OFFICIAL JOURNAL OF THE BRITISH HOROLOGICAL INSTITUTE

The Horological Journal

APRIL 2014
www.bhi.co.uk

Three Tourbillons Plus One

by Michael Beckingham MBHI

Introduction

Since retiring I have had more time to devote to one of my great interests which is the re-casing of unusual and rare watch movements that have lost their cases to the bullion dealers. I have written an article on this which was published in the ***Horological Journal*** in April and May, 2007.

From time to time I have been asked to make cases for wrist watch movements and, where I found them interesting and challenging, I have been happy to undertake this work. This in turn has led to being asked to undertake the making of some complete wrist watches. The front and back covers of this issue illustrate three examples.

The first step was to find a good supply of movements. After researching the European and Asian ébauche and mechanical movement makers I located a specialist movement manufacturer with its head office in Hong Kong, PTS Resources Ltd. This small but energetic company manufactures a good range of mechanical movements and was one of the first Chinese companies to manufacture a tourbillon.

All three watches on the cover have PTS tourbillon movements. The one on the left is one of the first that I made. The movement is PTS FD3062, 23 jewel, and has a planetary flying tourbillon. The watch on the right has a PTS DG8101 movement, which has 28 jewels, automatic winding and a concentric flying tourbillon. The cases and dials of both these watches are machined from sterling silver.

The centre watch uses a PTS CAL3900 movement. This movement was featured in ***HJ November 2009***. Quote: *'PTS Resources CAL 3900 made in Hangzhou, China. Tourbillon at 12, sun, moon and power reserve indications, spotting & Geneva stripes, mirror finish and sunburst graining on the ratchet and crown wheel, polished and blued movement screws. Frequency 28800 Hz, twin barrel, 60 hrs running, accuracy +/-15 sec/day, amplitude 240 – 270 deg. This movement epitomizes the huge improvement in the quality of the decoration – the blued screws, the fine graining of the steel of the ratchet wheel and crown wheel.'*

I can endorse the description of this movement and can add that, having dismantled it, I am very impressed by the quality of manufacture. I was particularly impressed by how simple it is to work on the tourbillon. The carriage is secured with two screws; let down the main springs and remove these and the whole carriage can be taken out for easy servicing, **Figures 1 & 2.** The lay-out of the motion work is also interesting. The minute hand can be mounted concentrically with the hour hand or off-set in regulator style. Another interesting tourbillon by PTS Resources was exhibited at the 2013 Hong Kong Watch and Clock Fair. It is illustrated in the ***HJ November 2013***.

Another tourbillon watch I have included in this article is one that I made for Paul Maudsley of Bonhams. Paul had acquired an interesting tourbillon movement and was looking for someone to make a case and dial for it, **Figures 3 & 4.** It is amazing what can be achieved with internet communication, as Paul is in London and I am in New Zealand. There is an interview with Paul Maudsley in *QP magazine*, Issue 42, 2010 in which he discusses the commissioning of this watch.

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Now to move on to the making of these watches. My workshop is probably typical of any watchmaker's workshop, **Figures 5 & 6**. I have made a few simple tools to help in the case and dial making processes and I will discuss these as we go along. All the parts for the cases, dials and hands were made in this workshop.

The first things to decide are: what will the cases, dials and hands be made of and what will the watch look like? I like a particular style, as can be seen from the watches illustrated in this article. The cases of all four watches are machined from solid cast sterling silver. Paul had requested a satin black dial and, as it is difficult to get a good satin black finish on silver, I chose a high quality aluminium alloy, code no 6061T6, that was most suitable for anodising.

Figures 7 & 8 show the parts that make up two of the watches. I usually make the dial first as it forms part of the movement which has to be secured into the band of the case.

Making the Dials

Figure 9 shows the dial set up on the table of the vertical mill. My vertical mill consists of an old Emco Unimate lathe mounted on a vertical rod at the rear of my Emco Compact 5 lathe. I use the dial gauge to make sure that the plate is level, packing with shims as required. This is very important, otherwise the cross hatching will be uneven.

Having decided on the design of the cross hatching, the next thing I do is to select the cutters. For most of the hatching I use ball burs that are readily available from jewellers' suppliers. I use burs from Grobet in the US and have had excellent results with them. I use a spindle speed of 5000 to 7000 rpm and a depth of cut about half the diameter of the bur. I find that on silver and aluminium one cut back and forth gives a result with a good finish. A lot of care, patience and concentration are

required to make sure that the correct setting is used on the lead screw and cross slide drums, **Figure 10.** The drums must be rotated in the same direction to avoid backlash, and the cross slide drum graduations must be multiplied by two as you are not turning a round. Plenty of cutting fluid is needed. Once the first areas are cross hatched the dial can be rotated to other angles, depending on the design. Interesting patterns can also be achieved using a rotary table. **Figures 11 & 12** show the completed cross hatching before and after anodising and before the dial is cut out of the plate on the lathe. The dial is now ready for the final machining and the marking of the hour, minute and second intervals. Exactly how these are marked depends partly on the skill of the watchmaker. I have chosen a simple solution and used a ball bur to cut a dot of appropriate size at each point. I do this by attaching the dial to a four screw levelling plate with superglue, which is easily dissolved in acetone after the work is finished. I mount the plate in a four jaw chuck and then, using a dial gauge, adjust the plate to run true, **Figure 13**.

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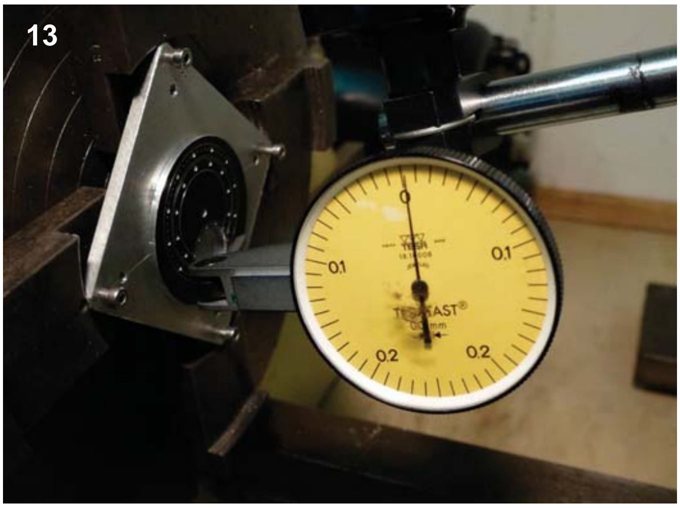

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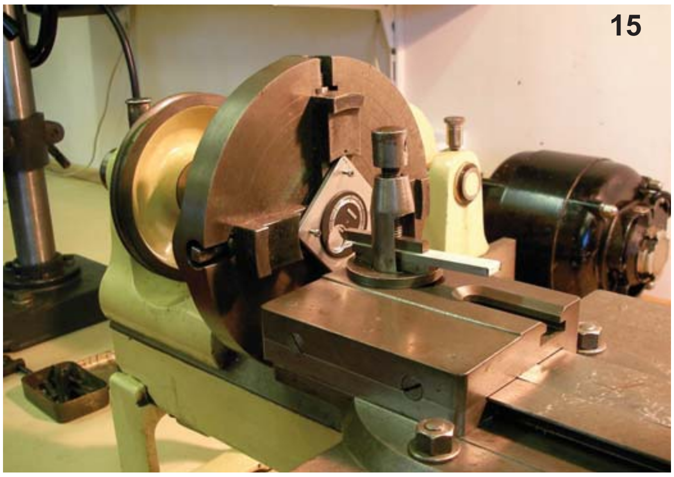
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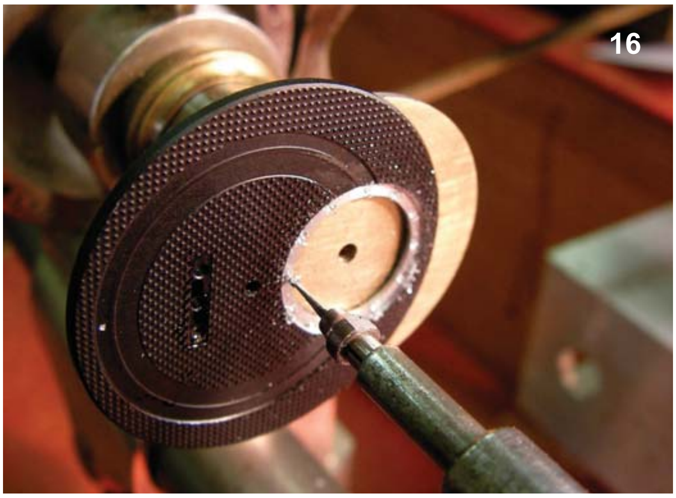
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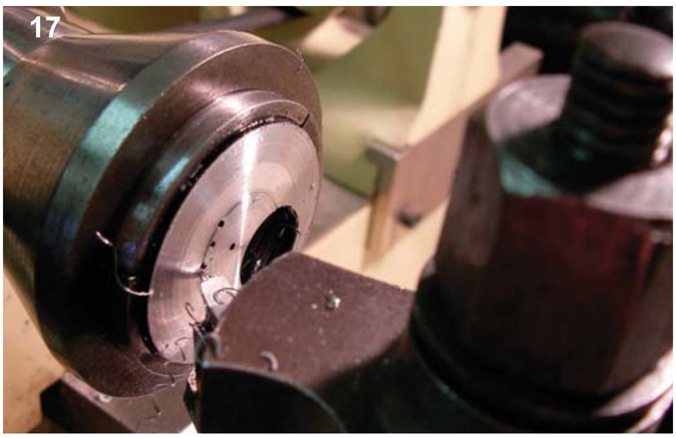
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Figure 14 shows the dial after the anodising has been machined from the tourbillon aperture. **Figure 15** shows the set-up on my 12mm Boley lathe for removing the anodising from the hour and minute chapter ring. Next, I mount the dial in my 6mm Lorch Schmidt lathe and, using the self-centring accessory fitted with the required bur in the tool holder, spin it by hand at the appropriate point, which has been established by reference to the 60 position dividing head on the head stock of the lathe, **Figure 16**. This is best done after the anodising has been machined off the chapter rings. A really sharp pointed tool is required to remove the anodising as it hardens the surface of the aluminium. The dial is then mounted in a step collet and machined to the required thickness, **Figure 17**. The face of the dial is now finished except for the final cleaning and filling of the hour, minute and second markers with the desired colour of Indian ink. I usually leave this to last.

The next stage is to mount the feet to the under surface. I usually turn the feet from 5mm dia. aluminium rod. I turn the rod down to the required diameter to fit into the dial plate and then turn down the face of the head until it is about 0.2mm thick. I then mount the feet in the dial plate, securing them with eccentric screws. Next, I apply a small amount of 5 minute epoxy to the centre of the head of each foot and centre the dial in place. Once the epoxy is set I remove the dial and apply a small amount of superglue around the circumference of the head of each foot to lock it in place. The dial is now finished, **Figure 18**.

Figures 19 & 20 show the dial of the latest watch I have made, before and after anodising. I consider the dial is the trickiest part to make: one mistake and you have to start again. However, it is also the part that gives a lot of scope for design and is often the part that makes the greatest visual impression.

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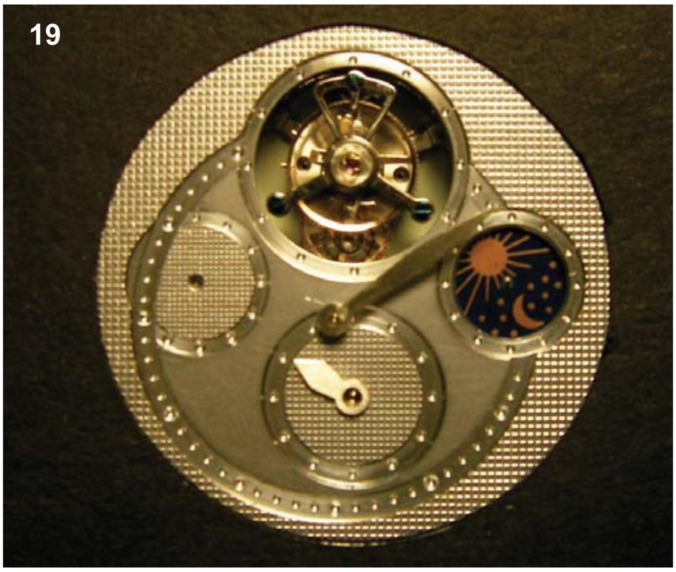
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Part 2 in next month's *HJ*


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About the Author
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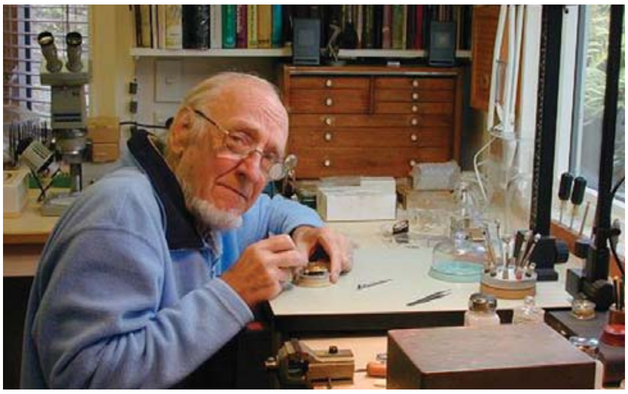

The author was born in Bristol in 1934, and in 1950 attended the Army Apprentices School in Arborfield, graduating as an Instrument Craftsman in 1953. In 1955 he moved to Auckland, New Zealand and worked as an instrument technician with Tasman Empire Airways (now Air New Zealand) and later to Kawerau with Tasman Pulp and Paper Co as an instrument engineer, returning to Auckland in 1958, where he established Beckingham Instrument Co, to service medical, scientific and surveying instruments. In 1979 he joined the Japanese company of Sokkisha (now Sokkia), at that time Japan's largest maker of opto-electronic surveying instruments, and moved to Sydney to establish Sokkisha Pty Ltd, in Australia. In 1984 he was appointed International Technical Manager, based in Tokyo, and in 1986 moved to England to set up Sokkisha UK Ltd. In 1988 he returned to New Zealand and became a director of Trimble Navigation NZ Ltd, a wholly owned subsidiary of Trimble Navigation, California. From 1993 he was consultant to the head office and commuted to Silicon Valley on a monthly basis to assist Trimble, pioneers in GPS, to develop their real-time kinematic GPS for use in the general survey market. He also headed a design and development division to produce an opto-electronic co-ordinate measuring system that would seamlessly integrate with GPS when GPS signals could not be received. During this period he was awarded four US patents. He remained in this position until 2001, when he retired to Whitianga, an idyllic seaside town on the Coromandel Peninsula, where he can indulge his passion for fine instrumentation. He was elected an Associate of the BHI in 1991 and a Member (M BHI) in 1993.


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