THE NEW SHALLOW WATER DEPTH INDICATOR

IBH Note. — Kelvin Hughes (Marine) Ltd. sent us the following note on a new shallow depth sounding indicator, which is likely to interest readers of the International Hydrographic Review.

During the last decade, many new oil loading terminals have been constructed or developed in different countries to cope with the growing fleets of large super tankers which have come into being during that period. The advent of bigger ships, new ports and new routes for the oil tanker traffic, however, has caused oil tanker operators to give attention to an aspect of practical navigation of primary importance to all ships' masters in ensuring the safety of their vessels. This is the question of shallow water soundings, particularly the range of soundings from 0 to 6 fathoms under the ship's keel.

The older type of echo sounder was capable of sounding only depths greater than 10 feet. This was due to the transmitting pulse smothering the returning echo. As the older type of echo sounder was fitted with internal hull projectors, these had to be placed some 8 feet apart to avoid inter-action through the ship's bottom plates; this spacing introduced a second problem, owing to parallax, which, in shallow water, meant that the echo sounder showed a greater depth than in fact existed.

The British firm of Kelvin & Hughes (Marine) Ltd. working in conjunction with Shell Tankers Ltd., have now dealt with the latter problem by producing an improved type of pierced-hull projector with the transmitting and receiving units housed in one small tank. This allows the transmitting wave and the returning echo to travel almost vertically, and thus, for all practical purposes, no parallax error is experienced. To overcome the difficulty of the returning echo being smothered, the transmitted pulse has been considerably shortened, so that echoes as close as two feet can now be detected. To facilitate the reading of depths of less than 30 feet, an electronic magnifier was developed that uses a cathode ray tube about 6 inches in diameter. The soundings appear as shown in the accompanying illustration. The cathode ray tube viewing unit is mounted in the wheel-house, and is additional to the recorder unit which produces a paper record and is usually mounted in the chart room. It also provides the advantage that soundings are instantly available.

The question of under-keel clearance has become increasingly important as larger vessels have come into service. With regard to river entrances and channels, accurate figures for under-keel clearance might mean that deeper draft vessels could use them. A knowledge of the desirable under-

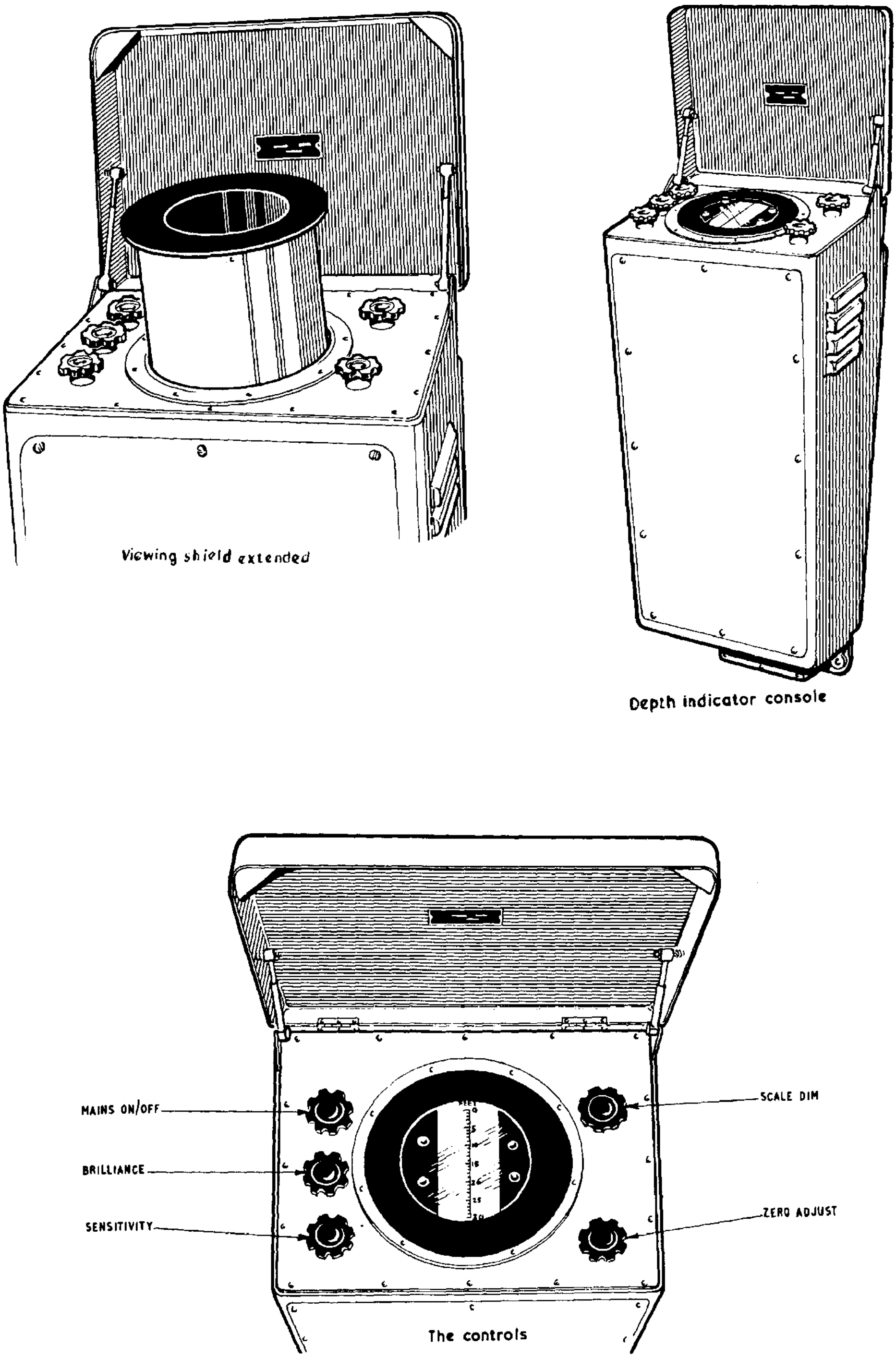
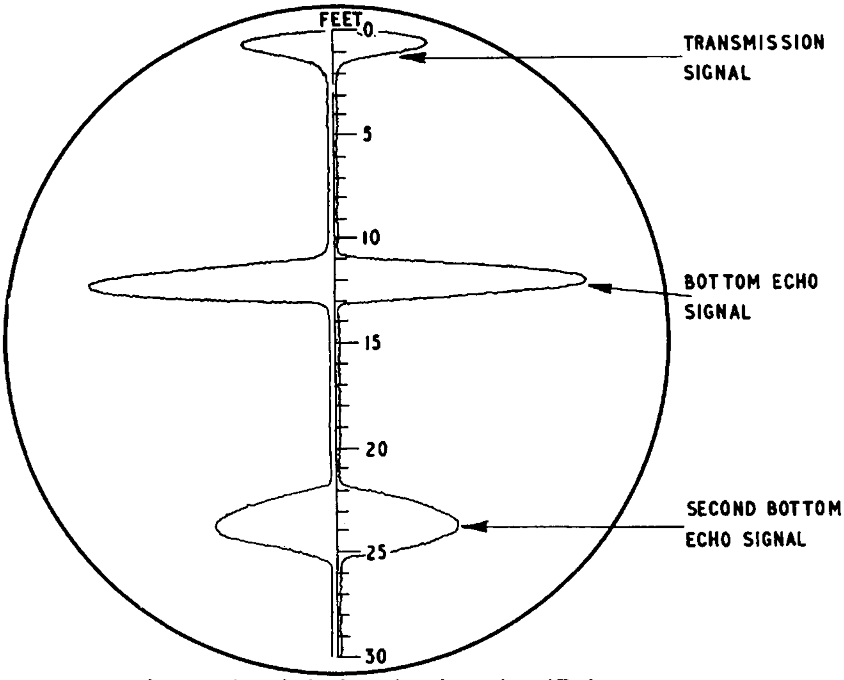
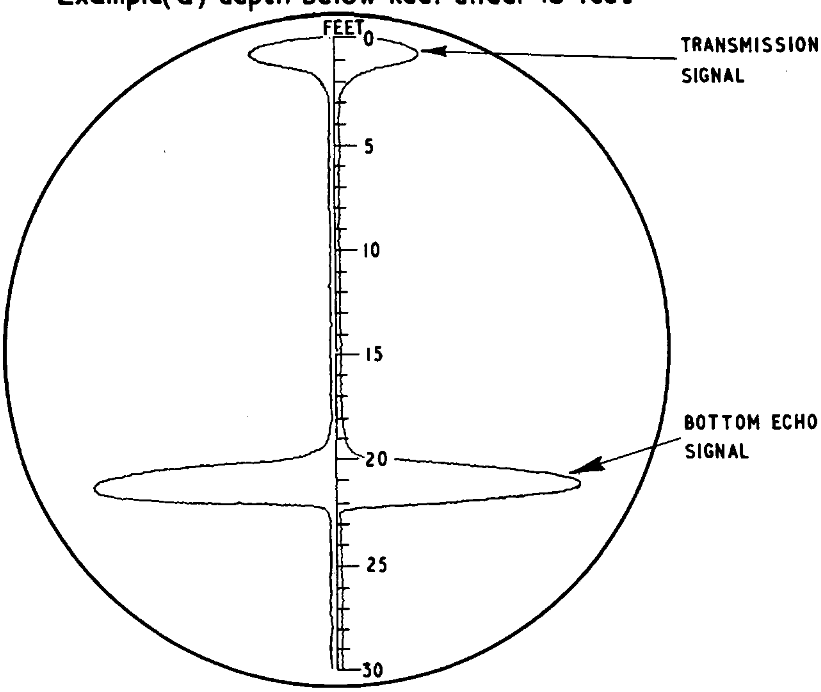

Viewing shield extended
Depth indicator console
MAINS ON/OFF
BRILLIANCE
SENSITIVITY
SCALE DIM
ZERO ADJUST
The controls

Fig. 1.



Example(a) depth below keel under 15 feet



Example(b) depth below keel over 15 feet

FIG. 2.

keel clearance is also of vital importance when berthing facilities are being developed and dredging schemes considered.

A slight fall in the relative water level around a vessel occurs when it moves through the water. The effects is most noticeable in a narrow waterway, here the water is not only shallow, but contained by banks. The vessel will thus float a little lower and the clearance beneath the keel will decrease. Under these conditions a change of trim also occurs and this, together with the decrease in the under-keel clearance is known as *squat*.

The following excerpt is from an article on shallow water soundings which appeared in the Shell Magazine and is reprinted with the kind permission of Shell International Petroleum Company Limited.

The amount by which a ship will *squat* depends on her draft, trim and speed, and also varies in different canals or rivers. Many experiments have been carried out over the last few years, and, whilst no two vessels are quite the same, certain broad principles have been established. A vessel that floats on even keel or near even keel when at rest will generally, when moving through a waterway, squat more at the bow, thus increasing her trim by the head. When loading to cross a bar or a shoal, therefore, it would seem preferable to trim the ship to an even keel (or at any rate only very slightly by the stern) to ensure that when under way she will trim by the head. Should she then be unfortunate enough to touch bottom, any damage that occurs will be at the forefoot rather than at the more vulnerable stern frame. Experiments have shown that in shallow water, in the open sea, and at a speed of eight knots, ocean-going vessels may squat almost one foot, whereas at the same speed, in a narrow canal with banks, the squat may well be of the order of three feet. A most important point, of course, is that a reduction of speed will result in a decrease in the amount by which the ship squats. In a narrow channel, a reduction from eight knots to seven knots could give as much as one foot more in under-keel clearance. At dead slow speeds (below four knots) squat seems unlikely to exceed six inches. These figures are, of course, only indications. A large number of variable factors must be considered in any given case.

Amongst the special uses foreseen for the new echo-sounding equipment is obtaining practical measurements of squat under varying conditions throughout the world, where the depth of water and the draft of the ship at rest are known. Furthermore, and even more important, the shallow water indicator will be able to detect when the vessel is approaching dangerously shallow water; if an appreciable reduction in speed is then made, the squat of the ship will be reduced, the under-keel clearance will be correspondingly increased, and the vessel may thus be able to clear the shallow patch.

Another possible use concerns ships lying in buoy moorings off-shore. The question of the clearance required under a ship's keel when she is lying fully loaded in a buoy mooring is important, especially when a sea is running, and is at present one that is very difficult to resolve. With the new shallow-water indicator, however, it should be possible to measure the changes in keel clearance under differing sea conditions, and this knowledge will be of great value when considering sites for new off-shore moorings.