Clive Holden: In the grand old age of brass! The Carruthers and Woods Wire-Angle Gauge – 1954

In 1952, while observing hydrographic casts in the Atlantic aboard the research vessel U.S.S. Rehoboth, James Norman Carruthers (1895-1973) turned his attention to designing an instrument for measuring the slope of hydrographic wires underwater.

At that time, oceanographers used empirical tables based on surface wire-angle and attained depths to distribute Nansen bottles along the hydro-wire so that they reached desired depths under steady current conditions. Carruthers realized that if he could measure subsurface wire-angles, similar tables could be constructed to determine how much wire would need to be played out to reach desired depths under any current conditions.

Back home in England, Carruthers lost little time in promoting his plan to senior engineer A.J. Woods at Kelvin Hughes Ltd. Together, they set about constructing a wooden prototype, which they presented to the Hydrographic Committee of the ICES in 1953. In the months that followed, Woods improved the original design and Kelvin Hughes produced the first commercial 'messenger-operated' subsurface wire-angle gauge in early 1954.

Kelvin Hughes produced two gauges; a simple type that measured wire-angle, and a more elaborate version that incorporated a small compass to measure wire angle direction. Both gauge types were issued to the research vessel Earnest Holt and trialled in the Barents Sea in June 1954. Those aboard reported that the gauges were easy to handle and worked satisfactorily to a depth of 1000m (Carruthers, 1954).

Figure 1. Carruthers and Woods Wire-Angle Gauge suspended on a hydrowire (Photo: Clive Holden)

Sales numbers are unknown, but Carruthers noted that the Argentine Navy made extensive use of the non-directional type from the start, and that the Japanese and the French firm Mécabolier made similar models to satisfy oversea demand (Carruthers, 1958).

In 1958, the British National Institute of Oceanography developed an improved version for application in the most dynamic environments. A modified design was eventually manufactured and sold by the Norwegian firm Bergen-Nautik (Carruthers, 1958). An example of the Bergen-Nautik wire-angle gauge can be found in the U.S. Naval Office Publication No. 607 (Anon., 1968).

The Kelvin Hughes directional wire-angle gauge pictured here (Figures 1 and 2) is made of tin-plated brass and constructed in two parts: one part clamps to the hydro-wire, the other rotates about the clamp and supports a composite pendulum,

index register (marked in 1 degree intervals) and compass mechanism. The entire frame measures 26 x 22 x 4 cm and weighs 3.4 kg in seawater.

When prepared for lowering at sea, the pendulum is cocked by pinching the sprung umbrella-type catch on the bob, then pushing the bob up, while sliding the rings (which are at the end of the braided copper support cord and the fall-away messenger lanyard) under the locating pin on the trigger bar. A thin glass slide (or potassium iodide tablet for timed release) is then inserted under the firing pin to lock the trigger bar in place, ready for deployment.

Once deployed, the gauge is tripped by a standard messenger. When the messenger hits the top of the trigger bar, the glass breaks and releases the fall-away messenger and pendulum bob, which clamps the compass and engages the register to fix wire angle and orientation.

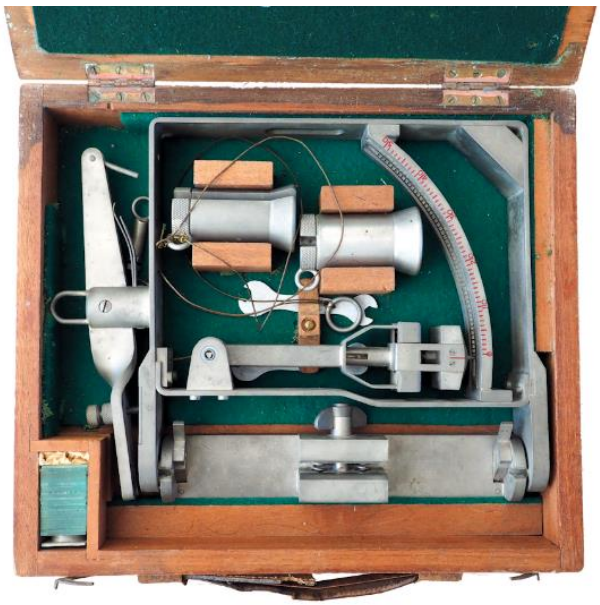

Figure 2. Carruthers and Woods Wire-Angle Gauge with two messengers in its original box (Photo: Clive Holden)

References:

Carruthers, J.N., with contributions by A.J. Woods and A.J. Lee, 1954. On the instrumental measurement of line shape under water; concerning the determination of the vertical distribution of slope (magnitude and direction) down oceanographic wires, and the measurement of current-caused obliquity of a rope strained between an anchor and a sub-surface buoy. Dtsch. Hydrgr. Z., 7: 22-35

Carruthers, J.N. 1958. Description of a prototype gauge the measure magnitude and direction of hydrowire slope in situ between reversing bottles at all depths and under all conditions of ship drift. J. Mar. Res. 17: 113-119

Anon., 1968. Pub. No. 607. Instruction Manual for Obtaining Oceanographic Data (Third Edition). Published by the U.S. Naval Oceanographic Office under authority of the Secretary of the Navy.

Clive Holden (cholden[a t]bigpond.net.au)