the metallic prominences, as a sequel to the spot; and there is evidence to suggest that a careful study will enable us to see by what process the reaction of the photosphere and underlying gases produced by the fall of spot-material tends to make the spot-material discharge itself in lower and lower latitudes, as the temperature of the sun's lower atmosphere gets enormously increased.

The observations of Professors Newcomb and Langley at the minimum of 1878, on the equatorial extension, are among the most remarkable. Professor Newcomb hid the moon and 12′ of arc around it at the moment of totality by a disk of wood, carefully shielding his eyes before totality. Professor Langley observed at a very considerable elevation. It is therefore quite easy to understand why this ring has not been seen or photographed at maximum. At maximum no precautions have been taken to shield the eye; no observations have been made at a considerable elevation; while the fact that the ring, if it exists, consists of cool material, fully explains how it is that the photographic plates have disregarded it.

I would propose, therefore, that the repetition of Professor Newcomb's observations of 1878 be made an important part in the arrangements of the eclipse for this year. A slight alteration in the method will be necessary, as the ring will be near the vertex and the lowest point of the eclipsed sun.

3. Another point of the highest importance at the present moment has relation to the existence of carbon. Until Tacchini's observations of 1883, the only trace of carbon in the solar spectrum consisted of ultra-violet flutings. He observed other flutings in the green near the streamers in the eclipse referred to.

Duner's recent work puts it beyond all doubt that stars of class III. *b* have their visible absorption produced chiefly by carbon vapor.

On any theory of evolution, therefore, we must expect the sun's atmosphere to be composed to a large extent of carbon at some time or other; so that the highest interest attaches to this question in connection with the height in the atmosphere at which the evidence of carbon is observed. The existence of the ultra-violet flutings among the Fraunhofer lines tells nothing absolute about this height, although I inferred, at the time I made the announcement, that it existed at some height in the coronal atmosphere.

These three points, then, are those to which I attach special importance at the present time.

We next come to photographs of the corona. I believe, that, with our present knowledge, the chief thing we have to seek in such photographs is not merely the streamers and their outlines, which we are sure to get anyway, but images on a larger scale; so that in a series of short exposures we may endeavor to get some records which will eventually help us in determining the directions of the lower currents. At present we do not know absolutely whether these flow to or from the poles. My own impression is that the panaches at the poles indicate an upper outflow.

In coming to the photo-spectroscopic observations, I am of opinion, that of the two attacks which I first suggested for the eclipse of 1875, and which have also been used in the last two eclipses of 1882 and 1883, one of them should be discarded, and the whole effort concentrated on the other.

We have learned very much from the use of the prismatic camera, — one of the instruments referred to; but the results obtained by it are not of sufficient accuracy to enable them to be fully utilized. On the other hand, though the slit spectroscope failed in 1875, it succeeded with a brighter corona and more rapid plates in 1882; and, with a proper reference spectrum, every iota of the facts recorded can be at once utilized for laboratory work and subsequent discussion.

On these grounds, then, I would suggest that slit spectroscopes alone be used for photographic registration. I think falling plates should be used, and that the work should begin ten minutes before totality, and continue till ten minutes after; provided the slit be tangential, or nearly so, to the limb.

I may state that arrangements have been made here to take such a series of photographs on the uneclipsed sun; and, with the improved apparatus, I am greatly in hopes that we may get something worth having. J. NORMAN LOCKYER.

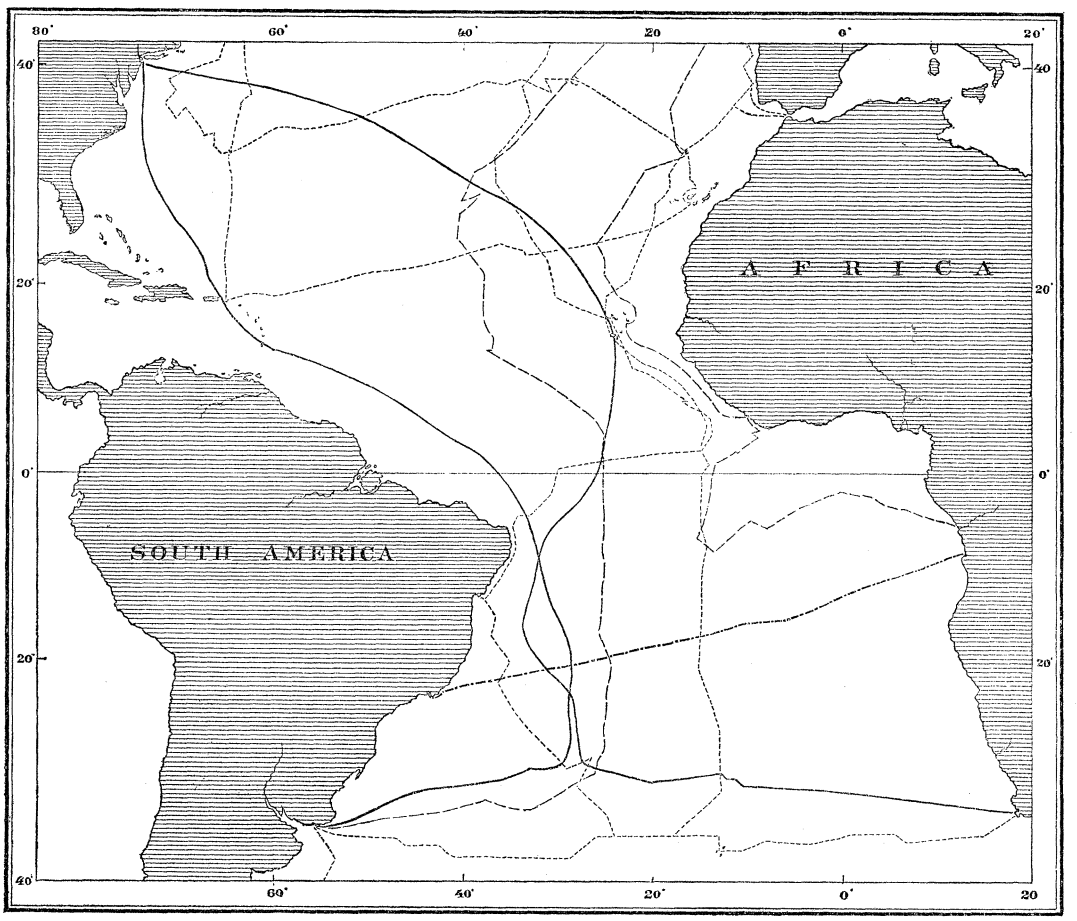
DEEP-SEA SOUNDINGS IN THE ATLANTIC.

THE U. S. S. Enterprise, Commander Barker, during her recent passage from Montevideo to Barbadoes, and from thence to New York, made a series of deep-sea soundings through the Atlantic Oceans which add considerably to our knowledge of the depths of those seas. Seventy-two casts were taken between Montevideo and Barbadoes, the distance run being 5,031 miles.

After leaving Montevideo, the course of the Enterprise was laid to the northward, towards Nelson shoal, where a depth of 2,088 fathoms of water was found, instead of 19 fathoms, as appears on all the charts of that locality. Commander Barker says, "From this point I steamed slowly, running from 200 to 250 miles to the northward of the Challenger's line, taking casts at in-

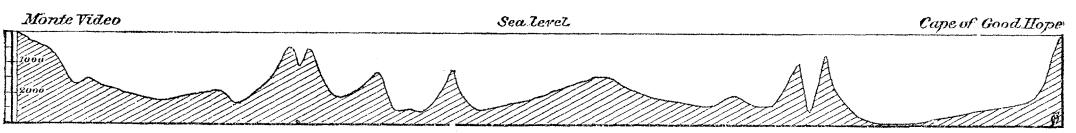
tervals of about sixty miles, the average depth being about 2,000 fathoms. In latitude 31° 22′ south, longitude 36° 39′ west, the water shoaled to 1,469 fathoms; and the next cast, taken in latitude found was 378 fathoms, in latitude 31° 02′ south, longitude 34° 27′ west."

This bank, which it is proposed to call Enterprise bank, extends about 150 miles in longitude.



DEEP-SEA SOUNDINGS IN THE ATLANTIC.

U.S.S. Enterprise, Commander A. S. Barker
U.S.S. Essex, Commander W. S. Schley
British ship Challenger, Commander G. S. Nares
German ship Gazelle, Capt. V. Schleinitz



PROFILE OF OCEAN-BED BETWEEN MONTEVIDEO AND THE CAPE OF GOOD HOPE AS SHOWN BY THE DEEP-SEA SOUNDINGS OF THE U.S.S. ENTERPRISE.

31° 15′ south, longitude 35° 42′ west, was only 547 fathoms. From this position casts were taken at intervals of five miles or thereabouts until over the shoalest part of the bank. The least depth

It may be much shoaler in other places than those sounded over, as its extent in latitude is not known, and there have been no soundings in that neighborhood which will admit of any generaliza-

tions in regard to it. The hydrographic office will have it further examined at the first opportunity.

From this point the easterly course was continued until the line of soundings taken three years before by the Enterprise was crossed, in about latitude 27° south, longitude 27° west; and then the line ran almost directly for the Island of Fernando de Noronha, the depths averaging about 2,800 fathoms, until the vicinity of this island was shown by a sounding of 2,280 fathoms. Beyond, the depths increased to an average of about 2,500 fathoms until the neighborhood of Barbadoes was reached, when the water shoaled again to 1,204 fathoms.

The depth of 2,560 fathoms in longitude 55° west, latitude 12° north, is within thirty miles of a sounding of 2,570 fathoms taken by the U.S. brig Dolphin in 1852; that of 2,714 fathoms in latitude 11° 25′ north, longitude 52° 50′ west, is within thirty miles of a sounding of 2,780 fathoms, also taken by the Dolphin in 1852.

After leaving St. Thomas, sounding was again resumed; the first cast, taken in latitude 19° 53′ north, longitude 65° 45′ west, showing 4,529 fathoms. As this point is about forty miles east-northeast of the famous cast of 4,561 fathoms, made by Lieutenant-Commander Brownson, U.S.N., with the coast and geodetic survey steamer Blake, the great depth obtained is peculiarly interesting. Beyond this deep the line ran towards Cape Hatteras, over a section formerly unsounded, showing an average depth of about 3,000 fathoms.

Commander Barker further says, "A ship like the Enterprise can undoubtedly sound in any sea and in any weather in which she can steam ahead fast enough to stem the wind and steer. The brake used was a plain piece of rope made fast inboard of, and abreast of, the lower part of the reel, then around the groove outboard, and held in the hand above. This brake controls the reel perfectly, it being possible to hold the shot, without any effort, at a great depth. In rolling heavily it is very easy to keep a constant strain on the wire. A distance-line of at least 12 fathoms was used, with a piece of lead weighing about a pound near the grommet. One length of the large American wire was put on next to the distance-line, as it was not so likely to kink. To prevent the shot from catching on top of the cup, a tripping-line was used, consisting of a piece of small stuff, one end made fast to the rod just below and in the plane of the hook, and the other end around the top of the cup: this line is of such a length as to be taut when the cup is closed. In nearly all the casts, sail was made after reeling in to 2,000 fathoms, but only such as not to give a greater speed than four knots. When reeled in to 1,000 fathoms, all sail was made. The wind was always kept on the starboard side, so as to have the wire to windward. The only accident which happened on the trip was due to the wire catching some part of the ship, probably the propeller: it was dark at the time, and she was going at the rate of about seven knots." The accompanying chart shows the principal lines of deep-sea soundings south of latitude 40° north. The hydrographic office has in course of preparation a series of charts showing the contours of the ocean-beds as determined by all reliable soundings that have been taken.

J. R. BARTLETT.

U. S. hydrographic office.

LONDON LETTER.

AFTER more than seven years of investigation and experiment, the Royal commission appointed to inquire into accidents in mines has presented its final report, which was issued on Saturday in the form of one hundred and ten pages of a large blue-book. The delay is accounted for by the long and difficult quest on which the commissioners were sent. They were to report, not only on the causes of mining accidents, but also on "the possible means of preventing their recurrence, or limiting their disastrous consequences." Not much is recommended in the way of mere legislative changes, but the scientific recommendations are most interesting and important. For example: with reference to the difficult question of the best method of firing shots in mines, they state that "electrical exploding appliances present very important advantages from the point of view of safety, over any kind of fuze which has to be ignited by the application of flame to its exposed extremity, as the firing of shots by their means is not only accomplished out of contact with air, but is also under most complete control up to the moment of firing. Their simplicity and certainty of action has been much increased of late years, while their cost has been greatly reduced, and but little instruction is now needed to insure their efficient employment by persons of average intelligence. The use of electrical arrangements for firing shots in mines where the employment of powder for blasting is inadmissible should be encouraged as much as possible."

Again, they state that "it has been shown that mines which have hitherto been considered free from fire-damp may have the air which passes through them vitiated to an extent corresponding to about two per cent of its volume of marsh-gas. The air in many such mines may probably never be entirely free from explosive gas; at all events, in the neighborhood of freshly cut faces of coal