CARNEGIE INSTITUTION MAGNETIC SURVEY OF THE WORLD.

History tells us that when Columbus made his memorable western voyage, his sailors mutinied because among other things the needle of the compass no longer pointed to the North Star; which showed that this phenomenon was observed but not understood. Since then all mariners have had to make allowance for the variations of the compass; for while in one part of the ocean the needle practically points due north, in other localities the variation, as the mariner terms the angle of departure of the compass from true north, is several degrees. Off the coast of Oregon and Washington there is a variation as high as twenty to twenty-five degrees. This variation does not exist only on the oceans, but is also found on land.

At present in the United States the line of no variation along which the needle points "true to the pole," or due north, begins in the eastern part of Lake Superior and Michigan and runs through Ohio about half way between Cincinnati and Columbus, and after passing through the eastern parts of Kentucky and Tennessee, cuts through South Carolina and enters the Atlantic Ocean near Beaufort. On the east side of this line the variation of the needle is west and on the west side the variation is east, and as a rule the further a place is from this line in our country the greater is the variation. In the northwestern part of Maine the compass points 21 deg. west of north and at Vancouver it points 25 deg. east of north.

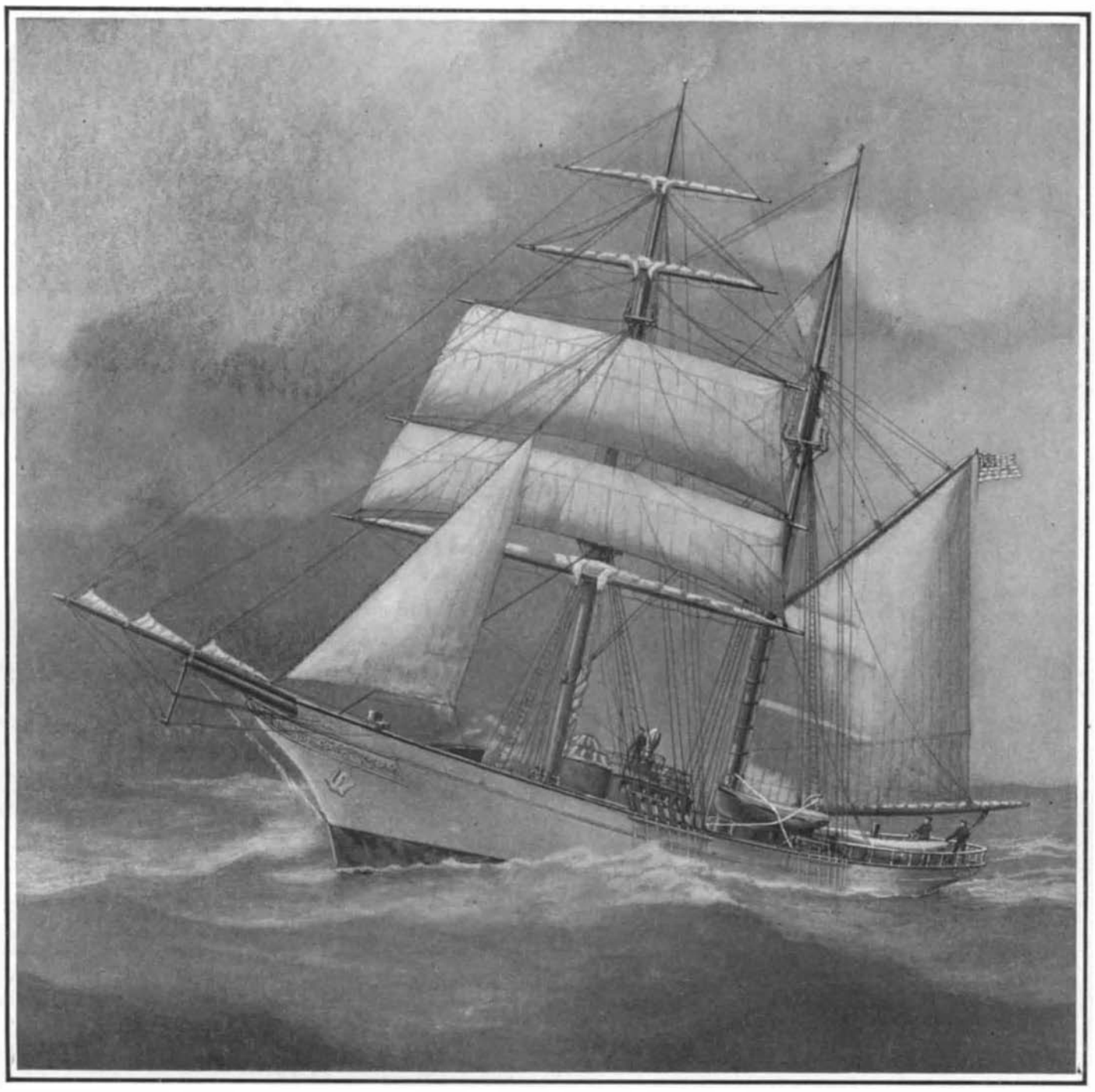
The position of the line of no variation, as given, is that assigned to it on the magnetic charts issued by the United States Coast and Geodetic Survey. This line has for many years been moving southwestward. How long this motion will continue scientists do not know. The true north pole and the magnetic north pole are not identical. The true north pole is stationary, except for the very small motion recently discovered by astronomers; but the magnetic pole appears subject to considerable motion with the lapse of time, the actual path being as yet unknown, because of lack of data covering a sufficient period of time.

Humboldt recognized the importance of terrestrial magnetism and suggested that four times in every century an expedition of three ships should be sent out to examine as nearly as possible the state of the magnetism of the earth. This plan has never been adopted and the surveys that have been made have been more or less incomplete. Some notable surveys have been made, but all the work done has covered hardly more than one-tenth of the navigable waters of the earth. The most notable contributions to our knowledge were those made by Sir James Clarke Ross (1839-45) in connection with his memorable Antarctic expedition, and the data gathered by the "Challenger" expedition (1872-76) regarding the magnetic conditions along the paths traversed by the ship.

About four years ago the Carnegie Institution of Washington undertook to make series of systematic surveys. A department of research in terrestrial magnetism was organized and the work placed in charge of Dr. L. A. Bauer, who was formerly in charge of the magnetic survey of the United States under the Coast and Geodetic Survey. The first step in the ocean work was to make a survey of the Pacific Ocean, where until then little had been done except shore observations on some of the islands along the coast since the notable voyages of the "Challenger" and the "Gazelle," more than thirty years ago.

Observations were made from the converted wooden yacht "Galilee" which between August 1st, 1905, and May 31st, 1908, made three successive voyages in the Pacific tracing the great circle route, zigzagging in and out of the islands and covering with a network of tracks all the places left uncovered by the "Challenger." The "Galilee" cruised more than 60,000 miles. The most northerly point visited by the "Galilee" was Sitka, Alaska, and the most southerly Lyttleton, New Zealand.

This was only the beginning of the work. The Institute has already made observations in many parts of the world and now has two expeditions in Africa, has just sent another to China, has one in Persia and Asia Minor, and has covered a part of South and Central America and British North America and Greenland. It is estimated that a magnetic survey of the world can be completed in about ten years more.



This interesting vessel is being built for the Carnegie Institution at Washington. Her survey of the oceans will form part of a comprehensive survey of the whole world, on land and sea, by which the magnetic variation of the compass is to be determined. No iron, steel, or other magnetic material will be used in her construction.

NON-MAGNETIC VESSEL FOR MAKING A MAGNETIC SURVEY OF THE OCEAN.

For the purpose of making systematic surveys to determine the magnetic conditions on all the deep-water seas of the world, the Carnegie Institution is having constructed a magnetic survey vessel, which has been specially designed for this work by Henry J. Gielow, the designer of some of our most successful racing yachts, to whom we are indebted for the following details of her design and construction: The ship is entirely original, being the first of her kind to be constructed. In order to render her practically non-magnetic, no magnetic metals, such as iron and steel, have been allowed to enter into her construction. The only magnetic material used is the thin, cast-iron liners of the cylinders of the internal-combustion engine with which she is fitted. Outside of the liners and the steel cams for the valves this engine is constructed entirely of bronze. As she is built for ocean surveys, the vessel is constructed in a particularly substantial manner, and combines with the strength of a merchant vessel all the beauty of finish and workmanship of a yacht. Her dimensions are: Length over all, 155 feet 6 inches; length on load waterline, 128 feet 4 inches; molded beam, 33 feet; depth of hold, 12 feet 9 inches; draft, 12 feet 7 inches; displacement, with all stores and equipment on board, 568 tons. She will have full sail power, with a brigantine rig carrying about 12,900 square feet of plain sail. The lines of the hull are fair and easy, and indicate both power and seagoing qualities throughout. The keel, stem, stern post, frames, and deadwood will be of white oak, the deck beams, planking, and ceiling of yellow pine, and the deck of Oregon pine. The fastenings will consist of locust treenails, copper and Tobin bronze bolts, and composition spikes. All through bolts will be riveted over rings both inside and outside. All metal deck fittings, metal work on spars and rigging will be of bronze, copper, and gun metal. The six-cylinder, internal-combustion engine is for the purpose of maneuvering the vessel when in port or crowded roadsteads, or during a calm at sea. It is capable of developing 125 indicated horse-power at 350 revolutions per minute, which, driving a feathering propeller of special design, will give the vessel a speed of six knots in calm weather. The shaft will be of Tobin bronze and the propeller and its feathering gear will be of manganese bronze. The engine will be operated by gas generated in a producer gas plant having a capacity to gasify 130 pounds of anthracite pea coal per hour, producing a fixed, well cleaned gas, containing 80 per cent of the heat units possessed by the coal. The vessel will carry twenty-five tons of coal in her bunkers, which will give her a cruising radius of 2,000 miles at a speed of six knots.

The living quarters for the officers, crew, and scientific staff are all below the main deck; and, for safety, the vessel will be subdivided into seven watertight compartments. The crew will be berthed forward in the forecastle. Then will follow the officers' messroom and staterooms. Abaft the officers' quarters are the accommodations for the scientific staff, from which a mahogany stairway will lead to the observation room on deck. By reference to our engraving, it will be noted that this observation room is located amidships between the foremast and mainmast. It consists of a central observation room, 14 feet 6 inches in length by 16 feet in width, which will be provided with the necessary desks, drawers, and tables, etc., for the work of the staff, and at each end of this room will be a circular observatory, 7 feet 6 inches in diameter, each of which will be fitted with a revolving dome constructed of bronze framework and plate glass. These two domes are shown in our engraving on a level with the deck of the observation room, and immediately forward and aft of the same. The construction of this exceedingly interesting craft is now proceeding at Tebo's yacht basin, Brooklyn.