INNOVATIONS IN BAR CHECKS

(Extracts from *The Journal*, Coast and Geodetic Survey, No. 2, WASHINGTON, April, 1949, pp. 43-48).

FOREWORD

by C. K. GREEN, U.S.A. Coast and Geodetic Survey

The bar-check is a means of determining the accuracy of echo-sounding instruments. Bar-checks are made three times a day, taking comparisons at 10-foot intervals throughout the range of depths encountered during the day's work. With the apparatus described in the Hydrographic Manual and under favourable conditions, checks can be made down to about 15 fathoms. In deeper depths the return signal frequently becomes too dim for accurate reading on the fathogram. In strong currents or rough weather, it is difficult and sometimes impossible to keep the bar vertical under the receiver unit while taking bar-checks, even in water shoaler than 15 fathoms.

During the 1948 field season, various field parties concurrently devised and tested new types of bar-check apparatus and procedures. The articles below describe two such methods. In addition to these, Comdr. Ector B. Latham used a new bar on the ship *Cowie* which gave superior results because of the intensity of echo from the bar itself. This bar was made from a 4-inch Monel metal tube, completely flattened by a steam hammer and made watertight at the ends. This device no doubt makes use of the fact that air is an almost perfect reflector of sound in water and that a small amount of air contained in the tube intensifies the rebound of the sound.

The method described below by Lt. Comdr. Healy has interesting possibilities. Some sources of possible error, however, are introduced because in this method, the fathometer records only half the actual depth. One such source is present in many measurements greater than 55 feet where the half-value is recorded for the depth on a different scale from that used for sounding. If this method proves successful and more simple to operate, after sufficient tests in actual use, the present method of using a flat bar may be superseded or placed on an alternate status.

A NEW TYPE OF BAR-CHECK APPARATUS

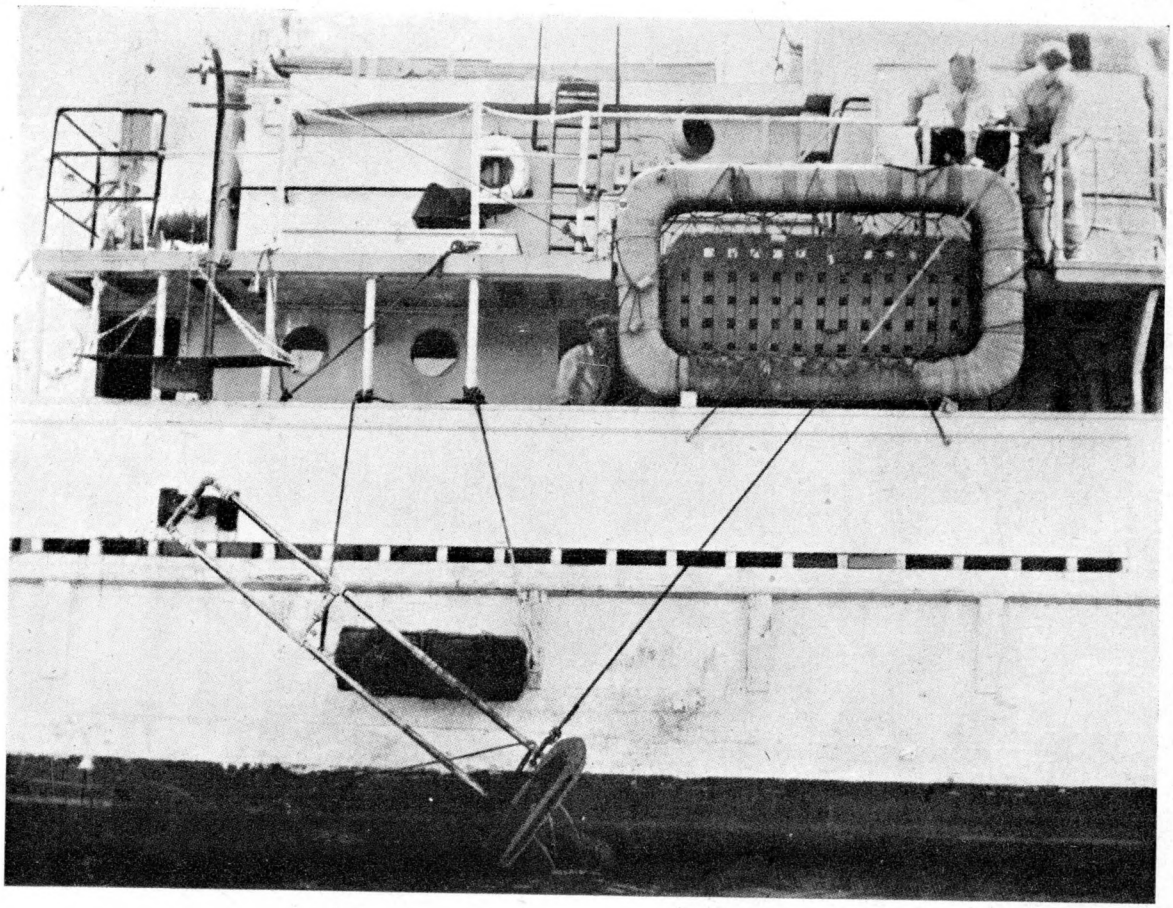
by Comdr. William M. GIBSON

An adequate bar-check apparatus should be a part of the surveying equipment of our ships. In an area such as San Francisco Bay, where strong currents and cross winds are the rule, the ordinary bar will not fulfil the requirements of the Hydrographic Manual that it "must be rigid enough so that it will not sag and it must be rigged so that it can be suspended in a horizontal position, at a known depth, and kept vertically under the acoustic units".

It was found that a bar to be handled conveniently was too light to meet these requirements. Consequently, a heavy bar was used with lines leading to the boat winch for handling. This arrangement was satisfactory but time-consuming. Recently, an improved design was installed on the ship *Bowie* that turned an unpleasant task into a pleasure.

This apparatus weighs 200 pounds and is handled by a small, permanently-mounted electric winch using 3/16-inch steel wire. The electric winch is operated by a controller mounted nearby. Only two men are required for the bar-check, one at the winch and one at the fathometer. The wire is marked in 20-foot lengths with a small piece of rawhide reeved through the strands. The bar plate is 18 by 48 inches and is attached to a 150-pound cast-iron weight. The wire is attached to the weight rather than the plate to prevent sagging. The chain bridles do not support the weight but prevent the bar from tilting. The weight of the bar appears to keep it under the transceiver in strong currents.

A serious difficulty with any bar apparatus is the setting of the marks at the water surface. This may be eliminated by setting a pointer on deck at the 10-foot mark when the



A new type of bar-check apparatus.

For this type of bar-check apparatus the acoustic units are mounted outboard and are so arranged that they may be swung forward on the top pivot and brought up to the deck level for cleaning and overhauling.

bar is at the surface in calm water. The succeeding settings are made exactly at the pointer rather than at the surface of the water.

This bar-check apparatus is contingent upon the acoustic units being mounted outboard. On the ship *Bowie* the units are so arranged that they may be swung forward on the top pivot and brought up to the deck level for cleaning and overhauling. This can be done in a few minutes without the need of the vessel to anchor or return to a pier.

Fathometer comparisons, down and up, at 20-foot intervals over the range of the A, B, C and D scales to 140 feet can be made in 12 minutes. Comparisons every 10 feet on the A scale can be made in 5 minutes. Recently, while taking serial temperatures, comparisons were made at 10-fathom intervals down to 300 feet and return, in 18 minutes.

An important advantage to the bar-check apparatus is an accurate determination of the phasing head error.

Table I shows the corrections obtained by bar-check to a depth of 140 feet :

TABLE I. — CORRECTIONS OBTAINED BY BAR-CHECK
(All values in feet)

Bar depth	Initial setting	Scaled readings from fathogram A	B	C	D	Phase correction	Corrected fathogram reading	Bar depth minus corrected reading
10.0	2.4	10.0				0.0 A	10.0	0.0
20.0	2.4	19.8					19.8	+0.2
		19.8						
40.0	2.4	40.0	41.7					
		40.0	41.6			1.6 B	40.0	0.0
60.0			61.6					
			61.6				60.0	0.0
			61.6					
80.0			81.6	82.2		2.1 C	80.0	0.0
			81.6	82.2				
100.0				102.4				
				102.0			100.1	—0.1
				102.1				
120.0				122.0	121.4	1.4 D	120.0	0.0
				122.0	121.4			
140.0					141.5		140.1	—0.1

Draft of transceiver : 2.4 feet.

A NEW METHOD OF OBTAINING BAR-CHECKS

by Lt.-Comdr. Henry J. HEALY

During the progress of hydrography in the Columbia River, considerable difficulty was experienced in obtaining acceptable results for fathometer corrections by using the standard bar-check equipment. It has proven difficult because of the river current, to keep the bar directly under the transceiver at all times. Unless this condition prevails erroneous results are obtained.

A new method of making bar-checks was devised. A standard unit from an 808 transceiver was suspended directly under the launch receiver. This unit was directly connected to the 808 fathometer by a long cable. The sound is transmitted by the regular unit in the transceiver and received on the unit lowered to the various depths required. In this manner the sound travels only one distance, from the transceiver to the receiver, or one-half the distance the sound wave travels using the standard bar. Very good results were obtained with this method.

The bar-check lines were made of 7 by 19 — 1/8 inch preformed wire rope. The graduations on the lines were spotted with solder and then painted. The lines proved very satisfactory. One of the lines was used with the single unit so that the depth of the unit would be the same as the depth of the bar and a good comparison of values determined.

The procedure for obtaining the fathometer corrections is as follows : Lower the unit to the depth desired—for example 30 feet—and set the initial at zero on the scale. The result as scaled from the fathograms is 14.1 feet. This multiplied by 2 gives 28.2 feet. The draft of the transceiver at the time is 1.0 foot. The total distance from the unit to the surface of the water is 28.2 + 1.0 = 29.2 feet. Therefore, the correction at 30 feet is 30.0 — 29.2 = 0.8 foot.

COMMENT

by Comdr. GIBSON

An adaptation of the bar-check apparatus devised by Lt.-Comdr. Healy was tested on the ship *Bowie*. Receiver units were mounted on each side of the 150-pound weight and connected in parallel. These units were in turn connected to the bridge fathometer with 160 feet of armoured cable. This new bar was operated by the electric winch, and an additional man was stationed nearby to reel the armoured cable by hand. A trial was made of this apparatus while taking serial temperatures in the Golden Gate and off Angel Island. By this means bar comparisons were made to 140 feet, registering on the "A", "B" and "C" scales.