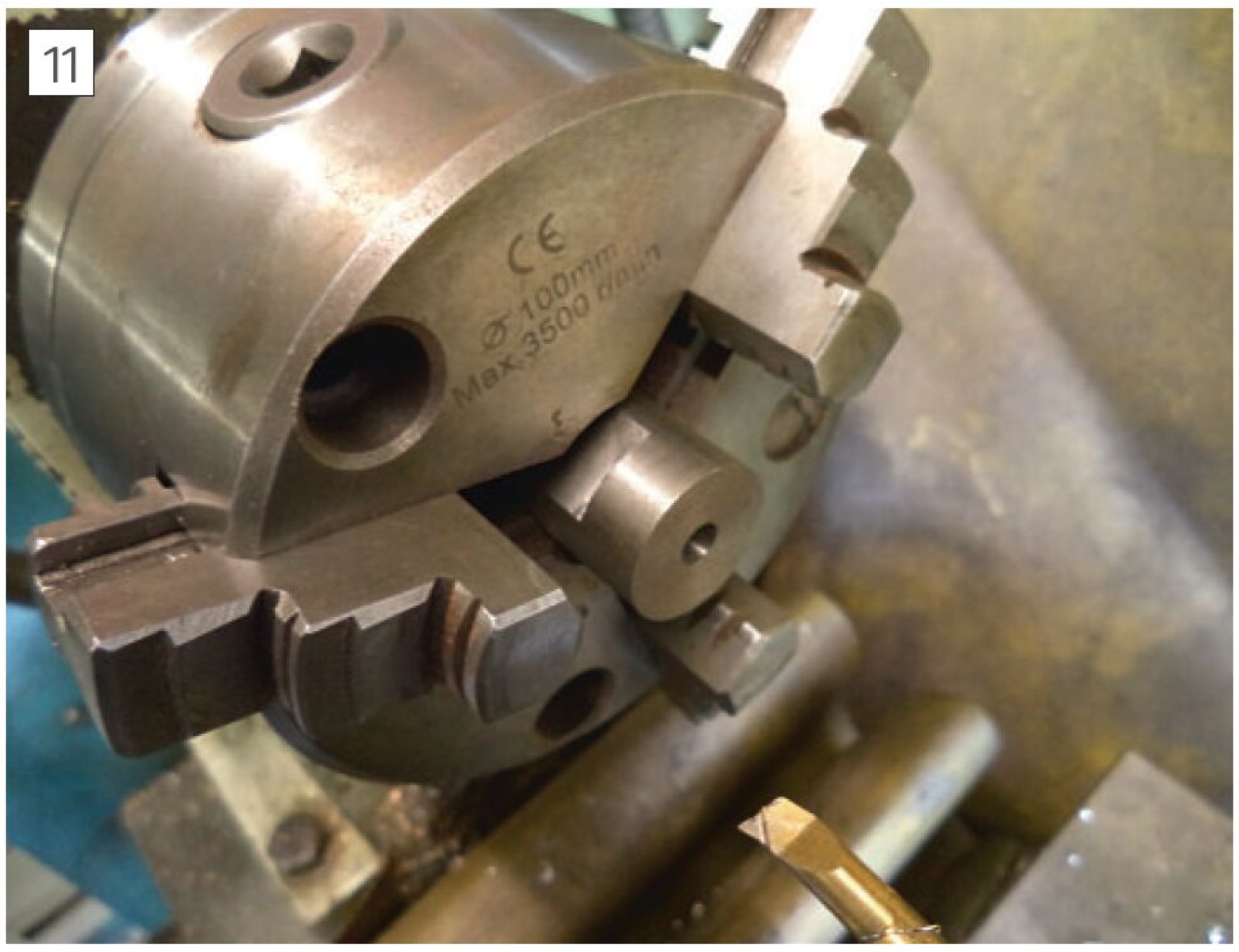
Tig welding washers in place, note homemade welding vice.



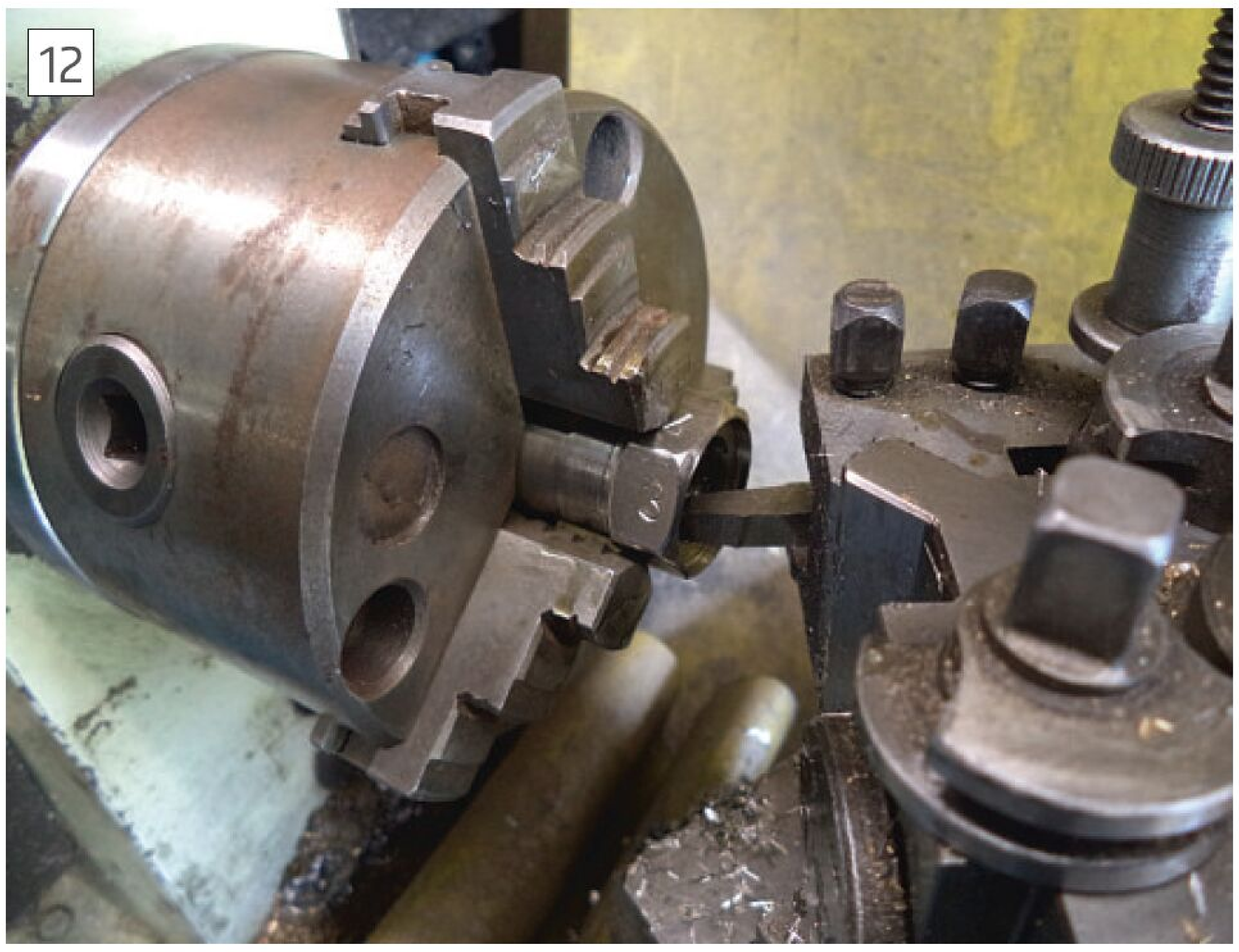
Machining tumblers out to 16mm.

Grooving tool ground from high-speed steel.

Back stop with draw bar.



Back stop in chuck.



Machining groove using back stop.

thread away as this won't detract from the lock working correctly, it will pay to machine a few spares just in case you make a mistake with the subsequent machining. You will now need to make a special tool to machine the 3.2mm groove from a piece of high-speed steel, **photos 8** and **9**. Sometime ago I made a back stop for my lathe using a blank M3 morse taper threaded to take different stops, **photo 10,** I fitted this to my head stock with a wide stop to take the nuts, **photo 11.** The use of this stop will greatly simplify the accurate machining of the tumblers.

Machining the outside diameter.

Machining the internal step.

Deburring the bore using emery cloth and lapping stick.

The first job was to face off tumblers 1, 2 and 3 to 12.3mm wide and to face off tumbler 4 to 10.5mm. Tumblers 1,2 and 3 are grooved at the same setting, put tumbler 1 in the chuck pressed up against the back stop, touch the face of the tumbler with the grooving tool, zero your dials and advance the tool 5.25mm plus ½ the width of the grooving tool, zero your dial again, this will give you the correct position of the groove. Advance the tool until it starts to cut, zero your cross-slide dial and advance the tool 2 and a bit mm and zero your dial again. Remove from the chuck and put tumbler 2 in hard up against the stop and working to your zeroed dials machine the groove, repeat for tumbler 3 if you get it correct all three tumblers will be grooved the same **photos 12, 13, 14** and **15**.

● To be continued

BEGINNERS WORKSHOP
These articles by Geometer (Ian Bradley) were written about half a century ago. While they contain much good advice, they also contain references to things that may be out of date or describe practices or materials that we would not use today either because much better ways are available of for safety reasons. These articles are offered for their historic interest and because they may inspire more modern approaches as well as reminding us how our hobby was practiced in the past.

PANEL BEATING

Beginner's Workshop

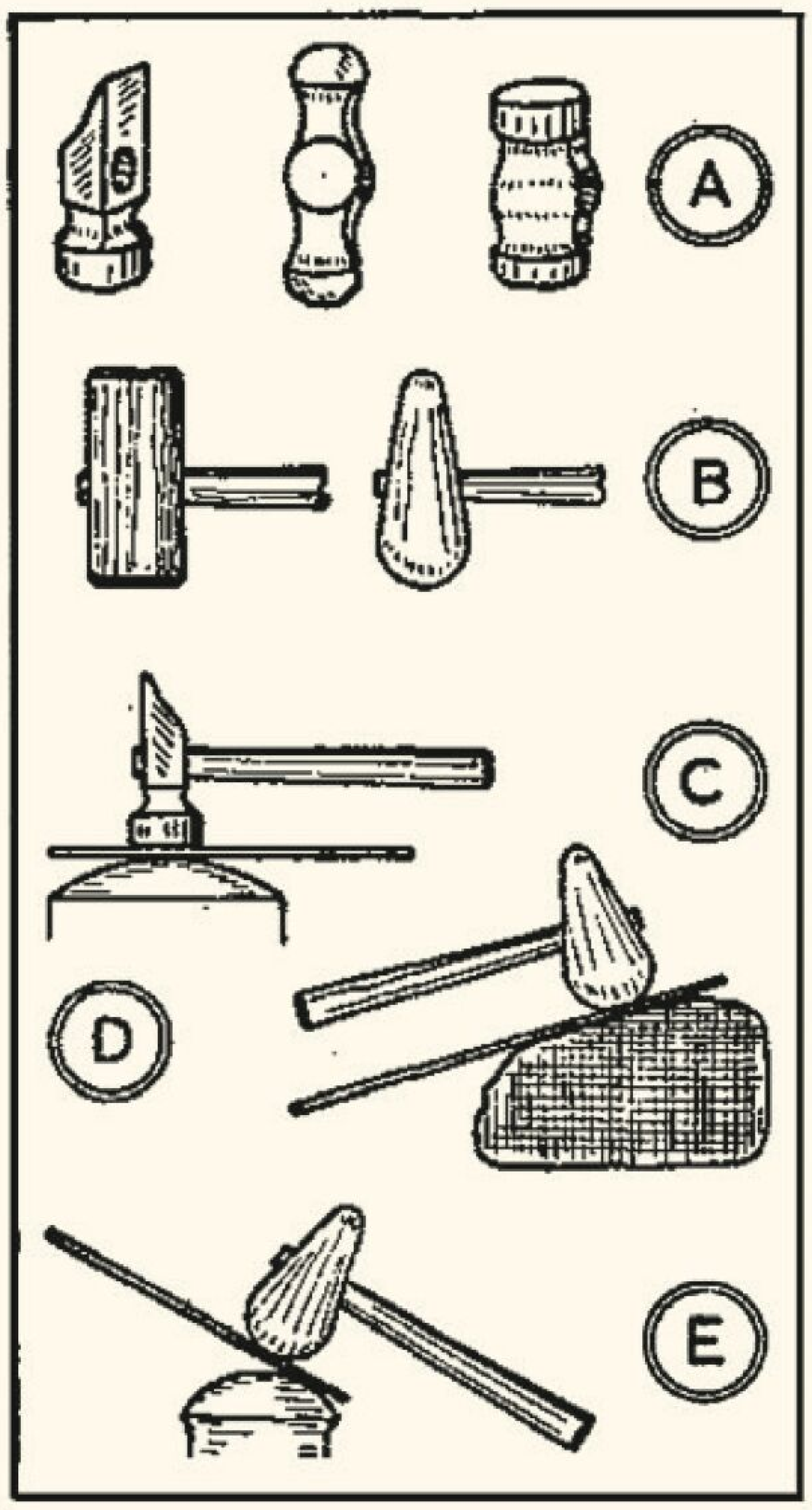
By

Geometer

WHILE commercial panel beating is a highly skilled process demanding years of practice for proficiency, many of its principles are sufficiently easy to assimilate, and by restraining one's ambitions until experience has been gained success in some degree is not too difficult.

Neither are materials-soft aluminium, brass and copper sheet, well annealed and between 1/32in. and 1/16 in. thick-too expensive and tools may already be in the workshop.

Main types of hammers, of which there are numerous variations, are shown at *A:* (left) type for general work and stretching and riveting; (centre) type for blocking and hollowing; (right) type for finishing or planishing-removing small dents, irregularities and previous hammer marks. These may be supplemented by wood and rubber mallets, of normal and pear shape, ***B.***



To rest the metal,, a panel beater utilises " stakes " whtch have a lower end tapered to fit a hole in an anvil or block, while the heads are of varying size and shape-flat, round, convex, etc. The amateur, however, may employ pieces of steel bar held in the vice, the ends filed and smoothed to different shapes. A sandbag is always essential.

Kinds of blow

Three kinds of blow may be struck. A resilient or elastic blow is when the instrument used is a wood or rubber mallet and the metal is supported on the sandbag, C, as when blocking or hollowing. A metal hammer may also be used but then the blow is harder.

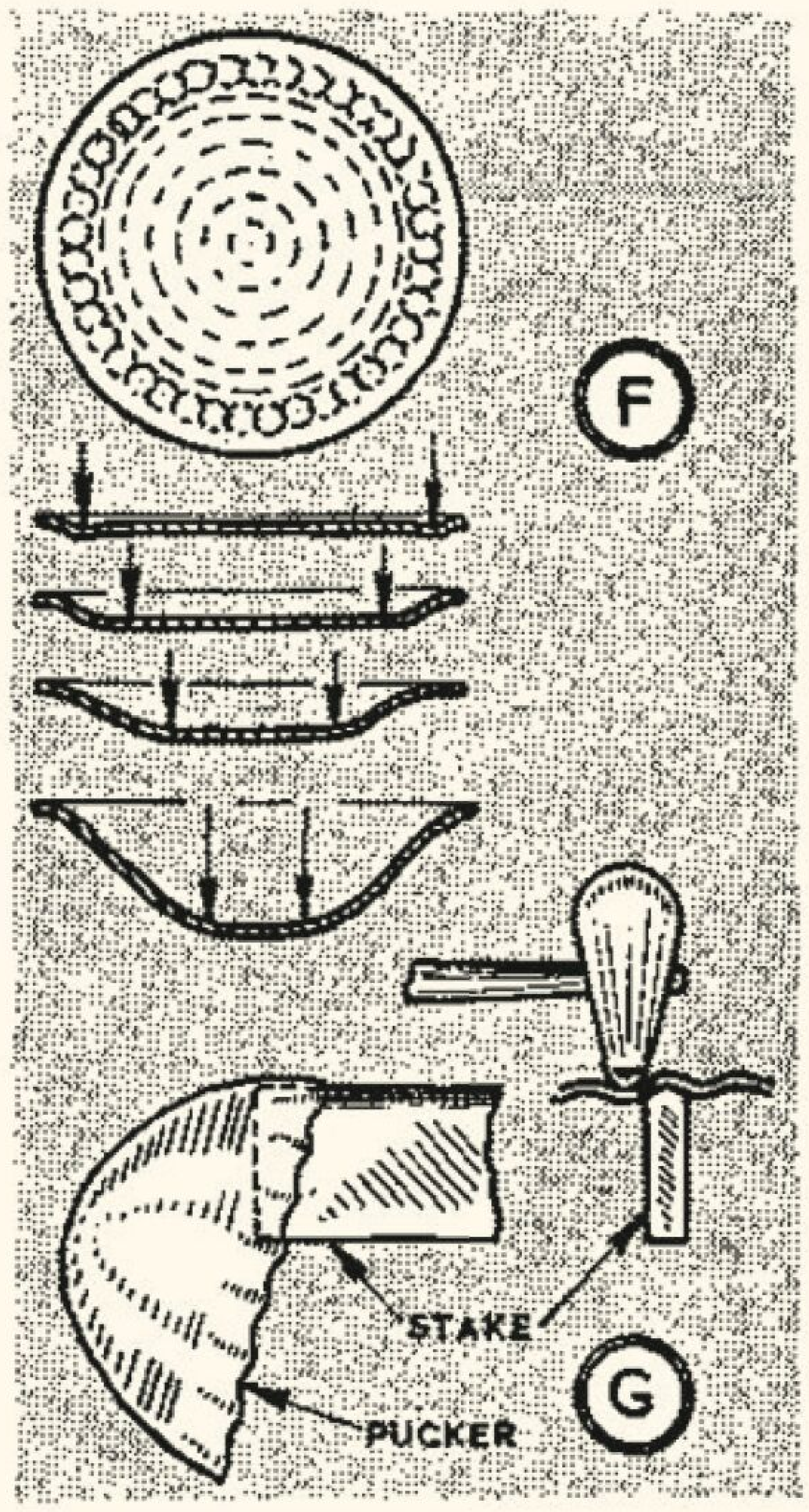
A direct blow, ***D,*** is when a hammer is used and the metal is held up from below on a metal support or stake. This type of blow stretches metal, and is also used in finishing and planishing, when blows are light and adjacent to eliminate previous marks.

A floating or off-support blow, ***E,*** with a hammer or mallet is used in conjunction with a metal support, which, however, is not on the line of impact. This type of blow will also dent and shape metal.

A simple bowl shape commencing as a flat disc is perhaps as good as any for initial practice, and it demonstrates the two methods which may be employed-hollowing and raising. In hollowing, the metal is stretched and thinned; while in raising its thickness remains much the same.

Using a ball-ended hammer, *A* (centre), or a pear-shaped mallet, the disc, ***F,*** is held by hand supported on the sandbag, and a circle of closely-spaced blows is struck round just within the periphery. The disc is slowly rotated a little after each blow and the result is a shallow channel.

The first circle of blows is succeeded by another of smaller diameter just touching the first; and the second circle is followed by a third-and so on to the centre. Should the hollowing not then be sufficient, another start is made near the outer edge.



In shaping by raising, the disc is held supported on a round steel or hardwood head, and floating or off-support blows, ***E,*** are struck in circles. The disc tends to pucker round the edge, and each pucker is carefully tapped, a little at a time, out towards the edge of the disc. Attempting to hasten the process may result in the puckers flattening, overlapping, and the metal cracking.

Puckers may be deliberately formed if necessary, and this method employed for raising. A round-edged stake, G, **is** used to support the edge of the disc, and the metal struck at the side to form each pucker. If this is done on a flat disc, the metal is then driven towards the centre, supporting on a round hardwood head, and employing floating blows. Planishing at the finish is performed with a flat hammer on a round or curved steel head.

Readers' Tips

Don't Lose Your Grip

TIP OF THE MONTH WINNER!

This month's winner is John Harding with a tip for those of us with arthritis or painful hands. And a quick note: please see 'On the Wire' for news of a Chester Machine Tools open day in December!

Pain in the fingers drove me to adding handle extensions to tools such as the chuck key in the photograph. This solved the pain and also yielded the bonus of eliminating drill slip, so it could be an idea of benefit to anyone really.

John Harding

We have £30 in gift vouchers courtesy of engineering suppliers Chester Machine Tools for each month's 'Top Tip'.
Email your workshop tips to **meweditor@mortons.co.uk** marking them 'Readers Tips', and you could be a winner. Try to keep your tip to no more than 400 words and a picture or drawing. Don't forget to include your address! Every month we'll choose a winner for the *Tip of the Month* will win **£30 in gift vouchers from Chester Machine Tools**. Visit **www.chesterhobbystore.com** to plan how to spend yours!

Please note that the first prize of Chester Vouchers is only available to UK readers. You can make multiple entries, but we reserve the right not to award repeat prizes to the same person in order to encourage new entrants. All prizes are at the discretion of the Editor.

Funding Model Engineering Part 1

Martin Berry shares his thoughts on how to make our hobby more affordable.

Model engineering can be one of the more expensive hobbies, but the cost is proportionate to your aspirations. A mini-lathe and a drill press or perhaps a small bench top mill may be perfectly adequate for some to make small steam engines or models, while others might aspire to a more substantial Colchester or Harrison lathe, Bridgeport milling machine, surface grinder and power saws for making large locomotives or traction engines. Unless you happen to have access to such equipment at work or a local college, there is going to be a capital outlay to buy not only the machines, but also the accessories. Then there are hand tools, measuring equipment, materials and consumables to consider. Unlike many hobbies, model engineering is not a hobby you have an initial capital outlay and an annual maintenance cost (e.g. club subscription), the outlay keeps on going the more you get involved.

I started model engineering in my late teens at the latter end of the 1970's with a new Cowell's lathe, **photo 1**, living with my parents and having, after a household commitments and running a motorbike, a degree of disposable income. As my hobby grew, I bought new and occasionally second-hand tools, although the realisation of relative expenditure soon caught up with me and second-hand purchases became the norm. As my engineering aspirations grew, so did my desire for a larger lathe. There were no affordable Chinese imports then. What I really desired, a Boxford, rarely came up on the second-hand market and a new Boxford ME10 was well beyond my means. I did manage to buy a rather old Boxford model B locally and this served me for a few years until the motor

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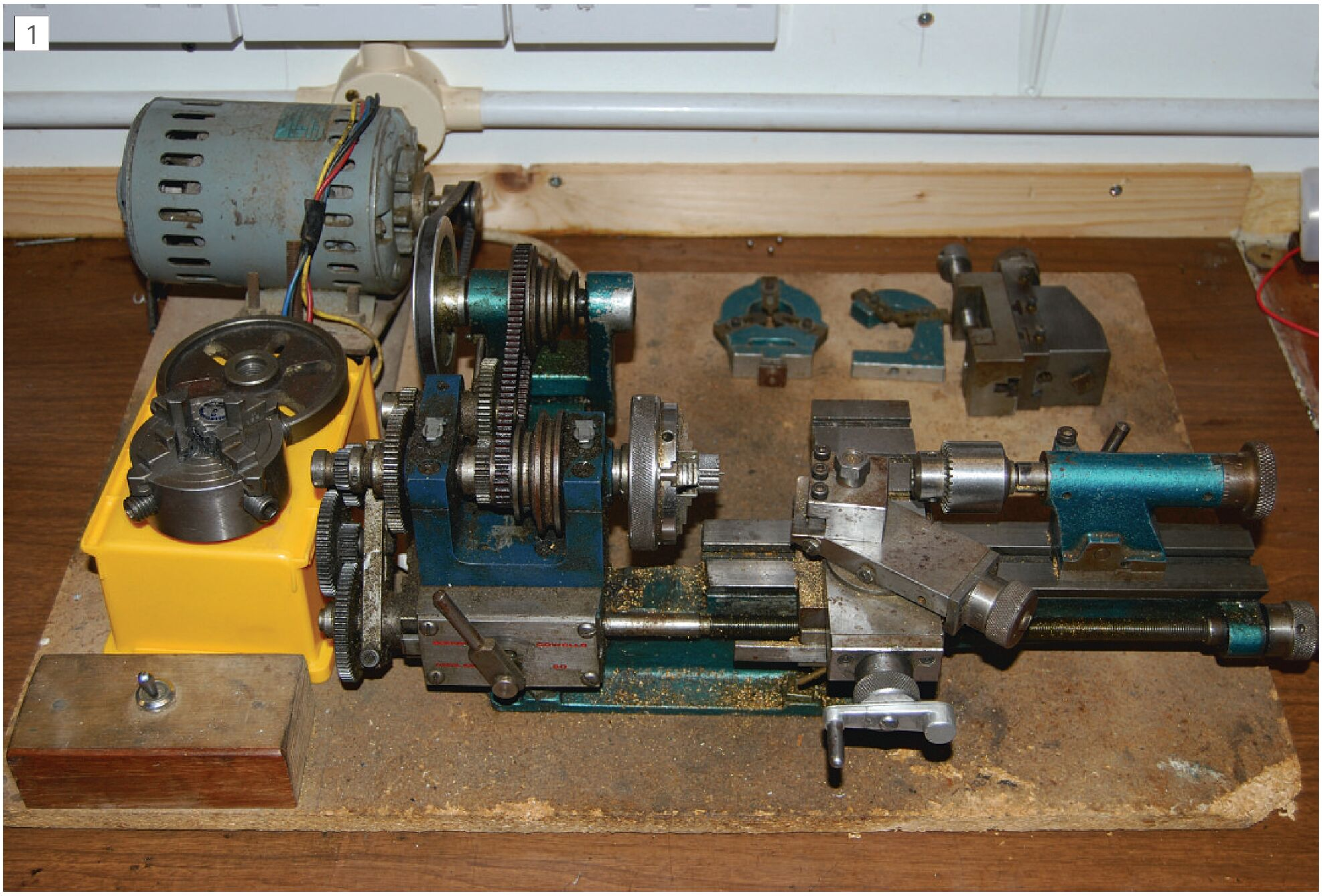


My first lathe.

decided to take up smoking, which became very detrimental to its health. I started building a Minnie traction engine and a 3.5" Tich locomotive but found that I was spending a large proportion of my time making other things, particularly tools to make tools and even tools for servicing my motorbike.

Then I secured a job away from home and the inevitable mortgage resulted in economies; hobbies, especially the expensive model engineering, fell by the wayside. After a few years, financial pressures eased, I stated to procure some more modern equipment, including a Boxford AUD and a Dore Westbury milling machine, all second hand. Along came marriage and the benefits of a dual income so I eventually splashed out on a new Wabeco F1200 milling machine followed, a few years later, by a dedicated workshop. The arrival of children reduced my disposable income and time available for hobbies, but the biggest blow was caused a few years later by the recession, when a dual income reduced back to a single income, as my wife lost her job, with further uncertainties of holding onto my own. At this time the motor on my Wabeco mill stopped working and the prognosis was expensive; a replacement variable speed drive was needed – it was not going to get repaired in a hurry. My relatively casual approach to financing my hobby had come to an end and financing the family in uncertain times was now my immediate priority to the detriment of anything else, a depressing situation I felt resigned to.

After a while I decided that, if I wanted money to finance my hobby, it would have to come from sources other than my regular income. This article summarises some of my experiences and thoughts on providing a revenue stream and minimising capital outlay to allow my workshop to stay operational. While the title of this article states "funding", some of the activities discussed below are cost avoidance. Several activities I've practised over many years, while others are more recent, and a couple are opportunities which I'll not personally bother with! I'm sure most readers will have, in some way, entertained similar ideas and activities.

Scrounging

In my early career, I worked in industry, so had access to odds and bits of mostly steel, always of unknown composition, and pieces of cast iron. Over time, I spent less time on industrial sites to the point where visiting the odd factory became a real treat. Once, in a factory which was relocating, I was directed to a skip where there was a pair of small fly presses, and in one of the workshops a box of surface grinder wheels. One fly press went into the workshop and the other to a tool dealer in exchange for some small tools. Closure of my company's office, provided me with a stock of 50 x 10 mm mild steel, acrylic sheet and aluminium extrusions from office partitions, box section steel from desks and loads of M5 screws. Scrapping old instruments, photocopiers, office printers and the like brings all sizes of useful round bar material, bronze bushes, screws etc. Many of the projects I undertake have used materials scrounged from one source or another.

My biggest bargain scrounge was a Harrison universal milling machine which was standing in a service corridor of a hospital I was working at, ready to go to the scrappy. After a quick word with the hospital Chief Engineer and the mill was, if I wanted it, mine; all I had to do was take it away. This I did for the cost of hiring a tail-lift van, a pallet truck and some muscle.

Unfortunately, scrounging requires you have the space to store said scrounged items until the day you need them. In my case, for over 40 years, and having piles of apparent junk can cause domestic friction, unless you can turn some of it into something useful or effect an urgent repair, and then point out the benefit of having a stock of useful material. As a long-term interest, casting metals necessitates the collection of castable metals, mostly aluminium and brass. It is about time my pile of scrounged materials was turned into something more interesting than a shed filler.

Recycling

Recycling is no different in principle to scrounging, except that it applies to materials recovered from life expired items at hand. Most of the copper I have comes from replacing the heating system in my previous and current homes and this also includes brass valves and fittings. I also saved all the wire ripped out when my previous house was rewired. Stripping wire from the insulation is a tedious process but it is safer and more environmentally friendly than burning it, not to say attracting less attention from the neighbours and the local environmental health inspector!

If separated, these metals (virgin metals have a better value if not mixed or coated in plastic) could go to the scrappy and improve cash flow although, as previously mentioned, I have plans for casting and to make my own bronze and gunmetal so I am saving it for now. The same applies to all the miscellaneous aluminium items I've rescued. Similarly, old motors are broken down for the copper and other bits of domestic appliances salvaged before the valueless carcase is carted off to the local waste recycling centre.

Selling Surplus Equipment & Other Items

After buying a bigger and better machine, I have a terrible tendency to hang onto the old machine, mostly for sentimental reasons and sometimes because I'm sure it will come in useful for doing some smaller jobs. Inevitably, said machine gets used as a shelf and sits there for years gathering dust and becoming an inconvenience as I invariably run out of space to move. Many of the hobbyist machines have a good resale value, especially if they do not need more than two able bodied enthusiasts to move and will go in the back of a decent sized car. Selling not only releases cash for re-investment, but also prevents having to invest in a further extension to the workshop.

I've sold a number of tools and miscellaneous materials through the Homeworkshop.org.uk site (it's free, although a contribution is welcomed by the site's administrators). If you belong to a model engineering or similar club, then club sales or word of mouth is another outlet opportunity. And, of course, there are the free adverts in Model Engineers' Workshop and www.model-engineer.co.uk.

Selling should not necessarily be constrained to workshop related items and anything from the domestic environment can be considered to help release space and raise a little cash. These days it's surprising what people will buy, and I've sold everything from old sales brochures, books, tools, broken printers, cabinets, shelving and bits of machine tools. Applying some engineering to a ride-on toy digger, no longer wanted by my children, returned it to a good solid working condition which allowed it to be sold for more than it was bought for new!

Don't Be Afraid to Sell at a Loss

If you can't sell at the price you want, it may be worth even less in the future, especially if it contains electronics, or may not sell at all. An early sale improves your cash flow and your ability to buy tools and materials which will be useful to you now.

Buying and Selling via Auction Websites

Auction sites place all sorts of useful items and junk at our fingertips, some good, some bad, some a bargain and some ridiculously over-priced. Similarly, they provide an outlet to sell your surplus and largely abandoned items to raise cash needed to feed your hobby. The most popular on-line auction site is eBay, and my comments below relate to this auction site, although other auction sites may have similar considerations.

When buying, the key here is to know what a sensible price for the quality of item you are looking at is, and stick to it. Not getting carried away and bidding those few extra pounds to win the treasure is a must, as someone else will be doing just the same. Unless something is truly a rarity, there is always a chance that another one will pop up at some time.

Buying local saves on postage but if a collection option is not mentioned, it is always worth checking with the vendor, as I've found some who, for some strange reason, won't accept personal collection. Postage rates vary and an apparently low item cost sometimes comes with a high postal charge to compensate.

Often a vendor will indicate a buy-it-now (BIN) price, to tempt you to snap up the bargain before anyone else. But, I've generally found that bidding prices don't get too close to the BIN price so it is often worth just bidding and hoping for the best.

An advert which has multiple decent quality pictures from all angles is a good sign that the the buyer is keen to show off the quality of the article he is trying to sell, so there is a good chance that what you get is what you expected. Conversely, poor pictures showing no detail may mean that the seller either does not care but also may not want to emphasise a blemish or fault with the item. The same applies to the listing description; a schedule of faults shows the seller as being as honest as possible whereas a widget "in good condition" says nothing at all. However, there is another way of looking at this; a poorly described item with a poor picture may put off a lot of bidders and so there may be less bidding competition. Most of the items I have secured at a bargain price fell into the poorly listed category. So as a seller, the more detail you provide, the better your chances at getting a good price. The description of "Barn Find" should be treated with utmost care as it is often a way of the sellers divesting themselves of any responsibility for the authenticity or condition of the object.

Quite often you may see an item being re-listed continuously, clearly not being sold, probably because it is over-priced. It is worth contacting the seller and offering a sensible price and asking them to re-list with a BIN price.

There are a number of considerations to selling, the main one being, how much do you want for the item. Some items are much more saleable than others; Boxford and Myford lathe accessories will sell, but old hand tools may not.

Nowadays eBay listing is largely free for occasional sellers like model engineers as you need to list more than 1,000 items/month before a fixed listing fee applies. There are optional extra fees if you want, including a 4% reserve price and 35p for each additional category you want to list in plus fees for international listings. Generally, the free listing is adequate. Once an item is sold, there is a 12.8% commission fee on the final price and the postage cost, plus 30p.

The most difficult decision is the auction starting price. A low start price encourages early bidding, but conversely, any lack of interest could mean that only one bid might be made, and you end up practically giving the item away. Whereas the buyer might have been quite willing to pay a much higher listed price. I prefer to list the item at the absolute minimum price I want for it (net of eBay fees) and hope the price gets bid. In my opinion, there is no point to paying to have a reserve price, rather than just listing at your minimum sale price. If it does not sell after a few re-listings, then a lower listing price can be applied in the future.

Within the listing, there is a buy-it-now (BIN) option, which is now free, giving the seller the opportunity to offer a potential buyer the chance to jump in and buy at a fixed price before the auction finishes; however once a bid is made the BIN option disappears. It may be difficult to judge the market value of an item to set as a BIN and I've sold several items where the bid process has taken the final sale value to significantly above what I might have thought to value it. I've also bought items which got nowhere close to the BIN price – it's a difficult one to judge!

As mentioned above, eBay also charges 12.8% commission on the postage and this should be borne in mind when determining the cost benefits of selling. I tend to value postage at cost, via couriers like Evri (was Hermes), and add £1 to cover packing materials and 15% to cover eBay's commission. Remember, if you have to buy postage containers and bubble wrap, these cost money. Offer cash on collection as an option, as this also saves you the effort of packing and arranging carriage. Large items which can't be posted or sent by the normal parcel couriers would normally only be advertised as cash on collection. For such items, people are often prepared to travel a significant distance to collect the right item. Do not restrict yourself to cash on collection for smaller items as this severely restricts your potential audience and the potential sale price you can achieve.

When selling on eBay, you now need to register your bank account and all buyer electronic payments less eBay fees are made directly to your account. Fees occurred for cash only payments are also billed to your account.

2

Cleaned and reset electric meters.

3

A 99p guillotine.

As hinted above, you need to consider the viability of selling something. Selling an item for £1, even if that's what it is worth, is just not viable as the fixed costs are going to be a high proportion of the eBay commission. The deductions are 12.8 p as the percentage commission and 30p fixed charge giving a total fee of 42.8p, leaving you with just 57p, almost half the selling price. And this does not take into account the cost of your time creating the listing, packing the item and the trip to the post office or letter box.

If you sell an item for £50, on a free listing with no other options and charge £10 postage and it actually costs you £10 to send the item the commission will be:

((£50 + £10) x 12.8%) + £0.30 = £7.98

so your final revenue is £50 – £7.98 = £42.02

Adding sufficient to your postage charge to cover materials and fees means that fees only effectively apply to the item sale price, and the resultant revenue to yourself will be £43.30, the same as for a cash sale.

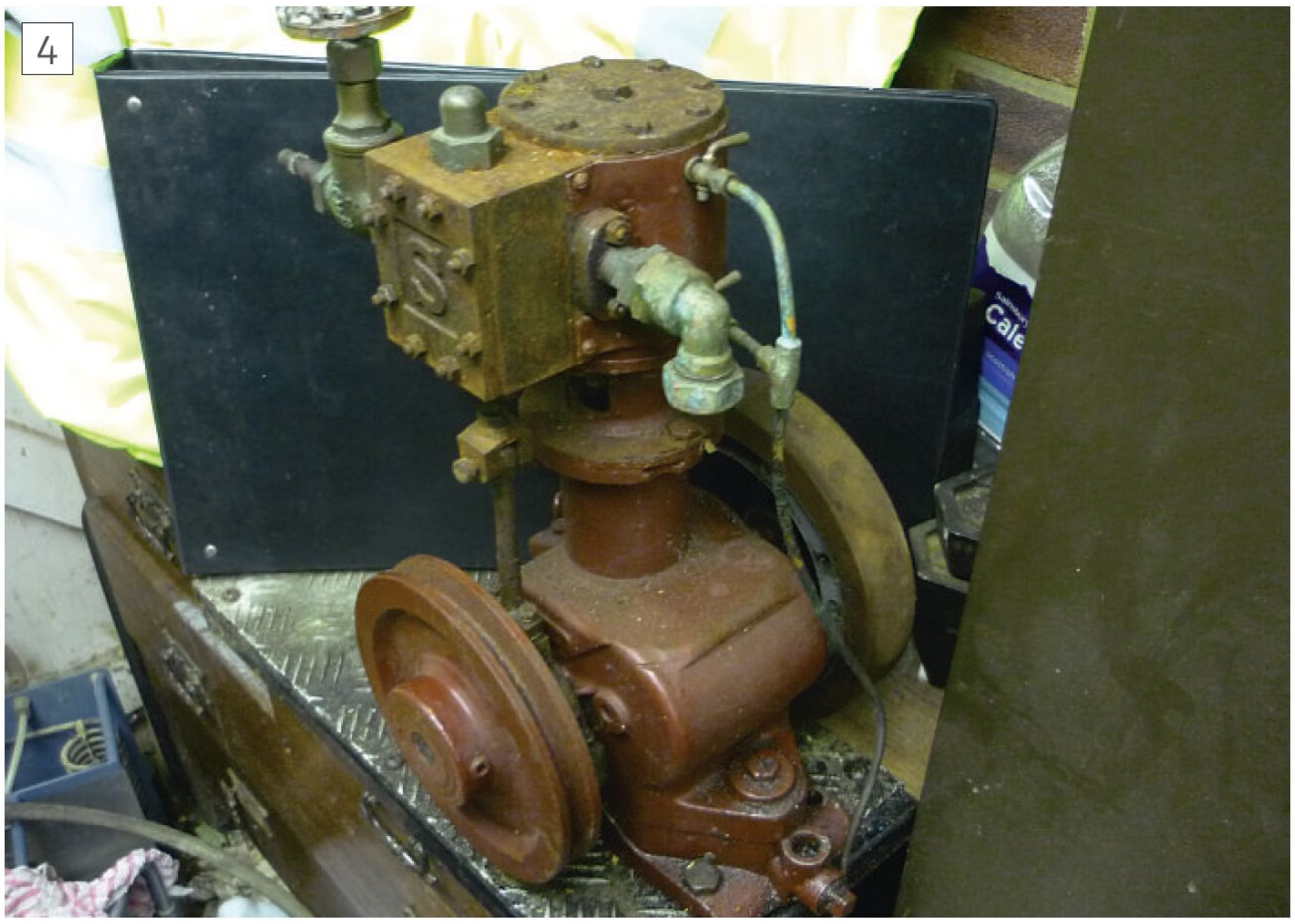
One occasional promotion to keep an eye on is the Max £1 selling fee. If you want to sell something of high value like a lathe, then this is worth waiting for. I don't know if this promotion is offered to all sellers or just established sellers.

eBay is constantly changing its options and charging structure, and the above structure was correct at the time of writing. Please check eBay's help pages for the latest terms and conditions.

Non-Auction Sites

There are other outlets for selling your surplus items and the likes of Gumtree and Shpock are classed as boot sale sites (derived from the principle of car boot sales). Both offer free sales space for private vendors and because it is not an auction, you set the price you want.

In the UK, a really good site for buying and selling anything from machine tools and accessories to steam models and other related items which may be of interest to the home workshop owner is Homeworkshop.org.uk. As well as offering an outlet for selling items, it also lists items being sought and information requests relating to machines and tooling etc. I've bought and sold via this site and helped others with information, often accessing the site daily to see what has been added. Being relatively



Hybrid steam engine advertised as a pulley.

specialised in its appeal, on average only a dozen items are probably added every week, so it's not so onerous as eBay. The site www.model-engineer.co.uk also offers free sale and wanted ads, as well as a forum for discussion.

Social media sites, like Facebook, have many topic-specific pages and groups providing a free advertising platform.

Car Boot Sales

Largely overtaken by on-line auctions, boot websites and social media groups, these are still a good way of finding that odd treasure, again ensuring that you have some idea of the price as some vendors are really traders out to make the most of their "rare as hen's teeth" items. Avoid buying no-name cutting tools (drills, mills, taps & dies, files, etc.) unless the brand or origin is clear, e.g., Dormer, Presto etc. Mahy apparently bargain tools are pretty much cheese painted to look like metal. But there are good opportunities to pick up a bargain, especially where sellers are clearing out grandad's garage and often know little about the tooling they are selling. For the seller, car boot sales generally attract those only looking for bargains, so not a good outlet for disposing of quality tools at a realistic price.

Look out for the Wanted Adverts

Wanted adverts offer an opportunity to sell something with minimal effort and at a realistic price. I've sold a few items including my Dore Westbury milling machine. The wanted advert appeared on a Thursday, details were sent to the enquirer the same day and the deal was completed on the Saturday. Another advert was someone looking for some milling machine parts. I had something along the right lines and after an exchange of emails and photographs, the deal was done. Not big money, but it would be unlikely that the items would have sold by any other means as no one would be interested at the time.

Buy with Profit in Mind

The odd bargain can be found, which may not be of direct benefit to yourself, but which can with a little effort be returned to the market after some input to, at best, clean up or, at worst, have to repair. The cost of repair has to be evaluated against the cost of spares, or the time taken to actually do the job. Spending ten hours of work to only make £10 profit is hardly worth the effort, so there is always a risk to buying and refurbishing. If the item cannot be repaired then its only value is scrap (if any) or salvageable materials, or sometimes sold as spare parts. Be prepared to make a loss, although if you know what could be wrong, this gives you half a chance of not getting caught out. Buying a refurbishment opportunity from auction sites can be problematical as it is often difficult to view the item or get useful information out of the seller before-hand to allow you to make an informed decision of whether the risk is worthwhile.

I bought five old electricity meters locally for £3, these were cleaned up and tested for functionality and all subsequently sold making over 600% profit, **photo 2**. Small scale maybe but we are not out to make a business of it.

Have an Equipment Shopping List and Know the Value of Tools

As my capability and knowledge increases, the shortcomings in my equipment continually grows, and my shopping list increases in length. Knowing what you want to acquire is linked to bargain hunting, because one day something you might want will present itself and securing it at a lower price to a new one is very satisfying.

Therefore, it is important to have a grasp of the market value of a tool. Very occasionally, I thought I'd bought a real bargain, only to realise that the saving was quite small if I'd shopped around at the time.

If You See a Bargain – Buy it

While it's worth having a shopping list of tools, always keep an open mind and scan the 'for sale' adverts. In recent times, I've found the odd real bargain including: a g-cramp for one penny, a steam engine, a large office paper shredder (for the motor), a 4" guillotine, **photo 3**, and a load of valves, all for 99p each from various vendors advertising on eBay. The steam engine was listed as a "pulley", and all I could determine from the picture was the cylinder assembly was a Stuart Turner, **photo 4**. On collecting it I found it to be a Stuart Turner 5A cylinder married to a single cylinder 2-stroke engine crankshaft. This was eventually sold for the Stuart Turner parts. The valves, I thought could be re-sold, but this proved more difficult than expected, so I reduced them to their component parts giving me a pile of round stainless-steel bar (which more than covered the cost of the valves), aluminium bronze and cast iron, the latter two potentially destined for future casting projects.

● To be continued

On the Wire

NEWS from the World of Engineering

Chester Open Week 2-6 December 2024

Following their recent successful Open Week this September, Chester are holding another event this December 2nd – 6th at their Hawarden showroom! Come along and view their latest machines and discover some great offers, just in time for Christmas!

Visit Chester at Hawarden Industrial Park, Clwyd Close, CH5 3PZ. This December 2nd – 6th, 9am – 4:30pm. What Three Words: ///ever.launch.page

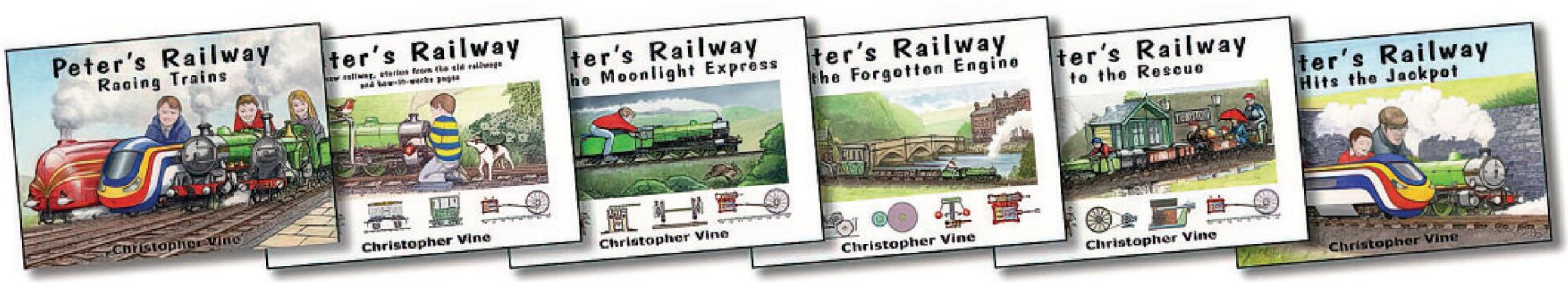
You can contact them to register interest at sales@chesterhobbystore.com or 01244 531631.

News from Chris Vine author of the Peter's Railway books

With Christmas approaching, maybe there's someone who would enjoy the Peter's Railway books. There are 20 books" in the series with something for everyone - age 3 to 90. The "Little" Peter's Railway books are for 3-6 year olds while the other titles, especially the hardbacks, are for older inquisitive kids (and adults) who are fascinated by trains and how things work.

If you would like Chris to sign and/ or dedicate your books, please order from our own online bookshop at **petersrailway.com**. MEW readers can use the code **PRWEB** for a 10% discount.

There's also a Peter's Railway YouTube channel? **youtube.com/@PetersRailway**. Featuring behind-the-scenes views of the farm railway and Fiery Fox / Bongo, there are also technical films and fun footage of steam railways in action. In one film, Chris reads "The Picnic" and cooks sausages in the firebox... The film about building the new turning loop has now had over a million views. Chris hopes you enjoy it too.



Polly Model Engineering under new ownership

At MMEX I was able to catch up with Matthew Atkins Thomas of Polly Model Engineering. Following Andy and Julia Clarke and Pete Thomas's decision to retire, employees Matthew and Julia Atkins-Thomas decided that the business must go on and with Tristan Dengate of 17D Ltd, took over Polly Model Engineering.

This is great news for all Polly Locomotive owners as spares and consumable will continue to be available, as will the great range of accessories and castings for models such as Anthony Mount's stationary engines and the Practical Scale range of fine-scale locomotives. The company has moved to the old mill in Cromford, Derbyshire adjacent to 17D. Going forward 17D will be supporting Polly with CNC manufacture, rather than this work being done in house, achieving some significant efficiencies. While Polly Engineering is not producing any new kits at the moment, Matthew, who is a 3D design wizard, hinted that there are exciting plans for the future. I'm sure readers will join with us in wishing them every success for the future.

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The personalities, legendary bikes and the race track heroes who mattered then... and still matter now.

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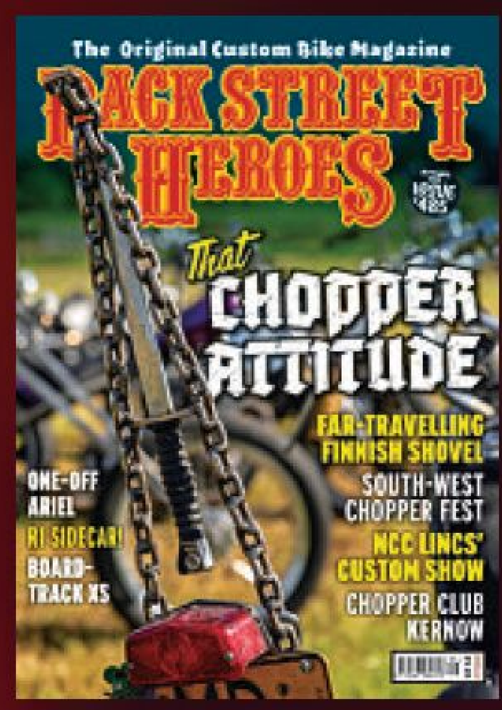
Celebrating the rich history of motorcycles and motorcycling, then and now.



The original and best mag for choppers, bobbers and all kinds of customs!

For news, innovative features, tech talk and practical tests, head to *Fast Bikes.*

Real-world tests of the latest bikes and kit, places to go and features not to miss.

Running, riding and repairing Japanese, European and US classics from the 70s onward.

The best classic and modern scooters. For enthusiasts, by enthusiasts.

Your guide to buying, running and owning a classic. Broad minded with a practical twist.

UK's premier nostalgia magazine, covering every aspect of life from the 1930s to today.

The Bible of the British-US car scene. If it's American and got wheels, we've got it covered!

For those who like building model boats, or just enjoy soaking up this huge hobby.

UK's biggest model flying mag packed with reviews, features and expert opinion.

From steam locomotives to new developments in scale engineering.

Britain's best magazine for those who love to grow their own fruit and veg.

The best rail news, features and images covering the UK's preservation movement.

Enthusiast-led content, news, in-depth expert features and outstanding imagery.

News and features for the modern traction and heritage modern traction enthusiast.

Recalling Britain's steam era through photos, recollections and historical features.

The UK's best rail title since 1897 – modern, steam and everything in between.

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Scribe a line

YOUR CHANCE TO TALK TO US!

Readers! We want to hear from you! Drop us a line sharing your advice, questions or opinions. Why not send us a picture of your latest workshop creation, or that strange tool you found in a boot sale? Email your contributions to **meweditor@mortons.co.uk.**

Headstock Indexer Errata

Dear Neil, I have just returned from a 3 week holiday in Portugal and my copy of October MEW was in the post box. I read through my article and there is an error in it. Fig 6 is supposed to be a drawing showing the handle, graduated collar and index collar components, see attachment above. In the printed article Fig 6 refers to the spreadsheet which is discussed in the final part of the article prior to the conclusion. The absence of the correct figure 6 makes the text on page 62 very difficult to understand. I think this problem is of my own making because I sent the article to you in more than I email because of its size and the drawing for Figure 6 was omitted.

Is it possible to print my apology for the omission of the correct fig 6, together with correct drawing as shown above, in the next issue of MEW?

Mike Cox, by email

Hi Mike, I remember being a little confused, your correct figure should appear on this page. Many thanks, Neil.

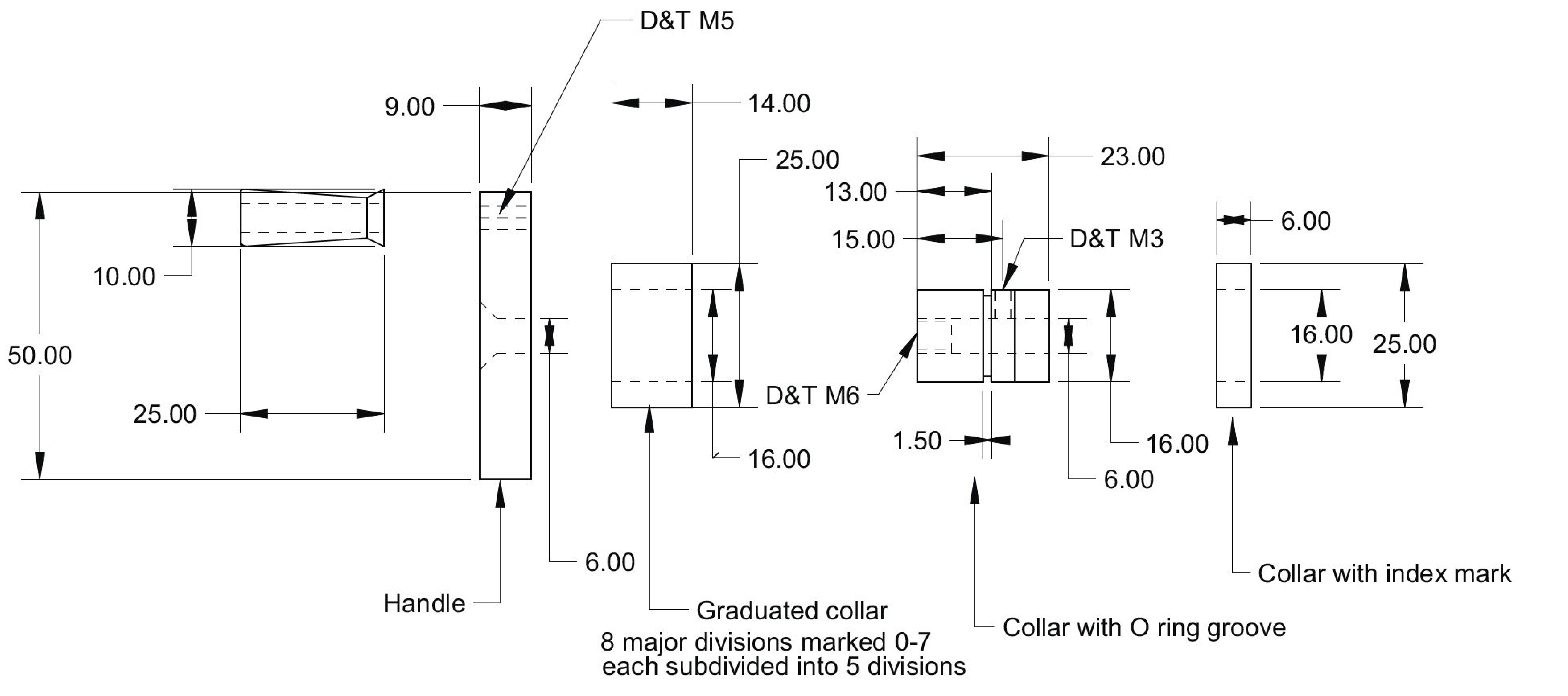


Fig 6. The components for the handle, graduated collar, and index collar.

More Fireside Reading

Dear Neil, in the October edition of MEW Wing Nut enquired about some good reads. I can recommend "Moon Lander How We Developed The Apollo Moon Lander" by Thomas J. Kelly. The author was a lead engineer on the project. I picked up a second hand copy for about $10 AUD on the internet.

Robert Walker, Australia.

Automaton Roller

Morning Neil, we've recently inherited a lawn roller (photo attached) and in trying to research the makers and origin we have thoroughly enjoyed reading your information on the internet. As far as we know the original handle is the existing one. With Thanks

Jane & Bernie Tickell, by email.

Readers may remember the Automaton Roller that was featured in my article about photo-etching. I had to guess the appearance of the handle, it seems I wasn't too far off, but not quite right!

Online Indexes

Here's a reminder that David Frith's latest Index for Model Engineers' Workshop can be downloaded on from the Forum at www.model-engineer.co.uk – just select Forums and then the Model Engineers' Workshop topic. Alternatively scan the adjacent QR code.

If you prefer the paper indexes, don't worry, David will be producing these in the future, carrying on Barry Chamberlain's sterling work.

Archive Pages

Dear Neil, in MEW no 345, the article on page 58, From the Archives "The Griptru Chuck" unfortunately the print of the reproduced article is so microscopically small that it is unreadable. I have just had new glasses supplied with which I was able to read the smallest print on the optician's test piece, I was however unable to read the text of the above article, please could we ensure that future print size is readable, otherwise the magazine is excellent.

David Wragg, by email.

Hi David, I'm sorry about that, it's a bit hit-and-miss with the archives as we are never quite sure how it will work out until we see the final printed version. That said I will try and ensure text is a bit bigger in future – Neil.

The Midlands Model Engineering Exhibition 2024

Neil Wyatt, MEW Editor, reports back from a busy four days in the middle of October.

LBSC's locomotive Ayesha first proved that coal fired miniature locomotives were practical.

I think it is fair to say MMEX 2024, organised by Meridienne Exhibitions, was a great success. As the exhibition opened on Thursday morning numbers were high, giving the feeling of the successful shows of the past. Attendance continued to be good, although it did drop a bit on Sunday, probably because of an atrocious weather forecast as the first named storm of the season barrelled through. Ironically, despite a few heavy showers and some robust winds, the expected downpour didn't materialise.

There were some remarkable rc helicopters, many were demonstrated outside.

I won't go into detail of the non-workshop aspects of the show, which will be dealt with properly in the pages of Model Engineer. Suffice to say there were many magnificent locomotives on display, from LBSC's legendary coal-fired Ayesha, **photo 1**, to a computer controlled, jet-turbine powered, loco producing insane amounts of power. Other stands included REMAP, the charity whose engineer volunteers

3

A traction engine powered sawmill.

4

Stages in the manufacture of ball-ended machine levers.

5

Lever held in a 'chullet' to machine a flat and bore and tap the large end.

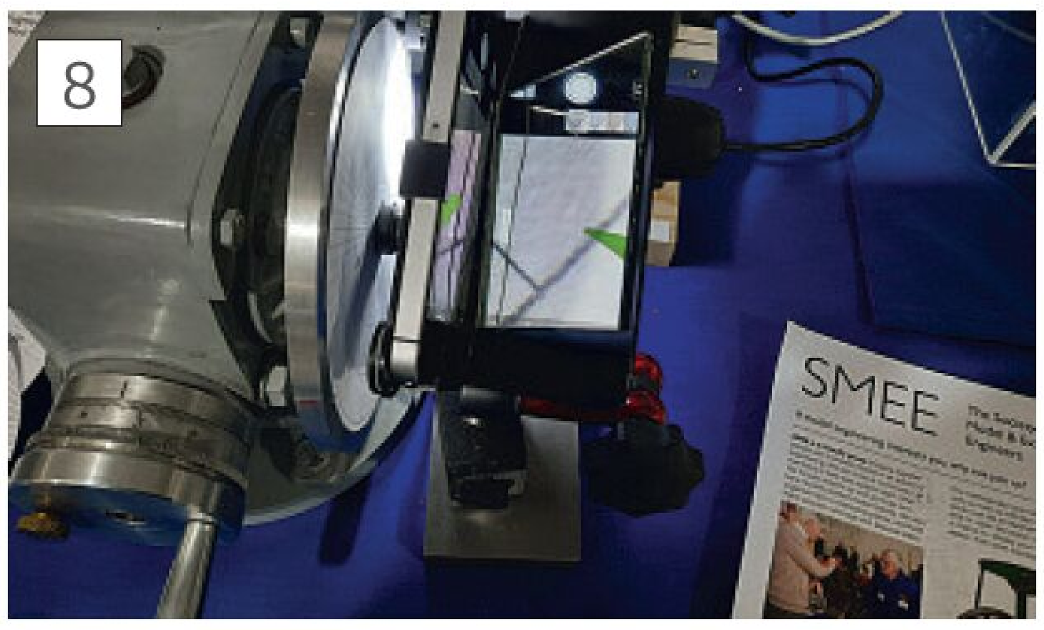
produce aids to help people overcome and cope with disability. There were stands selling all many of supplies, stirling engines, worklights, pinstriping tools, locomotives, helicopters, traction engines, brushes, paints and castings, **photos 2** and **3**. We will visit some of these in 'On the Wire'. In this issue I will report mainly on the activities on the SMEE's stand and the talks programme.

The Society of Model and Experimental Engineers

The SMEE had a major presence at the show and were giving regular demonstrations of machining on no less than two Myford Super 7 lathes, one of which was being used to make one of the small 'Elmer's Engines', whilst at the other Alan Hopwood was demonstrating parting off and making ball-ended machine levers, **photos 4** and **5**, Alan also brought along his collection of G.H. Thomas designed workshop tooling, **photo 6**. A variety of other demonstrations were given, including drill sharpening, **photo 7,** by Terry Mendham and Ralph Thompson**.**

6

George H. Thomas designed workshop tooling on the SMEE stand.

8


Jonathon Tickner's optical dividing head.

Photograph 8 shows a fascinating demonstration by Jonathan Tickner; on a dividing head he was able to fit interchangeable printouts for any arbitrary number of divisions. A mobile phone with a 'microscope' attachment and a digital microscope/computer offered two ways to line up a pointer to give rapid and confusion-free dividing. I experimented with the system and found it easy to

7

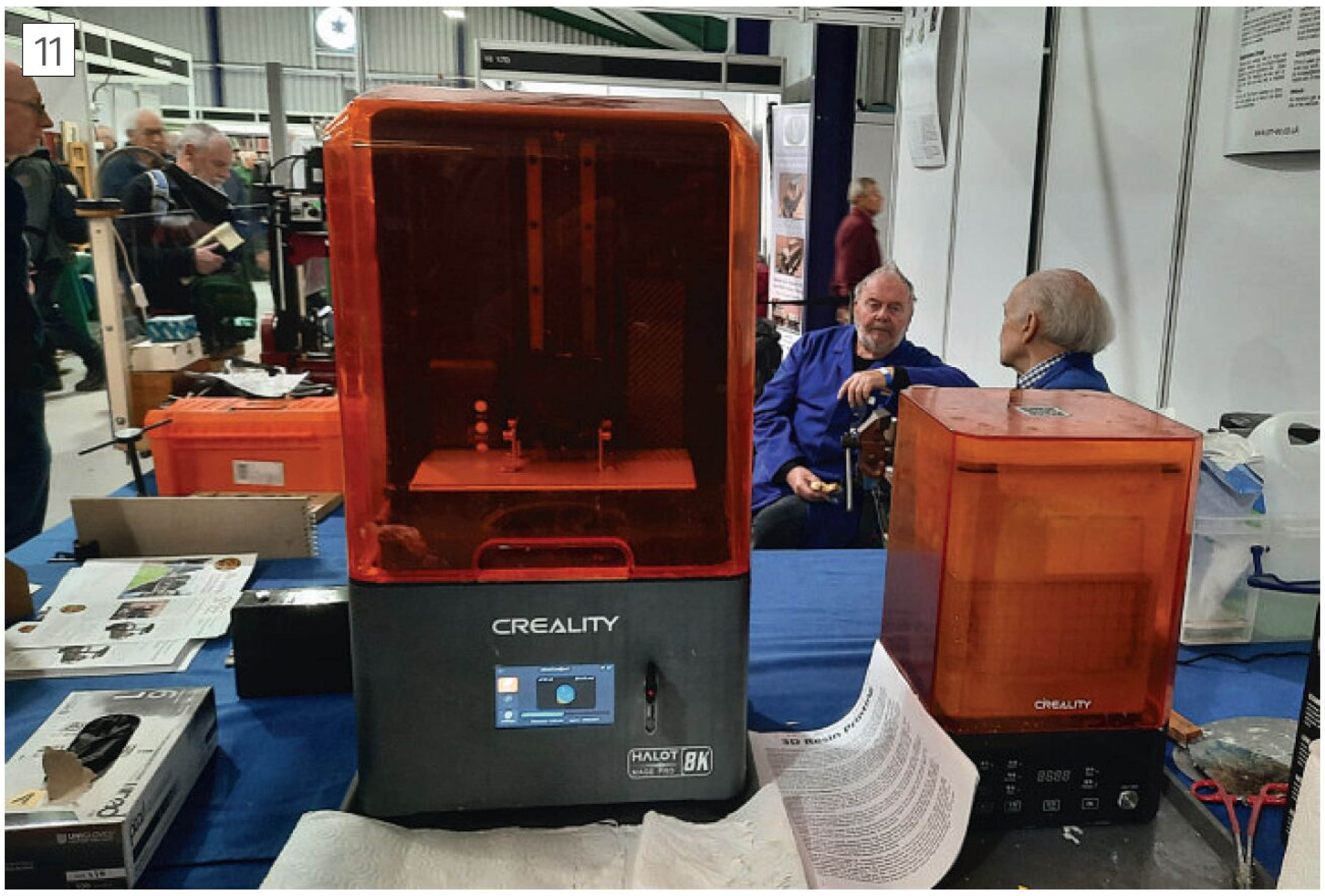
Terry Mendham and Ralph Thompson demonstrate drill sharpening.

9

Bob Reeve's gear hobber and electronic dividing system.

align the pointer with the middle of a radial line, giving comparable accuracy to using a dividing plate or the indexed handle of the head. In contrast, Bob Reeve demonstrated his electronic dividing system, featured the menu explained in his 'Arduino Map' article in MEW #261, the November 2017 issue, as well as an electronic gear hobbing system, **photo 9**. ›

The SMEE's display of completed models and tooling changes every year.



Resin printer and washer/curer machine on the SMEE stand.

The hall was at capacity for Roger Froud's talk on 3D printing.

The SMEE stand also featured a display of excellent models and tooling, **photo 10**. Just visible in the centre is one of my favourites, three stationery steam engines to the same design but different scales (from small down to tiny), all running on compressed air. Who says you can't scale nature?

Once again, I was demonstrating 3D printing on the SMEE stand. After the frantic experience of trying to keep both a resin and a filament printer running simultaneously last year, we agreed discretion was the better part of valour, and I only had the Creality Halot Mage Pro resin printer, **photo 11**. Of late there have been signs that after over 2,000 hours of printing time the LCD screen is getting rather tired. This was evidenced by thin layers of partially cured resin separating out, and they were getting more intrusive at the show, although I was able to produce some good demonstration prints. It's hard to get reliable estimates of how long the screen should last under heavy UV irradiation, with figures from 200 to 10,000 hours being quoted, so the achieved lifetime seems reasonable. Fortunately the screen is designed to be replaceable.

I should remind readers that membership of the SMEE is open to all model engineers, it's a friendly society that takes a particular interest in promoting the hobby and exploring new ways of doing things. Ther website is www.sm-ee.co.uk.

The Model Engineers' Workshop Talks Programme

In response to the feedback from attendees last year Meridienne Exhibitions improved the sound proofing for the lecture area, greatly reducing the ambient noise. I also bought a larger sound system that gave better coverage and a lapel microphone which proved easier to use than a hand-held or stand mounted microphone. We still have some thoughts on further improvements next year, not least repositioning the screen to reduce glare and possibly an even better microphone system. Attendances were generally high, particularly for the earlier times and on the busiest days, reaching about a hundred people for the busiest. But enough of the housekeeping, on to the talks themselves.

Bernard Towers (r.) receives the Stevenson Trophy from Neil Wyatt, photo: Roger Froud.

Bernard explains his eccentric chuck.

We started with a talk on 3D printing from Roger Froud, **photo 12**, with a focus on jigs and tooling that he has made to assist with toolholding in his workshop. This subject had been touched on in his talk on CNC last year, and there had been requests for more details. A show of hands demonstrated that 2D printers are now well and truly a mainstream approach for many model engineers.

After Roger's talk, we had the presentation of the Stevenson Trophy to this year's winner, Bernard Towers, **photo 13**, who had brought his eccentric chuck along, **photo 14**. There was a good deal of interest in this nicely made item too, I'm pleased to say it will be detailed in an article in the very near future.

The second talk was the welcome return of Noel Shelley, who had given many successful talks on foundry work in the past. Without any slides, Noel had a table full of practical examples that I foolishly forgot to photograph! Suffice to say he imparted a great deal of useful guidance in an entertaining way, **photo 15**. He also covered safety issues around this potentially risky activity in a way that was sensible and practical.

Malcolm High gave two talks, the first was on using different types of rechargeable batteries, especially the various lithium-based types. I've asked him to consider writing MEW an article on this topic. The second talk was on 3D printing, this time with a more technical perspective. He brought along some of his very nice 3D-printed, battery powered Gauge 1 locomotives to illustrate both talks, **photos 16** and **17**.

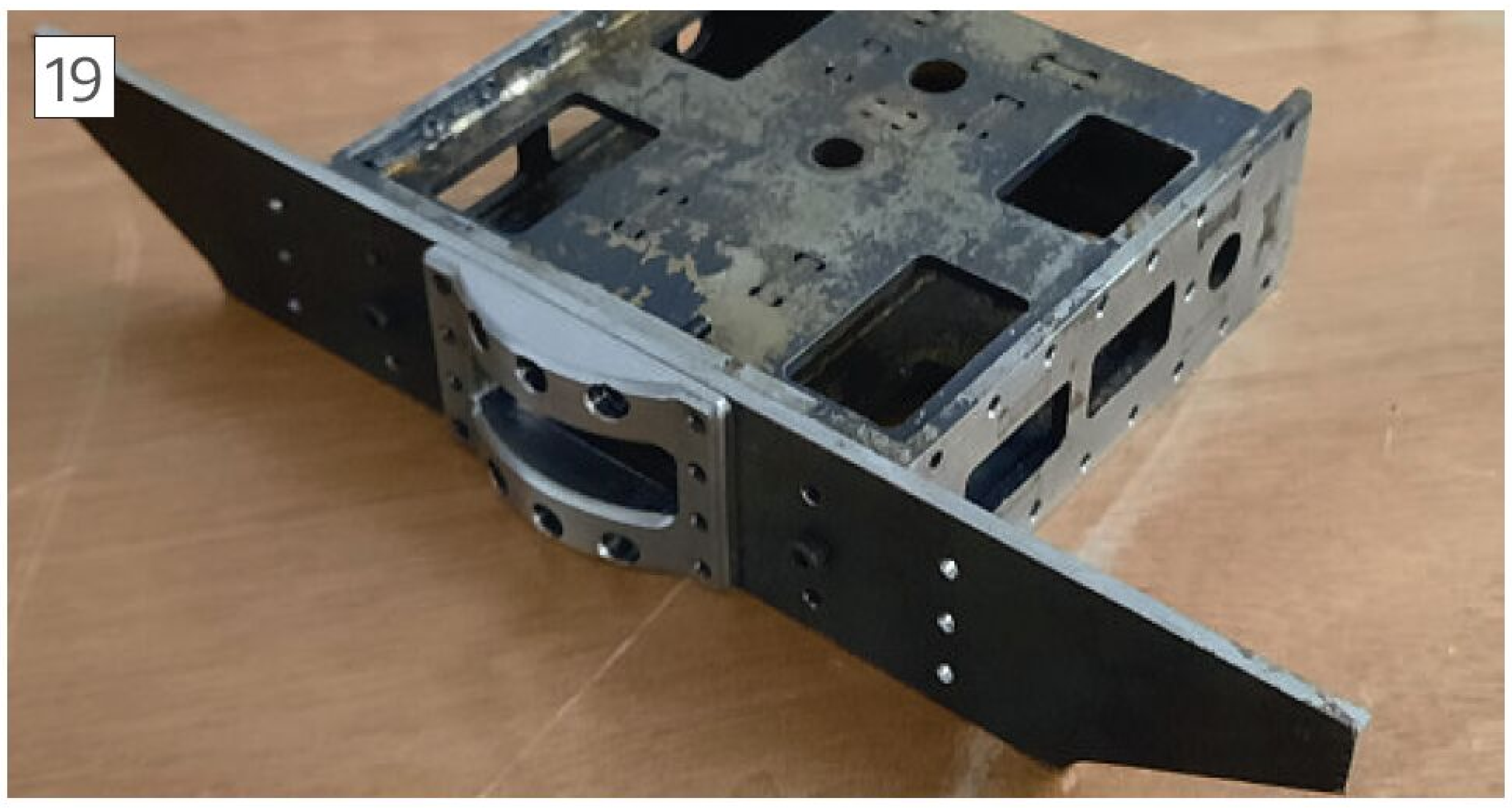
Noel Shelley takes a question.

Three of Malcolm High's 3D printed gauge 1 locos.

A close up of the 08 Shunter in gauge 1.

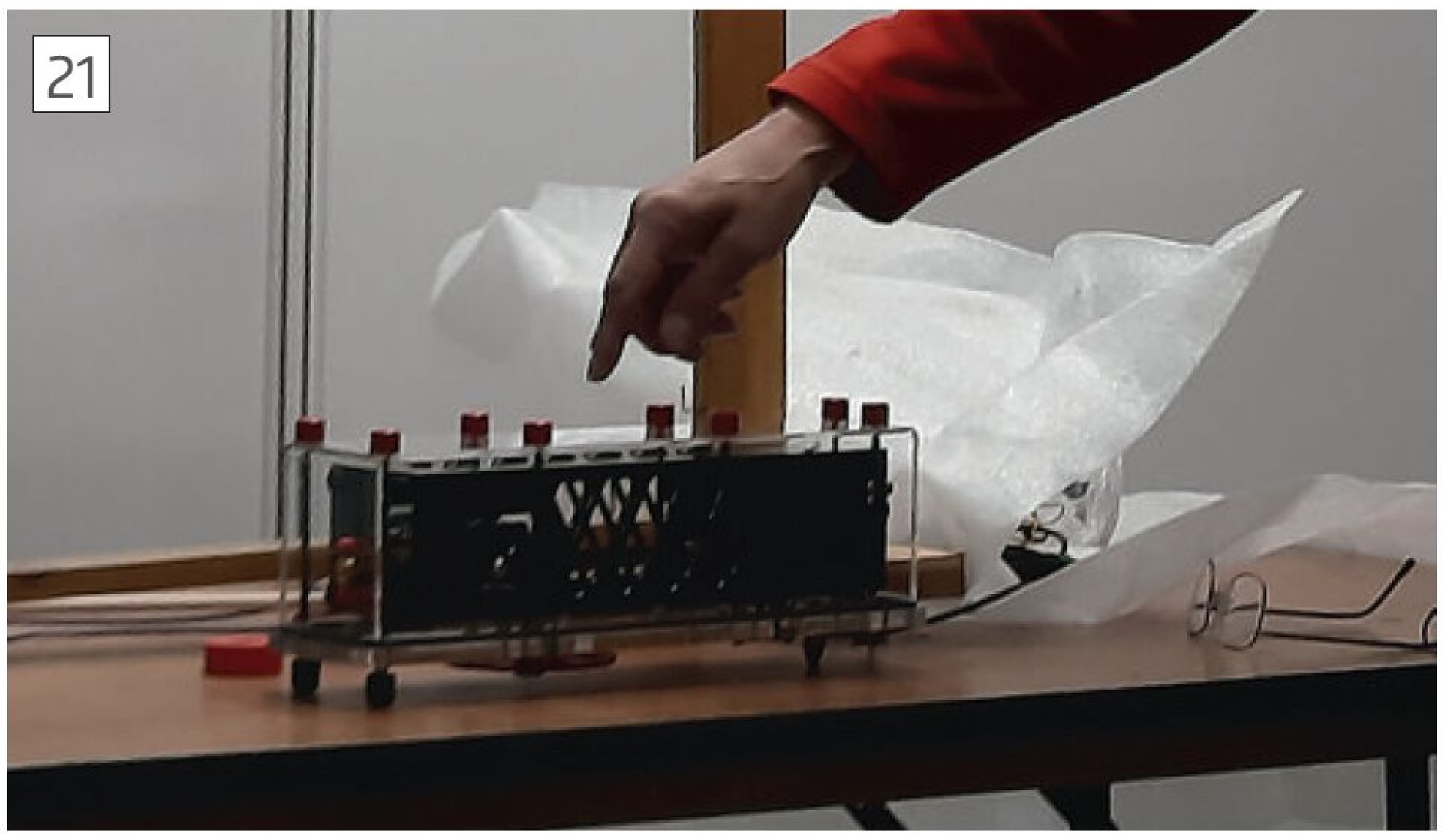
›

CuP Alloys brazing hearth kit.



This marvellous tender buffer beam and frame was one of the examples of CNC covered by Brian Neale's talk.

Mark Noel (and friends) demonstrating the 'farm gate' principle for detecting horizontal movement of the earth's crust.



Mark's incredibly sensitive yet compact design for a seismometer. We hope to feature a detailed design to build in the workshop in the future.

Shaun Meakin of CuP Alloys gave an excellent talk on the subject of 'Brazing made Easier – Not easy', that was particularly well attended. When I went to find him on the CuP Alloys stand, I noticed they were selling a kit for making a benchtop brazing hearth, **photo 18**. I already have the required large, thick blocks of vermiculite, but never seem to find the time to make them into a proper hearth, instead just cobbling together smaller bits of broken block. I decided to take the plunge and bought a laser-cut outer frame and a sheet of Kaowool insulation to line the hearth (and protect the vermiculite). I will report back on how I get on with this setup in a future issue.

CNC for makers of model locomotive was the subject of Brian Neale's talk which garnered considerable interest. He showed us several examples of complex locomotive parts that would have been impractical to make with traditional methods, **photo 19**.

'Hear the Earth' was a talk by Mark Noel. Sadly, the computer refused to play recordings of earthquake sounds, but he demonstrated several different types of seismometer using some excellent props and taking advantage of the fortuitously wobbly table in the lecture room, **photos 20** and **21**.

Bob Reeve gave an interesting talk based on his two MEW articles on CNC thread milling, a subject which seems to involve considerable head-scratching, **photo 22**. His main conclusion was that if Machinery's Handbook offers you advice, it's best to follow it!

I closed out the talks with one on my 'misadventures in model engineering', sharing some of the highs and lows of my workshop journey, and revealing some of my 'stalled projects'.

In the next issue I will look in more detail at some of the excellent workshop machines and tooling at the show.

● To be continued

Bob Reeve showed this deliberate example of 'worst practice' first hand.

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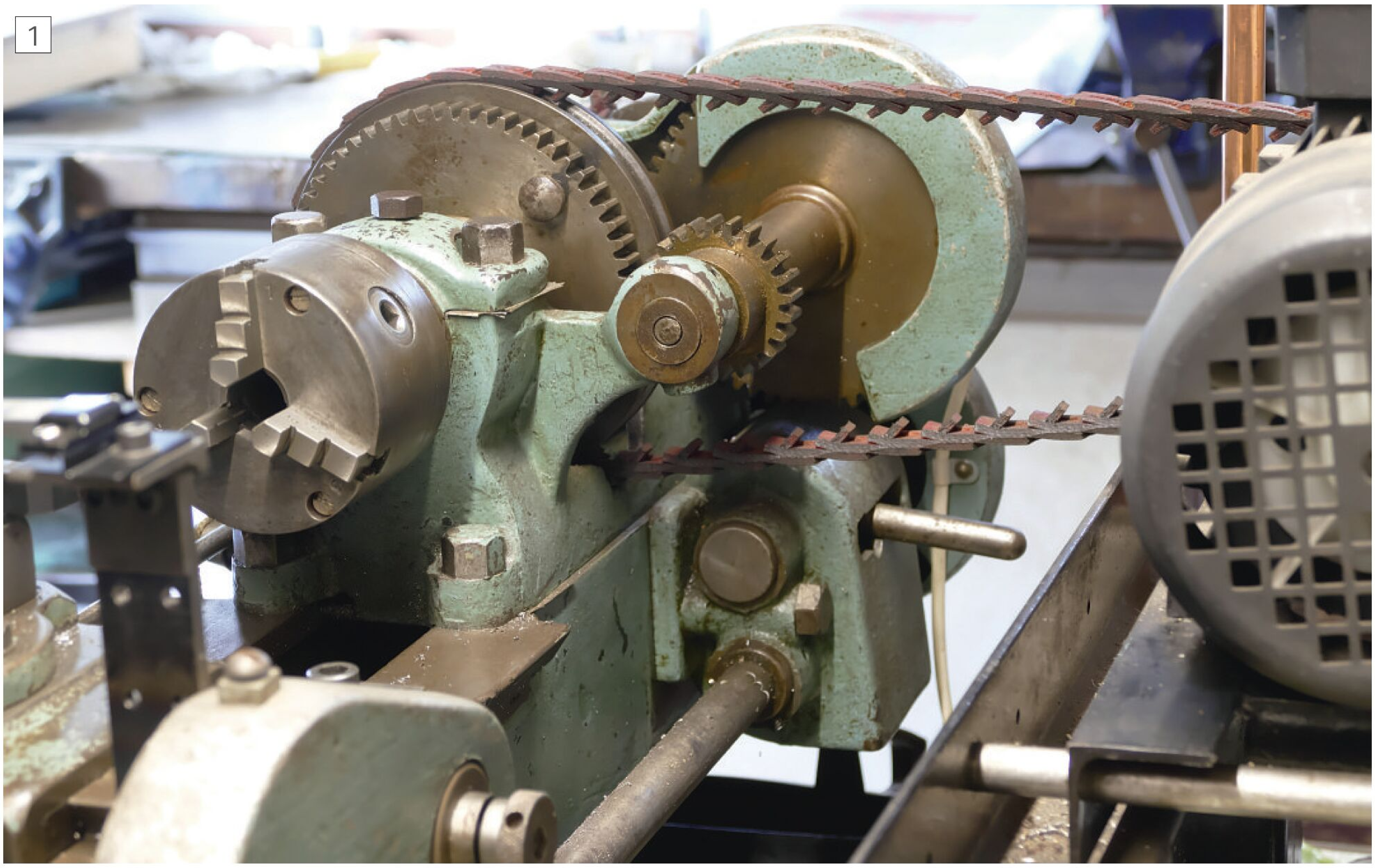
Credits

This index is compiled by David Frith, who has taken on the task of compilation from Barry Chamberlain.
For the latest computer searchable indexes please visit: www.model-engineer.co.uk/forums/topic/latest-mew-index/

Lathe Speed Measurement

Chris Gardiner explains his approach to measuring the rotational speed of a lathe.



Headstock of the author's Birmel lathe.

There are probably as many ways to measure the rotational speed of a lathe as there are makes of lathe, some a lot more convenient than others. One method has already been described by Chris Hobday in MEW325, my approach was somewhat different.

Background

I acquired my lathe, a 3 ½'' Birmel, about 12 years ago as a bare unit without any means to drive it. At the time it seemed that the simplest method would be to use a 3-phase motor driven by a variable speed inverter and avoid any belt changing, which would have been the only alternative. The inverter gave a readout of its operating frequency from which I determined that a 50Hz output represented about 850rpm on the mandrel. Varying the frequency and a bit of mental arithmetic would give me other rotational speeds, but the problem was that the inverter was mounted remotely from the lathe. A speed indication mounted on or near the lathe was required. Work on a design was started five years ago and having devised the solution, manufacture was completed quickly. The system worked well and has continued to do so for the best part of those five years.

Solution

The mandrel has a 60-tooth bull wheel and a 32-tooth mandrel gear driving the change wheels and the idea was to count the pulses from the gear teeth using a Hall effect device and a simple electronic counter. Using the bull wheel was the obvious choice as this would give a direct reading of RPM using a conventional frequency counter. However, the whole of the lathe's headstock is open and there is nowhere around the bull wheel where it is possible to mount a pickup without a high risk of mechanical or contamination damage to any wiring (The Hall effect device itself is well protected being designed to work in the oily condition in proximity to the engine camshaft). At the front of the headstock is the lead screw and at the back the power feeds shaft, **photo 1**. The decision was taken to use the mandrel gear at the left-hand end of the headstock as this was reasonably remote from physical dangers and the leakage of oil from the mandrel's plain bearing was unlikely to be a problem.

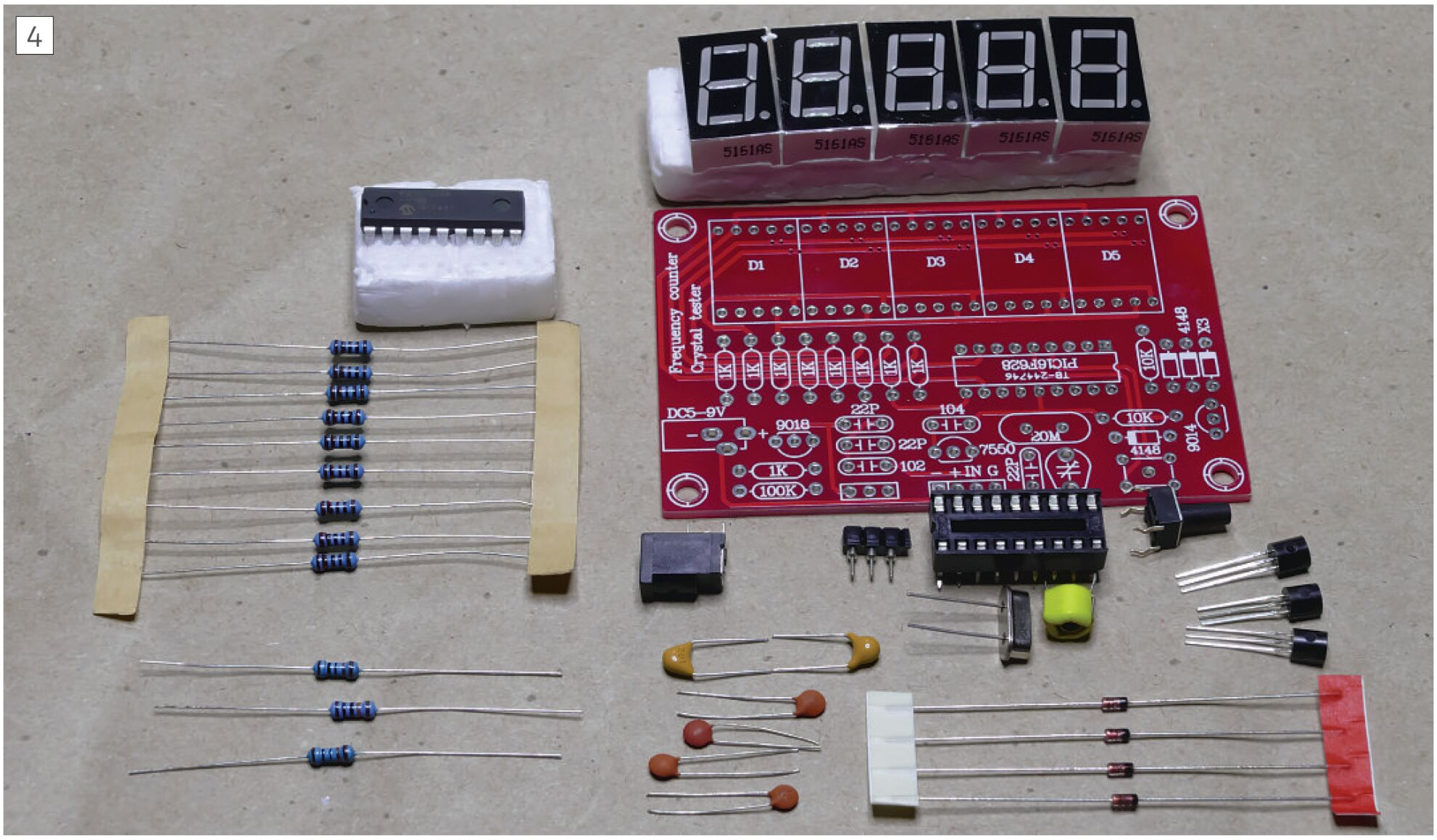
The Hardware

Four main items would be required

1. A Hall effect device that could be mounted on the lathe. The obvious choice here would be to use a unit from a vehicle engine as these have

Automotive hall effect sensor.

Water and oilproof connector.



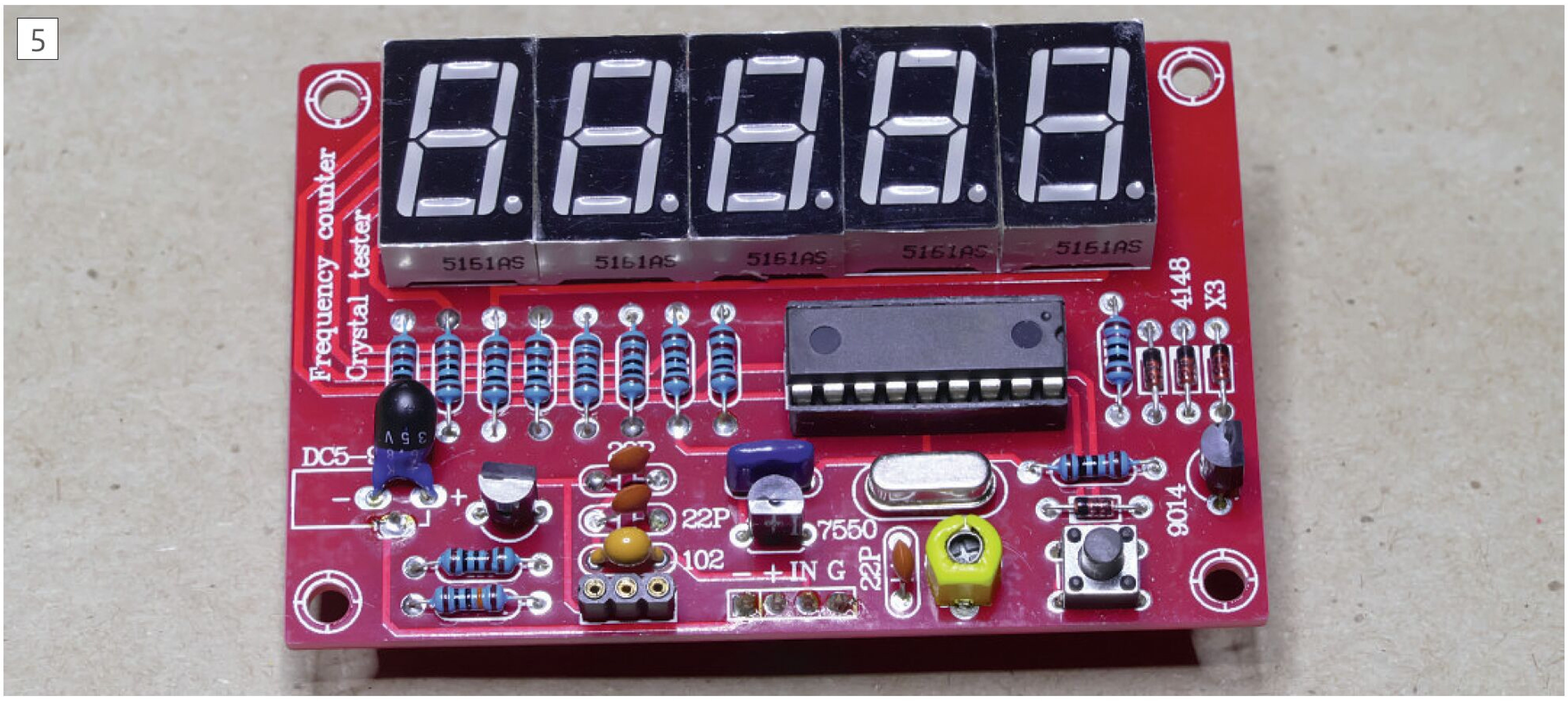
Contents of a frequency counter kit.

the device built into a robust case and are designed to work in an oily environment. A search around the internet found the camshaft sensor from a Vauxhall (GM) Z16 engine to be widely available and one was purchased for £3.95, **photo 2**. Much more difficult to find was the three-pin connector plug. These are normally built in to the vehicle wiring so are not needed as a spare but one was eventually sourced from a company in Bulgaria at a price of £4.99, **photo 3**. Today these connectors are freely available at lower prices from several sources and are known under the general name of "superseal".

2. A small frequency counter. Another internet purchase, this time from China, of a small unit that included an acrylic case thus saving on time and cost to build something suitable. This cost £6.47 at 2018 prices and is still available at about £10, **photos 4** and **5**. It should be noted that the first picture shows the kit without a case; these are supplied with a red circuit board whereas the cased unit has a yellow board with a few different component locations. The size of the components means that assembly of the board is relatively easy.
3. An electronic device that will upscale the 32 pulses per revolution from the mandrel gear to 60 pulses so that the counter reads revolution per minute. The circuit was breadboarded and thought was given to how this could be miniaturised and built as a permanent module; this would have had to be manufactured by an outside company, **photo 6**. Shown under test the input is the yellow trace and the output, at the higher frequency, blue.
4. A power supply for the system. The input voltage to the counter could be anything from 7 to 22 volts so the specification was not critical. A unit with a 13A plug similar to those used for phone charging with an output of a nominal 7V was considered the simplest and cheapest solution.

How the system developed

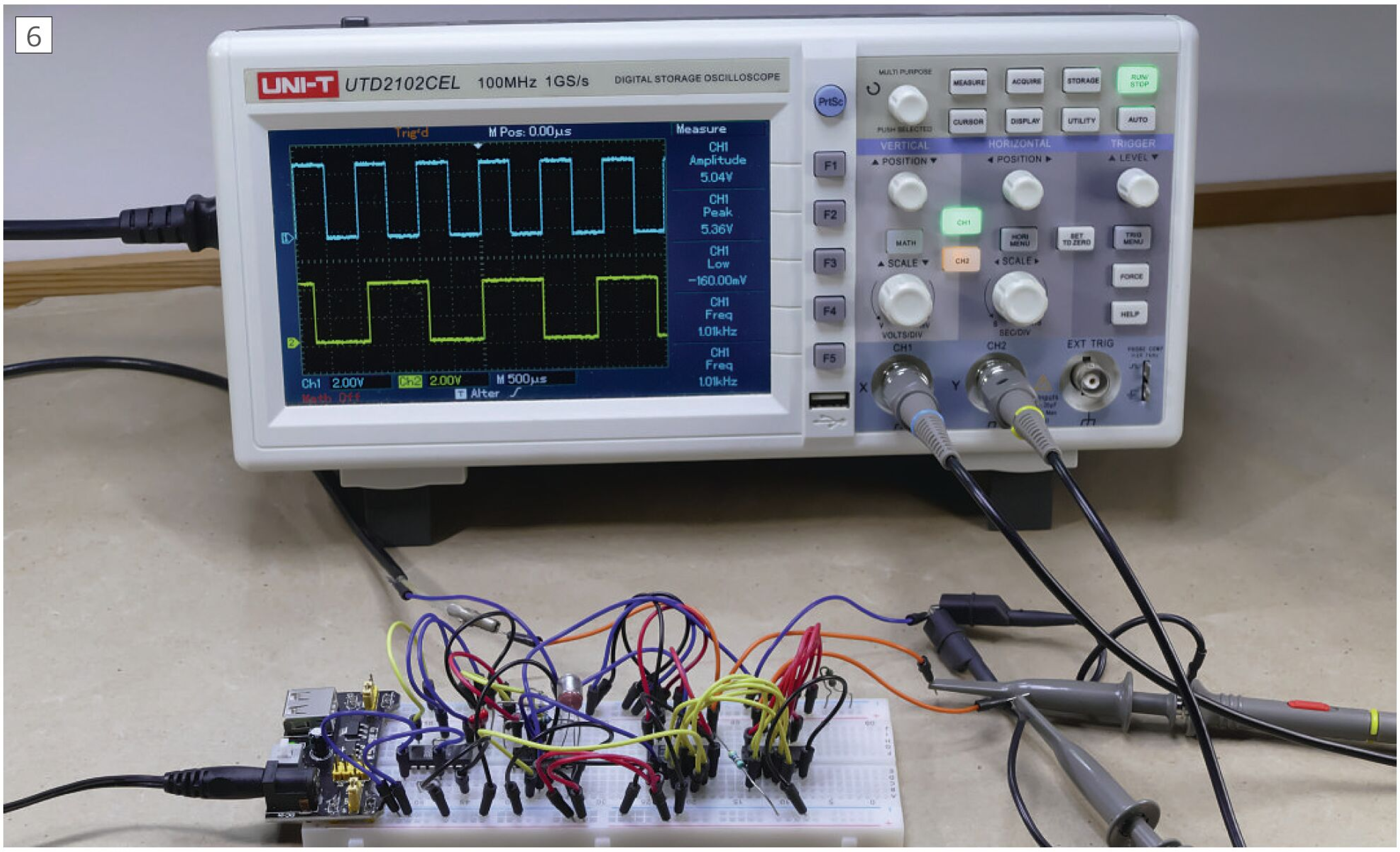
The frequency counter has an on-board regulator that provides 5 volts to the counter circuitry. Hopefully, the 5 volts



The kit, assembled. The cased version has a yellow PCB.

could be used to power the Hall effect device. No detailed specification was available as to its operating voltage, it would certainly not be above 12v, so it was tested at 5v and worked perfectly. This allowed it to be interfaced directly to the 32/60 pulse up-scaler. This outcome is not, perhaps, surprising as much of a modern car's electrical system will have computer equipment working at 5v or 3.3v.

It was at this point that my son suggested a simpler solution that avoided the up-scaler circuitry and reduced the main components to just three. The standard counter reads the number of pulses in one second and displays the result. If it could be made to read the number of pulses in 60/32 seconds, i.e.1.875 seconds it would read RPM directly. These counters are made in China but all come from a design by a German amateur radio enthusiast from about 2004 and use a processing chip manufactured by Microchip Technology Inc. The chip currently used is the PIC 16F628. Luckily, the design is very well documented on the internet, **ref. 1**, and over the past two decades has been modified by many other amateurs for special purposes



A breadboarded frequency converter.

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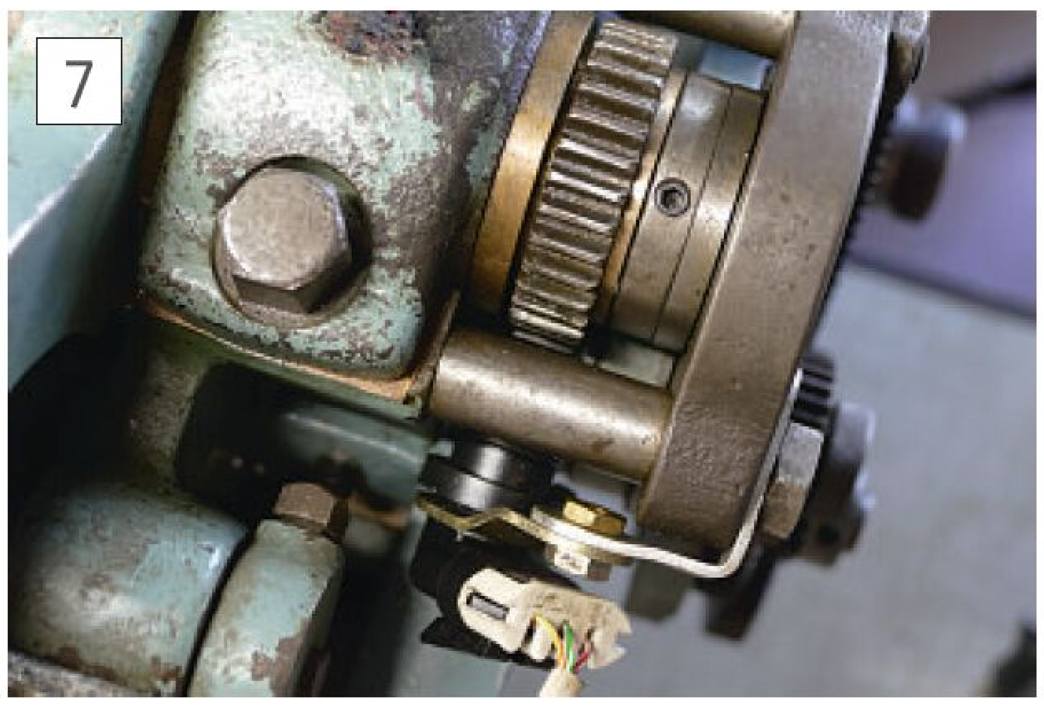
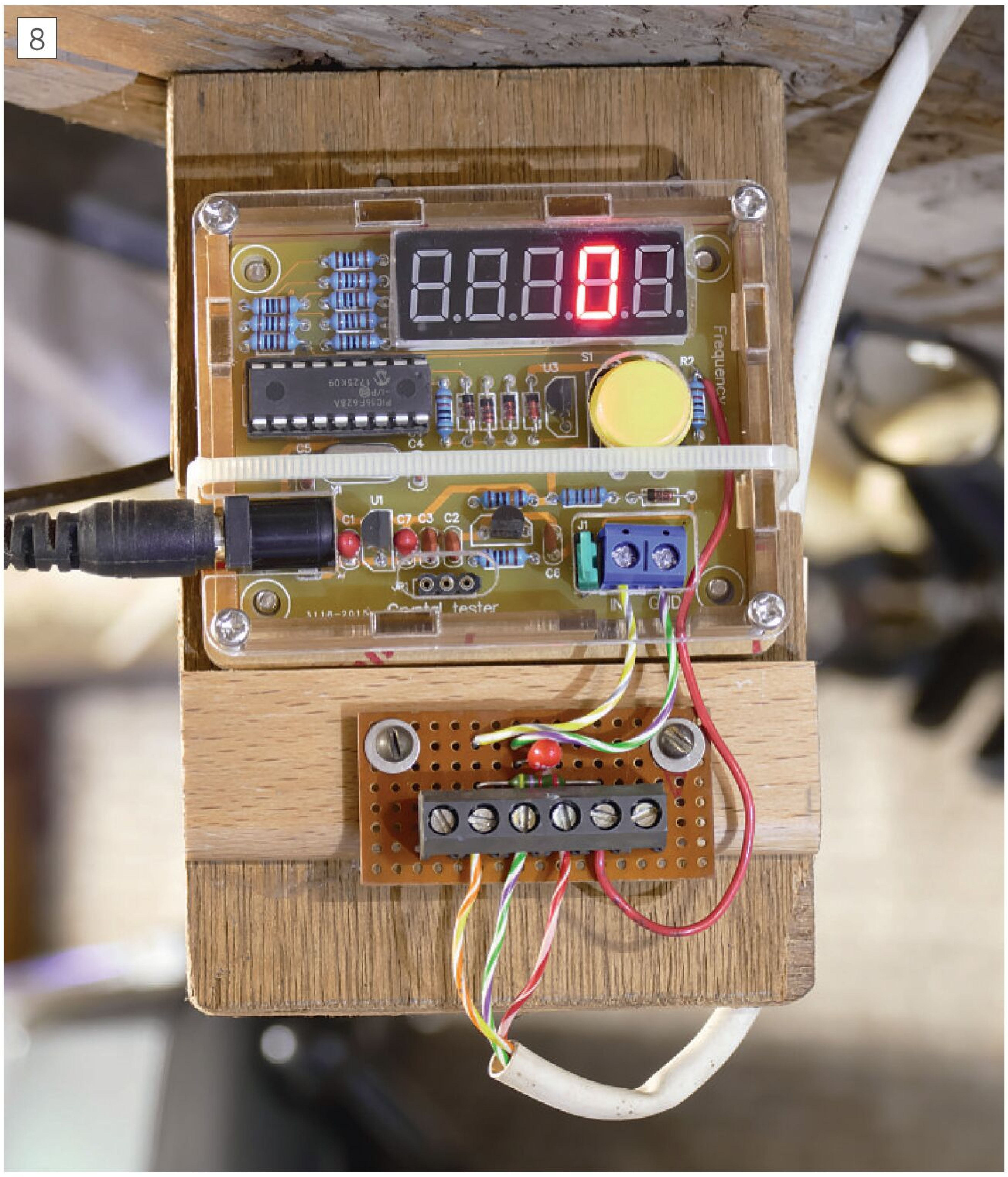


Mounting bracket for the sensor.

Final arrangement, fitted above the lathe.



Counter unit mounted on plywood board.

and the basic code updated for modern computers. The Chinese products all use the original code.

The gate time for the counter at the low frequencies used here is one second. This is generated in the chip using a timing loop where 100 loops gives one second. Adding 87 extra loops into the counter's program, making 187 overall provides the 1.87 seconds needed for this system. It will be noted that the correct time should be 1.875 seconds, unfortunately it is not possible to produce half a loop so there is an error of 0.27%, or a reading 2.7rpm low at a true 1000rpm.

Final Design

The Hall Effect device is mounted so that its active end is near to the mandrel gear. The bracket has slotted holes and is made from soft aluminium so positional adjustments can easily be made, **photo 7**.

The counter unit is mounted on a small plywood board that also accommodates a terminal strip wired into the counter that is used to interface with the sensor for both power and signal, **photo 8**. As a precaution, additional filtering with a capacitor is provided for the power feed to the Hall effect device although this may not have been needed. The board is attached to a low wooden roof beam that is above the left-hand end of the lathe. Cabling between the two is protected by being enclosed in a length of 15mm copper pipe. The mains power unit is plugged into a nearby 13A socket, **photo 9**.

Final thoughts

At today's prices the components for the unit should cost no more than £25, less if some of the components can be found in the spares box. For many people the largest cost will be the programming interface and adaptor board for the PIC microcontroller. The latest interface from Microchip Technology is the PICKit4 at around £85. The earlier PICKit3 is still available from sources such as eBay at about £40 including interface board and is quite suitable for use with the PIC 16F628 used here, but is still expensive if it is only to be used for this single project.

Most people may not have the facilities to program a PIC processor and so a better solution in terms of cost would be to use an Arduino board and interface this with a small LCD screen. The software code for a frequency counter and for the interface to the LCD readout are freely available from the Arduino website and from other sources and generally will only require changing one line of code to work with whatever number of pulses per revolution the lathe can produce.

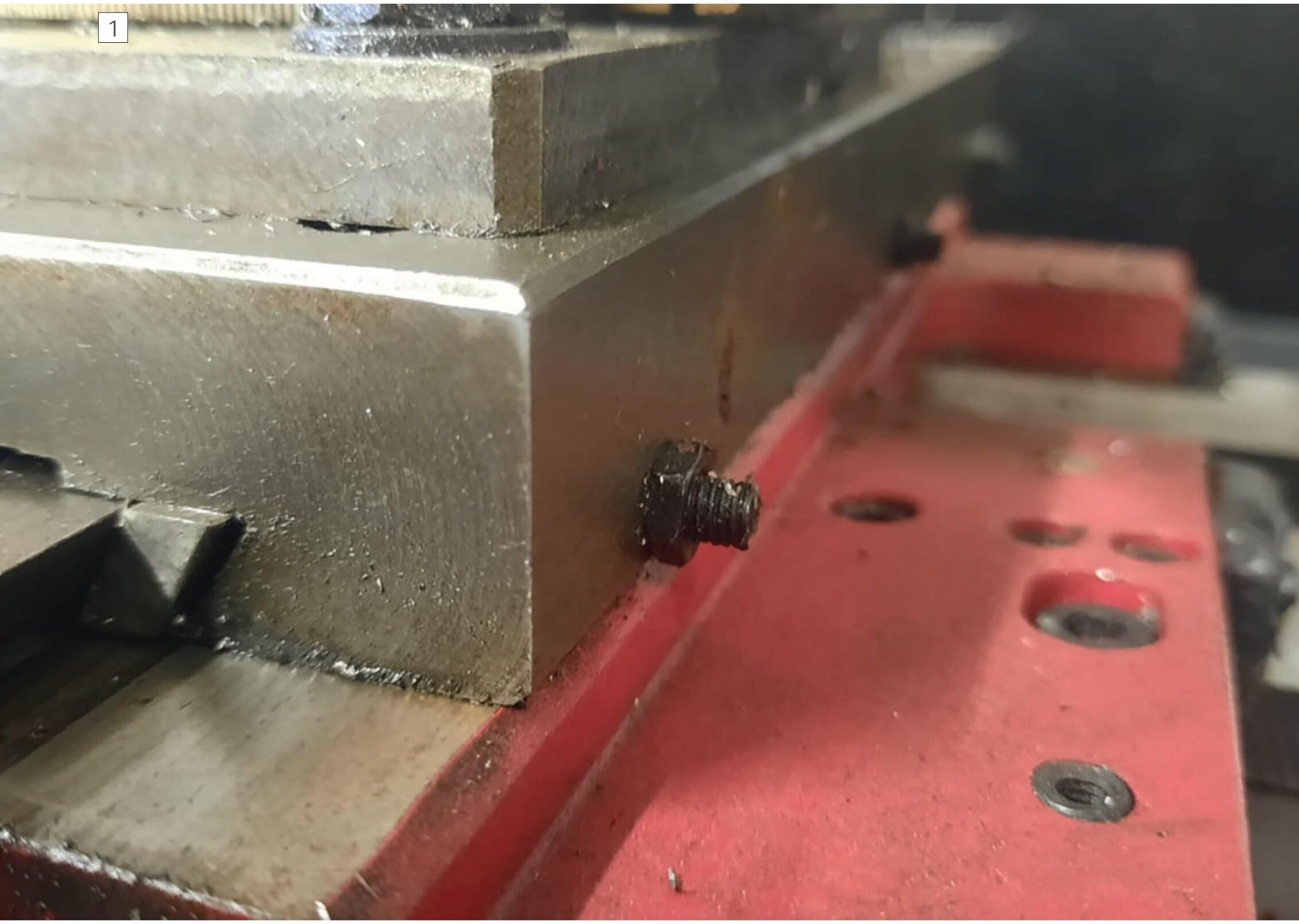
References

1 www.qsl.net/d/dl4yhf//freq_counter/freq_counter.html

Using Spring Washers to Ease Gib Adjustment

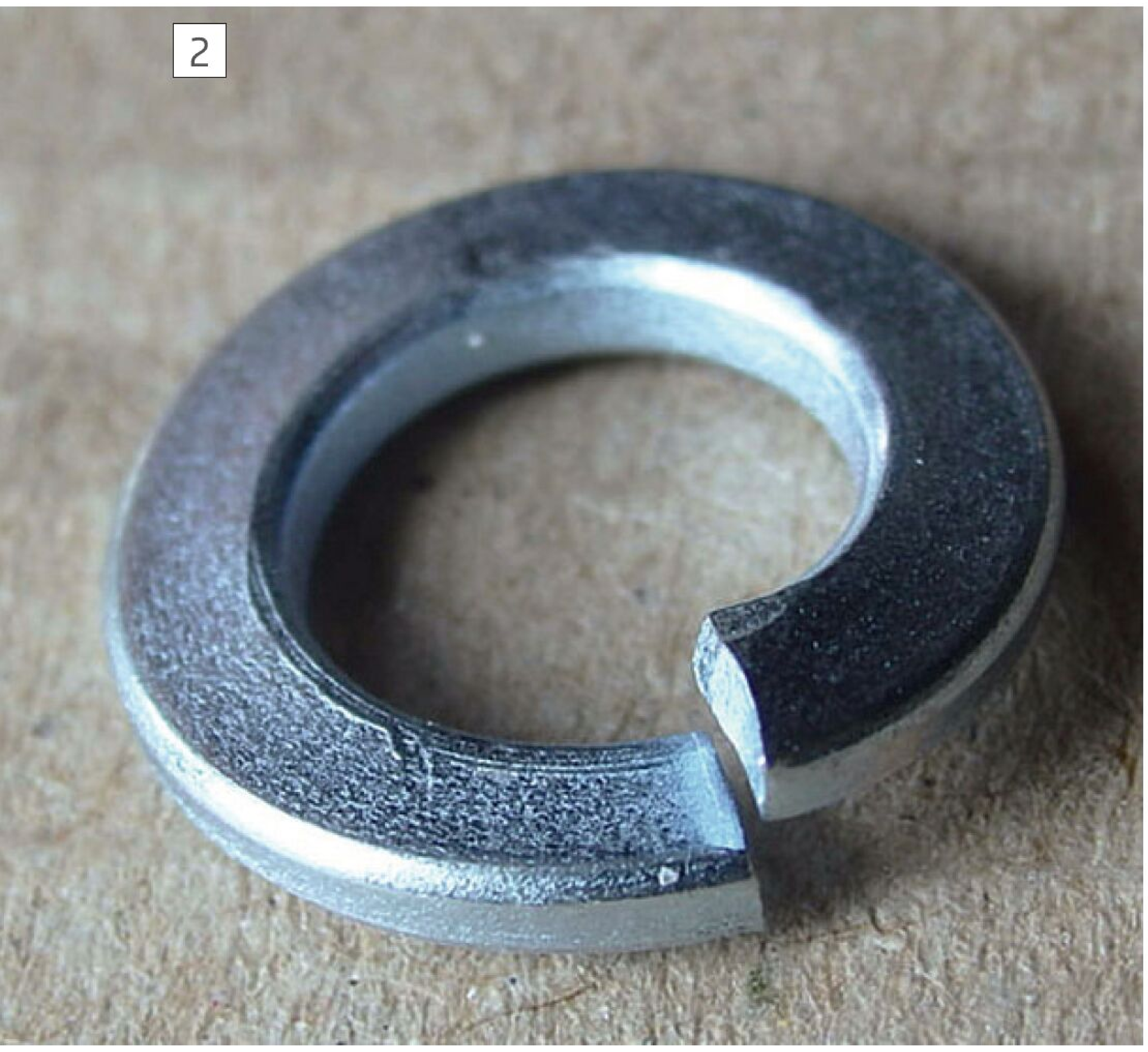
Jacques Maurel offers a simple way to make adusting gib strips easier.

1

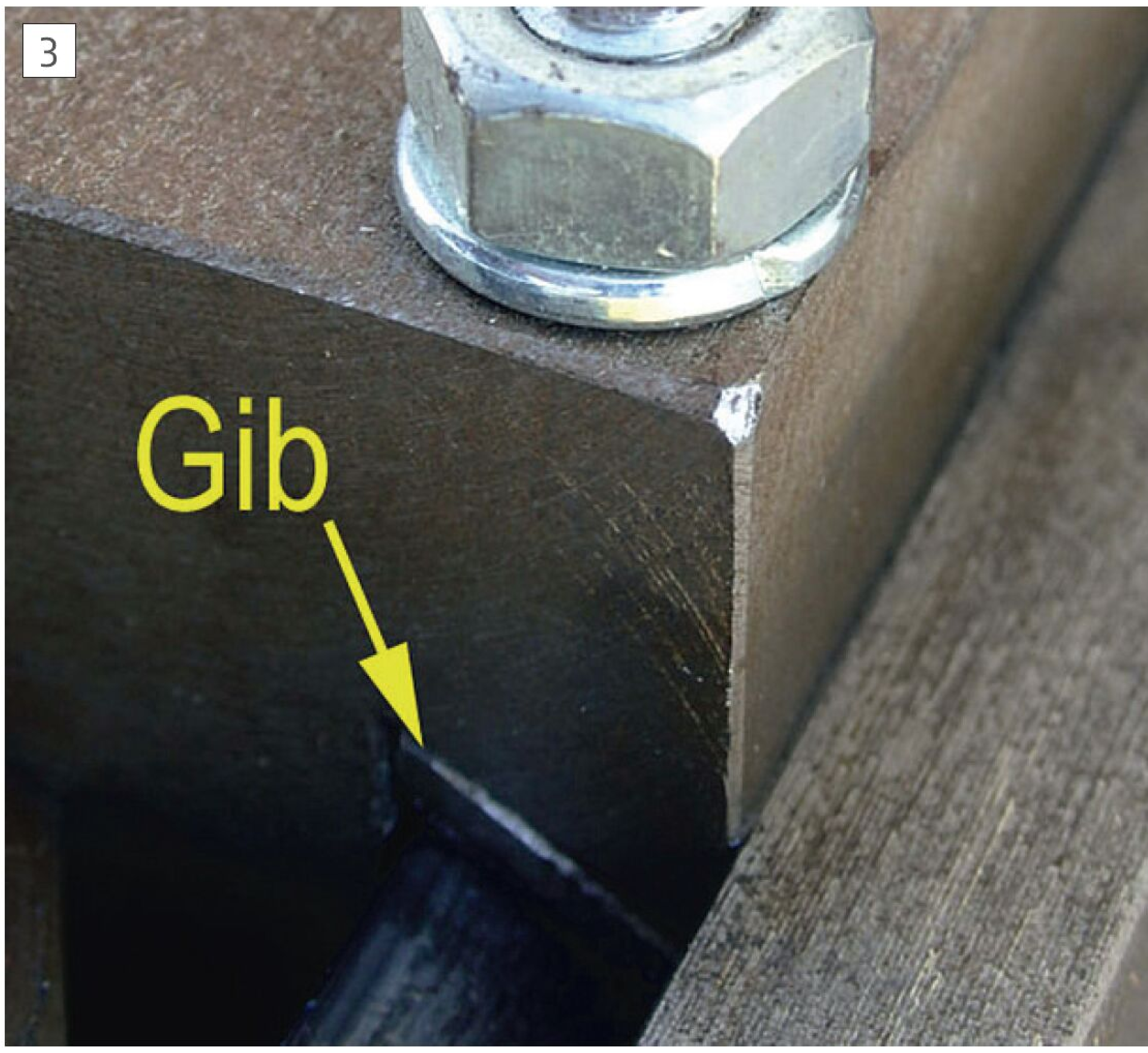


The usual gib adjuster arrangement.

To achieve smooth motion and minimize backlash. the gib strips on our machines must be adjusted for no play and sometimes for a slight drag. Use spring washers, **photo 1**, under the lock nuts; tighten each nut to flatten the washers and no more, Hold the nut in position with a spanner while turning the set screw for play adjustment, **photo 2**, as the set screw is maintained in "back contact" by the washer springiness. This way you avoid ›



A typical spring washer.



A spring washer in place under a gib adjustment screw locknut.

the plague of the usual play adjustment (with no spring washer), as when the play is correct, you must tighten the nut for locking, that moves back the screw and so the play is increased and the adjustment lost!

The springiness of the washers is usually sufficient to avoid unscrewing, remember the idle adjustment screw on carburetors is just pushing on a spring, never unscrewing despite the engine vibrations.

Belleville washers (dished washers) could be used too, but their outside diameter is often too big for this purpose. ■

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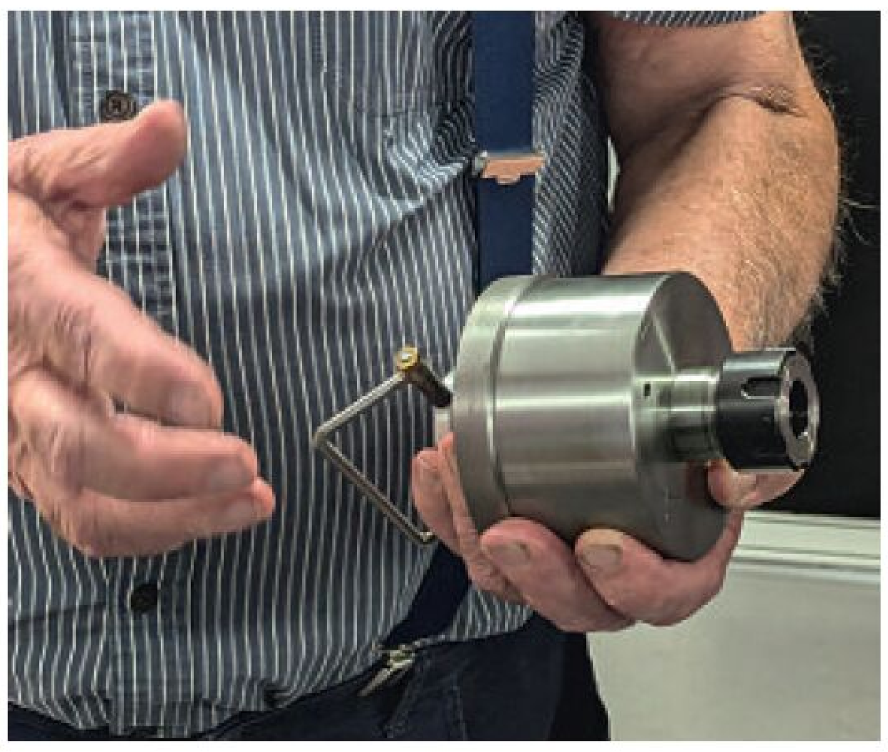
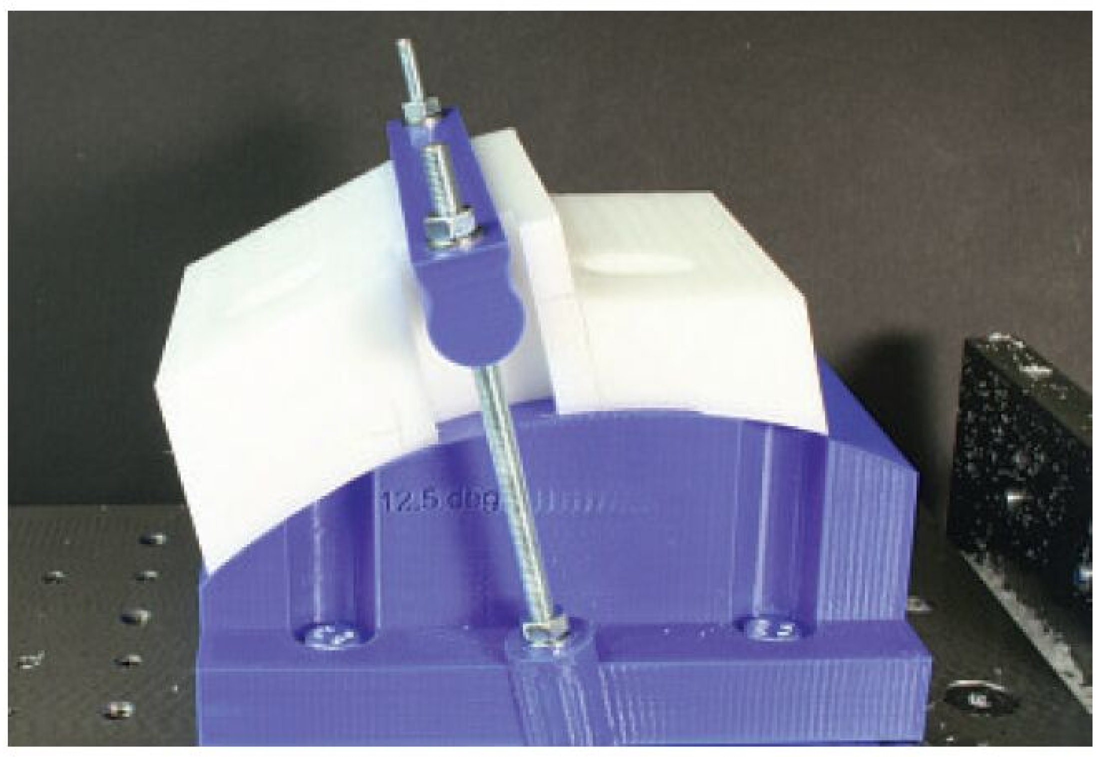
Coming up in issue 347, January 2024

On sale 20 December 2024

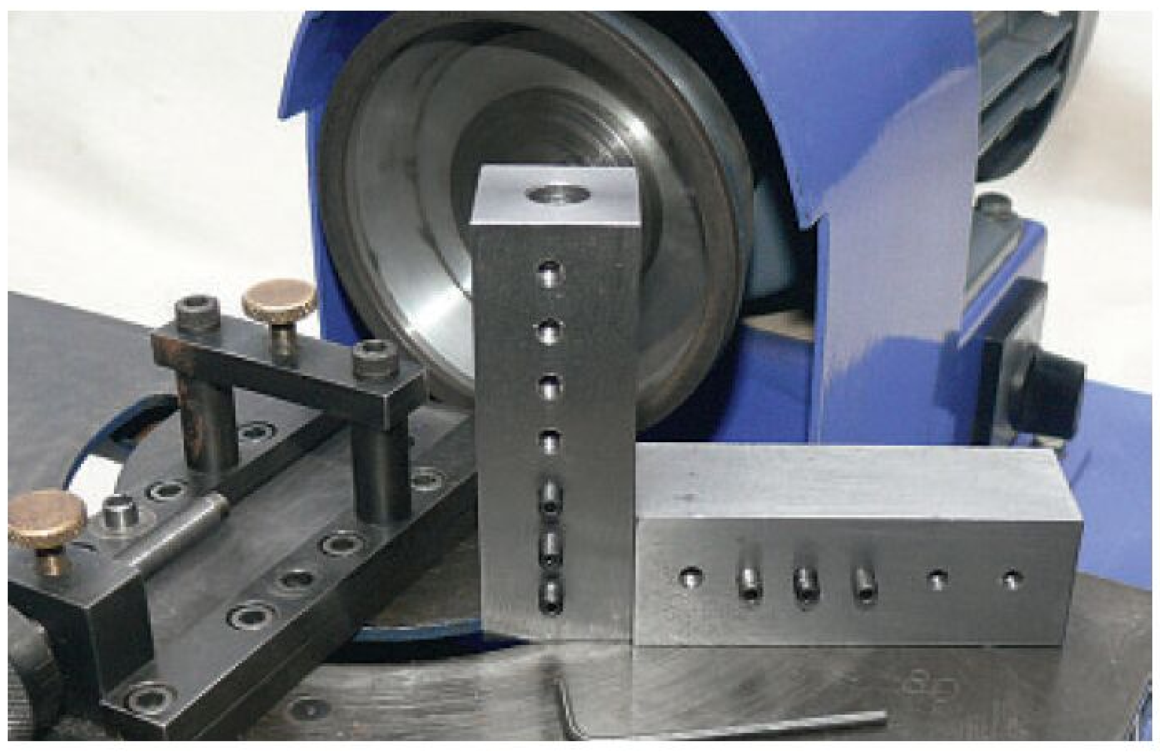
Contents subject to change



Bernard Towers describes his Stevenson Trophy -winning Eccentric Chuck.



Marcus Bowman undertook the challenging design and manufacture of some complex guide blocks.



Howard Lewis looks at grinding brazed tungsten carbide tooling.

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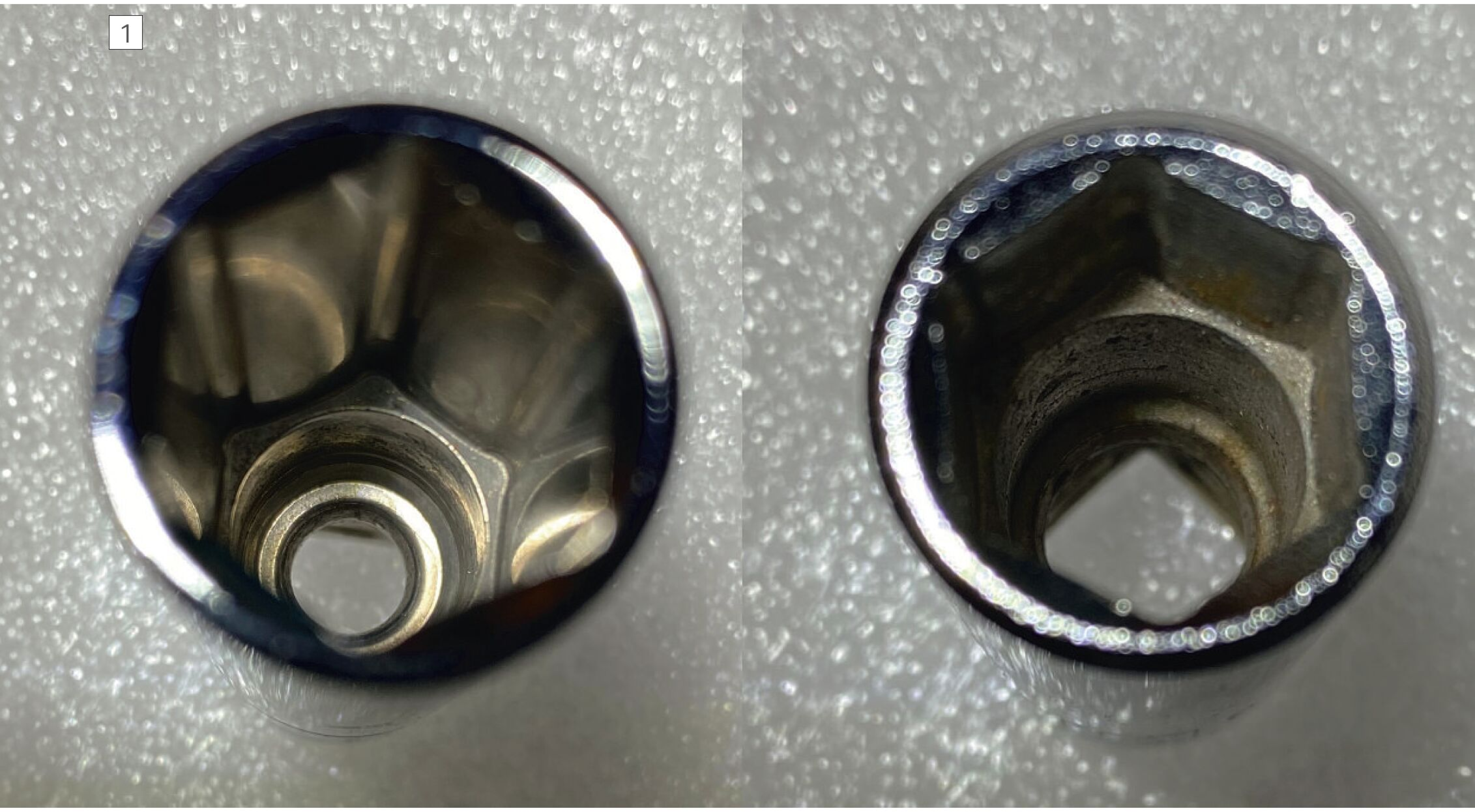
DON'T MISS THIS GREAT ISSUE-SEE PAGE 24-25 FOR OUR LATEST SUBSCRIPTION OFFER

Milling Machine Universal Wrench

Gregory P. Widin explains how to make a speed wrench for a milling machine.



Comparison between a true deep socket, left, and a long, but shallow, socket. A shallow socket will not remain securely on the lead screw.

One of the most satisfying things a model engineer can do is to re-purpose a commercially made part to make a simple project out of it, that would have posed a challenge in the small workshop. This project describes the construction of a simple speed wrench for the milling machine, made possible by using a commercially made deep-hole socket.

My problem to begin with was that the secondhand Kurt Anglock milling vice I had purchased had not come with a wrench, so I needed to obtain one. The attractive-looking speed wrenches in the tool catalogs seemed too expensive to me.

On my milling machine, a Clausing 8520, there are three different places where a hex wrench is required for adjustment: the milling vice, the drawbar, and the quill lock. Originally, these each required a different wrench. By creating the right style of wrench and re-sizing two of these three hex heads, I was able to make a single tool that conveniently served all three. First let me describe the wrench.

My mill vice has a long hex (1-1/8'') on the lead screw that just begged to be adjusted by a correspondingly long socket. Now, making a hex socket is not a trivial operation in the home workshop. While making a square socket can be done by milling a slot in a bar, then closing the fourth side of the slot, there is no correspondingly simple process with which to make a hexagonal opening. However, hex sockets are readily and cheaply available commercially, and they are available in a deep-socket style that matches the long hex on the lead screw.

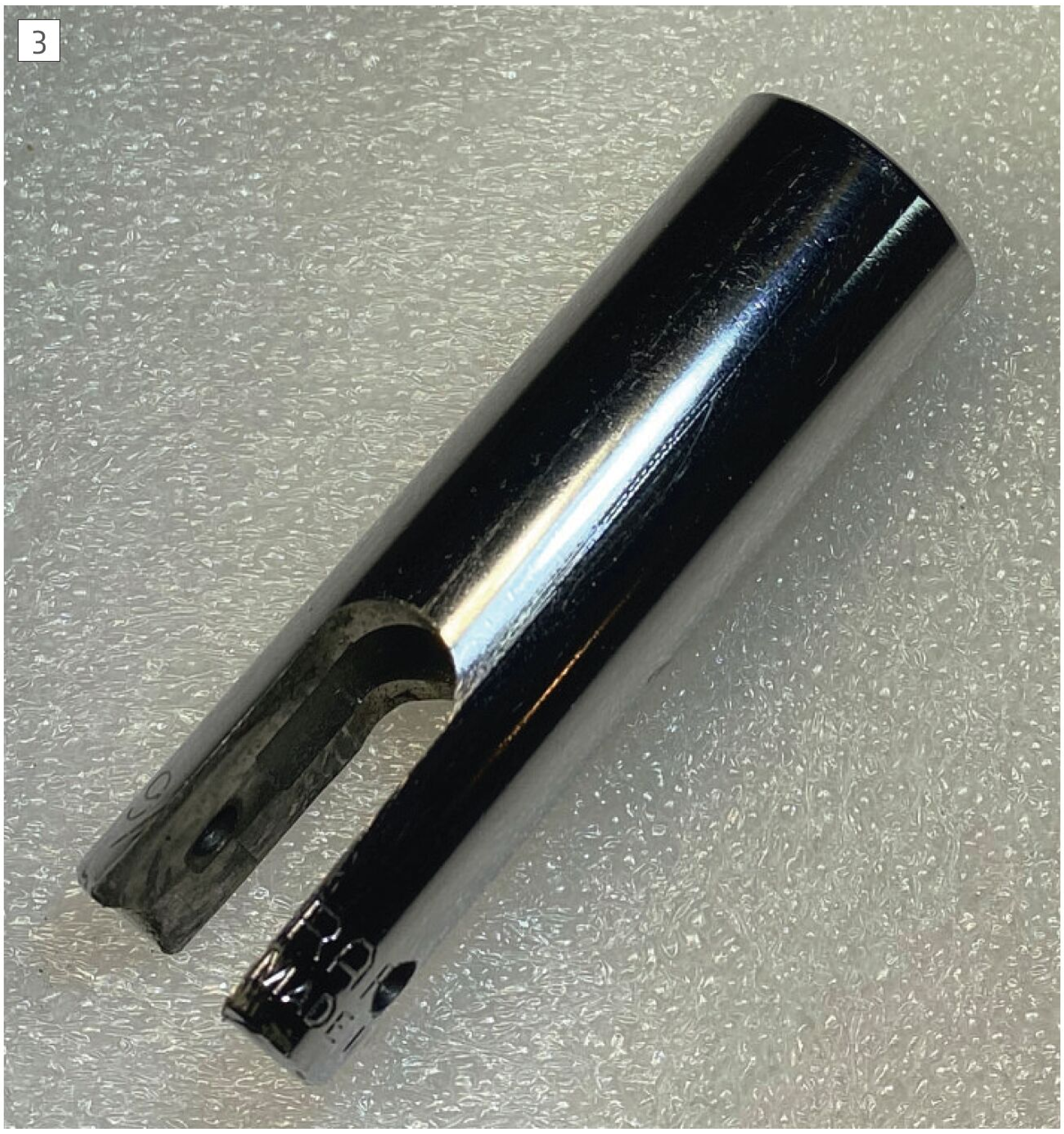
A large variety of individual sockets were available at my local tool emporium. I looked at the long sockets. Some were quite cheap, but a close inspection revealed that, on some, though the body was long, the socket was no deeper than in an ordinary short socket. Other long sockets contained much deeper socket holes, so I paid a little more and got one better matched to the hex on the mill vice. **Photograph 1** shows the comparison between deep-hole and standard sockets.

Though I originally thought I would simply use my 3/8'' ratchet wrench to ›

2

The new mill vice wrench as assembled.

3



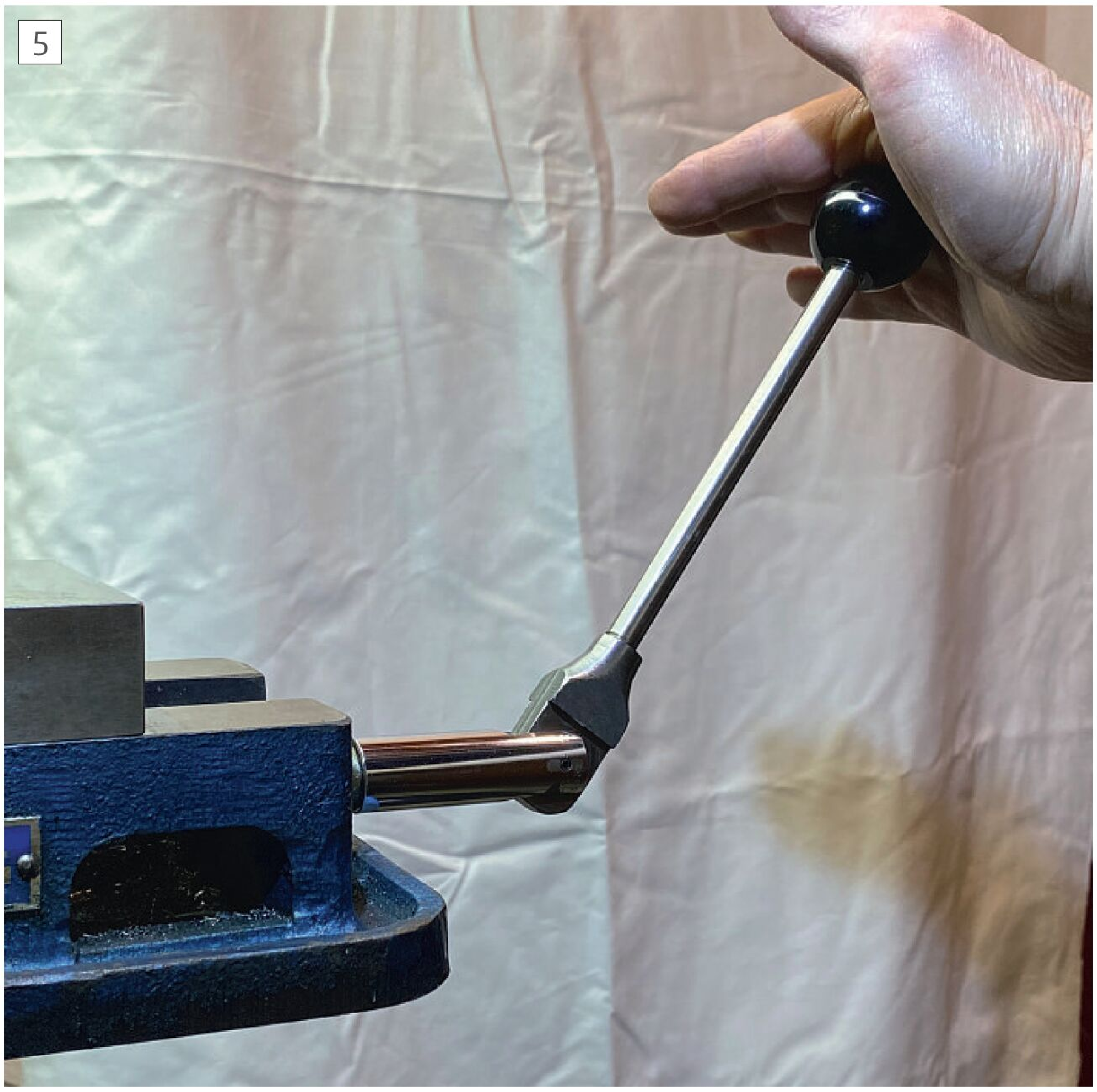
The socket after slotting to match the 3/8" drive square, and with the cross hole that holds the pivot for the swivel.

twist the socket, it became clear that a simple change to the drive arrangement would create a well-adapted special-purpose wrench assembly. Specifically, by milling a slot into the square drive location, I could attach a handle that would always be available, and could make it a "speed wrench." The new wrench is shown in **photo 2**.

Since the drive for the socket was 3/8", I simply milled out a slot of that width between two of the flats, creating two ears that could support a wrench handle, **photo 3**. The ears thus created are sturdy enough for the purpose they will be put to, and actually don't have to endure very much torque in twisting the lead screw. Mill the slot after first aligning the sides of the square recess with the milling cutter. A mill will often cut wider than its nominal width, but when I checked the drive square with a micrometer, it was actually 0.380", so you probably don't need to worry about milling oversize here. In any case, the handle swivel is machined to fit the slot, so it would be easy to compensate for a somewhat wider slot.

The 3/8" slot now needs an adjustment handle. Three parts are needed—a swivel, to accept a shaft; the shaft; and a knob for the end of the shaft, **photo 4**. The

The swivel, shaft and ball. The left side of the swivel is made to fit the slot in the socket, while the right side is sized to accept the shaft. The shaft shown here is simply threaded on both ends, and the ball is a commercially available item.



Using the swivel wrench to quickly adjust the vice lead screw. For higher leverage, the handle can be folded to a 90-degree angle with the screw.

swivel must fit into the slot milled into the deep socket. The shoulders should be milled to a close but free fit in the slot, and need to extend far enough so the wider part of the swivel never contacts the corners of the socket slot, as it swings from side to side. The swivel is attached in the slot by cross-drilling a hole to fit a pivot pin. Put the socket horizontally in a vice on the vertical mill. Use a rule on the surface of the new slot in the socket to align the drill, to ensure that the pin will be at right angles to the slot. Then center over the socket and mill a small flat at the top of the side of the socket (this can be seen if you look carefully at photo 2. Drill a hole through the socket for your pivot point—in my case a tension or roll pin. Finally drill through the swivel. The hole in the swivel should be opened somewhat so it will swivel (what else?) on the tension pin.

At the end of the swivel away from the pivot, I tapped a hole for the shaft; you could as easily attach the shaft in a plain hole with anaerobic adhesive such as Loctite or cyanoacrylate. Before attaching the swivel into the slot, it needs to be profiled around the hole for the shaft. The photos show what this looks like. Make the shape whatever looks pleasing. The only requirement is to leave enough material around the hole for the shaft. You can shape this part freehand using a file. The more persnickety will chuck the swivel in the lathe 4-jaw chuck and turn the profile, to ensure symmetry.

The shaft is simply a piece of 3/8" rod. The 6" length I used provides enough torque, and gives a good feel when the knob is palmed for use as a universal wrench. On one end, it must match your attachment to the swivel, on the other, match your chosen knob.

The knob on the end of the wrench could be of several types. If you've got a fancy ball-turning attachment, this could be your big opportunity to use it. I chose to use a commercially made round plastic ball with an embedded brass threaded insert. There are also tear-drop shaped plastic knobs that would work similarly. If the end of the knob is round, it can easily be palmed to perform the "speed" function of the commercially available vice handles, **photo 5**. Some model engineers may choose to make the handle end into ›

The universal wrench at home on the vice lead screw.

a hammer-head shape, providing a means to thump the drawbar to release an arbor or tool from the milling spindle. Doing this would interfere with the speed adjustment mode of the handle, though, and since that gets used a lot more than the drawbar needs to be thumped, I chose to stick with a rounded knob. The deep socket on the wrench means that it can hang conveniently on the vice leadscrew, being readily available to clamp and un-clamp whatever I'm working on, **photo 6**.

Once I had completed the wrench for the milling vice, there were still nuts on the drawbar and quill lock of different sizes. The drawbar that had come with the mill was someone's improvisation—only a piece of all-thread, with two jam nuts on the top end for adjustment. It didn't take too much work to thread a new piece of bar at one end to match the thread in the 2MT arbors that my mill requires, and then to apply and pin a piece of hex stock to the other, of the same 9/16" size as the hex on the vice lead screw. Now I had two places where my new wrench would work.

This of course left the hex head of the quill lock bolt. The original bolt there had a smaller hex than the other two locations, but it was easy to make a new bolt from an offcut of the same hex stock I had put on the new drawbar. Now I had all three major adjustments on the mill that used the same hex adjustment. My new wrench was now "universal."

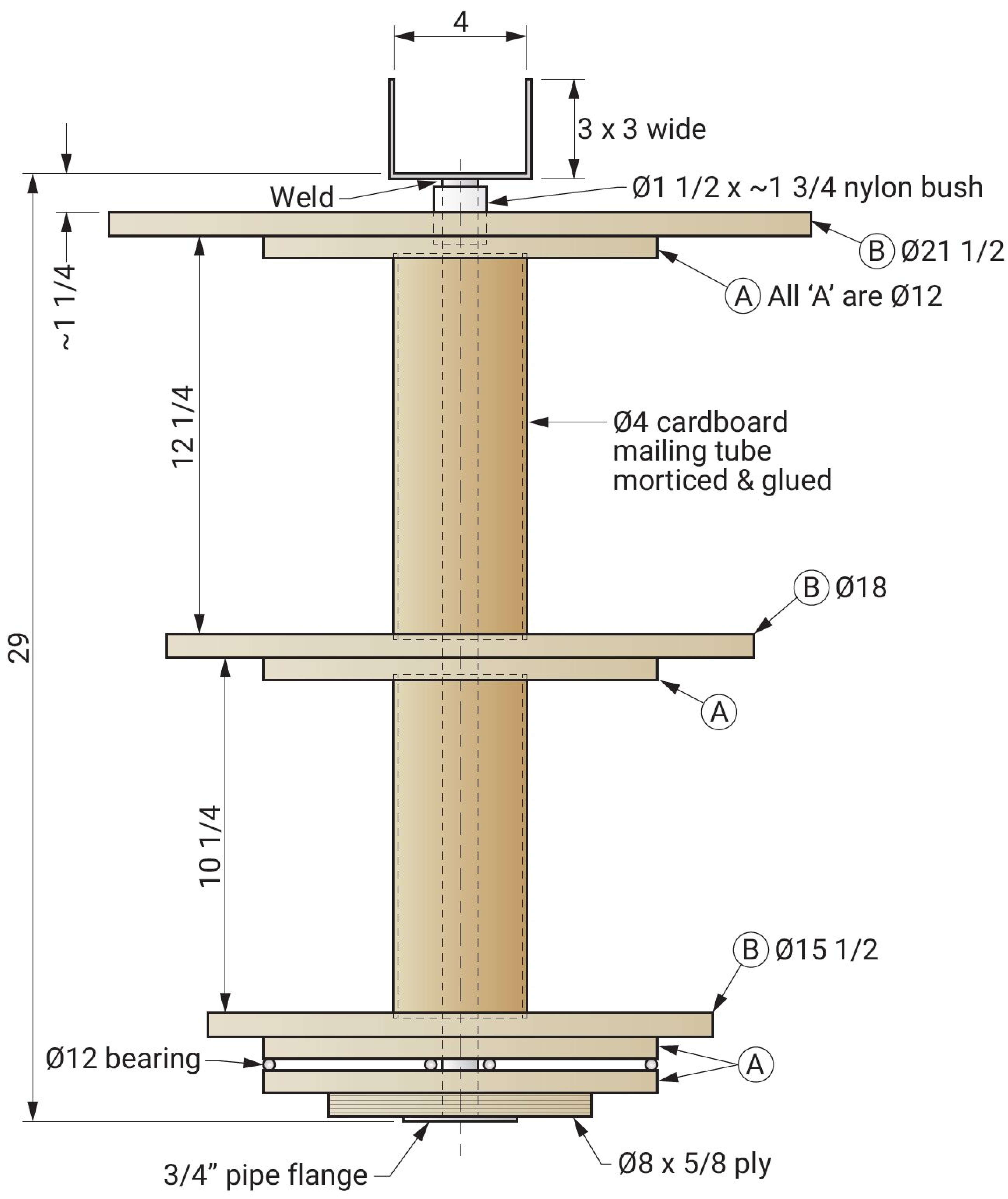
I haven't shown any drawings, since you will need to adjust the sizes for your own equipment. But for anyone who can handle modifying the deep socket to put a slot in it, a quick look at the photos will provide all the information needed to make a universal wrench that will fit your own mill and vice. By re-purposing a commercial deep socket, this becomes an easy but satisfying project to improve your mill operation. ■

A Rotary File Rack

Michael Potter shares his simple and efficient way to store a large stock of files.

I attended Oregon Technical Institute majoring in Gunsmithing/Metals (as it was then known), and Drafting. After a stint in the Marine Corps, I married and set up my one-man operation in the shop we built at our home; gunsmithing, locksmithing and fabricating replacement parts for obsolete mechanisms for nigh on 40 years, though now thankfully retired.

As my wife is a spinner, and weaver I was coaxed into a second career (now gone over 30 years), designing, crafting, and repairing spinning-wheels, looms and all



Hanging File Rack
Construction with discs A & B of 3/4" particle board.
Fabricated bracket at top screws to either side of a 4" x 12" laminated beam.
The large discs are wrapped with steel banding screwed on, drilled for the finish nails for hanging the files.
Once the assembly is slid up the pipe the flange is screwed on, that's it.
This rack will hold over 100 files & rotated smoothly.
Designed by Michael L. Potter & originially built by same approx. 25 years ago. All dimensions in inches.

Figure 1

The 'great Rack' holds over a hundred files.

The second rack is based around two wooden wheels, repurposed from spinning wheels.

relative appurtenances, for which I've garnered several awards. Over time one acquires some wheels beyond repair, thus when the `great-rack', **photo 1** with its capacity exceeding 100 files overflowed I pressed a couple of derelict wheels into a second rack, **photo 2** and **fig. 1**.

The `great' rack hangs conveniently over an important corner of major benches, and the second rack hangs nearby over one of the lathes.

Prior to equipping the shop with mills and shaper, files were crucial to my work, and today I can say scarcely a day passes without my using files for something. The green handles, as with hacksaws, denotes use for brass, etc.

If this interests readers I may send photos of the various benches: the musical-instrument, and clock-repair bench, and the main `fitting'-bench, where more files can be seen conveniently arrayed.

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Technical data

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Swing over cross slide	190 mm
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Bed width	180 mm
Spindle bore	38 mm
Spindle tip	MK5
Spindle speed	80 – 2000 rpm (adjustment in 2 ranges)
Metric thread	(18) 0.2 – 3.5 mm/turn
Inch thread	(21) 56 – 8 TPI
Longitudinal feed	0.085 – 0.832 mm/turn
Transverse feed	0.01 – 0.1 mm/turn
Maximum upper slide travel	65 mm
Maximum transverse support travel	210 mm
Maximum longitudinal support travel	650 mm
Tailstock spindle travel	100 mm
Tailstock quill diameter	38 mm
Tailstock quill taper	MK3
Motor power	1.5 kW / 230V
Dimensions	1520×675×1320 mm
Weight	295 kg

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Workshop Walls and Wheels

Austin Hughes recounts how he came to lay out his workshop, and hopes his experiences may be helpful to others.

When I was thirteen my dad suddenly announced that in order to comply with the new 'clean air' act, our coal-fired suburban semi was soon to be heated by electric fires instead. Apparently, the first nuclear power station was about to be commissioned, and it was rumoured that before long the energy would be so cheap that it would hardly be worth sending out bills.

I was very pleased to know that soon I would be free of the weekend chores of clearing the ashes from the living room back-boiler and breaking up the coal into manageable lumps for the next week. But I was even more delighted when Dad suggested that I might like to equip the lean-to brick-built (and now redundant) 'coalhouse' as my very own workshop. Of course this meant that he would benefit too, because I would no longer intrude on his 'bench' (the base of a Victorian sideboard) that he had squeezed in to the end of his beloved garage. I was scratch building 4mm scale model locos, and his vice and adjacent rack of hand tools were far superior to the kitchen table.

The new venue was narrow at only just over 3ft wide, 5ft long from front to back, with a leaky roof, uneven concrete floor, no light, and an ill-fitting door, but I was free to do as I pleased with it. I was given some sawn planks for a suspended floor, the top from an upright piano to use as a bench, and a small badly-bruised vice. I thought that the floorboards could span the width without any intermediate support, but they sagged unevenly when I stood inside, and the battens supporting the planks were screwed to the side walls with number 8 (roughly 6 x 50mm) slotted woodscrews, in holes laboriously hammered out with a Rawltool chisel and plugged with 'Rawlplastic' (which is no longer used, because it was asbestos based). The puny screws in oversized holes were hopelessly inadequate, and they soon came loose. But eventually, after gobbling up funds from pocket money and a paper round, it became much-loved, and was used for several years.

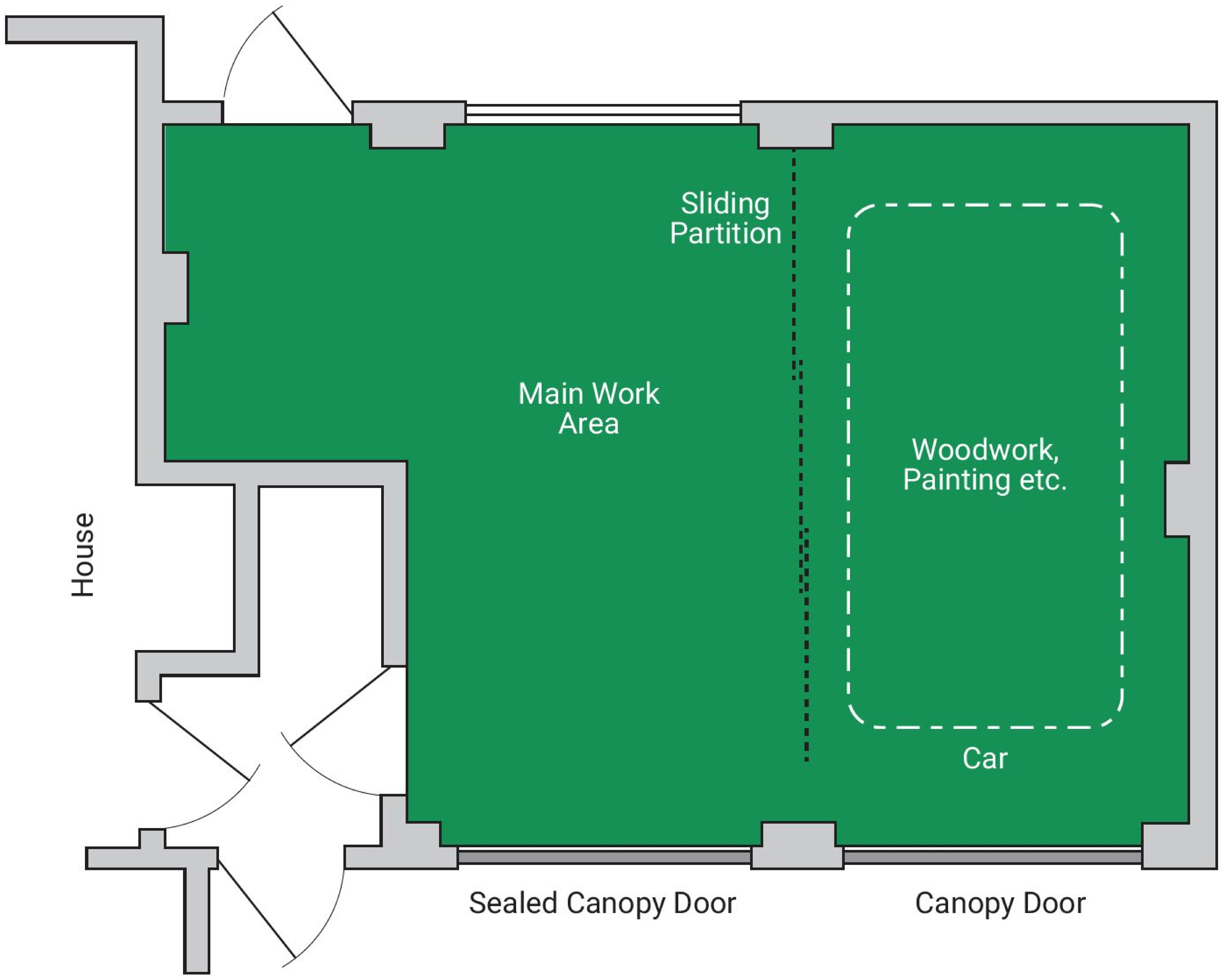


Figure 1

1

Wide access to loft, with rooflights above

Despite not realising it at the time, it was valuable experience that not only inculcated the habit of improvising by using what whatever was available (or could be scrounged), but also demonstrated the lasting value of learning from one's own mistakes. (Of course in the post-war austerity of the 1950's there was nothing unusual about having to adapt and improvise, rather than go out and buy – I suppose it was an early form of what is now known as 'upcycling'.)

These formative experiences clearly influenced my subsequent behaviour, so that in the various places where I have lived, I have always enjoyed fashioning a workspace, even when conditions were far from ideal. My conclusion is that no matter how much space is available, it always gets filled and leaves the owner wanting more, so the same considerations as to how to get the best out of the space come into play regardless of where one sits on the 'workshop ladder'. Fortunately, for the last thirty years I have had the lion's share of the double garage attached to my house (via a passageway that acts as a decontamination zone), and this long-term stability has allowed me to make progressive improvements, reflecting lessons learned along the way.

This article covers those aspects of my set-up that might be useful for readers planning their own workshops, though I make no claim for originality, as I have freely adapted whatever I have come across. Having been a reader of MEW for many years, I suppose this offering could appear under the 'one man and his workshop' heading, but I have not attempted a full description, preferring instead to focus on general issues that have more or less universal relevance.

After a brief description of the physical layout, the various topics fall into three broad themes, covering separation of activities to minimise transmission of dust and dirt ('wall' in the title); storage (also 'wall' – but not necessarily permanent); and work flexibility to maximise the use of space (hence the 'wheels' in the title).

Workshop Space

The floor plan is shown in **fig. 1**. It is a double garage in which the front has two canopy doors, separated by a stone pillar supporting a six-inch I-beam, the other end of which rests on the rear brick wall. The left side door is now semi-permanently sealed with mastic, which will allow it to be reinstated easily when the house is eventually sold. A bonus is that there is an additional rectangular space, now containing a sink, that leads to a door to the back garden. The area of the main work floor is 18m2, and of the car end is 12m2.

I rate lighting as a top priority, which, combined with the ever-present wish for more storage space explains why I replaced the original flat roof with a pitched one soon after moving-in. It seems appropriate to begin by discussing what influenced the design of the new loft space first, because it also impinges on the main workspace below.

The tiled roof weighs almost a tonne, so It was fortunate that the existing I-beam (giving mid-span support for the timber roof joists) was over-engineered and is well able to take its share of the additional weight of the pitched roof. Although the new loft space is primarily for general workshop storage, I chose to sacrifice new 'floor' space in favour of a relatively large cut-out in the original flat roof, with two Velux rooflights directly above the aperture. Daylight in the work area is thereby very much better than that which was provided by the only other window, high up in the rear wall, **photo 1.**

Car end of loft, with marooned storage trolley

Car end with canopy door open: curtain wall to left.

A retractable loft ladder provides access to the main loft area above the car end, and scrap steel conduit provides a safety rail around the opening. The pitched roof is of traditional pattern, with purlins, with mid-span support above the I-beam. The ridge is high enough to allow me to stand as long as I keep near to the centreline, and the safety rail surrounding the access cut-out is essential when I have to stoop and edge along to reach the other gable end.

With much of the stored material 'under the eaves' (i.e. in the space beyond the purlins), and hence not easy to get to, I tended to let stuff pile up in the middle of the floor, making it hard to see what was there. So during lockdown I made a large wheeled trolley with three shelves to store most of the stuff that had been lying about, **photo 2**: it never leaves the loft, (but it could be craned down) and is easy to move out of the way to provide access to the eaves, and it has proved a real boon.

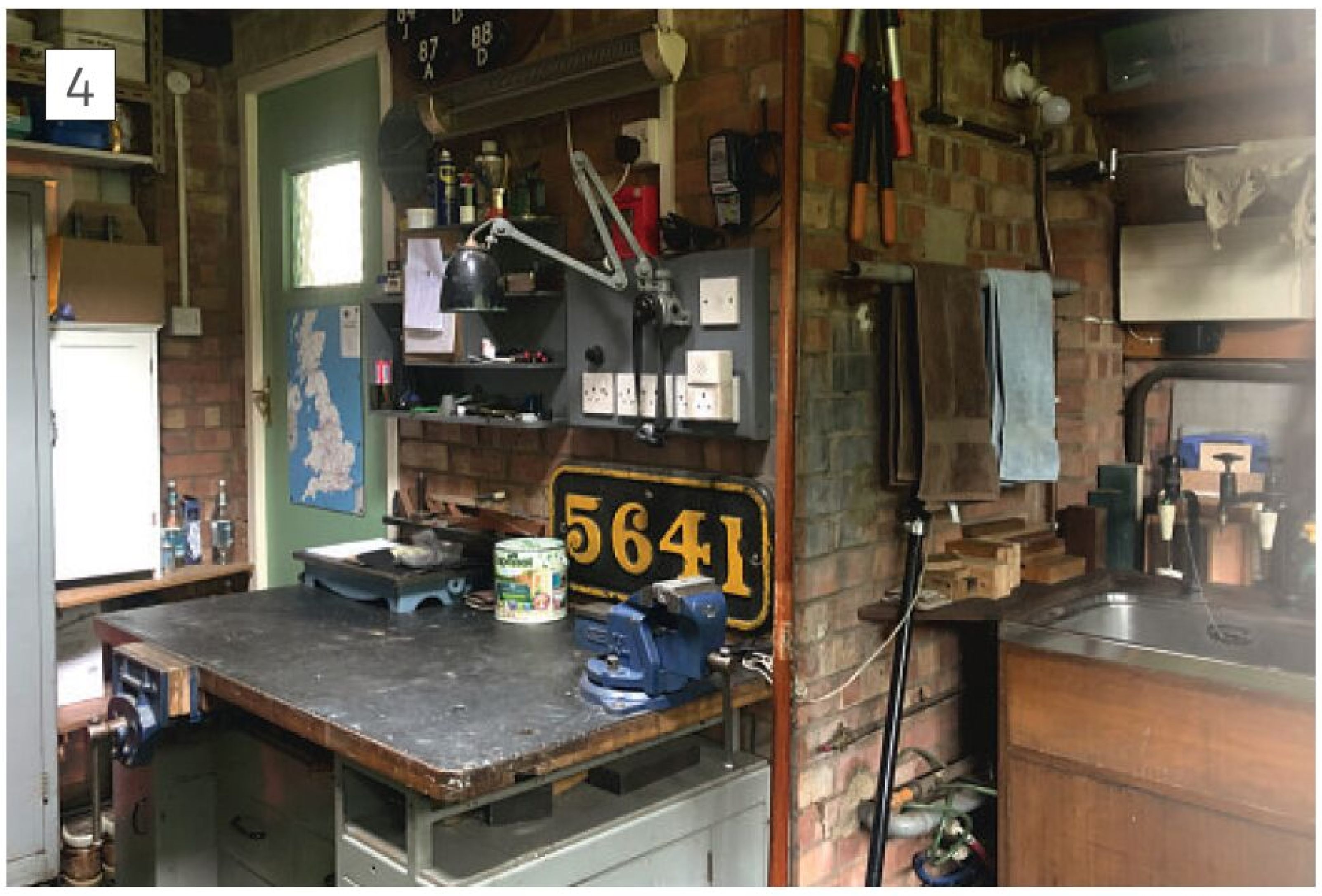
I have what many would regard as large stocks of mainly recycled metal and timber, and lots of 'stuff that will come in handy someday'. With a new project I prefer to start by looking through my stocks to see what is to hand that might be modified to form the basis of what is required, perhaps adapting my first thoughts in the light of what emerges, and thereby minimising the need for new material purchases.

Some of the seldom-used things living in the loft are heavy, so there is a chain hoist on a trolley running on angle iron rails under the ridge: once hoisted, items can be pushed to the unloading area. After many years of manual operation, one of my pandemic projects was to install an electric version, also photo 2.

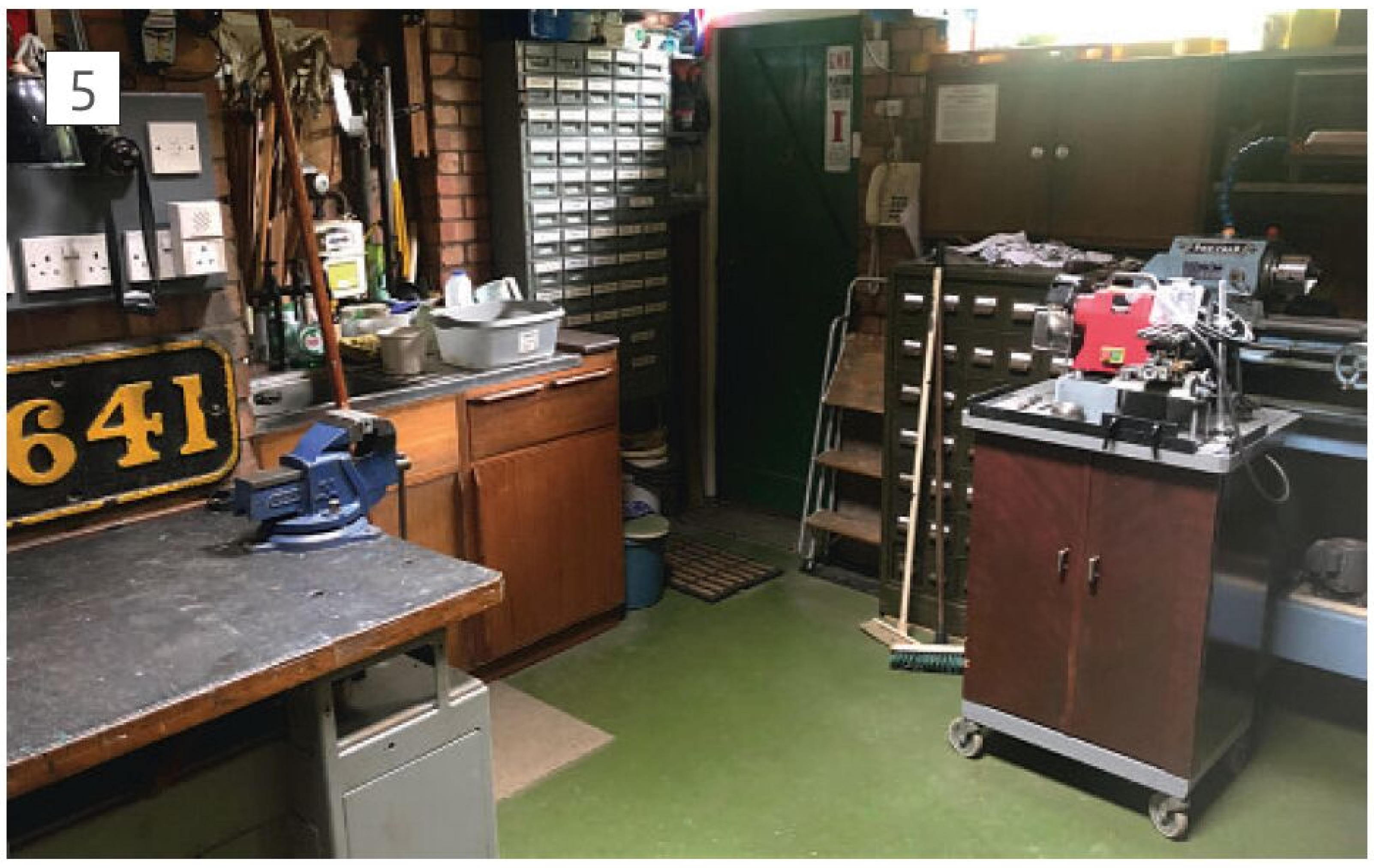
Split Layout

From the start, my wife made clear that she saw the garage as a place to keep a car, and despite me pointing out that hardly any locals garaged their vehicles, it was not an argument that could be won, so we compromised. One end was earmarked primarily for car storage, with the provisos that it would not be put in if it was wet, and that whenever activities such as woodwork, painting etc. arose, the car would be moved onto the drive. This has worked well, and it has to be admitted that the only other domestic intrusion - an upright fridge/freezer - is silver, grey, so it can almost be mistaken for a tool cupboard.

My main hobby activity centres on lathe and mill work, but DIY jobs often call for woodwork, and I was keen to keep the chips and sawdust (and paint smells) away from the 'clean' end, so it seemed obvious that a screen or partition would be needed to isolate the car end. But rather than erecting a permanent divider, I opted for a three-section removable sliding partition that allowed for full or partial separation of the two sections. Each section of 'curtain wall' is made from several strips of 300 x 3mm thick transparent plastic, as used in warehouses etc. At the top of each unit there are a pair of trolley-like wheels, each curtain running inside its own extruded steel track fixed to the ceiling joists adjacent to the I-beam (fig. 1). The curtain wall is seen on the left in **photo 3**, which is the view of the car end with the canopy door open: when



The cast-iron numberplate is from a GWR steam loco



Wall mounted and free standing storage chests, and grinding station

Lathe mounted on castors. Just visible to right of lathe is the wheeled base of the wood bandsaw.

'Virtual wall' to right of Sieg Mill, with curtain wall behind

this end is in use for woodworking, the front curtain section will be closed to keep dust out of the main work area on the left.

When equipment has to be moved between main and car areas, any of the three sections can be slid aside. Given my enthusiasm for mounting all the machines on wheels (see below) it is easy to move kit to wherever it is needed. The ability to remove the entire curtain wall also proved its worth when, after putting up with dust from the original concrete floor for many years, I invested in a resin floor and was able to give the contractor an unobstructed run at the entire floor.

Walls – real and virtual

A bare wall is a rare sight in a home workshop for the obvious reason that we need to store our stuff and racks, shelves, or cupboards need solid walls to take the sometimes considerable weight. The car end of my 'shop has two brick walls which have been exploited to the full with cupboards, shelves, racking, and even a child's wardrobe put to good use. The items at ground level underneath the glass-fronted wall cupboard at the far end all have castors, and include a low saw bench, a cut-down cupboard with rubber bump pads to assist car parking and a drill press: they would need to find new homes if a car with a longer bonnet was ever contemplated.

My main workspace has a decent area, but it has only two brick walls, both of which have doorways, so solid brickwork is at a premium, as can be seen from **photos 4, 5, 6, 7** and **8**, (not all of which were taken on the same day). This sequence of photos shows the main work area, moving clockwise viewed from above, and beginning close to the door that leads into the house.

I think that I can claim to have made good use of the two brick walls in the main work area, but nothing could be fixed to the sealed canopy door, so it is fronted by a large metal cupboard (on wheels) alongside the fridge/freezer. The fourth side of the work area is bounded by the curtain wall, so it too offers no firm anchorage: instead, it is in effect a virtual wall – solid enough to provide lots of storage, but capable of being moved whenever necessary.

My preference for drawers rather than racks for storage will be evident, as will my enthusiasm for having all the machines on wheels. The reader will probably also notice the similarity of appearance between many of the floor-standing units, all of which were adapted from the beautifully-made open-topped laboratory bench furniture scrapped and put into skips at the university where I worked. The carcasses (each consisting of a deep drawer with a cupboard underneath) were far too big from front to back for everything except the sink base, and the depth of the drawers (16cm) was too great for storing small items. However, I had lots of them, so it became possible to chop them up and fabricate more useable units, using the plywood sides to make new tops, with aluminium strips to protect the edges. Typically the front-to-back dimension and the depth of the drawers were reduced,

Behind the sealed canopy door are a steel cupboard with castors, the intruding fridge/freezer (conveniently close to the door into the house), and my metal bandsaw

making perhaps one 6cm and one 10cm drawer from a 16cm original, as shown for example in **photo 9**. Prior to the arrival of this bonanza of scrapped goodies, the furniture had been cobbled together from diverse sources, including a Victorian sideboard, several chests of drawers, a kitchen base unit and an enormous six-drawer architect's plan chest.

The virtual wall sits in front of the plastic curtain, to the right of the Sieg SX3 mill. The first two base units in photo 9 are shortened originals with reduced-depth drawers: both have plain wheels at the back, but none at the front, so they can be moved if the front is lifted, but are otherwise stable, and are very rarely moved. The third base unit (next to the stool) has deep drawers from four original carcasses at the front, but they are shortened, and a cupboard now occupies the space at the back: the top of this unit is usually kept clear and is used as a moveable workbench.

The haphazard array of stuff on top of the base units developed piecemeal, as various items turned up to be what is now called 're-purposed'. One of 'boxes' was made to fit some storage bins that I swapped with a friend, while the eight wooden drawers started life in my home office as a vertical set – I couldn't reach the top ones so it had to be chopped in two and arranged side by side. This is where most of the frequently-used lathe and mill tooling, angle plates, clamping kit etc. is stored,

Two useable drawers cannibalised from one large ones

Multi-drawer chest ideal for small items

Grinding station easily moved outside for dressing the wheels

and the front to back measurement is limited so that that the front half of the top of the base units is free for use to plonk down bits of tooling that will soon be used again. I like to have open-fronted shelves where the contents can sit on old baking trays and be seen easily, and everything is raised above the top of the worktops with upstands so that work in progress, boxes etc., can be slid underneath.

On reflection, I was lucky to work in a large organisation which invariably seemed to have a skip somewhere on site, so it was not surprising that a clandestine network of dippers were always alert to new opportunities. My workbench (see photo 4) was made from the frame of an outdated IBM line-printer thrown out by my own Electrical Engineering department, and I recall for instance that the sink taps were the result of a call from a member of staff in far-off Chemistry asking me "have you seen what we've thrown out today"?

The workbench, sink and 35-drawer steel chest, **photo 10**, are the only items that don't have wheels. The chest was salvaged by my mother-in- law from the plumber's union headquarters in London (for onward shipment to Yorkshire) because she 'thought it might be useful'. How right she was - it has proved superb not only for small items in tobacco tins which fit nicely in the 60cm long drawers, but also for metal stock: as a result It now weighs almost 1000kg!

Wheels

Strictly speaking, all of my stuff is on castors (which include wheels of course), except for one or two items that seldom move, which make do with plain wheels. In practice, only the grinding station, which is very easy to move, gets repositioned frequently, because it is used often and is parked in the main workspace, usually in front of the lathe. (It consists of two off-hand grinders (one for rough work and one for tool sharpening), mounted on an old sewing machine base now fitted with drawers to store grinding accessories). **Photograph 11** shows the grinding station wheeled outside onto the driveway for wheel dressing.

Amongst other items that are often moved are the metal bandsaw, welding gear, and the small vertical wood band saw that lives behind the lathe and mill. To get the latter out, the mill doesn't have to be moved because by traversing the mill table to the right (where it then overhangs the worktop) the bandsaw can be wheeled out of its hideaway: this is a good illustration of how wise positioning of the machines allows maximum utilisation of space.

Lathe

Having the lathe on castors will undoubtedly raise a few eyebrows. No one can dispute the convenience of being able to move it, perhaps to accommodate a very long workpiece through the headstock mandrel (that would otherwise foul the adjacent steel cabinet), or to access the rear for cleaning or maintenance, but all the books stress the importance of having a lathe grouted in solid concrete, with the bed absolutely horizontal. I was aware of these strictures when I got the lathe, but at the time there was no possibility of a permanent venue, and so castors seemed worth a try.

The Boxford bed is a very heavy casting and is securely bolted to its welded steel base that consists of two upright rectangular sections linked by horizontal members of channel section. The majority of the weight is at the headstock end, and the section at that end therefore has a larger cross-section than at the tailstock end. All of the steel is about 4mm thick (8 or 9 SWG), and it appeared to me to be well able to resist bending or torsion, both of which could result in warping or twisting of the bed.

In its previous existence, the lathe had been on a flat concrete pad, and lightly held down by screws which would have resisted anything that

Stability of lathe improved by 'outrigger' castors

Indirectly mounted castors

Ancient vice given new lease of life

might have threatened to topple it over: but if it simply rested on its base, no such restraint would be provided. I had in mind to use a set of heavy-duty rubber-wheeled castors (courtesy of Mechanical Engineering skip) which were clearly able to take the weight, but they would raise the lathe by 15cm: on the one had this suited me because I am quite tall, but on the other the lathe would be even less stable.

Feeling uneasy, I resorted to my preferred approach and produced a mock up, using 15cm wood blocks placed under each corner. Being very heavy (especially at the headstock end), it was good to learn that it still needed a hefty push to even wobble it, but it certainly didn't look right, and I had a scary mental picture of how it might behave when the blocks were replaced with castors. I could envisage it being moved transversely when suddenly the wheels hit a bit of a step in the floor, whereupon the momentum of that top-heavy headstock would cause it to topple away from me. So the four blocks were replaced with various long baulks of timber to simulate having the castors mounted like outriggers, projecting beyond the original footprint of the lathe's base.

My Boxford is of the older ('A') type, with the motor mounted behind the headstock, rather than underneath. The large drive pulley, **photo 12**, overhangs the drip tray at the rear, so that when the lathe stands in its place in front of the back wall, it can only be pushed back until the pulley just clears the brickwork, leaving the base well clear of the wall, which at first sight appears to waste useful floor space. But it also allows the rear heavy-end castor to be positioned so that it is in line with the main pulley, thereby giving a great deal more stability, as shown in the photograph.

This has proved to be a successful arrangement, with the castors mounted on heavy angle iron brackets bolted to the sides of the base uprights: it is probably over-engineered, and needs a big shove to get it moving, but then I can position it with confidence. The lathe usually sits where the floor is pretty flat and horizontal, so each wheel shares the load and hence the situation is essentially the same as if it were grouted in: happily, after twenty years, there don't appear to be any problems of bed distortion, although I don't do much precision turning so it is difficult to be sure.

Castor Experience

Given that most of the castors I have used have been second hand it's not surprising that not all have been successful. The worst have been plastic ones salvaged from light domestic equipment such as footrests or tea trolleys: they seldom last long on concrete, and often have mountings that are not easily adapted, so I generally go for the conventional steel/rubber wheeled type with ball-bearing swivel. I have used up all my salvaged ones, but happily they are surprisingly cheap and readily available in a wide range of sizes.

Mounting directly is seldom the best approach, and I usually make what amounts to a sub-frame, often of steel angle, to which the castors are attached. The example shown in **photo 13** illustrates a set of decorative furniture castors fitted to the end of my cumbersome saw bench to allow it to be trundled to and from its storage space (on the left under the glass fronted cupboard in photo 3). Fastening each castor into the wood would have required four very small woodscrews, and would clearly not be satisfactory. Instead, a length of mild steel was used for each pair, with each castor fixed with four 4mm tapped holes for screws with nuts behind, the whole then being screwed to the wood.

Final Thoughts

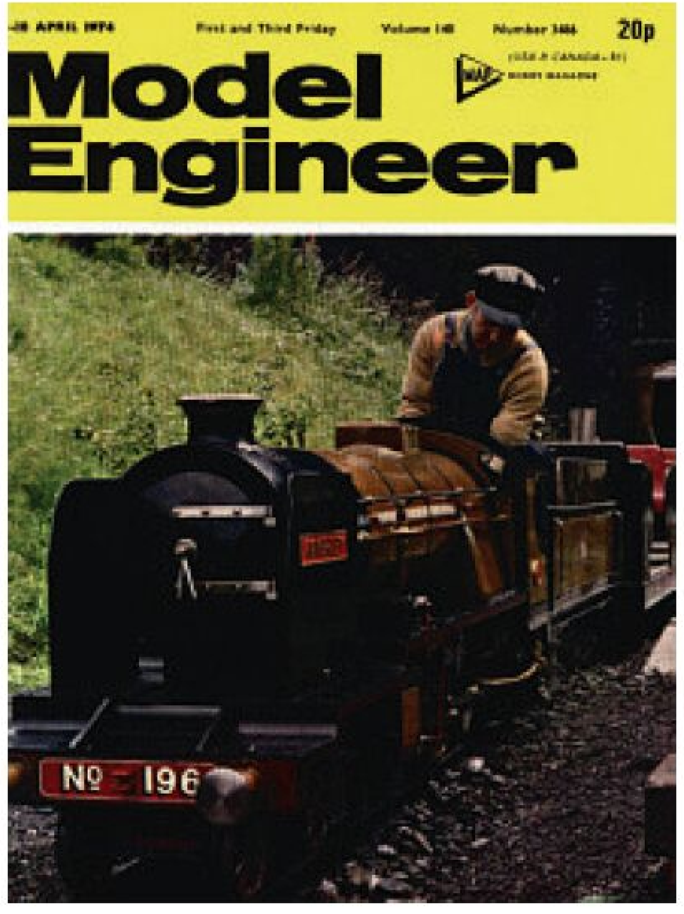
I rate flexibility of workspace and good light as top priorities, closely followed by the ability to isolate or contain dusty or smelly activities, so obviously these considerations have informed the development of my workshop. Power socket outlets are of course another priority: my first thought was that half a dozen would be enough, but as time went by and more power tools were acquired it became desirable to have sockets in all areas where work might take place, and now I have nineteen. Particularly useful are those adjacent to the external doors which see a lot of use in summer when I like to work outside.

As I hope will have been clear, I also very much enjoy using discarded items and turning them to good use. True to form, nearly seven decades after getting the ancient vice for my coalhouse workshop, I refurbished it, **photo 14**, to give to a grandson, who used his 3D printer to make me a 63-tooth change wheel for cutting metric threads: a good example of re-cycling on which to end? ■

From the Archives

With over 125 years of Model Engineer magazine and nearly 35 years of Model Engineers' Workshop in our archives, there's a huge selection of fascinating and often useful ideas for the workshop to be found.

This article by Tubal Cain (pen-name of the Late Tom Walshaw) gives sound advice on choosing a pillar drill for your workshop that is still relevant today. I have no idea why the photo of a Myford Dividing Attachment was included, perhaps it was relevant to the longer series of which this was a part. From Model Engineer 3486, Vol. 140, 5 April 1974.



WORKSHOP EQUIPMENT & MATERIALS

by "Tubal Cain"

THOSE who have good drilling machines can in fact cope with the ½in. and yet still "feel" the No. 60 as it feeds in, but this brings us back to point (1). There is a further problem for the man going for a drill for the first time — that of "chasing skylines". One machine has four speeds, another five; but if five, why not the one next to it with ten? Then there is one over there, same make, which takes ¾in. drills AND it has a tilting table, too. You can, in fact, go on for ever almost. Then on top of all this you will need a drilling vice; the chuck and chuckguard may be "extra"; and you've got to buy the drills themselves, too. So, what are the essentials?

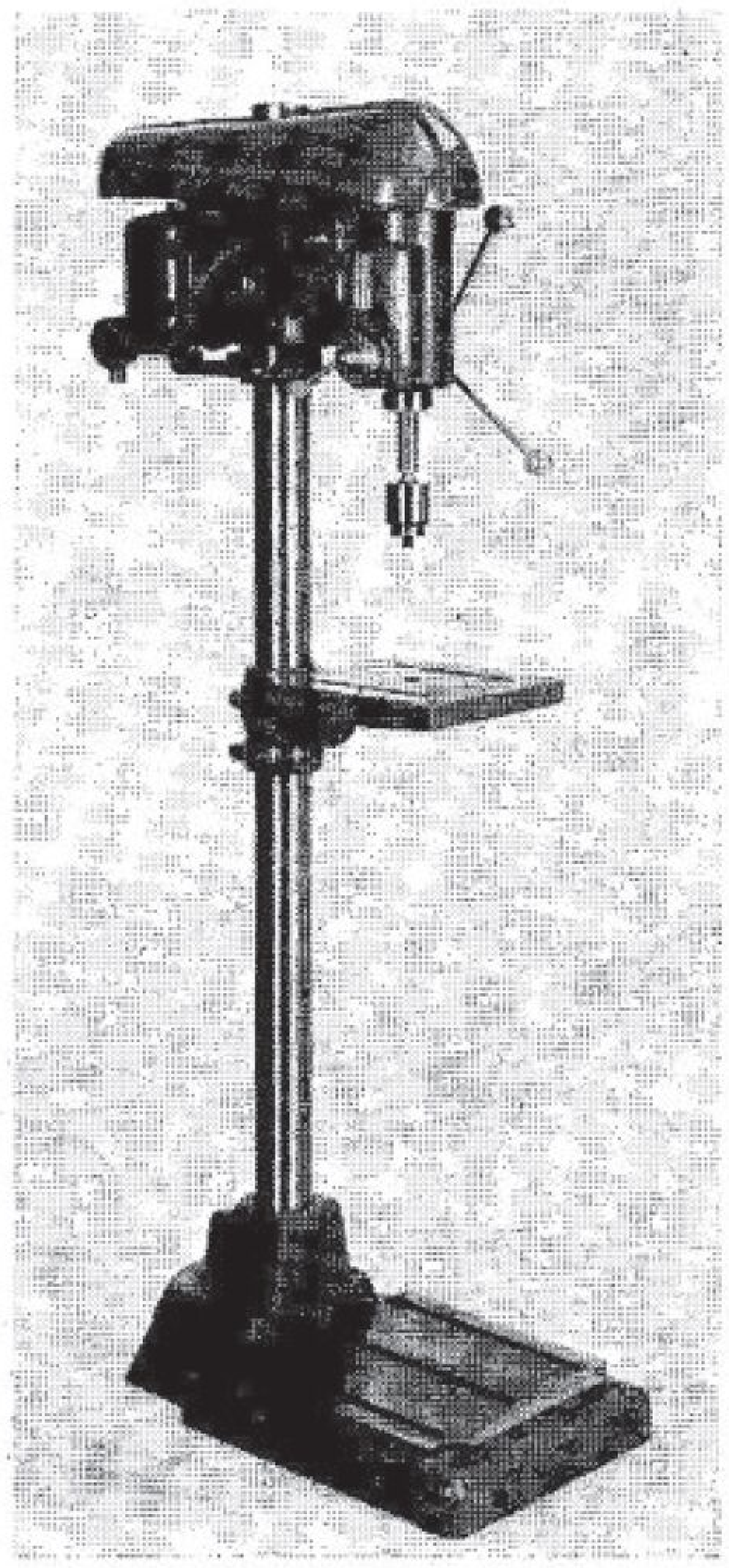
First, size. The average model engineer does most of his drilling between 3/16in. and ⅜in. (I'm speaking of drilling on the machine) the next big band being 3/32in. to 5/32in. Unless, that is, he makes a lot of injectors, when the consumption of drills in the 60 to 80 range may be fantastic! Holes over ½in. ARE needed, but seldom, and a lot of these are drilled in the lathe anyway. So my feeling is that ½in. is large enough for the AVERAGE chap. ⅜in. would do for many.

Having said that, look at the speeds. Cutting speed drilling cast-iron should be about 60ft./min.; alloy steel 40 and stainless 20ft./min. MAXIMUM. For a ½in. drill this means 450, 300, and 150 revs. At the other end of the scale, the "correct" speed for a 1/16in. drill in brass is around 9,000 r.p.m. Note that these are maxima; lower speeds will cut as well, and give a longer drill life. We can't expect one machine to reach from 150 to 9,000 revs., but it is the LOWEST speed that matters. If the machine can get down to 300 or 350 r.p.m. you can drill ½in. in anything except stainless, where you would be limited to ¼in., or ⅜in. if you sacrificed the drill a little. The top speed is not important at all, and if you reach 1,200 this will give reasonable feel, and a decent feed per rev. on the smallest drill you may use.

"Reach" is important. A ½in. drill sticks out 4in. or 5in. from the chuck; you need space for the vice and for any packing. If the tallest job is likely to be 5in., then you need a space of about a foot between chuck and base. (Note that some machines have a table AND a base, and the former can swing out of the way). The spindle travel governs the depth of hole you can drill and about 4in. is ample. A tilting table is of doubtful value, mine has one, never used in 20 years. Far more important is that it should be spot on at right angles to the drill! For drilling holes that are "slantendicular" it is better and cheaper to use an adjustable angle-plate. The table or the head must be adjustable to height except in very small machines where the drill travel covers the full distance between chuck and base. Motor — this should offer about 1 h.p. per inch of drill diameter, with not less than ¼ h.p. on the very small machines, and can be of the split phase type.

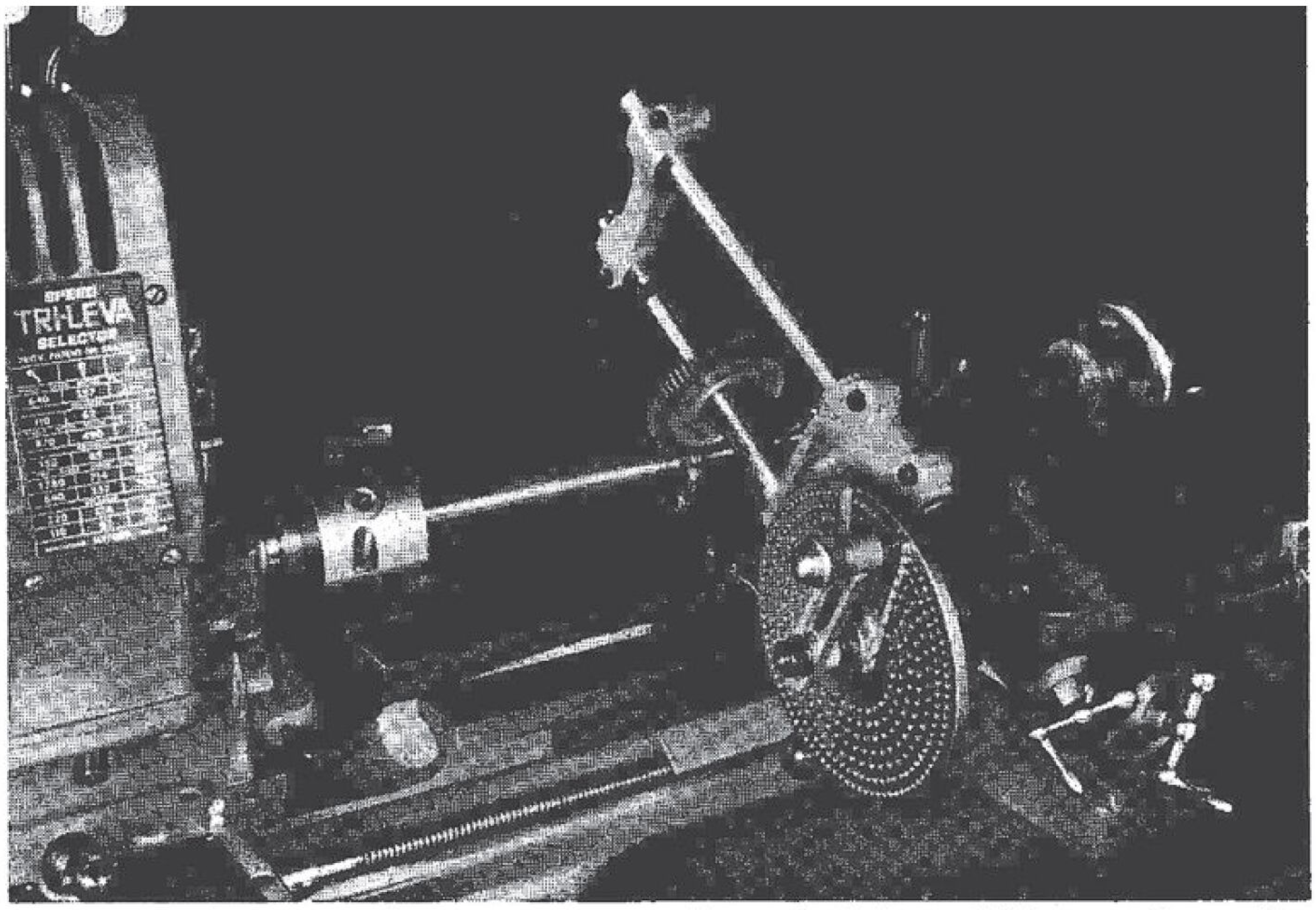
As to drill design, you should look for sturdiness of the column, of course. Cock an eye under the table and make sure that it is reasonably well ribbed, but not so that you can't put nuts on any bolts through the tee-slots. Enquire about the spindle; the best machines will have the drive pulley supported on bearings which are quite independent of those carrying the quill, the drive from the pulley shaft to the quill being through splines or a feather. The sensitivity of the return

A typical ½ in. pillar drilling machine. The Boxford/Union pedestal drill.



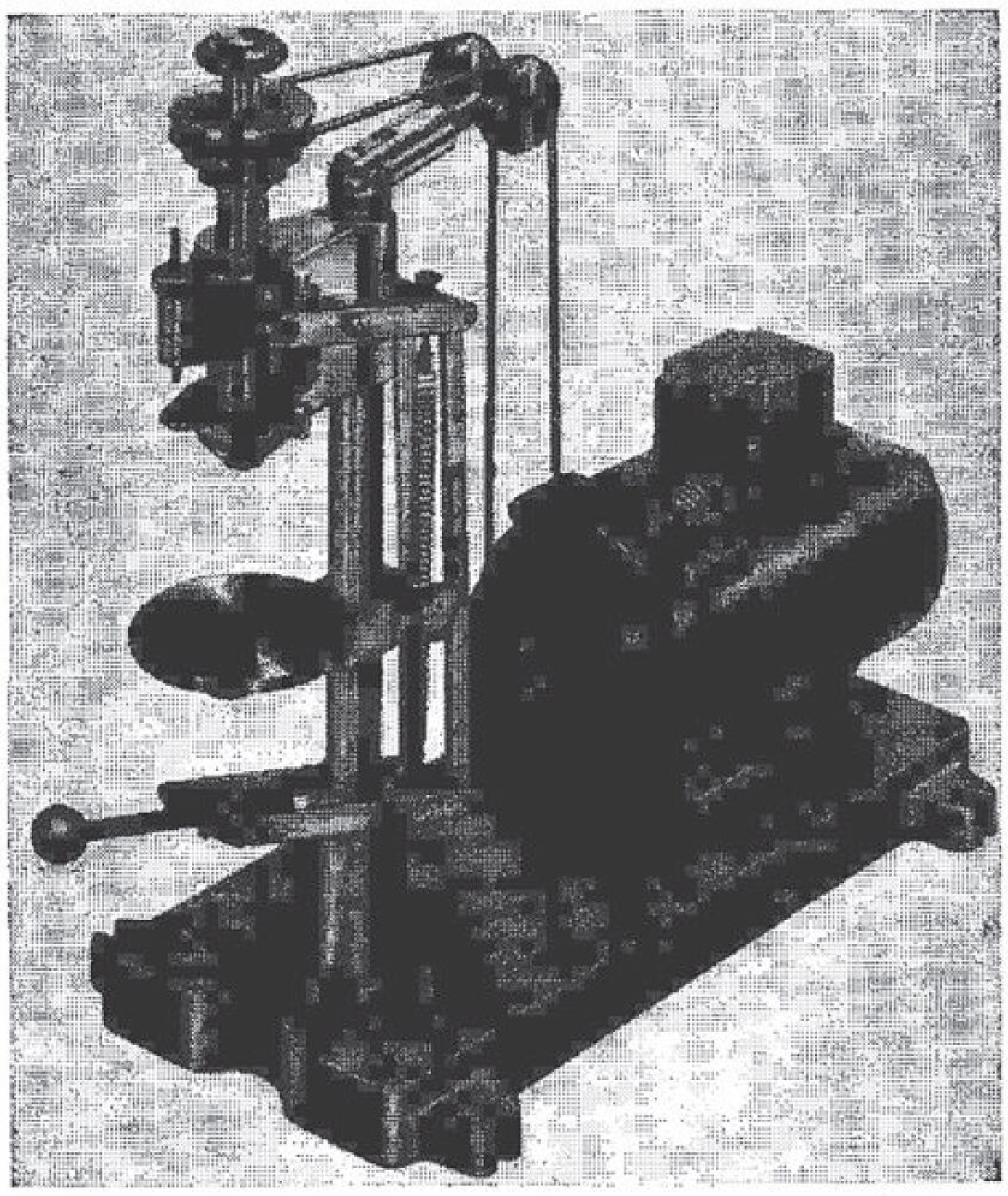
Opposite page: The "IME" precision bench drill. Photograph: E. H. Bernfield Ltd.

The Myford dividing attachment on a M.L.7. lathe.



spring should be adjustable, both to suit your taste and to allow for varying sizes of drill. The chuck should, preferably, fit direct onto a taper ground on the end of the quill. In which connection, note that a ½in. chuck should not be expected to grip a No. 60 as well! Check that it is possible to change chucks easily. Finally, especially if you are thinking of a pillar or pedestal drill, to stand on the floor, check the stability of the machine.

All that is fine if you can afford it, but what to do if funds won't run to the £100 or so it may cost? The first alternative is the second-hand tool factor — and these are very different places from



the "used" car dealer's establishment. Some offer only reconditioned machines, some will sell old machines "as seen". But the point is that there are many old-fashioned drills to be had which in many ways have advantages over the modern ones. For one thing, they have slower speeds. Many have a rack and pinion hoist to the table, and quite a few power feed to the head. Inevitably the table will be a bit gnarled and there may be wear in the bearings but an old Pollard, Denbigh, or Herbert sensitive drill (we used to call them "pin-drills") with a bit of time and money spent on it will serve a model engineer well.

There is an alternative to the usual ½ in. capacity machine, although this may not meet with general approval. This is to obtain one of the old-fashioned hand-operated screw-feed bench drills for large work, and set to and make a little ¼ in. sensitive drill to M.E. drawings for fine work. The main weakness of the hand drill—apart from the hard work—is the chuck, which is usually a bit crude, but it can be changed for a Jacobs fairly easily. I had one of these for very many years, single speed and with a ratchet auto down feed and it made nothing of pushing a ½ in. drill through cast-iron. It had the delightful feature in that you could fit the head on at right angles, clamp the machine to the floor and drill a hole in the wall with it. My son still has it, though he has just replaced it with a used machine he is reconditioning.

The one drilling device which is a dead loss except for work in wood is the average "Do-it-yourself" electric hand drill mounted in a stand. It runs FAR too fast and the set-up is nowhere near rigid enough.

For those who are going to do a lot of very fine drilling, it is worth considering a watchmaker's drill.

A New Small Chainsaw Vice

Will Doggett repurposes some old brackets to make a useful vice to hold a small chainsaw chain for sharpening.

The finished chainsaw vice is shown in **photo 1**. Over time I have, like most gardeners I suppose, assembled an array of tools for the jobs in the garden in my case this includes tree and shrub cutting tools from chainsaws down to secateurs. One of this assortment is a small four-inch battery chainsaw this is ideal for cutting branches too big for the normal loppers and too small to use a normal chainsaw.

The idea

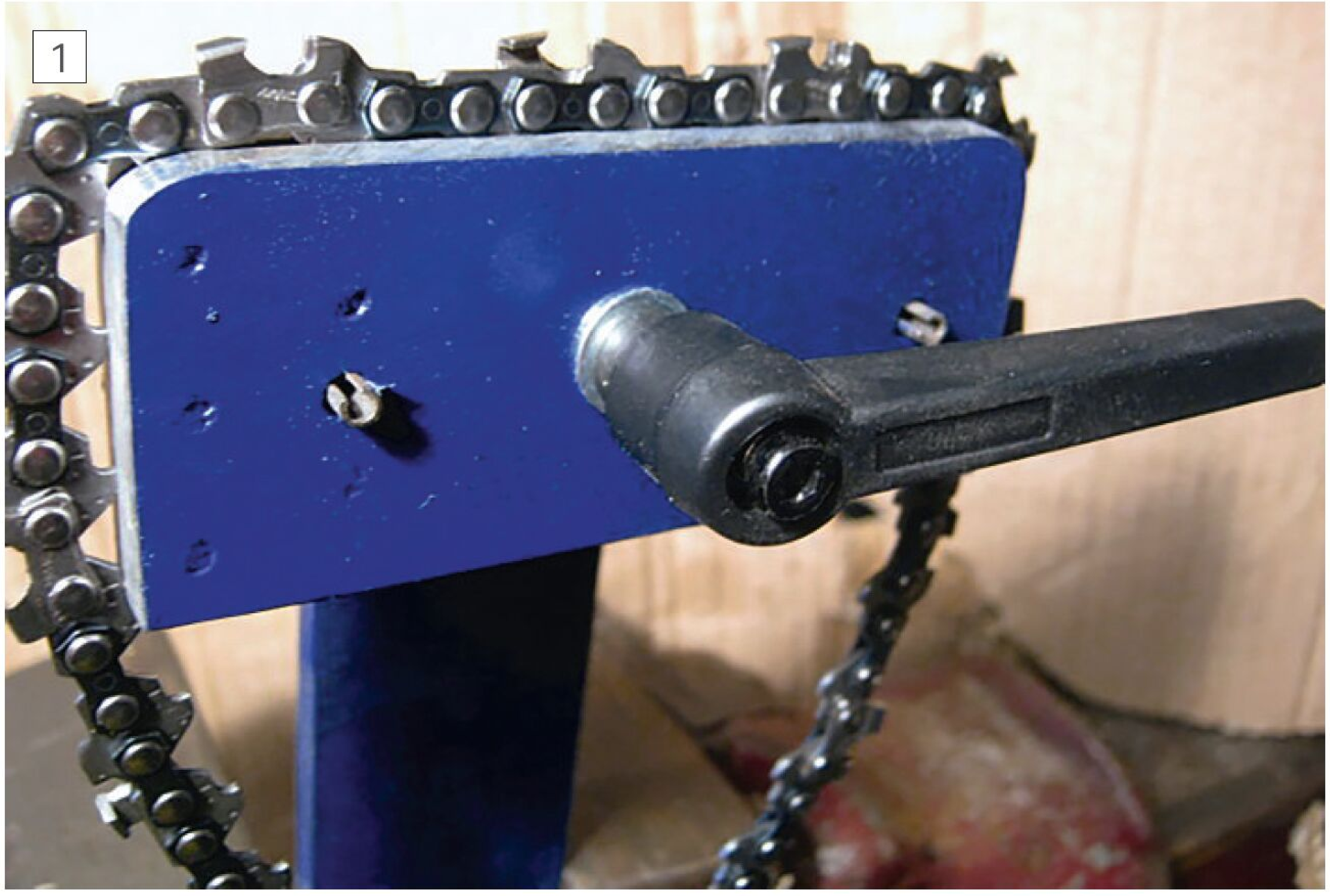
After using the battery chain saw for some time the blade required sharpening. New blades are available and are not that expensive but why replace a blade that with a little fettling with a file can be as good as new. The only problem is it is not possible to hold it in a normal chainsaw vice as it is only 150mm long; holding the blade to stop it rocking in the bar is not the solution.

I did think of using a small hand vice, but the jaws are not long enough as they are about 50mm long and would only hold one tooth to be sharpened at a time. This vice is shown in **photo 2**.

The solution was to make a small chain sharpening vice, which is the best option that I can see. The blade in question is 1/4"pitch 0.043 gauge (1.1mm) 28 drive links, 14 cutters and is shown in **photo 3**.

Figure1 shows the general idea for the vice that I'm going to make. The view is from the back, the support will be held in a bench vice so that the length of chain not being sharpened can hang down out of the way.

To make the vice jaws some flat steel was required, this I found in the oddment box. **Photograph 4** shows the parts

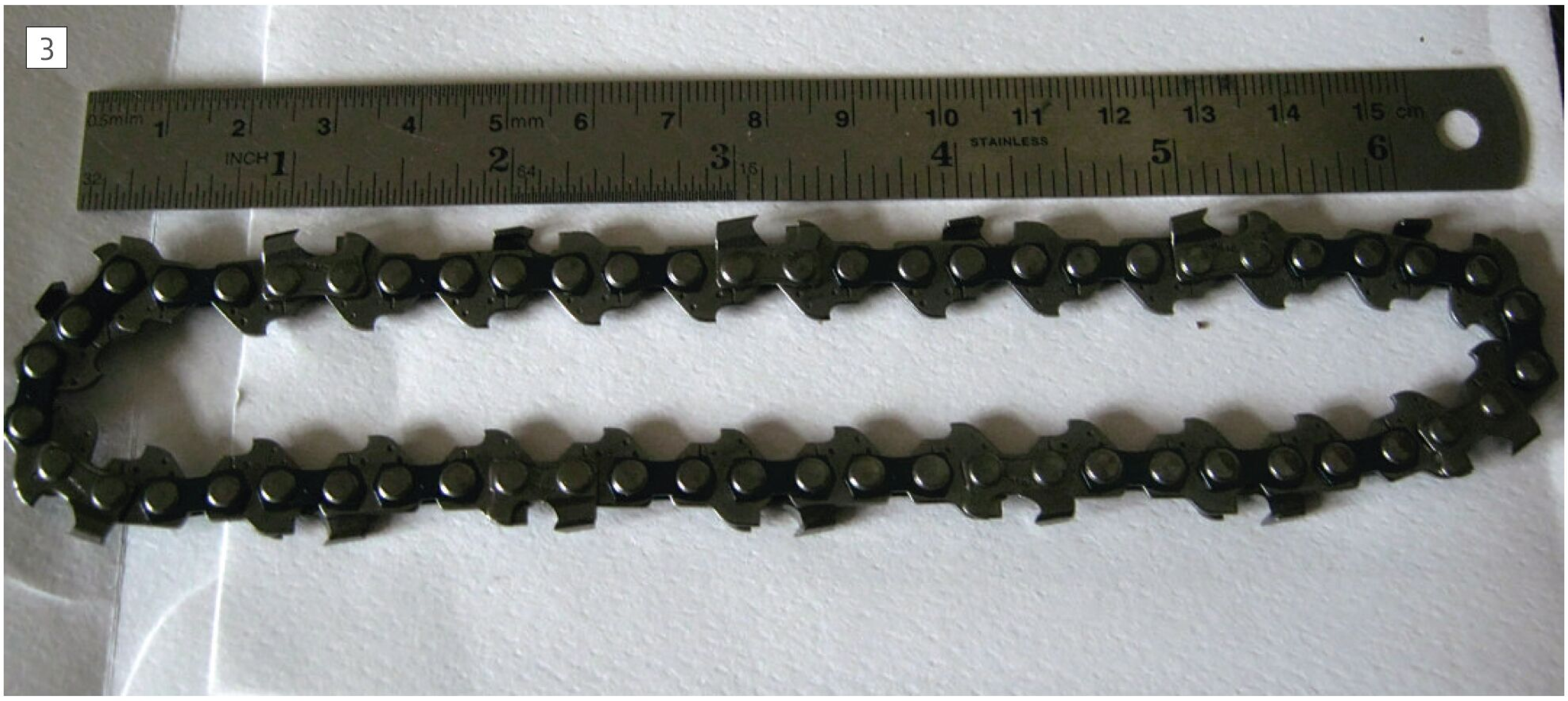


1

The small vice, suitable for sharpening small electric chainsaw chains.

2

Using this hand vice was considered, but it can only hold one cutter at a time.



The relatively short chain is too small to fit in a normal chainsaw vice.

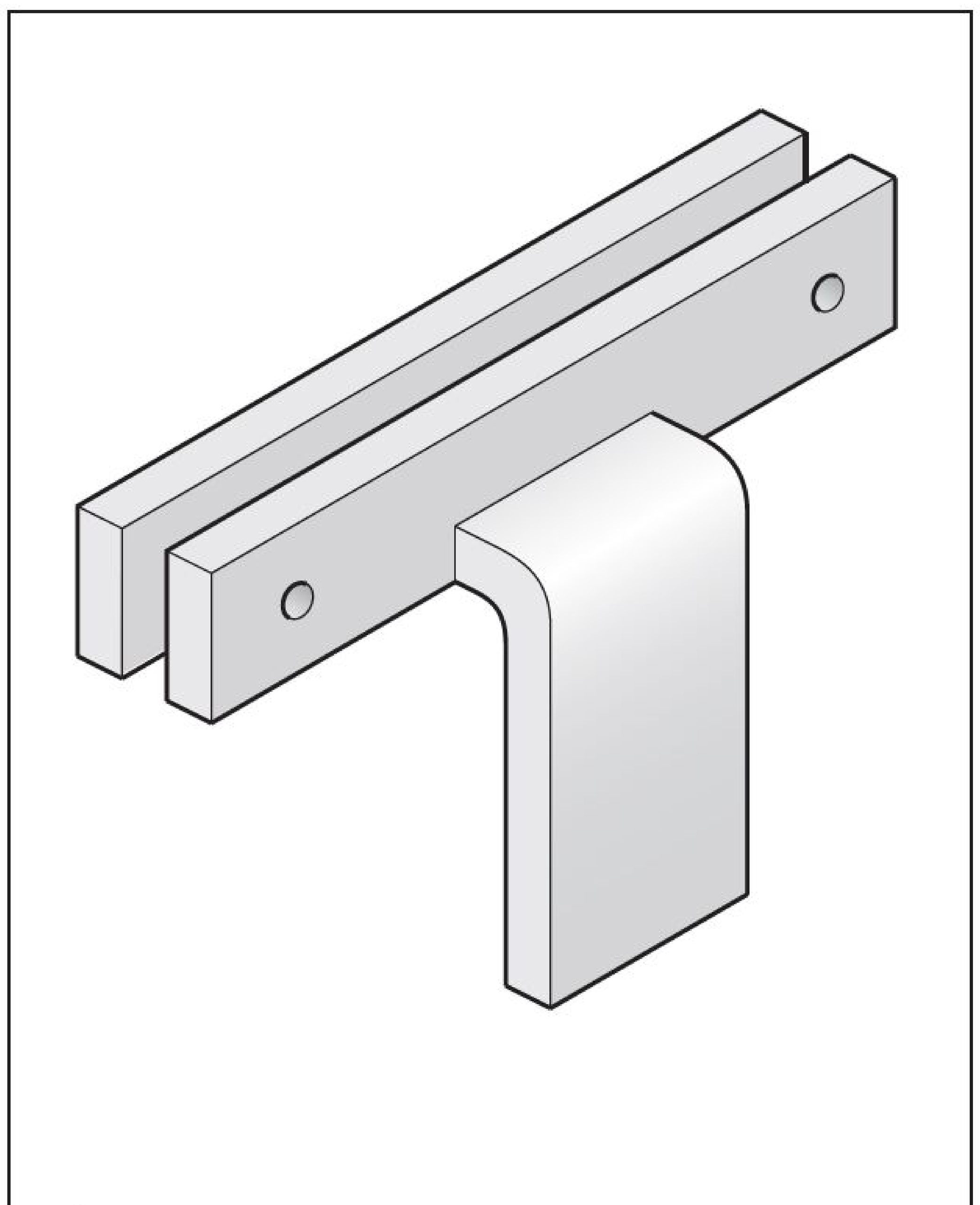


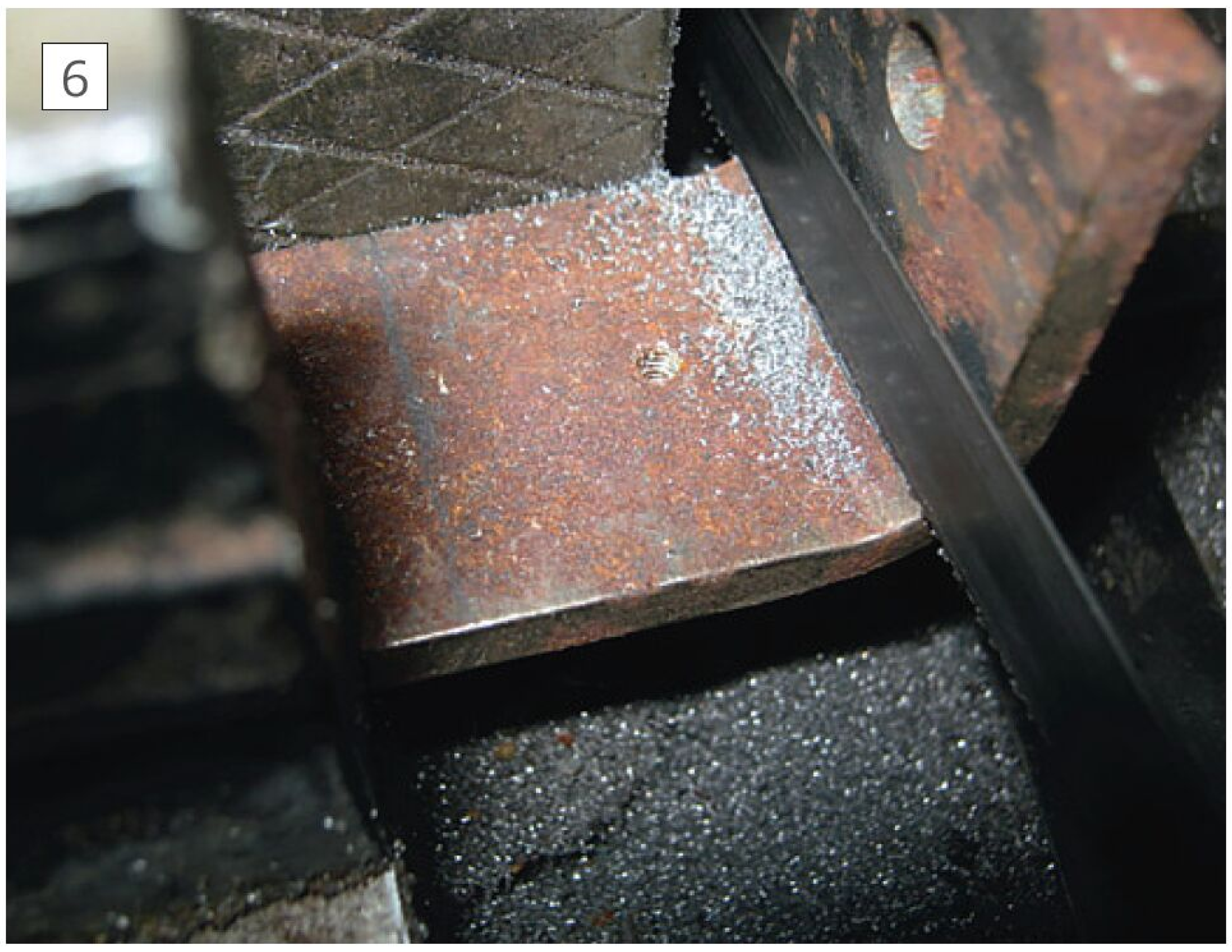
Figure 1

Scrap brackets used to make the vice.

A pair of 'Bristol' clamping levers.

as found, I think they were brackets of some sort, they have some small holes in them as can be seen in the photo, but these are not a problem as they can be filled with car filler or alternatively J.B weld or something similar. The bracket sizes are 6mm thick by 40mm wide giving a usable length of 85mm before the bend. These will be used for the jaws of the vice with the angle pieces removed, the other one with the bend still in it will be used as the support and welded to one of the jaws.

The other requirement is something to clamp the jaws together this turned out to be a pair of machine 'Bristol' clamping levers. These I found on the internet after a lot of searching, two of them are shown in **photo 5.** The ›



Sawing the brackets to length for the jaws.

Jaws as cut.

Jaws after initial tidying up.

photo shows some that I used on a previous job, I have ordered one more for this vice. The reason for using this type of clamp is you can adjust the position of the handle when tightened so that it is not in the way when using the vice.

Making a start

To start the jaws were cut to length on the band-saw to just over 85mm. The job is shown in **photo 6**, in **photo 7** the two jaws are ready for finishing to size and cleaning up. As you can see in the photo there is a small lip on one end of the vice pieces, this will be removed when the ends are cleaned up.

The cleaning up of the lip has been done and the ends are also finished in **photo 8** which shows the vice parts with the clamping lever ready for marking out.

Trimming the support piece.

Support piece ready to weld in place.

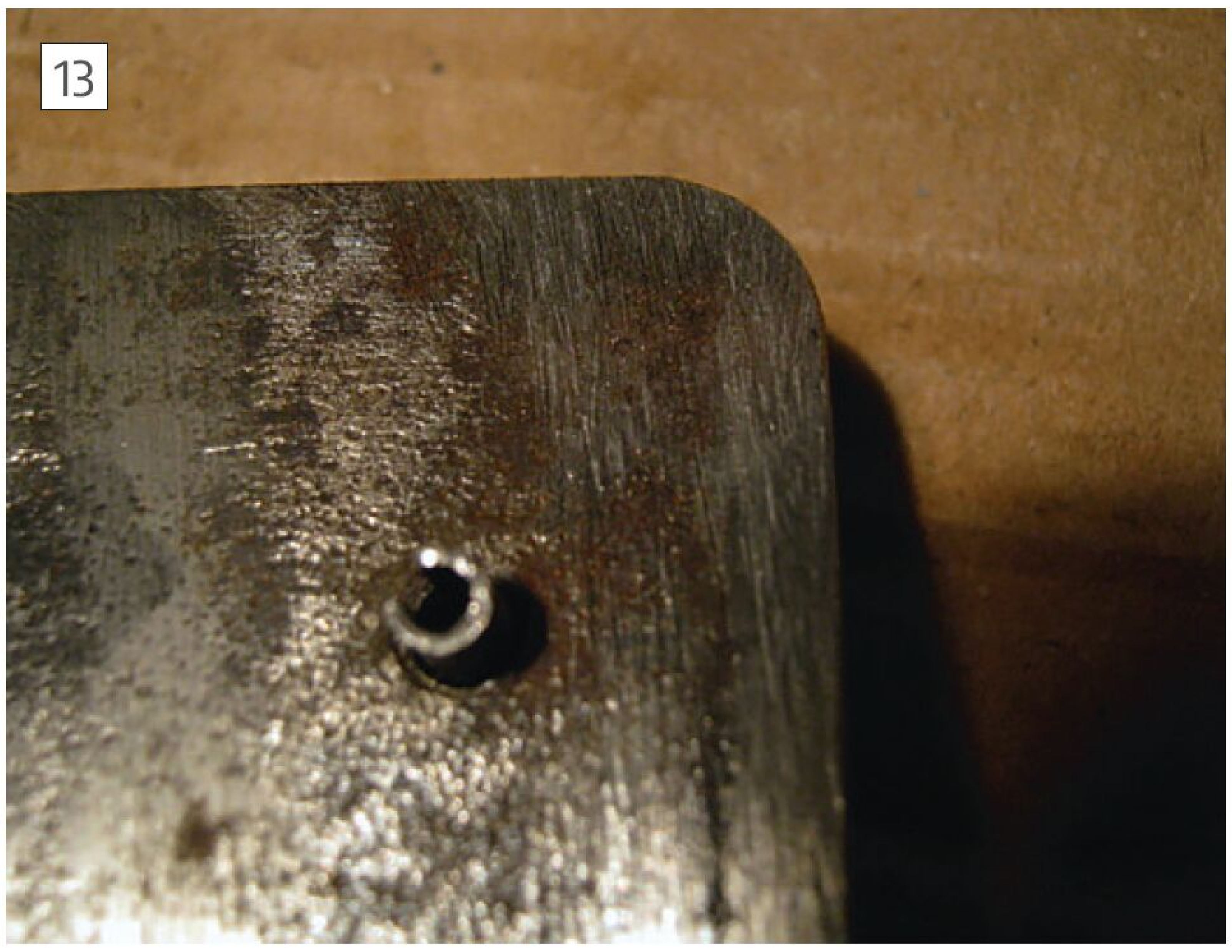
Holes in brackets filled except for two retained in each piece for guides.

The other cutting job was to cut the support arm to remove the waste. This will move the arm closer to the back of the vice. The operation on the band saw is shown in **photo 9,** the finished cut is shown in **photo 10.** This will be cleaned up before it is welded to the back of the fixed vice jaw. The welding will be done after the jaws have been drilled and tapped and a radius put on both pieces (the radius is to help the chain to move when sharpening it).

The small holes that are in the vice jaw pieces and the support were filled with car body filler, all but two as these will be used for the guide pins after drilling to the correct size as can be seen in **photo 11**.

Now the filing has be done the holes for the clamp can be marked out and drilled. For this I clamped the two pieces together and drilled M6 tapping size though both pieces. Next, I removed the clamp and tapped the

Roll pin fitted in the fixed jaw.



Corners of jaws were radiused so as to not catch on the chain.

Support piece welded to fixed jaw.

Painting the jaws.

back part M6 and opened the front vice hole to 6.5mm.

The next operation was to hold the two parts together with an M6 bolt and line the pin holes up, then open up the pin holes to 3mm. Next the front part was removed and drilled clearance for the pins, the rear or fixed jaw is shown in **photo 12** with the tapped hole and the pins fitted.

At this point I did think of putting a spring on the pins to help with opening the jaws of the vice, but this would require counter bores to allow for the springs in the jaws, but the springs would not be required as the jaws open easily without them.

Moving on with the build I clamped the two jaws together with a bolt and mounted them in the bench vice and removed the top corners at both ends of the vice jaws with a hacksaw. I then rounded them with a file to help when moving the chain for sharpening, the radius is shown in **photo 13**.

Now the vice jaws are ready for the support arm to be welded the back jaw. I use a MIG welder for this, but silver solder would be ok. The support arm is held in a bench vice so that the length of chainsaw chain that is not held in the vice can hang clear. The finished welding and cleaning up is now shown in **photo 14**. the next job was to paint the vice, shown in **photo 15**. The painted vice is on an old feed bag to protect the bench from paint.

The finished vice was shown in **photo 1** with a cutting chain in position ready to be sharpened. ∎

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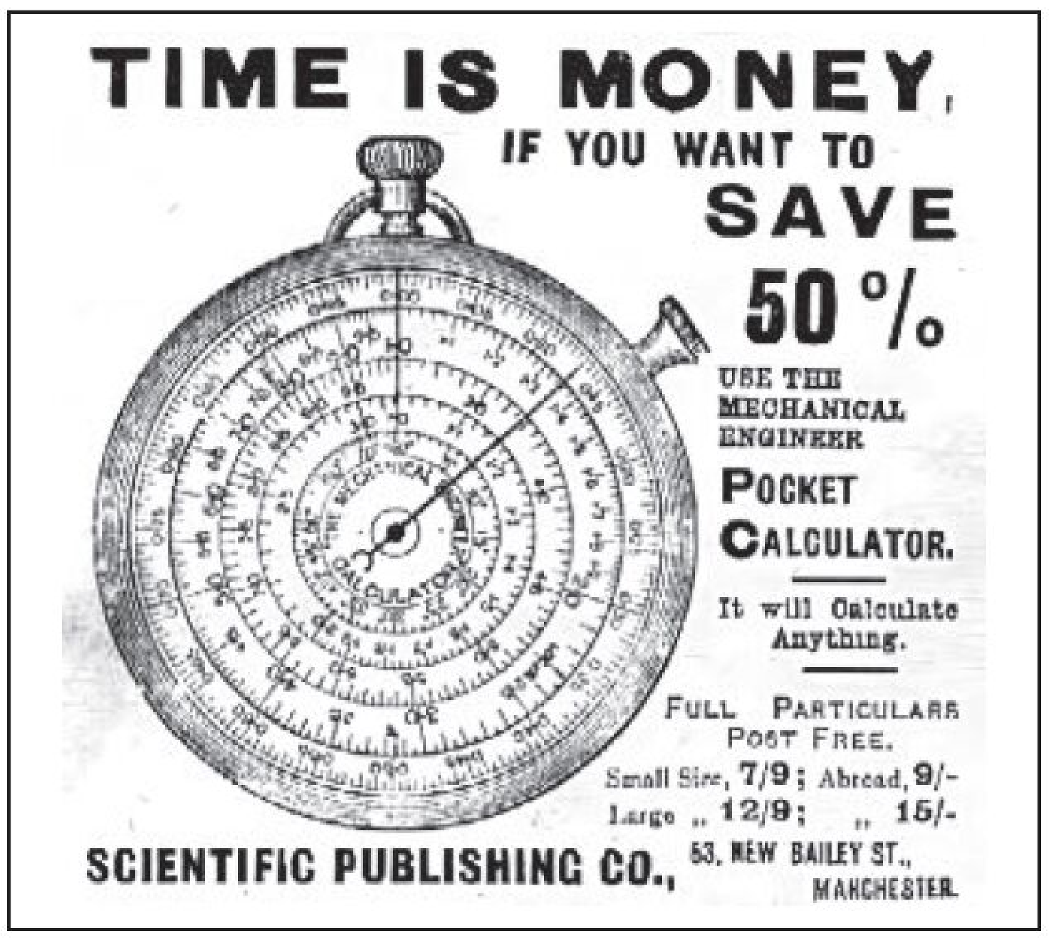

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