HINTS TO HYDROGRAPHIC SURVEYORS.

TIDAL OBSERVATIONS AT SEA WITH THE DORSEY FATHOMETER

by

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The need for a simple and accurate method of observing tides at sea for tidal control of hydrographic surveys on continental shelves has long been recognized. Methods used by the United States Coast and Geodetic Survey in the past have ranged from direct observations on specially designed staffs floating in iron pipe wells to indirect observations with various types of pressure gages. In general, the methods used have yielded results serving the purpose for which they were designed, but most of the devices are limited to comparatively shallow water.

The accuracy of the results which have been obtained in hydrographic surveys by the Dorsey Fathometer suggested the possibility of using this instrument to observe tides from the surveying vessel while at anchor. A series of observations made recently from the United States Coast and Geodetic Survey Ship *Hydrographer* by the writer illustrates the possibilities of the method. Wherever observations are desired the vessel is anchored for the night with a short scope of chain and over an even, level, bottom, as indicated by the hydrographic survey. Depths are read on the fathometer during the night at intervals of 10 or 15 minutes through the high or low water periods, and at half-hourly intervals otherwise. The instrument can be read to the nearest tenth of a foot, and the tide curve thus obtained shows that there rarely is an observation in error by more than this amount. The accompanying figure shows the observations and tide curve obtained at a station in the Gulf of Mexico 27 nautical miles off the Texas coast in a depth of approximately 70 feet.

It is not suggested that this method will supersede the standard methods in use for establishing the factors for tidal predictions along the coast, but it is apparent that it offers an opportunity to verify the factors used in prediction of tides at distances from shore, and for the purpose of applying tide reduction to soundings in such areas as the *Hydrographer* now is working — the extensive shoal water areas in the Gulf of Mexico on the continental shelf. It is also realized that there are many places where the ocean bottom, due to the irregularities, might not be suitable for such observations. There usually are, however, places of sufficient extent where the ocean bottom is smooth and level, and where tidal observations in the manner outlined above are quite practicable.

It will be remembered that the Dorsey Fathometer was described in the Hydrographic Review, Vol. XII, N° 2, November 1935, pp. 50-53. (See also F.S. BORDEN "Dorsey Fathometer Operating Notes", *Field Engineers' Bulletin* N° 10, December, 1936, pp. 122-123, U.S.C. & G.S.). While it was designed primarily for increased accuracy in shoal water sounding, the instrument has been used consistently by the party on the *Hydrographer* in depths of from 50 to 60 fathoms, and it has been used successfully on occasion to 135 fathoms.

NOTES ON THE USE OF METALLIC TARGETS.

(Reproduced from the *Annales Hydrographiques,* Paris, 1935-1936).

(Translated from the French).

Since 1932 the Hydrographic Expedition in Indo-China has adopted metallic targets of 25 to 30 metres height (80 to 100 ft.) of the same type as those used by the *Service du Cadastre d'Indochine,* for the survey of that part of the coast of Indo-China located to the southward of the mouths of the Mekong. These targets are composed of tubes fitted with cross bars and hafting into each other. The assembly is supported by three or four sets of shrouds.

TUBES. — The target is composed of nine iron tubes of from 3.5 m. to 2.5 m; (8 & 12 ft.) and of 0.2 to 0.1 m. (4 to 8 inches) in diameter, the latter dimension diminishing from the base to the top of the signal. The tubes are bored with holes to receive the cross bars which serve as rungs of a ladder. At the upper end of each tube is a brass sleeve coupling into which the lower extremity of the next tube is fitted. This extremity is provided with two notches thanks to which the tube can abutt on the bar which passes through the sleeve of the preceding tube. The base tube and the top tube differ slightly from the others in that the base tube is fitted with an iron pedestal while the upper tube has no sleeve.

It is essential that the tubes should haft into the sleeves rigidly and without play. Further, it is impossible for the man working at the end of a tube to exert much force, while, on the other hand, the slightest play will diminish the rigidity of the signal and render the entire assembly dangerous.

BARS. — The bars are iron stock having the same diameter as the holes in the tubes. They should fit very snugly into the holes so that once in place they may hold solidly and project to an equal extent on each side of the tube. The two upper bars of each tube, the one which pierces the sleeve and the one preceding it, each carry at their extremities a horizontal ring which is used for securing the davit to hoist the tubes into place. This davit which is like a cat-head davit, carries at its upper end a pulley through which is rove a line about 50 metres in length (100 ft.). Before affixing the davit it is necessary to drive in the supporting bars as far as the ring, otherwise there is a danger of bending the bar.

GUYS. — The guys consist of steel wires of from 10 to 20 mm. cir. (0.4 to 0.8 inch). The new signals have the guys attached to a collar which it is only necessary to slip over the tube before assembly. In general the first group of guys is attached to the upper end of the second tube, the second group to the upper end of the fifth tube, the third group to the upper end of the seventh tube.

When the guys are not attached to the collars the simplest and quickest method is to make an eye in the end of each guy and to secure it over the tube just below the two bars which serve to support the davit. In this way the man working on the signal is not hampered by the guys.

The guys are anchored by wooden pegs about 1 metre (3 ft.) long driven into the ground. In order to obtain a good hold for the pegs it will first be necessary to dig holes about half a metre deep (2 ft.), then drive the pegs down and fill in the holes when the guys have been affixed.

MATERIAL FOR THE ASSEMBLY OF THE SIGNAL. - TRANSPORTATION OF THE MATERIAL. The following material is required in the construction of the signal :—

The 9 tubes, the bars (about 45) and the davit.

Three groups of 4 guys, or about 250 metres of steel wire of from 10 to 20 mm. circumference.

15 wooden pegs (three spares).

1 sack of tools (spade, pickaxe, sledge-hammer, axe, hammer, burin, universal pliers and cutting pliers).

1 length of line about 50 metres to serve as falls for the davit, iron wire, marline.

1 can of axle-grease, some calico.

About fifteen coolies are required to transport this material. A small 1500 kg truck can transport three signals.

THE ASSEMBLY OF THE SIGNAL. — In order to proceed with the assembly of the signal, it is necessary :—

1° to check the tubes for their correct assembly fit.

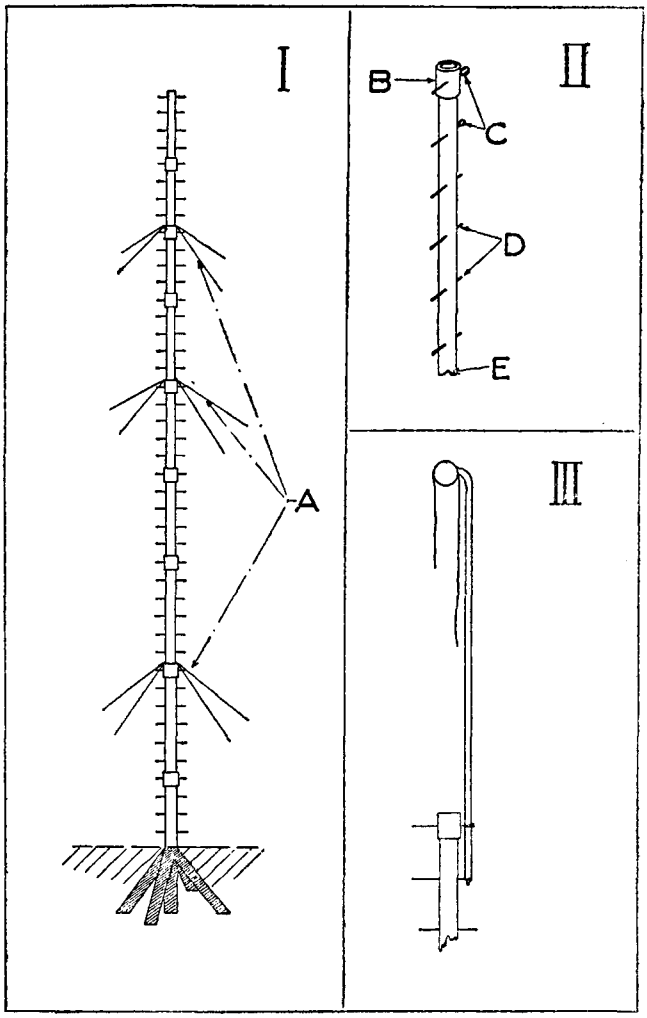
2° to have a hole dug about 1.5 metres (5 ft.) deep to receive the foot of the signal.

3° to plant the four pegs for the first group of guys at distances of 8 to 10 metres (25 to 30 ft.) from the hole for the foot of the signal.

4° Assemble on the ground the three or four elements of the signal (grease the sleeves to facilitate dismounting) attach the first four guys;

5° Mast the three or four elements of the signal; set up the guys taut.

6° Send a man to affix the davit. This man must lash himself to the top of the signal in order that he may work with both hands without danger. If the bars which must support the davit have a bit of play, lash the davit securely along the length of the tube with iron wire to avoid accidents.



7° When all is ready, attach the end of the falls from the davit to the next tube to be fitted in place. The falls should be attached to the tube sufficiently close to the sleeve so that the tube will be drawn up vertically with the sleeve up.

Hoist without jerking and keep the signal vertical, if the davit does not twist (a frequent accident). The man who is on the signal needs only to guide the tube and to slip it in place. Do not forget that this man is working under difficulties and cannot exert much strength.

8° Continue in the above manner for each tube. Have the guys affixed at the points previously mentioned (at the top of the fifth and seventh tubes). These positions may be varied depending upon the rigidity of the signal.

9° When the signal is erected have the piece of calico and some branches of trees attached to the upper tube in order to make the target clearly visible.

With a trained crew of three European sailors and about 15 coolies a signal may be erected in a few hours after having been delivered to the place of mounting provided the material is in good condition.