MAGNETISM AND ELECTRICITY INCLUDING THE MAGNETIC COMPASS.

Paper 6 (3 hours).

1. The ship's head having been swung to the eight principal points of the compass the following were the bearing of a distant object :—

Ship's Head	N	NE	E	SE	S	SW	W	NW
Bearing.	N3°E	N12°W	N18°W	N14°W	N11°W	N8°W	N2°E	N10°E

Find the values of the approximate coefficients A, B, C, D, and E; determine the deviations for the 9 points of the N.E. quadrant of the compass, and describe in detail how you would utilize your knowledge of the coefficients in adjusting the compass.

2. Is the direction of the ship's head, when building, of any practical value to a compass adjuster ?

Give full reasons for your answer.

3. The compass having been adjusted in the English Channel, H.F. 1·0 Dip. 63°, coefficient B — 10° was corrected by 12 in. of 3 in. diameter Flinders bar and a permanent magnet 24 in. from the compass needles.

Later, off Cape Verde, H.F. 1·6 Dip. 25°, a deviation of 3° W. developed on Westerly courses.

Find what alteration should be made in the amount of Flinders bar and in the position of the permanent magnet to properly adjust Coefficient B. (N.B.—Ignore coefficient E and possible Gaussin error.)

4. If 40 ft. of wire ·04 in. thick has a resistance of 3 ohms, find the resistance of 1,000 ft. of wire of the same metal ·06 in. thick.
5. Why is a zinc-copper couple more effective than a zinc-iron couple when dilute sulphuric acid is the exciting liquid in a simple voltaic cell ?
6. Explain clearly the regular and irregular changes in Magnetic Variation.
7. What relation has the power of a permanent correcting magnet in a binnacle, and its distance from the compass card, upon the deflection caused ?
8. A compass needle 5 cm. long and whose poles are of unit strength lies in the magnetic meridian. Variation 45° E.

A disturbing magnet of same length and strength as the compass needle is introduced lying in the true meridian Blue end North, its centre being 10 cm. East (true) from the centre of the compass and in the same horizontal plane. Calculate the initial moment, clockwise or anti-clockwise, tending to deflect the compass.

CONSTRUCTION, WORKING, AND UPKEEP OF SHIPS.

Paper 7 (3 hours).

1. What information is usually given in the Register of a Registration and Classification Society ?

What is the object of this register ?

2. What special provision is made in coasting vessels which are required to load aground ?
3. Show by sketches the structural arrangements in a double bottom tank, having floors on alternate frames.
4. What is the object of inclining the light ship ? Describe the experiment and state the conditions necessary to ensure accurate results ?
5. What is Synchronism ? How and why should it be avoided ?
6. The half ordinates of a vessel's waterplane are 0·1, 6·7, 9·5, 10, 10·2, 10, 9·8, 8·8, and 1·8. Common interval 16·2 ft.

Calculate tons per inch immersion.

7. Show that for small angles of heel the position of the Metacentre is determined by the Moment of Inertia of Waterplane and the Volume of Displacement, *i.e.* :—

$$BM = \frac{I}{V}.$$