with great ease the difference of potential between the poles of a single cell, on the other, it is readily seen that static electricity acquires its predominant but not exclusive character from great difference of potential, while galvanic electricity produces its most striking effects by the transfer of great quantities of electricity as a current. The terms 'static' and 'galvanic' serve only to denote the extremes of electrical phenomena. In fact, the contact theory of potential difference unifies the whole science by giving a common account of the historically diverse forms of static and galvanic electricity; for it is now generally believed that the potential difference in frictional machines is due to contact of dissimilar bodies, while the old contest which began with Volta and Galvani is now set at rest by the happy compromise of assigning electromotive force to contact, and the energy of the current to chemical action.

The first volume of Professor Wiedemann's new work treats of general electrical phenomena, the excitation of electricity by contact of dissimilar bodies, Ohm's law and its consequences, determination of resistance in a great variety of bodies, measurement of electromotive force, and galvanic elements. The second volume is devoted to dielectrics, the theory of frictional and influence machines, the relations between heat and electricity, and to electrochemistry.

Mathematical treatment of the subject is introduced so far as it serves to establish general principles or theories, and to discuss methods and confirm results. Beyond this, mathematical discussions, which are interesting as mathematical exercises, but which do not advance our knowledge of physical principles, are either omitted entirely, or are referred to by citation.

The applications of electricity are noticed only so far as they serve to give completeness to a scientific knowledge of the subject.

It was reported a year ago that the manuscript of the two concluding volumes was nearly ready for the press.

Professor Wiedemann has placed all physicists under obligations by his full and logical presentation of all the facts and principles of the science of electricity. While the work does not possess the originality of Maxwell's, and is written with an entirely different purpose, it must, nevertheless, be classed with it as one of the great works on electricity. Considered from the point of view of giving a complete account of what is known respecting this branch of physics, and of showing what each investigator has contributed to our common stock of knowledge of electricity, this book is not equalled by any other in any language.

H. S. C.

NOTES AND NEWS.

No piece of news of wider interest has traversed the wires of two continents since *Science* was founded than that which announced last week the rescue of the Greely party. The story of their frightful sufferings, their sad losses, and the successful accomplishment of their duties, is briefly told in the two despatches from Lieut. Greely, which we print in full below. It appears, that, when found, they were huddled in a tent, which the force of the gale had blown down upon them. The strongest of them could hold aloft the signal-flag, to guide the relief-party they could hear but not see, for two brief minutes only; and the weakest begged to be left to die in peace. Their provisions were utterly exhausted, and they had been living for weeks on a stew made from their sealskin clothing, with lichens and small shrimps; and it is highly probable that a detention of the relief-party for two days would have cost the entire party their lives.

The following two despatches from Lieut. Greely were received by the chief signal-officer on July 17:—

Brainard, Bierderbick, Connell, Fredericks, Long, and myself, the sole survivors, arrived to-day, having been rescued at the point of death from starvation by relief-ships Thetis and Bear, June 22, at Camp Clay, north-west of Cape Sabine. All are now in good health, but weak. Sergeant Ellison, who was rescued, died July 8. Cross died last January; Christianson, Linn, Rice, Lockwood, Jewell, and Edwards, in April; Ellis, Rainston, Whisler, Israel, in May; Kingsbury, Salor, Henry, Bender, Pavy, Gardiner, Schneider, in June. Abandoned Fort Conger Aug. 9. Frozen in pack, off Victoria Head, Aug. 29. Abandoned steam-launch, Sept. 11, eleven miles north-east of Cocked Hat Island. When on the point of landing, we were three times driven by south-west storms into Nares Sea. Finally landed, Sept. 29, in Baird Inlet. Learning by scouting-parties of the Proteus disaster, and that no provisions had been left for us from Cape Isabella to Sabine, moved, and established winter quarters at Camp Clay, halfway between Sabine and Cocked Hat. An inventory showed, that by a daily ration of four and one-third ounces of meat, seven of bread and dog-biscuit, and four ounces miscellaneous, the party would have ten days' full rations left for crossing Smith Sound to Littleton Island, March 1. Unfortunately, Smith Sound remained open the entire winter, rendering crossing impossible. Game failed, despite daily hunting, from early in February. Before the sun returned, only five hundred pounds of meats were obtained. This year minute shrimps, seaweed, sassafras, rock-lichens, and sealskin were resorted to for food, with results as shown by the number of survivors. Last regular food issued May 14. Only a hundred and fifty pounds

of meat being left by Garlington, compelled me to send, in November, four men to obtain a hundred and forty-four pounds English meat at Isabella. During the trip, Ellison froze solid both hands and feet, and lost them all; surviving, however, through our terrible winter and spring, until July 8. Survivors owe their lives to the indomitable energy of Capt. Schley and Lieut. Emory, who, preceded by three and accompanied by five whalers, forced their vessels from Upernavik, through Melville Bay, into northwater at Cape York with the foremost whaler. They gained a yard whenever possible, and always held it. Smith Sound was crossed, and our party rescued, during one of the most violent gales I have ever known. The boats were handled only at imminent risk of swamping. Four of us then were unable to walk, and could not have survived exceeding twenty-four hours. Every care and attention were given us. Have saved and bring back copies of meteorological, tidal, astronomical, magnetic, pendulum, and other observations; also pendulum, Yale and standard thermometers, forty-eight photographic negatives, a collection of blanks and photographic proofs. Eskimo relics and other things necessarily abandoned. The Thetis remains here five days probably.

GREELY, *Commanding.*

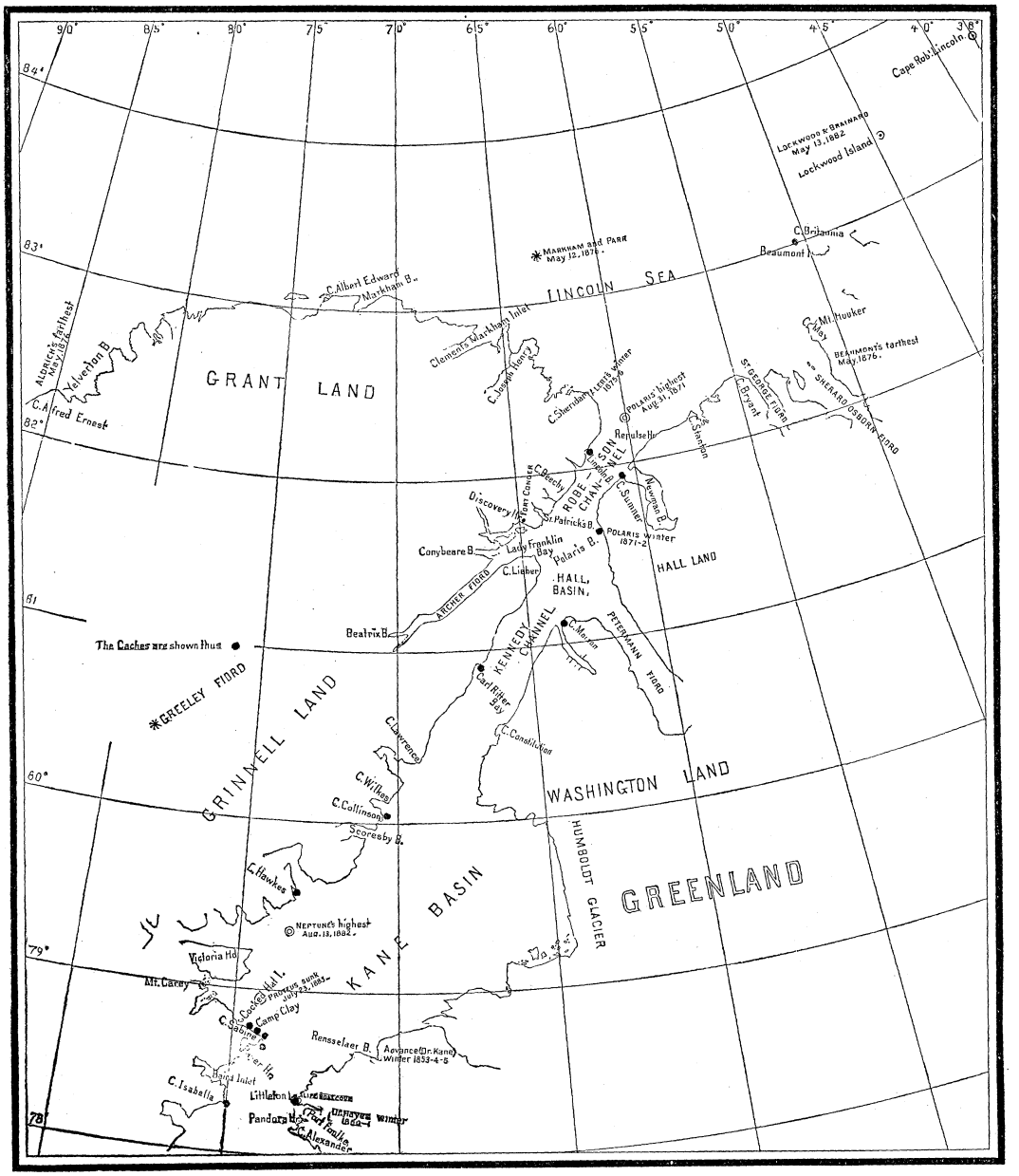
For the first time in three centuries, England yields the honor of the farthest north. Lieut. Lockwood and Sergeant Brainard, May 13, reached Lockwood Island (latitude 83.24°, longitude 44.5°). They saw, from a two thousand feet elevation, no land north or north-west, but, to the north-east, Greenland, Cape Robert Lincoln (latitude 83.35°, longitude 38°). Lieut. Lockwood was turned back, in 1883, by open water on North Greenland shore, the party barely escaping drift into polar ocean. Dr. Pavy, in 1882, following the Markham route, was adrift one day in polar ocean north of Cape Joseph Henry. Escaped to land, abandoning nearly every thing. In 1882 I made a spring, and later a summer, trip into the interior of Grinnell Land, discovering Lake Hazen, some sixty by ten miles in extent, which, fed by ice-caps of North Grinnell Land, drains Ruggles River and Weyprecht Fiord into Conybeare Bay and Archer Fiord. From the summit of Mount Arthur, five thousand feet, the contour of land west of the Conger Mountains convinced me that Grinnell Land tends directly south from Lieut. Aldrich's farthest in 1876. In 1883 Lieut. Lockwood and Sergeant Brainard succeeded in crossing Grinnell Land, and ninety miles from Beatrix Bay, the head of Archer Fiord, struck the head of a fiord from the western sea, temporarily named by Lockwood, Greely Fiord. From the centre of the fiord, in latitude 80.30°, longitude 78.30°, Lieut. Lockwood saw the northern shore termination some twenty miles west, the southern shore extending some fifty miles, with Cape Lockwood some seventy miles distant, apparently a separate land from Grinnell Land. Have named the new land Arthur Land. Lieut. Lockwood followed, going and returning, ice-caps averaging about fifteen feet perpendicular face. It follows that the Grinnell Land interior is ice-capped, with a belt of country some sixty miles wide between the northern and southern ice-caps. In March, 1884, Sergeant Long, while hunting, looked from the north-west side of Mount Carey to Hayes's Sound, seeing on the northern coast three capes westward of the farthest seen by Nares in 1876. The sound extends some twenty miles farther west than shown by the English chart, but is possibly shut in by land, which showed up across the western end. The two-years' station-duties, observations, all explorations, and the retreat to Cape Sabine, were accomplished without loss of life, serious accident, or even severe frost-bites. No scurvy was experienced at Conger, and but one death from it occurred last winter.

GREELY, *Commanding.*

On the same day, Commander Schley addressed the following telegram to the secretary of the navy, which summarizes the action of the relief squadron: —

The Thetis, Bear, and Loch Garry arrived here today from West Greenland. All well. Separated from Alert a hundred and fifty miles north during a gale. At nine P.M., June 22, five miles off Cape Sabine, in Smith Sound, Thetis and Bear rescued alive Lieut. A. W. Greely, Sergeant Brainard, Sergeant Fredericks, Sergeant Long, Hospital-Steward Bierderbick, Private Connell, and Sergeant Ellison, — the only survivors of the Lady Franklin Bay expedition. Sergeant Ellison had lost both hands and feet by frost-bite, and died July 6, at Godhaven, three days after amputation, which had become imperative. Seventeen of the twenty-five persons composing this expedition perished by starvation at the point where found. One was drowned while sealing to procure food. Twelve bodies of the dead were rescued, and are now on board the Thetis and Bear. One Eskimo, Turnevik, was burried at Disco in accordance with the desire of the inspector of western Greenland. Five bodies, which were buried in the ice-fort near the camp, were swept away to sea by winds and currents before my arrival, and could not be recovered. The names of the dead recovered, with date of death, are as follows: Sergeant Cross, Jan. 1, 1884; Wederick, Eskimo, April 5; Sergeant Linn, April 6; Lieut. Lockwood, April 9; Sergeant Jewell, April 12; Private Ellis, May 19; Sergeant Rainston, May 23; Private Whisler, May 24; Sergeant Israel, May 27; Lieut. Kingsbury, June 1; Private Henry, June 6; Private Schneider, June 18. The names of the dead buried in the ice-fort, with date of death, where the bodies were not recovered, are as follows: Sergeant Rice, April 6, 1884; Corporal Salem, June 3; Private Bender, June 16; Acting Assistant Surgeon Pavy, June 6; Sergeant Gardiner, June 12, drowned while breaking through the newly-formed ice while sealing; Jans Edwards, Eskimo, April 24. . . .

Greely abandoned Fort Conger Aug. 9, 1883, and reached Baird Inlet Sept. 29 following, with entire party well. Abandoned all his boats, and was adrift for thirty days on ice-floe in Smith Sound. His permanent camp was established Oct. 21, 1883, at the point where he was found. During nine months, his party had to live upon a scant allowance of food brought from Fort Conger, — that cached at Payer



MAP SHOWING POINTS VISITED BY GREELY'S PARTY.

Harbor and Cape Isabella by Sir George Nares in 1875, but found much damaged by lapse of time; that cached by Beebe at Cape Sabine in 1882; and a small amount saved from the wreck of the Proteus in 1883, and landed by Lieuts. Garlington and Colwell on the beach where Greely's party was found camped. When these provisions were consumed, the party was forced to live upon boiled sealskin strips from their sealskin clothing, lichens, and shrimps preserved in good weather, when they were strong enough to make exertion. As thirteen hundred shrimps were required to fill a gallon-measure, the labor was too exhausting to depend upon them to sustain life entirely. The channel between Cape Sabine and Littleton Island did not close, on account of violent gales, all winter; so that two hundred and forty rations at the latter

point could not be reached. All Greely's records, and all the instruments brought by him from Fort Conger, are recovered, and are on board.

From Hare Island to Smith Sound I had a constant and furious struggle with ice in impassable floes. Solid barriers of ice were overcome by watchfulness and patience. No opportunity to advance a mile escaped me; and for several hundred miles the ships were forced to ram their way from lead to lead, through ice varying in thickness from three to six feet, and, when rafted, much greater. The Thetis and Bear reached Cape York June 18, after a passage of twenty-one days in Melville Bay, with the two advance ships of the Dundee whaling-fleet, and continued to Cape Sabine. Returning seven days later, fell in with seven others of this fleet off Wostenholme Island, and announced Greely's rescue to them, that they might not be delayed from their fishing-grounds, nor be tempted into the dangers of Smith Sound in view of the reward of twenty-five thousand dollars offered by Congress. Returning across Melville Bay, fell in with the Alert and Loch Garry off Devil's Thumb, struggling through heavy ice. Commander Coffin did admirably to get along so far with the transports so early in the season, before an opening had occurred. Lieut. Emory, with the Bear, has supported me throughout with great skilfulness and unflinching readiness in accomplishing the great duty of relieving Greely. . . . The Greely party are very much improved since rescue, but their condition was critical in the extreme when found, and for several days after. Forty-eight hours' delay in reaching here would have been fatal to those now living. The season north is late, and the closest for years. Smith Sound was not open when I left Cape Sabine. The winter about Melville Bay was the most severe for twenty years.

This great result is entirely due to the unwearied energy of yourself and the secretary of war in fitting out this expedition for the work it has had the honor to accomplish. W. T. SCHLEY, *Commander.*

From a despatch to the New-York *Herald*, we learn fuller details of the explorations, mostly undertaken by Lockwood and Brainard, to northern Greenland and the interior of Grinnell Land, which are positive additions to geography. The position of Lockwood Island (latitude 83° 24′ 30″ north, longitude 44° 45′ west) was astronomically determined by observations extending over two days; and, in their journey to this point, animal life was found to be abundant, with scant vegetation similar to that met with in Grinnell Land. Traces of hares, lemmings, ptarmigan, and snow-bunting, and the tracks of a bear, were seen, and droppings of the musk-ox as far as twenty miles north of Cape Britannia. The party was absent fifty-nine days. In one of their journeys in the interior of Grinnell Land, Lockwood and Brainard reached its western coast, and looked out on the polar sea. They found an immense glacier, named Agassiz Glacier, forming the ice-cap of southern Grinnell Land, with a belt of land sixty miles wide between it and the northern ice-cap. At the mouth of Greely Fiord they rested three days for observation, and determined their position to be latitude 80° 48′ 39″ north, longitude 78° 26′ west. From a cliff twenty-two hundred feet high, they saw, on a clear day, that in the north the land terminated in a high headland fifty to sixty miles distant, which they called Cape Brainard; and in the south, more distant, they named another headland Cape Lockwood. Beyond this, with open water between, they descried land which they took to be separate from Grinnell Land, and named Arthur Land. Lieut. Greely himself made two journeys into the interior, on which he was absent twelve and nineteen days respectively, and discovered a large body of fresh water, which he named Lake Hazen, fed by streams from the northern ice-cap, and discharging through Ruggles River into Weyprecht Fiord. The river was open at its mouth in April. Winter quarters of Eskimos were found, and some relics showing that they had possessed dogs, sleds, and iron. Two ranges of mountains were found parallel to and beyond the United States range, which he named Conger and Garfield ranges. Greely ascended Mount Arthur, about five thousand feet high, and the highest point in Grinnell Land. Game was found abundant on this journey, a hundred musk-oxen having been seen, with hares and birds.

The return party left Fort Conger with the steam-launch, ice-boat, and two boats in tow, on Aug. 9. The next day they reached Cape Baird, across Lady Franklin Bay. They were frozen for five days in the ice before reaching Cape Lawrence, and gained Cape Hawkes by the 26th, where they took in the provisions left there by the English, and, leaving the same day, had open water for six hours; then the pack closed around them, and they drifted with it, being finally driven to within six miles of Cape Albert, just south of Victoria Head. Here they were obliged to leave the launch and one of the boats; and, making two small sleds from the timber of the launch, they started over the ice for Cape Sabine, eleven miles off, making the slow progress of about a mile a day. On Sept. 13 they had to abandon their last boat, the large sled weakening under it. Twice they were driven back into Kane Basin by south-west gales. Finally the floe, much broken, was driven, on Sept. 22, into the mouth of Baird Inlet, the piece on which they were established being reduced to about fifty yards in diameter. They finally forced a landing on the northern side of the inlet on Sept. 29. The sad prospect before them was speedily discovered by scouting-parties; and, to be nearer the base of their scanty supplies, they made their way northward through a passage to Buchanan Straits (proving Cape Sabine an island), and then eastward along the coast, to where they made their final camp, the advance reaching here Oct. 15. Here they built a hut of stones, roofed with a broken whale-boat and canvas, and banked with snow. This they were compelled to abandon early in May from the moisture from the melting snow, and to occupy the tent higher up the hillside, where the relief-party found them. During the entire winter they had no fuel, except to warm, not cook, their food. As soon as their scanty stock of provisions

was known, they were reduced to a daily allowance of 14.88 ounces each; and this was afterwards still further reduced to 6 ounces, making it last until May 14. During this entire time all the game they obtained was twenty-four small foxes averaging four pounds each, fourteen ptarmigan, and sixty dovekies, excepting a small seal and a bear, killed in April. The last, weighing 257 pounds, undoubtedly saved the lives of the last survivors of the party.

— The managers of the Philadelphia electrical exhibition announce that the buildings are finished, and ready for the preliminary arrangements to accommodate exhibits. The committee urge upon all who have applied for space to begin preparations for installation.

— Dr. Lewis Swift, director of the Warner observatory, has received intelligence of the discovery of a comet by Prof. E. E. Barnard of Nashville, on the night of July 16; and the discovery was verified by the motion of the comet July 20. It is in the head of the Wolf (right ascension 15 hours, 50 minutes, and 30 seconds, declination south 37: 10), and is moving slowly in an easterly direction. It seems to be growing brighter, and is probably coming toward the earth. This is the first comet discovered in the northern hemisphere this year.

— From *Nature* we learn that the following are some of the special questions which have been arranged for discussion at the next social science congress, which is to be held at Birmingham on Sept. 17–24: — How far are the requirements of the country for well-trained teachers in elementary schools met by the pupil-teacher system and the existing training colleges? In testing the efficiency of schools, should processes, or 'results,' be chiefly regarded? Health: 1°. What is the best method of dealing with (*a*) town sewage, (*b*) the products of house and street scavenging, and (*c*) the products of combustion? 2°. What are the best means, legislative or other, of securing those improvements in the dwellings of the poor which are essential to the welfare of the community? 3°. How far may the average death-rate of a population be considered an efficient test of its sanitary condition, and by what means can the high death-rate of children be reduced?

— *Nature* states, that Dr. Chavanne, who is travelling on the Kongo for the Brussels national institute of geography, has established a meteorological observatory at Boma. Mr. Stanley has transferred the site of his station of Vivi to a tableland some fifteen hundred metres to the north; and a railway from the new station to the Kongo is in course of construction. A new station, called Sette-Cana, has also been established at the mouth of the small river Sette. Numerous small wooden houses are being made in Belgium to be transported to the new Vivi. A sanatorium has been constructed at Boma.

— In the report of the surgeon-general of the navy for 1881 (Washington, 1883, p. 70) are to be found photo-micrographs, and a short account of a comma-shaped bacterium, a rather unusual form, observed by Surgeon J. H. Kidder in water through which air had been aspirated (summer of 1881), and in well-water near Washington (1883). Until we have more precise descriptions of Koch's cholera bacillus than are yet available, it will be judicious for microscopists to bear in mind, in case of the appearance of cholera on this side of the Atlantic, that similar forms have been found in water when no case of cholera was known to exist. Dr. Kidder supposed the form which he photographed to be the same as, or very similar to, that noted and figured by Billroth (*Untersuch. über coccobacteria septica*, Berlin, 1874, taf. ii. *B.*, *C.*), found in the droppings from an imperfect water-faucet in his work-room, and called by him Siphonomyxa nostocomii viennensis.

— The treasurer of the local committee of the American association reports that fifteen thousand dollars have been raised for the entertainment of the association while in Philadelphia, and recommends that the expenditures be kept within that sum, as it is doubtful whether more could be obtained.

— Dr. Benjamin Apthorp Gould, director of the observatory at Cordoba, Argentine Republic, has been elected an honorary member of the Royal meteorological society.

— An exhibition of appliances used in brewing will be held next September in Hanover.

— The *Kansas city review* states that Prof. J. G. Porter of the coast-survey has been elected astronomer of the Cincinnati observatory.

— By some good fortune whose explanation is too deeply political for our fathoming, the monthly Pilot charts continue to be issued from the hydrographic office; and the number for July maintains the value of its predecessors. It is notable for the number of waterspouts, of which eight are charted, and for the indication of currents by floating wrecks that have been observed on different dates. The schooner Warbeck drifted eastward just south of latitude 40°, from longitude 64° on April 9, to longitude 44° on June 12, thus travelling about nine hundred miles, or fourteen miles a day. A buoy, adrift from Cape Hatteras on June 1, was noticed on its way north-east on June 11, and was unfortunately picked up in latitude 40°, longitude 63° 30′, on June 21, having floated about five hundred miles in twenty days. These having followed the main extension of the Gulf Stream, their rate of motion was relatively rapid. The bark Ponema, that collided with the British steamer State of Florida on April 18, latitude 49°, longitude 36°, is reported from London to the hydrographic office as having been sighted on June 7, in latitude 49° 15′, longitude 33°, about thus having averaged only about two miles of eastward drifting a day. Again: the schooner Maggie M. Rivers, wrecked off Cape Hatteras on Jan. 7, was sighted on the eastern margin of the Gulf Stream on Feb. 6, and since then has been seen four times, the last date being June 14, wavering about with small change of position in the slack water a third way from the Bermudas to Norfolk.