RELATING MAGNETOPHONE TO BUOY ANCHOR ON R. A. R. BUOY CONTROL HYDROGRAPHY.

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I. METHODS USED ON THE *HYDROGRAPHER*

by R. A. RIDDELL, Jr. H. & G. Engineer, U. S. C. & G. Survey.

One of the largest sources of error on R. A. R. work when using floating magnetophone stations lies in relating the position of the magnetophone to the anchor of the buoy marking the station.

As the magnetophone must be maintained at some distance astern of the station ship in order to be free from ship noises, it is generally necessary for the vessel to anchor several hundred metres from the buoy to avoid fouling the magnetophone cable on the buoy when the vessel swings with the current.

The accompanying plate, reduced considerably in scale, shows the actual plotting of the relationship between the magnetophone and buoy anchor on August 21, 1931, while the *Hydrographer* was serving as a station ship at Buoy *BOY*, Georges Bank.

The necessary observations, ordinarily made at half-hourly intervals, are (1) current observation, (2) bearing and range finder distance from bridge to buoy, and (3) bearing and range finder distance from bridge to magnetophone.

The plotting is done on as large a scale as convenient. From an assumed position of the buoy anchor, the circle representing the path of the buoy is swung, using the scope of the buoy as a radius. For a particular observation, the buoy is plotted on the circle from the data furnished by the current observation. The position of the bridge is then back plotted from the buoy and the position of the magnetophone plotted from the distance and bearing to it from the bridge. The true bearing and distance of the magnetophone from the buoy anchor is then scaled directly from the plot, entered in the records and radioed to the sounding vessels. The form used for entering the data in the records of the several units is shown in inset on the plate.

It will be noted that the path of both the bridge and magnetophone, as determined by half-hourly plottings, is definitely elliptical. The major axes of the ellipses undoubtedly result from the straightening out of the ship's anchor chain during the strength of the current. The question naturally arises as to what the actual path of the buoy is and how much it differs from a circle. Tests made to settle this point have not, thus far, been conclusive.

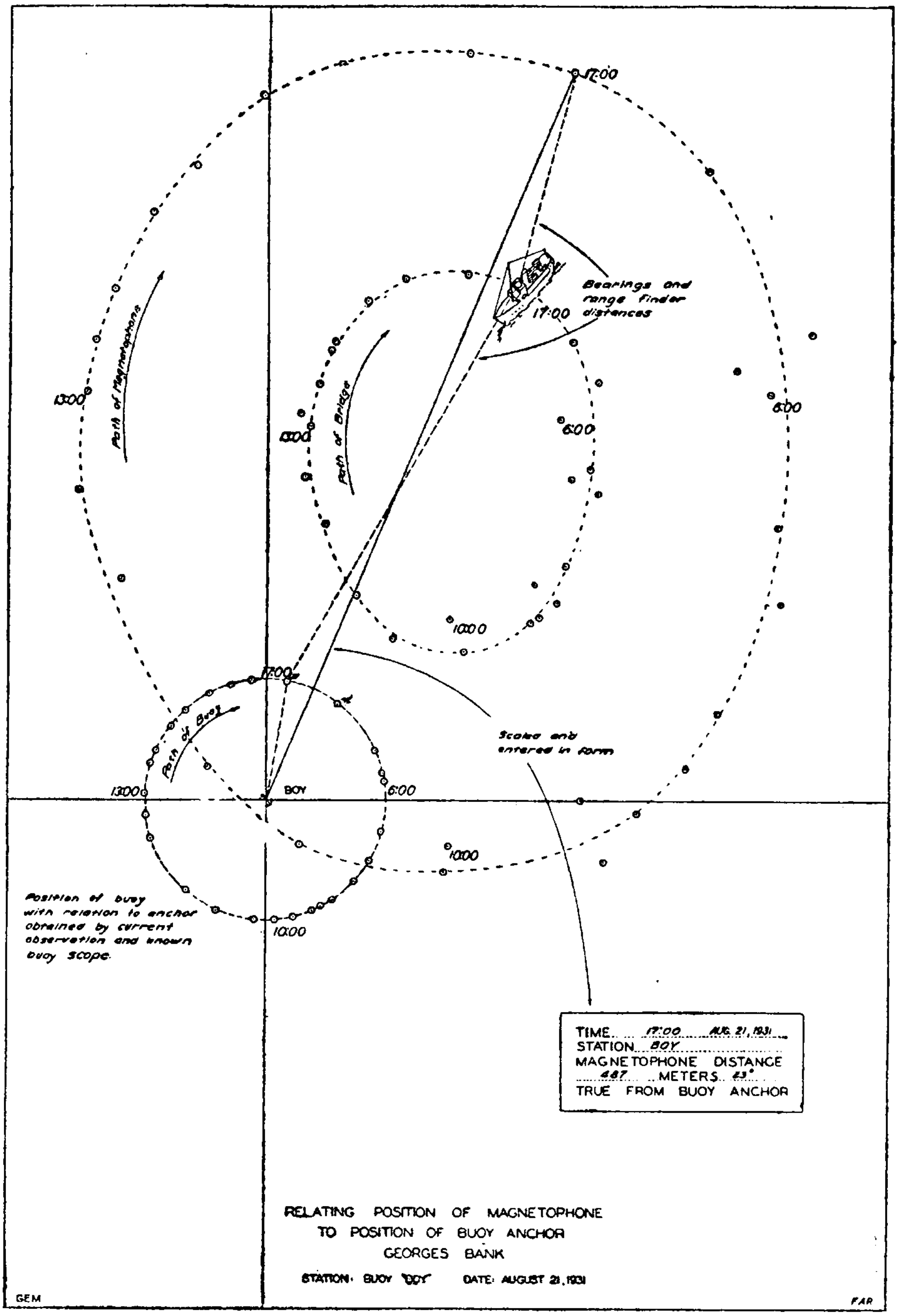
When using the method desribed above on R. A. R. triangulation to obtain the correction at the magnetophone end of a bombed line, the component of the eccentric distance measured along the azimuth of the line between the two buoys is obtained and applied as a plus or minus correction to the bombed distance. In much the same way, the correction at the other end, necessary to relate the bomb to the second buoy anchor, is obtained.

In case the combined eccentricity of bomb and magnetophone, normal to the line, is large enough to cause appreciable error, due to assuming that the actual distance is the same as its projection on the line between the buoys, a correction for the difference must be applied. With a line 18000 metres (approximately 10 miles) in length and a resultant magnetophone and bomb eccentricity, normal to the line, of 600 metres, the correction amounts to $18000 - 18000 \; Cos \; (1^{\circ} - 55') = 10.1$ metres.

II. METHODS USED ON THE *LYDONIA*

by G. D. COWIE, H. & G. Engineer, Commanding "Lydonia".

When the *Lydonia* acted as a magnetophone station and a range finder was available, she obtained the same data that the *Hydrographer* has mentioned. When none was available, she obtained distances by sextant angles. A base was measured from



stem to stern on the *Lydonia*, and two observers stood at the ends of the base. Each observer measured the angle between the other's sextant and the buoy. These angles plotted on the base gave the distance from the ship and the direction with reference to the ship's head. When the buoy was almost ahead or astern, this method could not be used, and so a depression angle and pelorus bearing was taken to the buoy.

The range finder was the most accurate method of finding distances. By hanging a lantern on the buoy, distances to the buoy could be measured at night by the range finder. Other methods would not work at night.

In plotting the data, instead of starting with the buoy anchor and working to the magnetophone, as done by the *Hydrographer*, the *Lydonia* started with the ship's bridge or the base of the ship and worked to both the magnetophone and the buoy anchor. The base was laid off on co-ordinate paper and the angles plotted to the buoy positions. From the buoy positions a line was drawn in the direction opposite that of the current for a distance equal to the scope of the buoy. The distance and direction of the magnefophone float were plotted from the position of the ship's bridge. A line was drawn trom the position of the magnetophone float to the anchor of the buoy. The length of the line gave the distance between the magnetophone and the buoy anchor. The angle between this line and the line of the ship's head, plus the true bearing of the ship, gave the direction between the magnetophone and the buoy anchor.