BY THE OLD HYDROGRAPHER

As it Was

Soon after the first Directing Committee of the International Hydrographic Bureau arrived in Monaco in 1921 the Directors began to receive reports from a number of newly enrolled Member States which, turning from their wartime attempts to locate submarines and underwater obstructions with acoustic methods, were now directing their efforts to developing echo depth sounding apparatus. Such reports were relayed to Member States in Special Bureau Publications. Whilst attending Hydro 2002 in Kiel I was happy to find in the Shipping Museum, only two or three hundred metres from the Conference Centre, a display of the work of Dr Alexander Behm who invented one of the earliest echo sounding machines.

Alexander Behm, who was born in Bavaria in 1880, made his way as a young man to the great naval base at Kiel where he began work in the Laboratory of Undersea Torpedo and Mining.

As early as 1912 he began studying the passage of sound signals to and from the seabed. 1500 metres per second had been regarded as the speed of sound in seawater, but Behm sought a more precise measurement by photographing sound waves. He used an electric spark to produce the underwater sound source.

The receipt of the sound wave at a known distance was illuminated by a second spark; both images were thrown onto a sensitised plate producing a picture from which the time of passage could be accurately gauged. From these experiments Behm adopted a speed of sound in seawater of 1435 metres per second, always accepting that varying sea temperature, salinity and, above all, increasing pressure with depth could modify this figure to a limited extent.

By 1922 Dr Behm had developed his †Echolot'. Microphones were placed on both sides of the vessel below the waterline one of which he called the receiver, which was affected by a sub-surface sound source, and the other he referred to as the echo receiver.

The diagram (Figure 1) shows the arrangement of the Echolot on the bridge of a vessel. A chamber in which a cartridge could be placed (K) was connected by a pipeline through which the cartridge could be sent to the over-side firing apparatus (U) using the airgun (P) where it was held in readiness for a sounding.

The cartridge was fired by closing the electric switch (L) sending the bullet into the sea. The bullet was composed of a small charge of explosive with a short time fuse which triggered it about half a metre below the sea surface. By pulling the handle (H) the firing apparatus was opened to allow the spent cartridge case to fall clear to permit reloading.

The time of the sound signal travelling to and from the seabed was measured with a complex chronomicrometer, invented by Dr Behm, capable of recording to an accuracy of 1/140th of a second (shown as M on Figure 1, and in Figure 2).

At this stage I have to admit that despite studying for some hours the description and a diagram of the chronomicrometer in I.H.B Special Publication No. 4 (1925) I am unable to describe adequately the working of this sophisticated instrument. Suffice it to say that it consisted of a well balanced disc, revolving on ruby bearings fitted with a small armature. When released by a signal from the receiver microphone the disc rotated under pressure from a fine spring until stopped by the signal from the echo receiver. At this point a light, powered by a small battery, illuminated the depth reading on the scale.

Before taking a sounding three buttons had to be pressed on the face of the chronometer - No. 1 to switch on the battery, No. 2 to switch on the microphones and place the disc in its zero position under the spring pressure and No. 3 to open the firing electric circuit in readiness for firing.

With the original Echolot capable of sounding to depths of about 70 metres the first recorded seagoing trial was carried out onboard the Danish beacon tender Lövenörn in 1923 the results of which were reported by Commander Sinding of the Royal Danish Navy in a national maritime periodical.

During the short trial the Echolot operated well, the depths agreeing with those on the Danish chart of the Lille Belt. The ship at times was rolling which did not interfere with the sounding although the motion was said not to have been appreciated by Dr Behm. A further trial was to take place but had to be abandoned on account of the inventorâ€[™]s indisposition à was he perhaps subject to mal de mer?

In 1924 the German steamship Hansa of the Hamburg America Line carried an Echolot and took soundings when on the continental shelf on either side of the North Atlantic finding general agreement with the published charts.

By 1930 Behm had developed photographic recording enabling soundings to be obtained from depths of 1,000 metres. His sounding machines had been patented both in Germany and in several other maritime countries. Alexander Behm's 50th birthday was popularly celebrated throughout Kiel and other German seaports in 1930.

https://www.hydro-international.com/content/article/as-it-was-8