…eless Telegraphy and Meteorology.

Acc… …is, the director of the meteorological observa- States …at Aix la Chapelle, visited the United States in this … and, having become convinced in Washington of … reliability of regular wireless communication be- c… …een vessels, instituted, in the course of his return …oyage, experiments which demonstrated the feasi- …bility of transmitting weather indications from ship to ship in this way. The coast wireless stations which are most important for communication with vessels navigating the Atlantic Ocean are those of the English Channel, the west coast of Ireland and the eastern shores of the United States and Canada. Several of these stations can make themselves understood to a distance of 2,000 miles, so that vessels can receive intelligence from land during the entire voyage across the Atlantic. The wireless transmitters on shipboard, however, are much less powerful. Their radius of action never exceeds 500 miles, and they cannot send messages directly to land from a greater distance than this.

During the summer of 1908 Dr. Polis made an experimental voyage across the Atlantic and back, on the Hamburg steamer "Kaiserin Auguste Victoria." He had arranged with several steamship companies to take part in the experiments, and from their vessels he received 25 wireless messages on the outward and 19 on the return passage.

In addition, the Aix la Chapelle observatory sent him, *via* the wireless station at Clifden, Ireland, daily reports of meteorological observations made on the English and French coasts. The transmission was perfectly successful up to the end of the fourth day of the outward voyage, when the ship was about 2,000 miles from the Irish coast. The messages, which were in cipher, were transmitted without a single error.

When the ship came within the zone of influence of the American stations, it received daily reports from the Weather Bureau at Washington. These reports were transmitted more rapidly than those from Aix la Chapelle, but they were often curtailed, a fact which was attributed to the employment of code words instead of ciphers.

Conversely, meteorological observations made on the ship were sent out daily by wireless, for transmission to Aix la Chapelle. During the first two days of the westward voyage these messages were received directly by the wireless stations on the English Channel. Afterward, the messages were transmitted indirectly through vessels nearer shore. This system was employed until the ship was in mid-ocean, and the transmission of the message to Aix occupied two full days. The messages sent directly on the return trip reached Aix in less than 13 hours—one of them in one hour and forty minutes.

Daily weather charts were drawn from the reports received from land in combination with observations made on board. A German commission has since been appointed for the purpose of conducting a more extensive series of experiments.

Collaboration between meteorological and wireless stations, ashore and afloat, would benefit navigation as well as meteorology, for the captain of a ship at sea has a profound interest in forthcoming weather changes. The receipt of various meteorological data from a few stations would not always suffice, but the void would be filled if the wireless stations on the coast should send out daily, at a predetermined hour, weather forecasts obtained from neighboring meteorological stations, for the benefit of all ships within the zones of influence of the wireless stations. In particular, effective warnings of approaching storms might be given in this way.

An attempt in this direction has already been made in Holland. The police schooner of the North Sea fisheries receives daily, while within the zone of influence of the wireless station of Schevennigen, the weather forecasts of the meteorological institute at Bilt. Whenever it is possible, special storm warnings are also sent to the schooner, which transmits the messages to the fishing boats by flag signals.

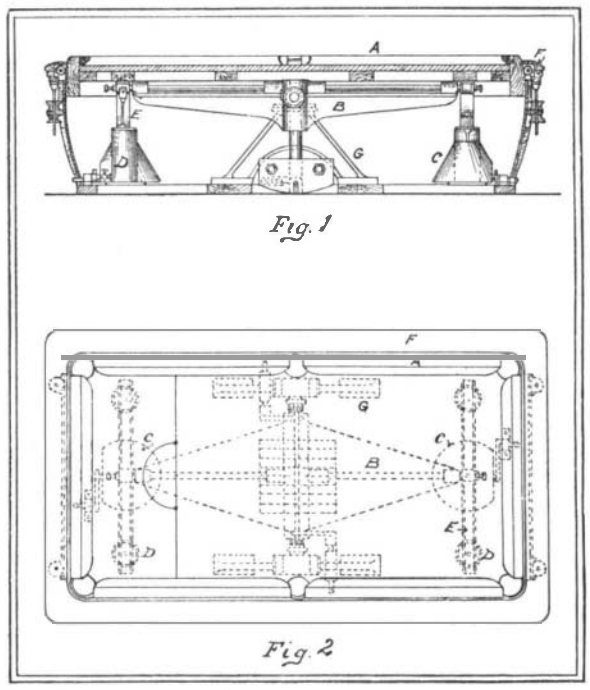
It may be expected that, as the number and frequency of weather reports sent by vessels to meteorological stations increase, the forecasts will become more accurate and more valuable to the vessels which receive them.—Cosmos.

Experiments in abrasion conducted at a French mint have proved that aluminium coins will be less rapidly worn by use than coins made of gold, silver, or even bronze.

A BILLIARD TABLE FOR SHIPS.

BY HAROLD J. SHEPSTONE.

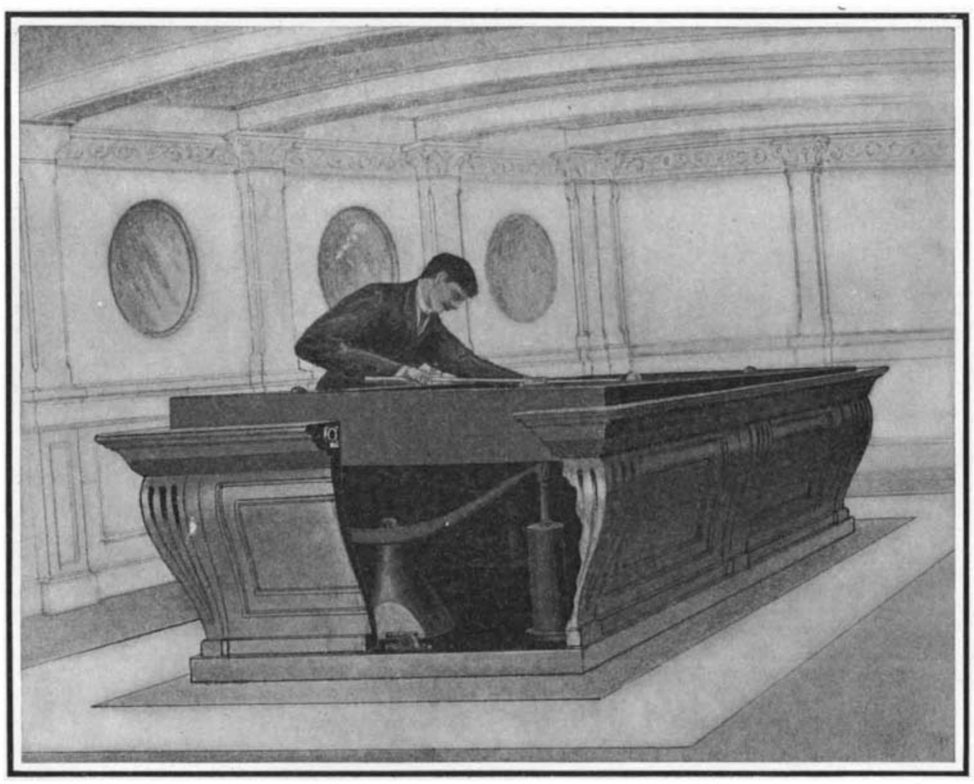
To the wide range of amusements now found on the leading liners, billiards may be added in the near future. This has been rendered possible through the invention of an ingenious movable table top by two London inventors, Messrs. Terrey and Warren. Hitherto it has been impossible to play billiards at sea, chiefly for the reason that billiard balls, like other things, are inexorably subject to the law of gravitation. It seems an undoubted fact, nevertheless, that a billiard table was put into the "Great Eastern." The assumption may possibly have been that the huge proportions



SIDE AND PLAN VIEWS OF THE BILLIARD TABLE.

of the mammoth liner would insure so stable a platform at sea, at all events in ordinary weather, that the balls would not cannon of their own account. If such was the expectation, however, it was doomed to disappointment. To-day it would be just as impossible to play billiards on the "Lusitania" or on the "Adriatic," unless they were at anchor, as it was on their precursor of fifty years ago.

A comparatively modern idea—for the question of a suitable billiard table for ships has received the attention of the makers for a considerable time past—was to fit up a ship with a saloon so suspended that it would remain unaffected by the vessel's movements.



A BILLIARD TABLE FOR SHIPS.

Its floor, it was hoped, would remain perfectly horizontal, whatever the rolling or pitching, and its occupants would be immune from sea-sickness. This notion, despite its humanitarian motives, was doomed to disappointment. The swinging cabin did not work satisfactorily in practice. For one thing, it proved too jerky, and did not add to the safety or comfort of the ship.

A reference to our plans will show how these desirable qualities have been secured. *A* is the bed of the table, which is secured to transverse girders, situated near the ends of the table. Each girder carries, at the center of its length, the hollow element of a pivot whose axis is longitudinal to the table, the solid element of the pivot consisting of the shaft *B*. This latter is secured to a cross piece, to which is also secured a transverse shaft, which is carried in brackets *G*, bolted to the deck of the billiard saloon of the ship. The horizontal position of the bed of the table is maintained by depending counterbalance weights, of which there are three, namely, one at each end, secured to the transverse girder, for counteracting the effect of the list of the ship, and a central counterbalance, for counteracting the effect of a change of trim. *D* is a dashpot to hold the opposite end of the table in balance. The two shafts are each carried on ball bearings for the purpose of eliminating friction as much as possible. The table shown in our illustration measures 6 feet by 3 feet, or three-quarters size. A full-size table, of course, could be erected on the same principle, but space being valuable on board ship, it is probable that the smaller size would be chosen.

A Project for the International Exploration of the Atlantic.

At the international geographical congress which met recently in Geneva two delegates called attention to the necessity for an international exploration of the Atlantic Ocean, and suggested the formation for this purpose of an association similar to that which has already been formed for the study of the seas of northern Europe. All Atlantic exploring expeditions of recent years have proceeded southward from Europe and have confined their observations almost entirely to the southern half of the Atlantic. Since the memorable voyage of the "Challenger" (1872-1876) and the last American expedition no ship equipped with modern apparatus has made explorations in the Gulf Stream and the northern Atlantic, although thorough knowledge of these waters is necessary to a complete understanding of the phenomena of the south Atlantic. Almost nothing is known about the laws and range of temperature and the velocity of currents in the north Atlantic, although the variations of temperature of the Gulf Stream undoubtedly exert a powerful influence upon the climate of all northern Europe. A study of the meteorological conditions of the northern Atlantic is also greatly needed, for through this region sweep the barometric depressions, the frequency and paths of which seriously affect the crops of western Europe. The connection between hydrographic and atmospheric phenomena, about which so little is known, also demands study.

Many biological problems, too, await solution. The larvæ of the European eel have been found in the Atlantic, west of Ireland, at a depth of 3,300 feet, and Dr. Hjort has found larvæ of other fishes at great depths in the ocean between Norway and Jan Mayen, so that a systematic and scientific north Atlantic fishery would probably produce surprising results. In this connection the quantity and character of the plankton, which both directly and indirectly influence the migration of fishes, demand thorough study. Finally, the exploration of the waters of northern Europe cannot be regarded as complete, so long as we remain in ignorance of the currents, temperatures and biology of the Atlantic, of which the North Sea, the Baltic, the English Channel, etc., are dependencies.

It is the more remarkable that the north Atlantic is one of the least known of oceanic regions, as the most important highways of traffic traverse this region. It is true that the profile of the sea bottom has been made known, in rough outline, by the work of the cable layers, but we know very little more of the physical characters of this region.

The Gulf Stream requires especially thorough study, because of its great influence on the climate of Europe. Voyages of exploration should be made four times each year and the operations should always include measurements of temperature and salinity at various depths and the collection of specimens of plankton and sea bottom. All the expeditions should use identical instruments, methods, units and constants, so that their results may be directly compared with each other. In order to save expenses the proposed plan does not include an international bureau of operation, but merely an international commission to prescribe instruments and methods and assign to each government the field which it is then to explore with its own men and at its own expense. The participation of individuals will also be welcomed and sought, and the assistance of the great steamship companies is confidently expected.