SCOTTISH TELESCOPE MYSTERY

TRYING to stand up in a force six gale with near horizontal squalls of rain and hail, 300m up on the Scottish hills while at the same time endeavouring to hold a conversation about the possible uses for an obscure surveying instrument, may not, on the face of it, be everyone's idea of fun.

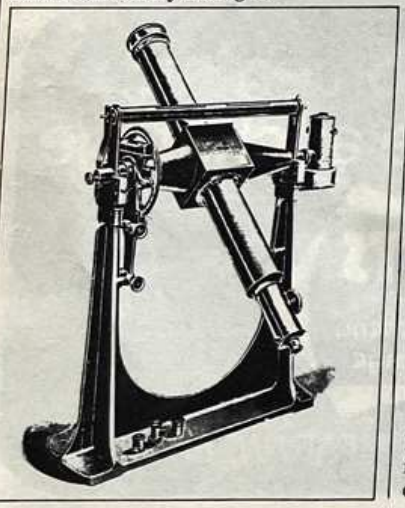
But that was the challenge when, accompanied by Roland Paxton, chairman of the East of Scotland local association's museum collection and Chris Atkinson a Lothian Regional Council engineer, I tried to re-enact the use of the 'mystery instrument' described and illustrated in *NCE* 25 February 1988. Paxton had wanted the help of readers in identifying both what it was, and what it was used for.

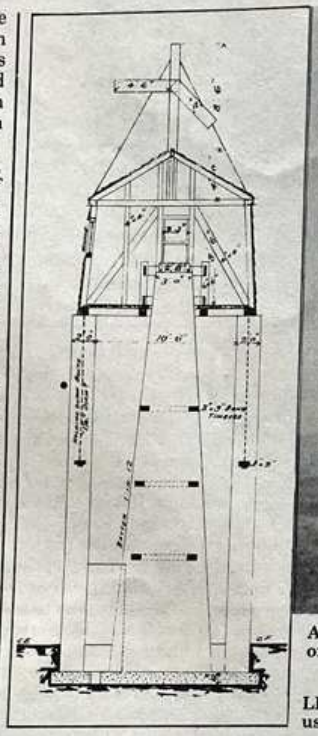
Called a transit instrument, it consists of a brass telescope with a reflector to illuminate the axis, a lantern, diagonal eyepiece, direct eyepieces of varying power and axis level. It can move up and down but not swivel and would have been mounted on a cast iron stand.

The instrument was used at the turn of century on the construction of the Talla water supply project which still supplies Edinburgh. The scheme comprises a 56km long aqueduct and a 4.8km long 12.7M.m^3 reservoir near Tweedsmuir. The aqueduct varies in width between 1.8m and 2.3m with cast iron syphons under the rivers Tweed, Lyne and North Esk, and has 21 tunnels totalling 14.5km.

Since the item was shown in *NCE* the magazine has been inundated with letters and telephone calls. Almost all have supported two main theories: observing the stars to determine precise local time, and for checking tunnel alignment. The former is technically possible but has been ruled out in terms of its surveying use. The tunnel theory was the one most generally favoured by readers and was initially supported by Paxton as the most likely explanation.

BELOW: Engraving of a transit instrument from a 19th century catalogue.





ABOVE: Atkinson (left) and Paxton at the remains of one of the 'peel tower' observatories.

LEFT: Original drawing showing how it looked when in use.

Then Atkinson came up with a third theory based on old drawings in his office and the remains of stone observatories that he had seen while walking on the hills. So last week I joined Atkinson and Paxton in the hills south of Edinburgh taking with us the actual instrument.

'With this you would have been able to set out intermediate points with great accuracy' Atkinson told us as we set off in the rain. 'At first I thought it might have been used for setting out inside the tunnels but the telescope is so powerful I think it was intended for use over long distances. You can even see the craters on the moon with this.'

Paxton agreed. 'I think it was used for accurate setting out above ground rather than in the tunnels and was mounted on these unusual stone pillars.'

At the time we were sheltering from the storm inside what is described on the original drawings as an observatory. An 8m tall stone tower, inside which is a 9m high stone column on which an instrument could have been mounted.

Paxton felt it was a bit of an overkill to have built these structures just to mount an instrument on them. 'But what else could could they have been constructed for? The drawing clearly shows a timber shelter on the top and judging by today's conditions, the instrument would have needed some protection.'

Atkinson thought so as well. 'All the columns are on the line of the aqueduct and I suppose they would have set it up inside the wooden housing and then sighted through it to the next column. But it is surprising that they went to all that trouble and expense just to set out a short length of tunnel. They must have planned to return and use them again.'

By this time the storm had abated a little and we walked to one of the smaller stone pillars on which we hoped to be able to place the instrument and test the theory.

Paxton climbed on top of the pillar and found further evidence to support it. 'There are some holes that could have been for bolts to hold the instrument in place.'

He and Atkinson then tried to place it on the pillar but the wind was so powerful they decided not to take the risk. But at least I was able to take some pictures of them with the instrument on location in an endeavour to capture the mood of 80 odd years ago.

Paxton however still had some doubts. 'The surprising thing is the power of the telescope; it's far more than you would have needed for the job. The observatories and columns are not that far apart and you could

have done it with a theodolite which would have been much cheaper.'

But as Atkinson pointed out, they did not do things by halves in those days. 'It took them 10 years to do the Talla scheme and they did not skimp on anything, they even built a full gauge railway to the site of the dam. Look at the quality of the stonework.'

We walked down to a ventilation shaft from the aqueduct between two of the columns, again a substantial structure. By now we were all very wet, Paxton had lost his hat half a dozen times and I had narrowly avoided serious injury from scrambling over barbed wire and electric fences placed to keep the sheep away from the roads.

So we decided to return to Edinburgh and continue our discussion in the comfort of the Lothian Regional Council offices where the instrument had first come to light. 'It was found a few years ago in a cupboard when the water and drainage departments merged' said Atkinson. 'Unfortunately the stand is missing and so are the two wooden boxes described in the catalogue. Nothing survives to connect its use directly with the Talla scheme but it must have been and we have the original drawings showing the observatories.'

On my return to London I found a letter from George Mathieson enclosing an extract from Rankine's 1894 *Manual of Civil Engineering*. Independently he too had come to the same conclusion because the manual says 'For setting out very long straight lines the theodolite is not sufficently exact and it then becomes advisable to use a small transit instrument consisting simply of a telescope with a horizontal axis resting on a suitable stand so as to be capable of being turned over in a vertical plane.'

The irony of the story is that it was Atkinson's department that presented the instrument to the East of Scotland local association museum, apparently without knowing what it had been used for. 'Nobody asked me' he says.□

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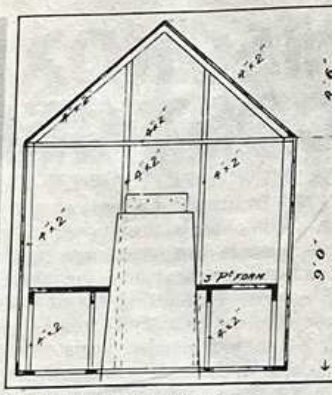

ABOVE: Original drawing showing the protective wooden housing.

LEFT: Atkinson and Paxton examine one of the pillars.

BELOW: Copy of part of the original plan of the aqueduct showing positions of observatories and shafts.