“Fiddling” In The Workshop

David Haythornthwaite finds a use for his Dremel in the workshop and discovers a quick and easy way to shorten small BA set-screws.

In between making tools, I am trying to find time for making a beam engine and on the day in question I had mounted the engine bed plate onto the baseboard using 12 x 5BA hexagon head setscrews and nuts. **Photo 1.** Having tightened up the 12 nuts and bolts, the setscrews were obviously just that little bit too long for the job. Only about 3 mm too long but in my eyes they spoiled the whole effect. I temporarily turned them over and fastened them “nuts down” which looked very neat, but there is no way that a full size engine bedplate would be fastened down in this way. Out they came for shortening and the fiddling started. We all have our different methods of doing things, but when shortening bolts and setscrews I always follow the same procedure. First I put a well fitting nut onto the bolt and then saw off the excess length in the vice leaving the nut on the retained portion. I then transfer the job to the vertical belt sander where I polish the sawn end using a fine grade belt. I hold the nut in my left hand acting

Background

My dear wife of many years has a wonderful appreciation of finely machined articles and will frequently exclaim “Oh isn’t that beautiful” when faced with some engineering masterpiece at a Model Engineering Exhibition. She also actually encourages me to buy tools for the workshop, in fact more than one model engineer has asked me where I got her from and asked if there were there any more like her at home? However when friends ring to speak to me, I often hear her say that she will bring me to the phone as I am “fiddling in the garage”. Now to my mind that does not adequately describe my valiant attempts at semi precision machining in the workshop. However on this day in question, she was probably right, I **was** fiddling in the workshop.

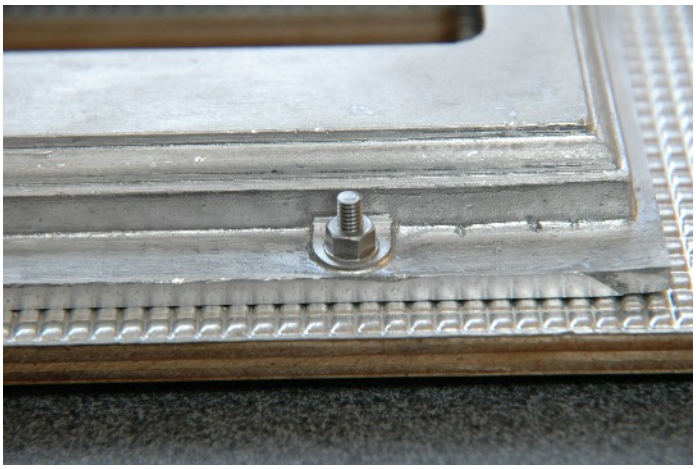

Photo 1. The Offending Over Long Bolt

Photo 2. The Accessory Collar

Photo 3. The Toolpost Mounting Clamp

Photo 4. The Clamp Fitted to the Dremel

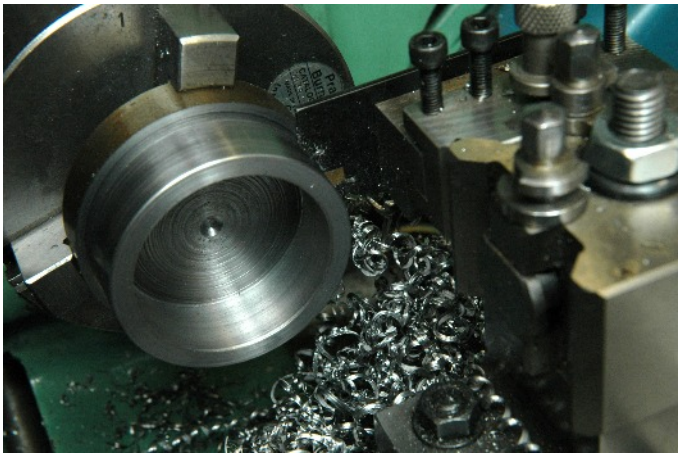

Photo 5. Parting off the Ring

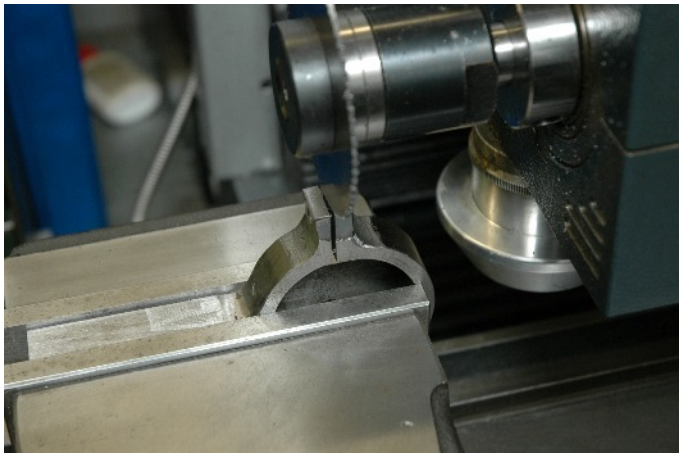

Photo 6. Slitting the Ring Clamp

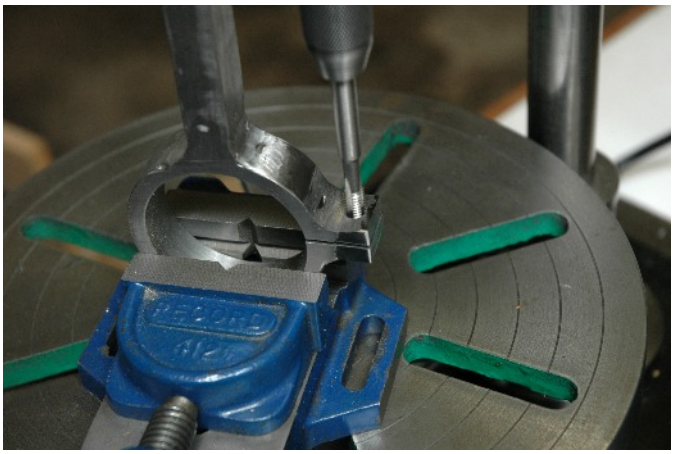

Photo 7. Tapping the Ring Clamp

Photo 8. The Temporary Lantern Chuck Parts

as a bearing on the bolt and, using my right hand, I spin the bolt against the belt at an angle to smooth the end of the thread and add a gentle chamfer to the end of the bolt. Finally, removing the nut from the bolt, or setscrew, ensures that the thread on the end is undamaged and workable. This works well with 6mm bolts or larger, but can be quite fiddly with something as small as 5BA. Additionally I required all 12 bolts to be exactly the same length.

The Christmas Fairy

I own a Dremel (Mini Drill) tool - a one-time Christmas present from the Christmas Fairy mentioned above. I have never considered it to be a real engineering tool, as the bearings are not good enough, but I do find it quite useful from time to time, particularly those small cut-off discs which are great for slotting screw heads, shortening hardened rods or small screws and various other tasks. From time to time, I have wondered about mounting it on the lathe tool post, but have never got round to it. The problem has always been to find an easy way to mount it on the toolpost.

On the front end of the Dremel, there is a thread and collar for fitting various attachments and this appears to be ¾" x 12 TPI which would possibly be ¾" BSF. **Photo 2**. However the thread is too short to use the collar to clamp through a plate and the thread is plastic and therefore somewhat frail. It would however be possible to screw it into a suitable tapped hole. I decided however that a clamp to go round the body of the drill would be more rigid and I set about making the item shown in **Photos 3 & 4.**

I had a birthday approaching, and with a little prompting, the aforementioned Christmas Fairy had decided that my workshop needed a MIG welder and this had arrived a few days before. The manual was useless, but there is a wealth of information available on the internet and you can even listen to the "fizz" as some expert shows you how to weld on a YouTube video. Of course we all know that we should start by practicing on some scrap bits of metal, but being an impatient soul I decided to learn to weld by making a toolpost clamp for the Dremel. Please don't look too closely at **photo 3.** but it wasn't too bad for a first attempt.

The front part of my Dremel is circular and measures 46.5mm diameter, so I chucked a short length of 2.5" (63.5mm) diameter mild steel bar in the 3 jaw using outside jaws and turned a ring 57mm outside diameter, 46.7mm inside diameter, to a depth of 15mm. I was almost knee deep in swarf by the time it came to part this off and **Photo 5** shows this being parted from the stock bar.

From some stock bar 12mm x 15mm I cut off a length of 65mm for the toolpost arm and a 12mm length to form the clamping lug. Where the lug and the toolpost arm were to be welded to the ring, I chamfered them on the grindstone ready for welding and clamped the three parts together. The two pieces of bar are attached at 90 Deg. To each other, as shown, as it gives the best position for adjusting the clamping screw, once the Dremel is in situ on the toolpost. Much to my surprise the welding was quite uneventful and very satisfying, resulting in the item shown in **Photo 3.** after cleaning up the welds with a round file.

The item was then transferred to the milling machine and the clamp was split using a fairly thick slitting saw as in **Photo 6.** Due to the shape of the clamp, if I mounted the clamp with the mounting arm upwards, it fouled the body of my vertical miller and similarly if I mounted it with the mounting arm downwards, it fouled the milling table. The answer was to mount it horizontal and turn the milling head through 90 Deg. as shown in the photo. Finally the clamp was drilled through at 5.1mm, tapping size for a 6mm setscrew. The top half was opened out to 6mm clearance and the lower half was tapped 6mm on the pillar tool as shown in **Photo 7.**

Having spent the afternoon "messing about in the workshop", I had made a lot of swarf and had given myself my first lesson in Mig welding. It was now time to start shortening those bolts which started this whole thing.

The correct way of holding small bolts for turning in the lathe is to use a lantern chuck – presumably so called because it resembles a lantern.. For those readers who are unfamiliar with this accessory, I show the basic layout in **Fig.1** The chuck is designed in such a way that an outer "Lantern" is screwed onto a mandrel which is held in the lathe chuck or collet. The screw to be shortened or worked upon, is inserted into the back of the outer "lantern", projecting through a hole in the end of the unit. The lantern is then screwed further onto the threaded mandrel so that the end of the mandrel traps the head of the small screw and holds it tight. Typically, the chuck only holds one size of screw or a small range of sizes, and they are not too easy to make quickly.

I decided that there was a much simpler way of holding the 5BA setscrews that I was proposing to shorten. Looking in my box of nuts and bolts, I found some 8 mm domed headed nuts and decided that these would work adequately as a temporary lantern chuck. I selected an 8 mm bolt, sawed off the head and mounted it in a collet in on the lathe. I checked that the thread was running true by screwing on the domed nut and clocking it for concentricity. Surprisingly it was remarkably true. I then turned away the first two or three threads to ensure that the end of the bolt would reach into the end of the nut cavity. Screwing the nut onto what is now a mandrel, I turned a slight flat onto the end, centre drilled it and then drilled 2.7 mm - tapping size for 5BA. Transferring the collet chuck to the pillar tool, complete with mandrel and nut, the nut was then tapped 5BA. **Photo 8.** shows the original nut and bolt together with the two finished parts and **Photo 9.** shows the tapping taking place.

Now the unit was ready, I could mount the mandrel on the lathe, screw the 5BA setscrew into the back of the domed nut and fit a 5BA nut onto the setscrew. The Dremel was mounted in the toolpost and the small cut-off disc was fitted. The lathe was set in motion at moderate speed and the Dremel was used at full speed to grind off the excess length of the setscrew by feeding the cross slide. Technically, the lathe should be run backwards so that the directions are opposing, but with the fast speed of the cut-off disc compared to the slow spindle speed of the lathe it really does not matter.

The set-up is shown in **Photo 10.** and you will see that I have

Photo 9. Tapping the Nut

Photo 10. Using the "Lantern Chuck"

Photo 11. The Work is Under Way

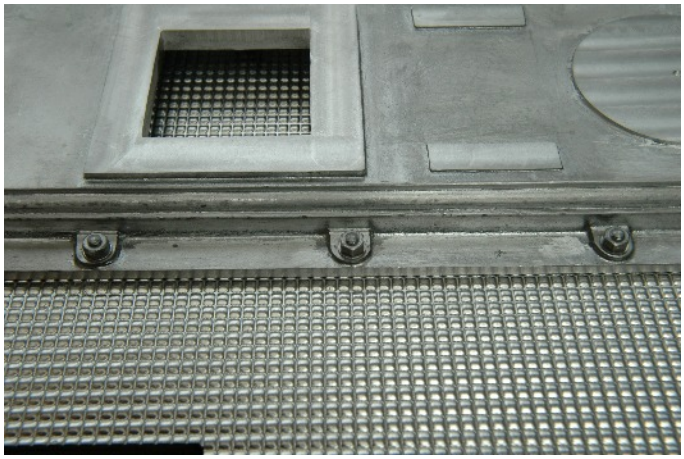

Photo 12. The Finished Result

Fig. 1

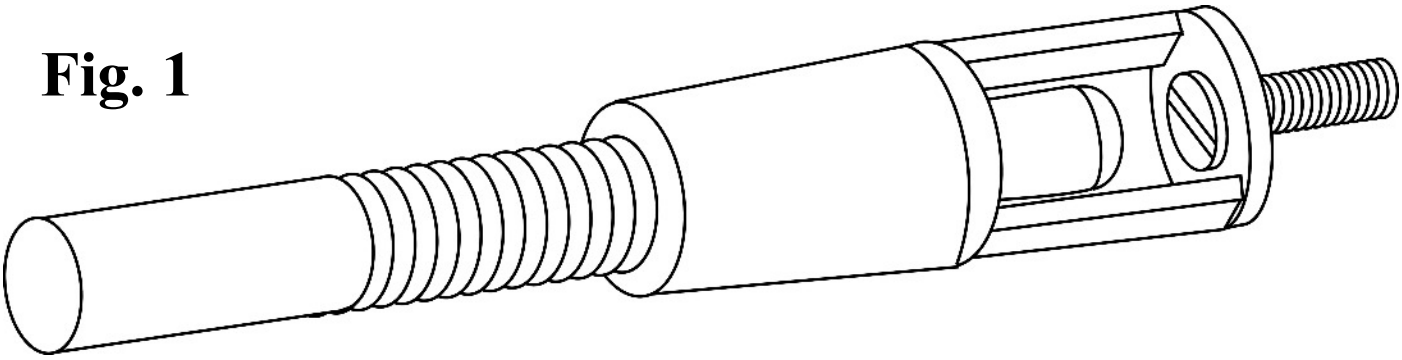

Fig.1 A Typical Lantern Chuck

covered the bed of the lathe with kitchen roll. This is not just to give photographic clarity, but is to protect the lathe from the abrasive dust from the cut-off disc. **Photo 11.** shows a close up of the operation with the setscrew half cut through. After cutting off, I spun the lathe at full speed and touched the end of the setscrew with a fine file held at an angle to chamfer the end. This is much safer to do with a collet chuck than with a large and dangerous 3 or 4 jaw.

If you do this yourself and are cutting the setscrews very short, then make sure that you can get them out afterwards. There is no room inside an 8mm domed nut for a 5BA box spanner, so either a larger domed nut and mandrel (say 10 mm) would be required , or the small screw should be simply placed through a clearance hole in the domed nut and held fast with a 5BA nut and locking nut.

So – "Her Indoors" was correct – I hate it when that happens !! I **was** fiddling in the workshop, and all I had to show for it were 12 identical, shortened bolts for my steam engine. However I do think it was an improvement and therefore worth the effort. The final result is shown in **Photo 12.**

The toolpost clamp for the Dremel will continue to be useful. The tool is not powerful enough to drill large holes, but I can see it being very useful for spotting out the holes on something like a cylinder cover plate, whilst dividing 12 equal divisions using a headstock dividing device. It can also be used at right angles to the lathe axis for fitting pins to shafts and collars.