AN ELEGANT BALL TURNING TOOL

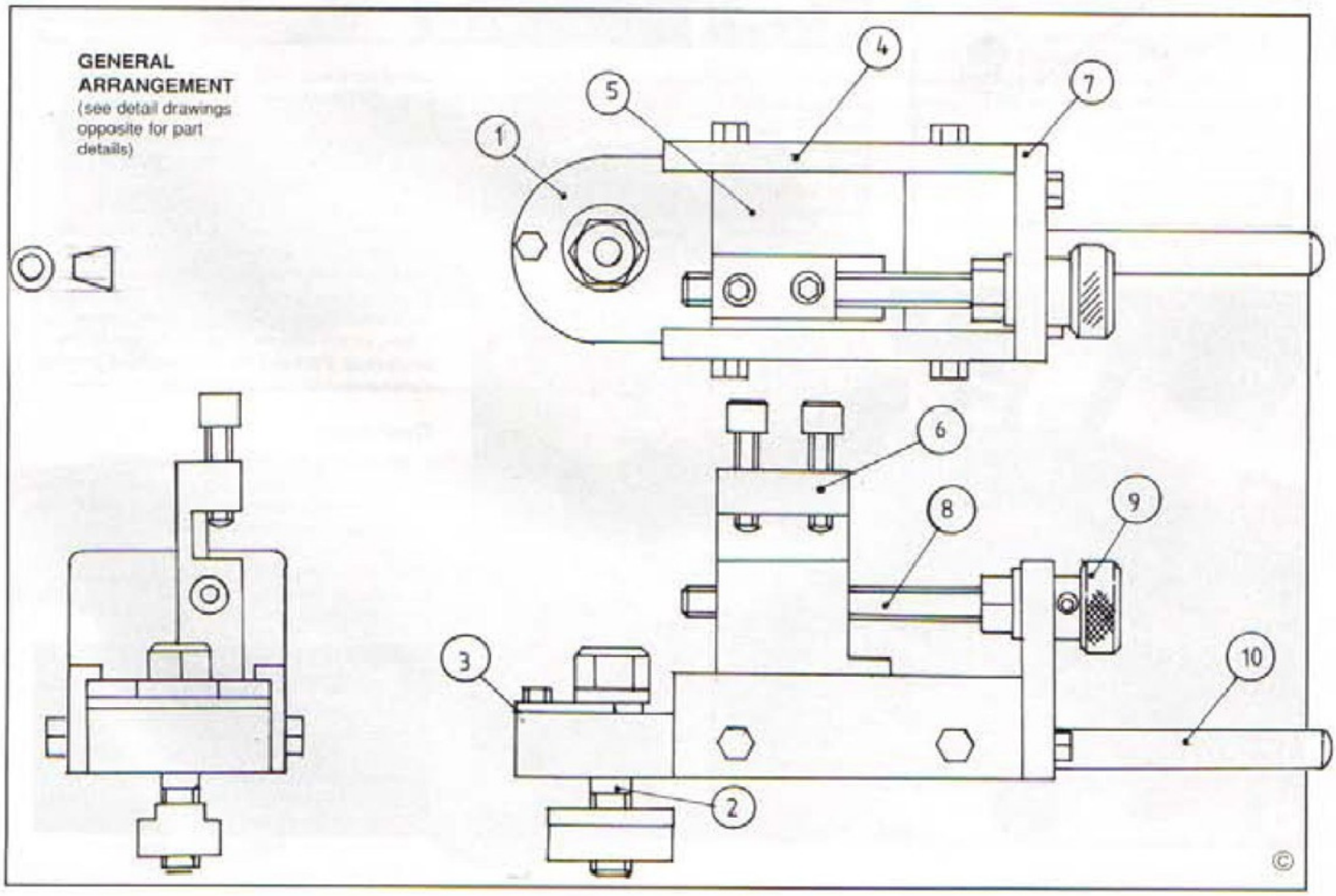
MR. G. W. H. Swallow of Dorking has produced this interesting ball turning attacment. This design makes a serious attempt to improve on the others which have been proposed over the years. It is, still very simple and will not tkae one away, for long, from the main task in hand of turning ball handles or similar.

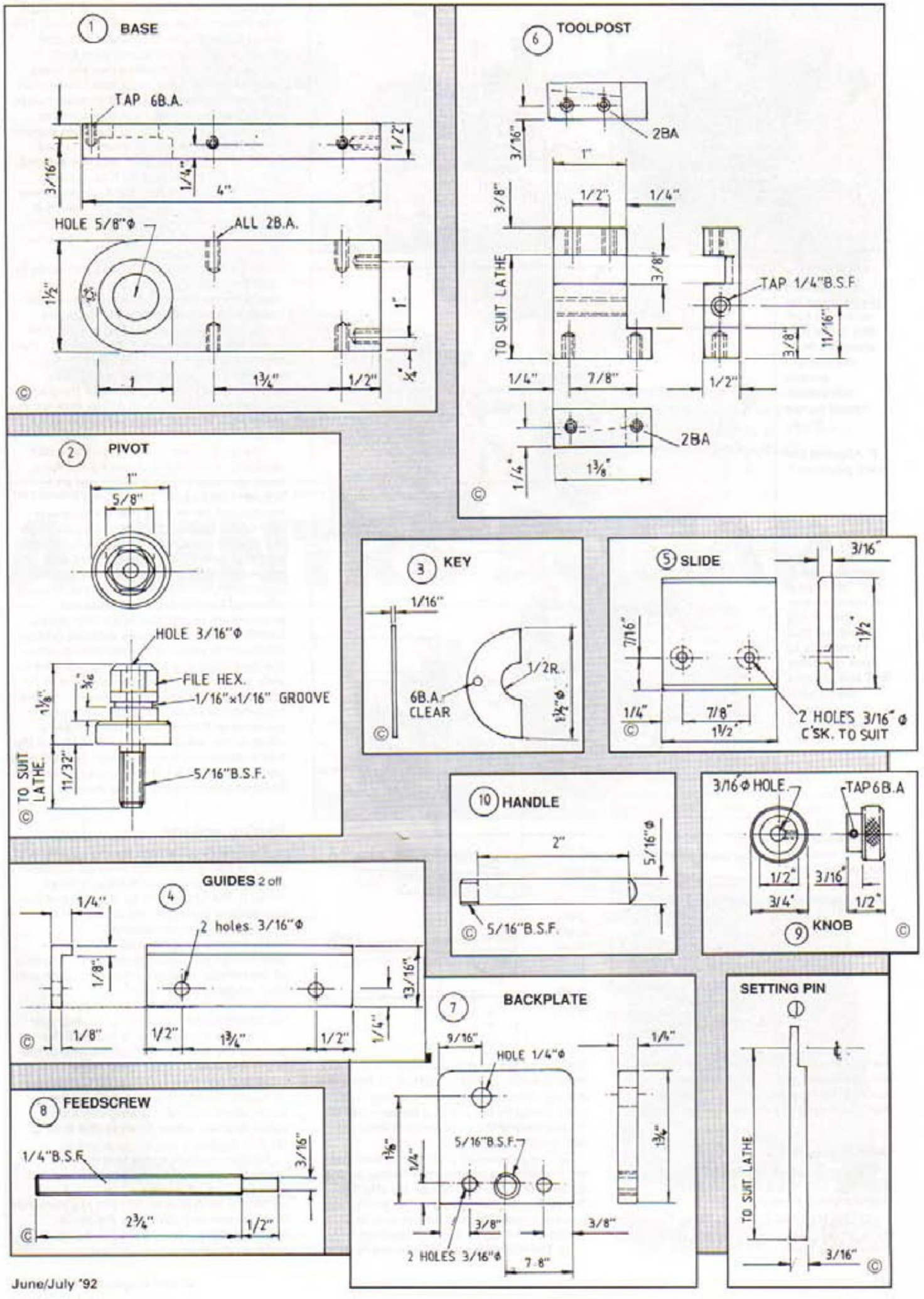
To groans of "Oh, not another ball-turning tool!", I can only say that I have not seen one exactly like this before. This is not itself a good reason for another one; a ball-turning tool is only at best needed occasionally, and the well-known handles-with-knobs-on for which it is mostly used have a Victorian appearance out of keeping with today's hi-tech.

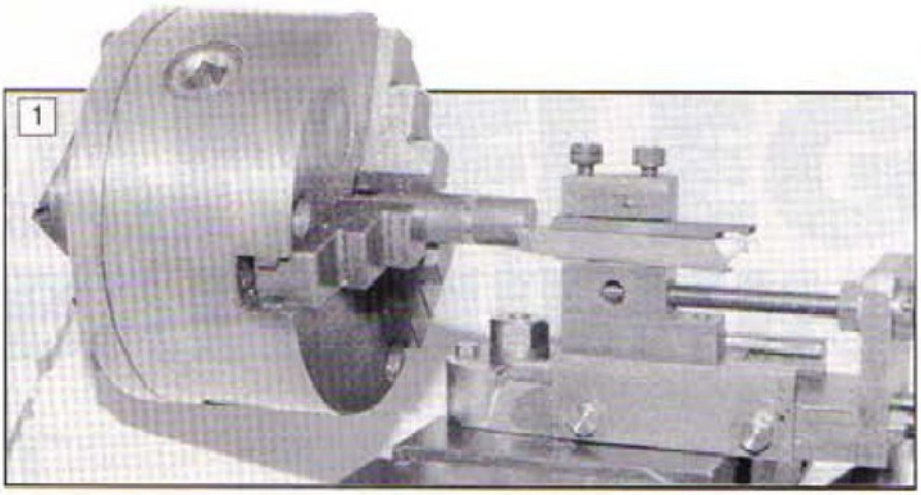
Well, this was all true until Professor Chaddock entered the scene with the Quorn cutter-grinder, which fairly bristles with ball-handles, sixteen of them in all. Besides this, there are now so many Quorns about that anyone making one without the proper handles would expect to bring down howls of derision. However, Professor Chaddock's recommended method of making them is different, and requires a form-tool in three sizes, made from an old file. Having tried this and sheared off the first two half-formed balls (probably because the blanks were made of the wrong grade of steel), I arrived at the end of that episode and the beginning of this one. The tool to be described was completed just before the arrival of the August 1991 *MEW* containing the description of a "radius-turning tool". I wrote to the Editor about this with comments from my recent experiences and he invited me to add another chapter to the saga.

As this tool started life as an unwelcome diversion rather than as a planned project, the first inclination was to search for a ready-made design, and I vaguely knew that several had been published over the years in *Model Engineer*. Finding them was another matter, and I eventually had to retreat to the design by Edgar Westbury in his book *Lathe Accessories*, bought fifteen years earlier. This tool was a simple affair, too simple in fact, merely a steel bar pivoted at the end, with a tool fixed in place and set in line with the radius of the pivoting circle. With sixteen double-ended handles to make, the thought of feeding the tool with a delicate push from a thumb-nail was repellent even without working out how the geometry would allow it to be done. It was therefore the matter of a moment to work out a tool-feeding arrangement with guides and a slide and to start work, using such materials as were to hand. This latter point determined all that followed, and it will not escape notice that the tool in the drawings is better-looking than the one in the photographs, the actual finished tool being more a result of what happened than of any conscious design effort. The other consequence of the hurry was the use of at least one short-cut in construction that real engineers would frown upon.

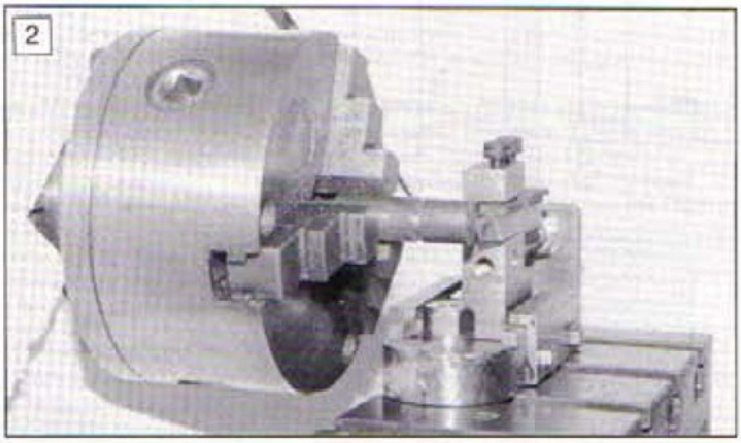
Construction of the modified version had reached an advanced stage before it was discovered that neither the original design nor this one (nor the one in *MEW*) would turn a ball! The point of the tool being radially in line with the pivot means that the inboard side of the ball cannot be turned, as the whole assembly would run into the chuck before the inside of the ball was reached. A hasty redesign had to be devised, and this redesign explains all the spare holes evident in the photographs. The slide was re-drilled to offset the toolpost so as to feed the tool-bit tangentially rather than radially, avoiding the problem described earlier. In this form



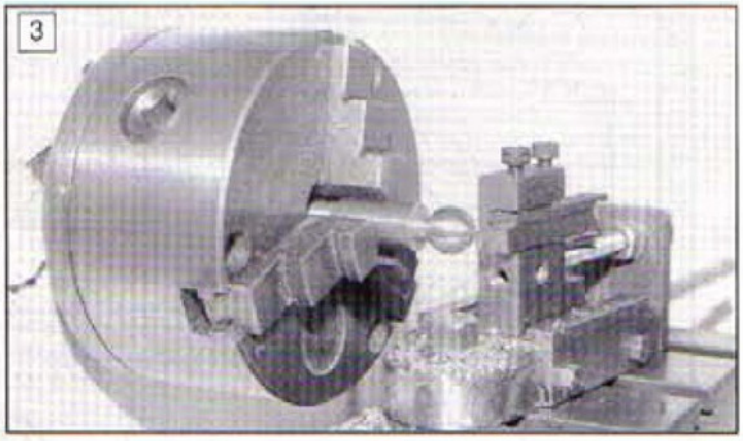

1 BASE
TAP 6B.A.
3/16"
1/4"
4"
1/2"
HOLE 5/8"Φ
ALL 2B.A.
1½"
1"
1
1¾"
1/2"
¼"
6 TOOLPOST
2BA
3/16"
1"
1/2"
1/4"
3/8"
TO SUIT LATHE
TAP 1/4"B.S.F
11/16"
1/4"
7/8"
1/2"
1¾"
2 PIVOT
1"
5/8"
HOLE 3/16"Φ
FILE HEX.
1/16"x1/16" GROOVE
1⅛"
3/16"
11/32"
TO SUIT LATHE.
5/16"B.S.F.
3 KEY
1/16"
6B.A. CLEAR
1/2R.
5 SLIDE
3/16"
7/16"
1½"
1/4"
7/8"
1½"
2 HOLES 3/16"Φ C'SK. TO SUIT
10 HANDLE
2"
5/16"Φ
5/16"B.S.F.
3/16Φ HOLE.
TAP 6B.A
1/2"
3/16"
3/4"
1/2"
9 KNOB
4 GUIDES 2 off
1/4"
2 holes. 3/16"Φ
1/8"
13/16"
1/8"
1/2"
1¾"
1/2"
1/4"
7 BACKPLATE
9/16"
HOLE 1/4"Φ
1/4"
1⅛"
1/4"
5/16"B.S.F.
1¾"
3/8"
3/8"
2 HOLES 3/16"Φ
7/8"
SETTING PIN
TO SUIT LATHE
3/16"
8 FEEDSCREW
1/4"B.S.F.
3/16"
2¾"
1/2"



1: *Setting the tool in preparation for making a ball, this is the first position. Note the run-out groove previously turned on the blank.*



2: *Aligning the tool, position 2.*



3: *A few minutes later, the ball is formed on one end of the blank, all that remains is to turn the other ball and remove the surplus material between the balls.*

4: *Some of the work in progress, from blanks to ball ended handles.*

the tool worked perfectly, and all the ball-handles were made in one afternoon, or at least the balls were; getting rid of the material between them is another story.

Construction

The construction is evident from the drawings, and it is only necessary to indicate a few points:

(1) This tool was made to fit my Portass lathe, which has a centre-height above the cross-slide of just under two inches. The position of the feed-screw and the tool-slot need to be reviewed in relation to the lathe and the materials used for the base and slide. Also, the tee-nut and bottom half of the pivot need to be made to fit the particular machine.

(2) The maximum diameter of ball that can be turned is mainly determined by the distance that the tool-bit can be offset to the left whilst still cutting at the point. However, even this maximum will be reduced if the pivot is made too high.

(3) The top edge of the slide needs to be bevelled, as the inside corner of the angle iron used to make the guides is round. The fixing holes for the guides were spotted through with the guide and slide both clamped in position with a piece of brass shim under the slide. Also, bolts were used in preference to countersunk screws in case adjustments were needed afterwards to ease the slide (i.e. by filing the holes bigger).

(4) The slot in the toolpost is slanted inwards to allow the tool-bit to be skewed to reach the pivot-centre. This not only allows the full range of sizes but emulates the form of the original design, which is best for turning inside radii. For this latter purpose, the tool-bit needs to be ground with a left-hand point.

(5) The widest part of the pivot needs to be turned so as to provide a few thou. clearance for rotation of the tool, and the base must be held without slop on the pivot by the key. The best sequence is to make the bottom half of the pivot first, then the recess and hole in the base, then the key, and then to use these last two as gauges to turn the upper end of the pivot and the parted groove in it. The hole for the setting-pin should be drilled at the same time.

The feed screw is a length of ¼in. BSF studding, shouldered down for the feed knob and held in place with a nut and washer Loctited on. The short-cut mentioned earlier was that the screwed part of the feed-screw turns in a plain hole in the back plate. This was done so that the tool-post could be spotted, drilled and tapped through the back plate to ensure exact alignment of the feed-screw. Anyone offended by this departure from real engineering might also reject the use of studding and turn a screw with the proper left-hand thread! It was intended to index the feed knob and to provide a lock for the slide but neither of these was found to be necessary. One unexpected result was the repeatability of the ball sizes without any measuring. If the point of the tool-bit is offset to the left by exactly the radius of the ball to be turned (using a scrap of BMS as a gauge), the tool-bit stops cutting when the finished size is reached. Hey presto!

Setting and use

The first requirement for the setting is to turn the ball-blank to the finished diameter and to part a groove of sufficient width down to the shank size for the point of the tool to feed into. The rest of the setting consists of three operations:

(a) After setting the tool-bit to the required offset, align the base with the axis of the lathe and wind in the cross-slide until the tool-bit touches the blank;

(b) move the cross-slide right and turn the whole tool anticlockwise 90 degrees;

(c) move the cross-slide left until the point of the tool-bit touches the end of the blank and then lock the cross-slide.

At this point the tool can be withdrawn using the feed-screw until it clears the blank when rotated. Turning can then begin. It takes longer to write this than to do it.

Finally, I should stress that nothing novel is claimed for this version of an old tool. Anyone who has ever turned a ball without a form-tool must have encountered this problem and probably the same solution. Old truths are always being rediscovered!