

## THE EARL OF CAITHNESS GRAVITATION COMPASS.

A new mariner's compass remarkably devoid of complication in its various parts, has recently been invented by the Earl of Caithness, F. R. S. The ordinary compass is mounted upon gimbals, that is to say upon two axes at right angles to each other, for the purpose of allowing the compass-box the power of swinging freely in all directions, the necessary result being that the bottom of the compass-box is kept by the force of gravitation, parallel, to a great extent, to the plane of the horizon, whilst its mountings move in various directions, as influenced by the motion of the ship. The essential feature of the Caithness compass is that instead of its being mounted upon gimbals it is mounted upon the top of a pendulum which swivels in a ball-and-socket joint. The gimbals of the ordinary compass are intended to give the compass-box the power of moving in a true circle; but they do not absolutely give that power, and never can, since there are two points in the performance of the circle in which there is a slight catch which tends to make the box oscillate, first to the right and then to the left or vice versa, as the case may be.

The new Caithness compass consists of a ball close underneath the compass-box working in a socket fixed at the top of a conical support. The pendulum is about 2ft. in length, and is attached to the small ball, which has thus the power of giving a perfect rotation. It works in a perfect circle and it does not matter how much the ship rolls. The Earl of Caithness calls it the "gravitation compass," because the pendulum always points to the centre of the earth. He says that it will bear very great rolling and pitching of the vessel—in fact, a roll of more than 30 deg.

In the course of a voyage across the Atlantic, made about the middle of October last, in the *Java* (Captain Martin), by the Earl of Caithness, he tried experiments with the compass on a large scale, the result being that the maximum vibration of the compass-card was about a quarter of a point, whilst nearly standard compasses on board gave much larger vibrations.

The engraving on page 1 represents the compass. The little ball underneath the compass-box has a small slot in its side; a corresponding pin goes through the socket and falls into the slot, thus preventing the compass-box from rotating upon its vertical axis, and keeping the "lubber's point" in a straight line between the axis of the compass needle and the head of the vessel. This "lubber's point" marked inside the compass-box is a guide to steer by, since it shows the position of the head of the vessel in relation to the points of the compass.

When in use the compass is suspended at the top of an ordinary binnacle, which is regulated in diameter so as to give scope for the play of the pendulum, and to confer a power of moving to the extent of 40 deg. The longer the pendulum the steadier of course would be the compass-box; but a very long pendulum would require room for a large swing, and on board ships every inch of space is valuable. A pendulum 2ft. long is found to be sufficient, the advantages of still further elongating it being more of theoretical than of practical value.

THE "CHALLENGER" IN THE SOUTHERN OCEAN --  
KERGUELEN'S LAND.

The following extracts from the "Occasional Notes" of a contributor to the *Hour* will be read with interest, especially those referring to the visit of the ship to Kerguelen's Land, which, it will be remembered, is one of the spots selected for the Transit of Venus Expedition.

The *Challenger*, having been thoroughly refitted during six weeks' stay at the Cape of Good Hope, steamed out of False Bay on Wednesday, November 17, 1873, bound for Marion and Prince Edward's Island, the Crozet Group, Kerguelen's Land, Heard or McDonald's Island, and afterwards as far south as could be reached without actually getting amongst pack ice, and from thence to Australia. Besides the ordinary purposes of the expedition—deep-sea exploration in all parts of the world—one of the objects for which the ship was ordered to Kerguelen's Land was to investigate its numerous bays, creeks, and harbours, with a view to selecting the most suitable place from which to observe the Transit of Venus on 9th December, 1874. The information was to be sent home from

Australia, and would reach before the expedition left England. It was also intended to leave an account of the proceedings in a cairn in Christmas Harbour, and Betsey Cove. We sighted Marion and Prince Edward's Islands on the 25th December, in the evening, but, as the weather was very thick and misty, and the coast little known, we were compelled to heave to until morning. On the morning of the 26th surveying and exploring parties were landed, the ship remaining under way surveying, sounding, and dredging. The kelp extended fully 160 yards from the shore, and grew in the water at a depth of 50 fathoms; it floats in long strings, and makes a most effectual breakwater. We landed on large rough boulders, covered with slippery weeds, where a little stream from the hills ran into the sea. Ascending the hillside from the beach you come on soft boggy moss, beautifully green. At first one seemed to walk with great ease, as the ground was so springy, except when you occasionally sank over your ankles; but after a time it was found very tiring, and it was with the greatest relief one came upon a bit of comparatively hard ground. There were many albatross (*Diomedea exulans*) sitting on their eggs on the high ground, where they looked, from a distance, like sheep grazing on the side of a hill. They allowed you to approach without taking the least notice, but if you showed that you had designs on their eggs they stretched out their necks and snapped their beaks; but it was not the least difficult to shove them off the nest with your foot, without injuring them, and take the egg. The nests are mounds about two feet high and about seven feet round the base, made of moss, with the top side concave to hold the egg. We never saw more than one egg in a nest. We strolled along the shore for a couple of miles, keeping a look-out for seals. We came to a penguin rookery, and three kinds were seen—the king penguin (*Avanodytes rex*), the grey penguin (*Johannes*, they are called by the Cape people, but I cannot find them described or named), and the crested and rock-hopper (*Endiptes chrysoxomus*). This is the first time we have seen the king penguins; they look very fine, drawn up like a regiment of soldiers, with their bright yellow necks and breasts. The Kerguelen cabbage (*Pringlea antiscorbutica*), grew in considerable quantities in crevices and ravines leading down to the water-courses, in fact, in all sheltered situations. When cooked, although not unpalatable, it has a peculiarly bitter after-taste, which made me dislike it, but some of my messmates relished it highly. I afterwards tasted it mixed with potatoes and fried with meat, when I thought it good. The ship's company had quantities cooked, and most of them relished it very much. On shore out of the wind the sun was very hot, and one was glad to take off some of the special clothing, but when exposed to the wind, particularly in the afternoon, it was bitterly cold. Occasionally the clouds and mist cleared off the peak (3,000 ft. high) and range of mountains in the background, which were covered with snow; the line of perpetual snow was estimated at about 1,000 feet from the sea, and although it is now near Midsummer, patches of snow were within 800 ft. of the water. When Captain Cook passed this island he said he thought he saw trees, but we discovered no signs of even a shrub. The rocks and moss upon one of the hills rather resemble underwood when seen at a distance, but you are un deceived on nearer approach. The ground gradually rises from the sea, but is very rough, and broken by numerous water-courses. As the Island so closely resembles the description of Kerguelen's Land, we were surprised at not finding ducks, more especially as there is plenty of cabbage-seed for them to feed upon. But nothing was found except the elephant sea-birds, and their parasites; and there were no traces of either goats or hogs seen by any of the shore parties.

On the afternoon of the 2nd January Possession Island was occasionally seen through the mist. Steam was got up, and the mist having cleared considerably in the evening, we steamed into Navire Bay. Several very fine cascades were observed, the water tumbling down from the high cliffs to the N. W. of the bay outside. Inside the bay a small hut, with a boat and some casks, were seen; a gun was fired to attract attention, but there were no signs of any sealing or whaling party. A most remarkable appearance was seen on the eastern side of the bay, where the sun was shining brightly on the high redish cliffs above the belt of mist which obscured most of the land. A very heavy swell was setting into the bay, which prevented anchoring, so the ship steamed out and made sail. A high perforated rock, through which it is said a vessel