The use of ultra-high radio frequencies is developing rapidly. It may soon be possible to direct a radio beam (approximately 1/2 metre in wave length) from the upper structure of a ship and orient it forward in such a fashion that a highly directive receiver, underneath the transmitter and oriented to receive forward, will receive the signal only when some reflecting object exists in front of the ship.

A NEW ROTATING RADIO BEACON.

(Extract from *Nature*, London, 6th April 1935, p. 539).

A new type of rotating radio beacon, likely to simplify navigation both by sea and air, was recently developed in Japan. It is common knowledge that taking bearings with the rotating radio beacon generally requires, at the receiving station, the aid of a stop-watch or chronometer. In the new type, however, the use of the chronometer becomes unnecessary. This new device is described in a paper by U. OKADA, published in the report of Radio Research in Japan, Vol. IV, October 1934, page 185; it makes use of a vertical loop transmitting aerial as previously, to give the usual "figure-of-eight" radiation characteristic. Instead of rotating this loop continuously, however, it is swung backwards and forwards about a vertical axis through an arc of 180°. During its movement the speed of rotation is uniform and equal to one revolution per minute. The movement in each direction starts from a north and south position alternately, at each of which a characteristic morse signal is emitted. This signal is then followed during the rotation of the loop by a succession of 90 dots, at the rate of 1 dot for every 2°. By counting the number of dots from the starting point to the signal minimum, the bearing of the receiver from the transmitter may be calculated. The additional observation taken with the loop moving in the reverse direction enables the midpoint of a broad minimum to be accurately determined. Tests carried out in Japan on land and at sea have shown that an accuracy of observation of $\pm 6^{\circ}$ was obtained at distances up to 46 km. with an experimental beacon operating on a wave-length of 950 m. It is considered that by attention to details of the apparatus the maximum error could be reduced to 2°, which it is suggested is sufficient for practical purposes.

EXPERIMENTS AT SEA WITH THE BUBBLE SEXTANT.

The following is a short summary extracted from the *Revue d'Optique Théorique et Instrumentale*, Paris, October 1934, of an article by E. O. HULBURT appearing in the *Journal of the Optical Society of America*, Volume 23, 1933, entitled *Experiments with the bubble sextant at sea.*

In the Bubble Sextant the bubble is used to provide an artificial horizon. Unfortunately the bubble is subject to two sorts of perturbations: the first, the period of which is less than one second, is due to the vibrations of the vessel and the second, the period of which reaches several seconds, is due to the rolling and pitching. If it be assumed that the rolling is represented by a sinusoidal function, the plane defined by the bubble at any moment lies, with reference to the horizontal plane, at an angle d such that $d = \tan f/g$, f being the acceleration of the rolling and g the acceleration of gravity. This relation, when applied to the case of a destroyer under average conditions, suggests an error of the order of 163' in sextant observations. As but few data are available as to the accuracy of observations in practice, the author examined the results given by existing bubble sextants under various conditions. Observations taken on land under good conditions showed errors of the order of 3'. At sea, in a vessel of 950 tons under average conditions, the error for an isolated observation may reach 60'; when the mean of 5 consecutive observations is taken, the error is usually less than 30'. On board a vessel of 12 tons the accuracy is still less. In all cases the errors due to rolling are greater than those produced by short period perturbations. In these circumstances, the author remarks that, in the middle of the oscillation of the roll, the acceleration f, and consequently d, are nil. At this moment, the bubble gives the true horizontal plane. Thus if a pendulum, whose proper period is fairly short, be made to follow the oscillations of rolling and to close an electric circuit exactly at the middle of the oscillation, thus actuating a sound signal, sextant observations could be taken in the best circumstances. In this case the mean error for 5 consecutive observations falls to about 15'.

THE NEW SPHERICAL COMPASS.

(Extract from *Zapiski po Gidrographii*, Leningrad, 1934, No. 3, p. 148).

In the March 1934 number of *Marine Engineering* there is a note on the new KELVIN-WHITE spherical compass, invented and improved by Wilfred O. WHITE, of Boston.

Four years ago, Mr. WHITE, after various attempts to obtain a more stable compass, became convinced that if the compass bowl were spherical, instead of flat as in the ordinary type, it would give greater stability to the compass card at sea.

The principle of the instrument is based on the fact that the movement of the ship when rolling and/or pitching always gives rise to a force acting vertically; in the flat-topped compass, at each vertical movement the liquid strikes the glass and causes turbulence round the bowl in a horizontal direction, drawing the card with it and causing instability in the latter. In the spherical bowl, the liquid, taking up the same spherical form, with the card at its centre, remains quiet even when the bowl oscillates in all directions.

Further, in the spherical compass the "magnetic element" is established in such a way that the inertia and the magnetic moment are in harmony, giving excellent results.

The combination of the spherical glass of the bowl and of the liquid which completely fills it forms a kind of meniscus which magnifies the card considerably on the side opposite that from which one is looking.

Thanks to its great stability and better visibility, the spherical compass is now widely used in the American Mercantile Marine. For instance, after trying out these compasses on board various ships, the American Hawaiian Line has ordered twenty-five spherical compasses for its fleet.

G. B.

THE CHIEF RULES FOR THE TREATMENT OF MAGNETIC COMPASSES ON BOARD SHIP.

by

W. ULLRICH, of the DEUTSCHE SEEWARTE.

(Extract from *Der Seewart*, Altona-Elbe, Heft 1, 1935, page 2). (*)

In many industrial or commercial establishments it is the custom to extract the essentials from the innumerable instructions, rules and precautions to be observed, to group them in a clear, synoptic form, and to exhibit them as near as possible to the places where work is going on so that they may be continually exposed to the view of the employees. The favourable results obtained from this practice would seem to encourage its application to the principal points to be observed in the treatment of magnetic compasses on board ship, i. e. to group these points in rules easy to understand, without inconvenient extra work. It is reasonable to hope that their observation

(*) *Original text in German.*