the wood, and overhanded together with sinews in a longitudinal seam. The sheath is terminated at each extremity by a narrow strap: that at the foot of the staff is a mere ornamental appendage. It is perhaps an inch in width by three in length, and is adorned with a tassel of horse-hair attached to it by a leathern string. The upper thong is five-eighths of an inch wide, and encircles the head outside the wooden hoop, following the groove. The free extremity terminates in a long gore, which fits into a corresponding opening at top of sheath, on the side opposite the origin of the thong. It is secured in place by stitches of sinew. An ornamental row of brass-headed nails attaches this thong to the wooden hoop beneath. The straps are cut in one piece with the remainder of the sheath.

The grip, or lower half of the staff, is furnished with a second casing, formed from a belt of bead-work, manufactured of a proper width, and joined along its edges like the inner sheath. This belt is, for the most part, woven in narrow alternating stripes of green and of white beads. The top of the grip, however, consists of a broad band of white, upon which, done in green, figures an Indian, adorned with an eagle-plume, and holding in one hand something, perhaps, intended to simulate a tomahawk. The ribbon attachments shown in the plate have been added by the Ojibwas. Possibly the bead-work envelope may also have been contributed by the latter, as the Ojibwa women are most expert in the art of needle-weaving.

Ojibwa bone-breakers.

I am informed by Ojibwas[1] competent to speak in the matter, and also by other authorities, that an instrument corresponding in several particulars with the one above described was formerly commonly employed for domestic purposes among the Ojibwas. The latter implement is said to be actually in use at the present time, at isolated points where bands, or parts of bands, are yet living, practically, in the 'stone age.' The Ojibwa utensil is named a bone-breaker. It is a coarse implement, having a roundish form, without pointed extremities. It is furnished with a groove, like the Dakota specimen, and it is much the same with that weapon in general size. The stone head is attached to the handle by methods identical with those used in binding the head to the central stem of the puk-gah-mah-gun.

[1] Ojibwas, or Chippewas. The former term is that by which these people designate themselves: the latter is our corruption of that name.

The head of the bone-breaker appears to be the counterpart of a small stone object described and figured by Dr. C. C. Abbott, in his 'Stone age in New Jersey' (see his fig. 312). At least, this figure has at different times been pointed out to me as a bone-breaker by intelligent elderly Ojibwas of Red Lake reservation, to whom, during a summer spent at their agency, I took occasion to exhibit certain of the plates in Dr. Abbott's book.

Very explicit and interesting statements concerning this implement were made by various persons, and particularly by the missionary in charge, Rev. Fred. Smith, an Ojibwa brought up as a 'blanket Indian,' in what is now central Minnesota. In his early youth, Mr. Smith had frequently seen the bone-breaker in service in the family lodge. He had occasionally met with implements of the sort elsewhere, though they have, of late years, fallen into general disuse; but he believed that such were still used by the Red-Lakers of the north shore who are remote from the agency. He had never known this utensil to be employed as a weapon, and thought Dr. Abbott's figure was undoubtedly a bone-breaker. It was used for breaking the bones of game when they could not be parted readily with a knife; as, for instance, in dividing the spoil of hunters, in cutting up meats for cooking, or in distributing food to one's family.

Franc E. Babbitt.

THE CRUISE OF THE ALBATROSS, FROM CURACOA TO ASPINWALL, IN FEBRUARY AND MARCH.[1]

We left Curaçoa at 7.20 A.M., on Feb. 18, and ran a line of soundings in a southerly direction to the mainland, the greatest depth found being 738 fathoms. The government and people of Curaçoa will watch with peculiar interest the result of this line of soundings, as it will go far towards solving the problem of procuring a much-needed supply of fresh water by sinking artesian wells.

The relation this island bears to the mainland has been heretofore unknown; the general impression being that it was an isolated volcanic peak, having no connection with the watershed of the contiguous coast of Venezuela. In this case, water would not be found by sinking artesian wells: on the other hand, if connected with the main by a plateau or neck of land

[1] Abstract of the official report of Lieut.-Commander Z. L. Tanner, commanding, to Prof. S. F. Baird, U.S. fish-commissioner. Received through the courtesy of Professor Baird.

having a moderate depth of water over it, wells might be sunk with a fair probability of success. An effort was made recently, by the colonial government, to ascertain the depth of the channel, but without success.

During the afternoon we made a haul of the dredge in 122 fathoms, and of the trawl in 208 fathoms, in the channel above mentioned, with but moderate success. A few specimens were, however, secured from both hauls. The small amount of life on the bottom of the Caribbean, compared to that off the New-England coast, has been a constant surprise to me during the cruise.

At 1 A.M. the following day a course was made north-north-west for Alta Vela, a small island on the south coast of San Domingo. Soundings were taken at intervals of 10′, 20′, and 25′; and at 9.10 A.M. we sounded in latitude 13° 17′ 45″ north, longitude 70° 1′ west, with a depth of 1,701 fathoms, the bottom composed of foraminiferous ooze and coarse sand. The small beam-trawl was landed on deck, with a few sponges, shrimp, small fish, etc., indicating any thing but rich ground. On the morning of the 21st we passed a few miles to the westward of Alta Vela, and laid a course north-west for Cape Jacmel, sounding at intervals of about 16′.

The deepest water found between Curaçoa and San Domingo was 2,694 fathoms, in latitude 13° 40′ 20″ north, longitude 70° 10′ 45″ west. The bottom was brown ooze, without a trace of foraminifera. The average depth was about 2,300 fathoms until within a short distance of the land, when it shoaled rapidly to 302 fathoms four miles south-west of Alta Vela, deepening again to 2,410 fathoms 20′ west-north-west of the island; the next sounding, 16′ distant north-west by west, revealing 2,434 fathoms, — the greatest depth between Curaçoa and Aspinwall, with the single exception before mentioned.

The line was extended to Jacmel, showing bold water to the cape; then 60′ south, crossing a ridge which extends westward from Alta Vela. We then ran a line north-west 40′, crossing the line of the ridge above mentioned, but found it had terminated, or changed its direction, as we carried a uniform depth of about 2,400 fathoms. We then steamed 18′ west-south-west, and sounded in 2,490 fathoms, brown ooze, latitude 17° 39′ 30″ north, longitude 73° 22′ 15″ west; 'Leighton rock awash,' hydrographic-office chart No. 36, being located in latitude 17° 37′ north, longitude 73° 21′ west. After another run of 15′ north-west by west, we sounded in 2,369 fathoms, brown ooze, latitude 17° 48′ north, longitude 73° 34′ 15″ west; 'Loos shoal' being placed in latitude 17° 45′ north, longitude 73° 30′ west, hydrographic-office chart No. 36. These shoals were searched for in 1872 by H.M.S. Philomel and Plover, and, as they were unable to find them, they were expunged from the admiralty charts; but, being still shown on hydrographic-office charts, I considered it advisable to settle the matter beyond all dispute by ascertaining the actual depth in the localities assigned them.

Another sounding was taken 9′ south of Point Abaçou, in 1,039 fathoms, and then a line run 30′ west, sounding every 10′; then north-west 13′, and south-south-west 53′, sounding at intervals of about 15′ for the purpose of eliminating a large number of negative soundings appearing on the chart, and also to examine two shoals referred to in hydrographic-office publication No. 63, as follows: "More recent soundings of 16 fathoms have been reported in latitude 17° 45′ north, longitude 74° 39′ west, and also in latitude 17° 13′ north, longitude 74° 58′ west." We found 803 fathoms within three miles of the former position, and 1,120 fathoms on the position assigned to the latter, demonstrating conclusively that shoal-water does not exist in the positions named. It is highly probable, however, that much less water may be found west and north of this locality.

From our last position we ran 15′ north-north-west, and sounded in 968 fathoms; then changed the course to north by east for 70′, sounding at intervals of about 15′, except in one case, when a sounding of the Blake intervened. A reference to this line will show the bottom to be very uneven in this locality; and a depth of 262 fathoms in latitude 18° 18′ 30″ north, longitude 74° 53′ 30″ west, about 10′ south-east by east from Navassa, is something of a surprise. The water deepens to 1,040 fathoms 15′ to the northward and eastward of the island, and to 1,347 fathoms 8′ north-west of Cape Dame Marie. From this point we ran east by north 60′, sounding at intervals of 20′; the second cast giving us 1,974 fathoms, and the third, 342 fathoms, about 10′ to the westward of Gonave Island. From this point we steamed north by east 20′, where we found 800 fathoms, and 20′ west by south 502 fathoms, which was, of course, a surprise. From this point we ran a line west-north-west 76′, sounding at intervals of 20′. The maximum depth found in the windward passage was 1,923 fathoms.

At 12.40 P.M., Feb. 25, we sounded in 1,639

fathoms, green sand, latitude 19° 45′ north, longitude 75° 4′ west, took serial temperatures, and at 2.40 P.M. put the trawl over, veering to 2,400 fathoms, landing it on deck again at 6.55 P.M., having made a successful haul. There were a variety of sponges, some very large shrimp, one fish, numerous shells, small crabs, holothurians, and an interesting octopus, the arms all of the same length, and connected by a membrane. The color was cherry-red on its head, changing gradually darker towards the extremities.

Feb. 27, we stood out of the harbor of Santiago de Cuba, and made ten hauls of the tangles in search of Pentacrinus. Several hauls were made before we succeeded in getting a specimen: finally, however, we procured four fine ones in perfect condition.

We next ran a line south-south-east 93′, in the direction of Navassa, sounding at intervals of 10′ to 20′. The maximum depth, 2,275 fathoms, was found 44′ from Santiago de Cuba lighthouse, gradually decreasing to 870 fathoms about 6′ from Navassa, from which point we ran a line west 30′, sounding at intervals of 15′; the first cast giving 1,015 fathoms, and the second 620 fathoms, 7′ east from Formigas banks. A line was then run south-south-west 50′, sounding at intervals of about 12′. The greatest depth, 1,153 fathoms, was found midway between the banks and Morant Point, the last cast on this line giving 450 fathoms, 10′ east-south-east from the light, which was in full view. Having located the ship accurately with reference to the above-mentioned light, we started ahead at 4 A.M., running a line east-south-east, sounding at short intervals, towards a shoal marked as follows on hydrographic-office chart No. 35: 'Eight shoal.' We found 21 fathoms on the northern end of the shoal, east-south-east about 32′ from Morant-Point lighthouse, inlet 17° 44′ north, longitude 75° 50′ west. It is about 9′ in length north-north-east and south-south-west, and from 3′ to 4′ in width. The least water found was 17½ fathoms.

Leaving the southern edge of the bank, we ran a line west by north 58′, sounding at various intervals. The depth of water found, at the first cast south-east of an 18-fathom sounding on the edge of the bank, was 360 fathoms, increasing to 838 fathoms 3½′ to the westward; the greatest depth on the line, 875 fathoms, being reached 4′ farther to the westward, from 400 to 700 fathoms being found throughout the remainder of the line. Port-Royal light bore north-north-west 7′ distant, at the last sounding on the above line, which gave 484 fathoms. Another and the last cast before entering port gave 400 fathoms, 2′ north-west by north from the position above mentioned, and quite near the bank. Having passed quarantine, we went on to Kingston, where we anchored.

During our stay here, we had several dry days in succession, — an unusual occurrence since our arrival in the Caribbean. The naturalists were busily engaged in collecting while in port, and found it excellent ground, the best, in many respects, that we have found in the West Indies.

On the morning of the 11th of March, we again proceeded to sea. Arriving near the edge of the bank, we put the tangles over; but, unfortunately, they fouled on the coral bottom, and were lost. We then ran a line of soundings south 15′, sounding at varying intervals, crossing the centre of California bank in 26 fathoms. At 6.40 P.M. we sounded in 966 fathoms, sand, latitude 17° 36′ 10″ north, longitude 76° 46′ 5″ west, and put the trawl over, landing it on the bottom at 8.20, and on deck at 10 P.M., after a successful haul. One rather remarkable specimen was a large earthenware jar, with its surfaces pretty well covered with worm-tubes.

We steamed about 5′ to the north and east during the haul, and, starting from that point, ran a line directly to Morant Cays, east-south-east 42′, sounding at short intervals. At 11.45 A.M., March 12, anchored in 4 fathoms, under the lee of north-east Cay. At 8.35 P.M. we turned our head to the southward, and ran a line south by east about 140′, to a group of negative soundings, in the midst of which we cast the trawl in 2,295 fathoms. We then continued the line about south-south-east, in the direction of Santa Marta, and, finding no indications of shoal-water, passed about 12′ to the westward of Santa-Marta lighthouse, sounding at frequent intervals as we approached the coast; then stood off north-west 35′, sounding at intervals of 15′; then south for the mouth of the Magdalena River and Savanilla, anchoring off the latter place at 8.28 A.M., March 16.

The sounding-wire parted several times during the night of the 11th, and morning of the 12th, in a most unaccountable manner; losing either lead or sounding-rod, and a thermometer, with more or less wire each time. We were inclined to blame the splices at first, but soon found that we must look farther for the cause. In the mean time, we changed wheels, leaving the solution of the mystery until the following day, when, after reeling the wire off, the drum was found to be collapsed. The metal was neither broken nor cracked; but the centre simply

settled down on the bolts, the sides retaining their form. There would have been little or no harm arising from this; but the edges of the drum drew away from the sides, leaving sufficient space for a turn or two of wire, which became so firmly fixed in wheeling in, that it would part before clearing itself when sounding. This condition was caused, probably, by slack turns from time to time, when taking very deep soundings.

We were unable to examine the bar at the mouth of the Magdalena River because of the high winds.

The government of the republic and people of Barranquilla realize the necessity of providing a more practicable outlet for their great river; and, with this end in view, surveys have been made for a deep-water terminus of the Bolivar railway.

We left Savanilla at 8.15 A.M. on the 22d, and ran a line of soundings west 52′, to the position in which the U. S. S. Powhatan reported shoal-water, where we found 1,175 fathoms, the water having deepened regularly since leaving port. From this point we ran a line south 40′, and being then 16′ west by north from Cartagena lighthouse, in 825 fathoms, we stood offshore west-south-west 43′, then south-south-east 51′, to a point 7′ north-west of Fuerte Island, where we found 38 fathoms. Soundings were taken at intervals of 10′ to 15′ since leaving Savanilla: the change in depth was gradual, making it extremely improbable that shoals exist outside of the shore reefs. At 3.30 P.M. we started on a line west, sounding at intervals of 5′ to 20′, crossing the bay at the bottom of which lies the Gulf of Darien. At 4 P.M. we cast the trawl in 42 fathoms, green mud, latitude 9° 30′ 15″ north, longitude 76° 20′ 30″ west, and at 4.55 another haul was made in 155 fathoms, green mud, latitude 9° 30′ 45″ north, longitude 76° 25′ 30″ west, both hauls furnishing us with a small number of good specimens.

The line was continued, sounding at various intervals, to Aspinwall, where we arrived at 2.55 P.M., March 25. The strict quarantine observed in this port, because of suspected yellow-fever, will, of course, prevent our naturalists from making collections which I expected would be the most fruitful owing to the facility with which they could reach the interior by the railroad. The return home of Ensign A. A. Ackerman will restrict our investigations, as he has taken the branches of geology and mineralogy during the cruise.

We expect to sail to-morrow, April 2, running a line of soundings to Old Providence Island, thence to Cape San Antonio, and to arrive in Key West about the 14th instant. [See Notes for account of the next cruise.]

THE OLDER WIND-CHARTS OF THE NORTH ATLANTIC.

THE series of charts of the North Atlantic now in preparation at our hydrographic office, of which three monthly sheets are just issued, recalls the famous work of Lieut. Maury, thirty years ago, with which our approach to a precise knowledge of ocean meteorology began. Current-charts go back to 1678, when the first one for the Atlantic was published by Kircher,[1] and the general circulation of winds was roughly shown as long ago as in the map by Dampier,[2] of a little later date; but these, and all their successors down to comparatively recent years, were based only on general records, and not on the systematic apportionment of observations to definitely limited small areas of the ocean. The method of 'squaring' observations began with the English hydrographer, Rennell, about 1830, but was not then carried very far, and waited for its full expansion till taken up by the enthusiastic Maury. The remarkable series of charts published by him about 1850, for the Atlantic and Pacific Oceans, marks an epoch not only in our knowledge of the ocean, but in the progress of inductive meteorology; and the greater number of wind and current charts published since that time are taken very closely from his results.

The improvement in this kind of work during the past fifty years has been not only towards greater accuracy, as permitted by the increase in the number of observations, but also in the method of charting, in which the aim has been to reproduce in a compact form, as clearly and fully as possible, all the original records, so that the navigator may recognize not only the average of the conditions of air and sea that he is to encounter, but the separate elements from which the averages are derived. Maury evidently perceived the importance of thus exhibiting observations as nearly as possible in their separate forms, instead of in the inaccurate generalizations of his predecessors; and this led him to the construction of the most realistic charts of the ocean that have ever been published. Not only the winds and currents were plotted in their place of observation, but the track and name of the vessel from whose log they were taken were mapped also. A small part of one of the North Atlantic wind and current charts is here reproduced in fig. 1, omitting certain details concerning the strength of the winds, as well as the colors by which the seasons were distinguished. The full, broken, and dotted lines indicate months within the seasons. Nothing could be better adapted to emphasizing the reality of the work in the mind of the average sea-captain; and the result of the ingenious device was soon apparent in the general interest ex-

[1] Ath. Kircheri, Mundus subterraneus. Edit. tert. Amstelod., 1678, i. 134.

[2] Discourse on the trade-winds, in his Voyages. London 1705.