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

and in the return air-ways. It has been demonstrated in our experiments, that, when the atmosphere contains five to five and one-half per cent of marsh-gas, it becomes highly explosive. We have even obtained explosions which, though less violent, might be nevertheless destructive of life if they occurred, on the large scale possible in a mine, when the air contained only four per cent of marsh-gas. It will thus be seen that air which would appear free from gas if tested in the ordinary way, may become, by the addition of only about two per cent of marsh-gas, capable of propagating flame and causing destruction, while the addition of about three per cent converts it into a highly explosive mixture. Air which would appear quite free from gas if examined by a lamp-flame, may become explosive when laden with fine, dry coal-dust. Appliances now exist by which very small proportions of marsh-gas in air may be readily detected, and which can be used for examining the atmosphere of a mine. With Liveing's indicator, gas present in the air can be estimated with sufficient accuracy for all practical purposes, even when the proportion is as low as one-quarter per cent."

In connection with this subject, the suggestion, first due to Mr. Galloway, that coal-dust alone suspended in air might cause an explosion, is considered, and an account is given of some carefully devised experiments which rather tend to confirm this conclusion. The commissioners discuss with some detail the means of removing this dust, and devote a large section of the report to the question of the conditions under which blasting can be done in safety. Considerable space is devoted to safety-lamps, and it is pointed out how great an influence the velocity of the air-currents in the air-passages of a mine has on the safety of a lamp. The electric lamp is perhaps the chief hope of the miner, though it does not, like the safety-lamp, indicate the presence of gas. The commissioners arrived at the following conclusions: "that it is most important that all mines should be carefully examined by means of indicators capable of detecting as small a proportion as one per cent of gas; such examination to be made before the commencement of each day-shift, and, in case of an interval, also before the succeeding shift; and that in all dry mines where the air may be laden with coal-dust, and where fire-damp is either known to be given off from the strata, or may from experience be reasonably suspected to exist, the secretary of state may require safety-lamps to be used, unless the owners and workmen of such mines prove to the satisfaction of a court of arbitration, to be appointed by the respective parties, that less liability to accident generally will be involved by the working of the mine with open lights than by use of safety-lamps. It should be a special instruction to such court that the circumstances of each mine be taken into consideration."

The late Prof. John Morris, who died in January last, had been engaged for some time in preparing a third edition of his invaluable 'Catalogue of British fossils.' The first edition was published in 1843, and the second in 1854. From that date onwards, Professor Morris had been collecting materials for a third edition, which, unfortunately, he did not live to complete. But his manuscripts have been placed in the hands of a committee, which includes the keeper of the geological department in the Natural history museum, the president of the Geological society, and other well-known geologists. They have divided up the work among several specialists, who have engaged to finish their respective parts within six months; and it is therefore hoped that this great work may be completed before very long.

The publication of the Challenger volumes is now proceeding rapidly. No less than fourteen reports are at present passing through the press, and it is expected that the entire series will be completed by the end of next March.

The Lumleian lectures, now in course of delivery before the College of physicians by Dr. W. H. Stone, are attracting unusually large audiences. Their subject is 'The electrical conditions of the human body.' Dr. Stone was one of the first to call attention to the importance of determining accurately the physical constants of the agent electricity when employed in physiological investigation. In these lectures he has shown that most of the contradictory results obtained by the earlier investigators are due to the neglect of this precaution. The enormously high resistance of the epidermis was demonstrated; and, when this was eliminated, the average resistance to a continuous current from the ulna at the wrist to the malleolus at the ankle, was shown to be about 1,170 ohms, due allowance being made for the errors caused by polarization, according to the ingenious method first devised by Sir Henry Mance for the Persian Gulf cables. Some entirely new experiments were detailed, and in part repeated before the audience, showing that the human body could be charged and discharged like a secondary battery. An electromotive force of two volts was employed, and curves showing the rate of discharge were exhibited. A discharge current of sixty micro-amperes at first, under an electromotive force of about one volt,

sank to forty-eight in five minutes, and remained at that for some hours. The resistance offered by the body to an induced current was stated to be only half that offered to a continuous one. An ingenious speculation was hazarded as to the possibility of the human nervous system distantly resembling a duplexed telegraph-cable, in which a transmitted impulse is balanced and inhibited at the sending-station, but unbalanced and exhibited at the receiving-station. W.

London, April 13.

NOTES AND NEWS.

THE following, in addition to those given in our last issue, completes the list of papers read at the National academy of sciences, April 20 – 23 : Alfred M. Mayer, On the diathermancy of ebonite and obsidian, and on the production of calorescence by means of screens of ebonite and obsidian ; On the coefficient of expansion of ebonite ; On the determination of the cubical expansion of a solid by a method which does not require calibration of vessels, weighings, or linear measure ; On measures of absolute radiation ; E. D. Cope, On the geology of the region near Zacualtipan, Hidalgo, Mexico ; Edward S. Morse, On ancient and modern methods of arrow release ; Theo. Gill, The ordinal and super-ordinal groups of fishes ; H. A. Rowland, On the absolute and relative wave-lengths of the lines of the solar spectrum ; Wolcott Gibbs, Platinous compounds as additive molecules ; Ira Remsen, Influence of magnetism on chemical action ; A. Graham Bell, Upon the deaf and dumb of Martha's Vineyard (continuation of research relating to the ancestry of the deaf) ; S. P. Langley, On the invisible spectra ; G. F. Becker, Cretaceous metamorphic rocks of California (by invitation) ; Ogden N. Rood, On color contrast ; Charles D. Walcott, Classification of the Cambrian system of North America (by invitation) ; A. W. Wright, Crystallization of platinum by means of the electric discharge *in vacuo ;* W. K. Brooks, The Stomatopoda of the Challenger collection ; Budding in the Tunicata ; A. W. Wright, Effect of magnetization on the electrical resistance of metals ; R. E. Peary, U.S.N., On a proposed expedition into the interior of Greenland.

LETTERS TO THE EDITOR.

Science at Cornell.

MY attention has been called to the communication signed 'H. N.' in *Science* for April 16, and I beg for a little space in which to point out one or two errors into which the writer has fallen.

I shall not attempt to deal with the swarming misstatements and exaggerations of the letter. These, although inviting game, are comparatively unimportant. But the fundamental idea of the writer is not without importance, and therefore should not pass unnoticed. That idea is divisible into two parts. The first is, that Cornell university, in developing its non-technical side, is doing violence to the fundamental law and charter of the institution ; and the second is, that, in so doing, 'the successor of Andrew D. White' is reversing the traditions and former policy of the university. "Where," exclaims the writer, "are the traditions and the law and charter of Cornell?" Let us see.

First, The fundamental law declares its purpose in the words, "in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." To accomplish this declared purpose, which, it will be seen, is of the broadest possible character, the law required "the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts." How this shall be done is explained in the clause, "in such manner as the legislatures of the states shall respectively prescribe."

Here we see, in the language of the law itself, a purpose that is clearly unmistakable. It includes not simply agriculture and the mechanic arts, but 'other scientific and classical studies,' 'military tactics,' and 'the several pursuits and professions of life.' Furthermore, these provisions shall be carried out in such a way as the legislatures of the states may severally prescribe. So much for the fundamental law.

Second, The charter of the university, after repeating the provisions of the fundamental law, and doubtless in view of the very large gift of Mr. Cornell, adds the following sentence ; "But such other branches of science and knowledge may be embraced in the plan of instruction and investigation, pertaining to the university, *as the trustees may deem useful and proper.*" In other words, the trustees are left by the charter to determine precisely what branches of science and knowledge shall be embraced in the plan of instruction, after those specifically provided for have been established and duly equipped.

Third, Now as to traditions. As soon as the trustees named in the charter came together, the first thing to be done was to determine upon a plan of organization. A committee for that purpose was appointed, of which Andrew D. White was chairman. On the 21st of October, 1866, he presented his famous report. In the very first part of it, under the head of 'Fundamental plan of instruction,' he argues the very question which lies at the bottom of 'H. N.'s' grievance. He is of opinion that the fundamental law justifies the establishment of all the departments of a true university. But, even if it did not, he finds unmistakable warrant in the provisions of the charter. In order that there may be no possible misunderstanding of President White's views, I quote a single sentence from p. 4 of the report : "Even if it should be claimed that the whole effort of the trustees ought to be devoted to agriculture and the mechanic arts alone ; even if we were to construe away the plain words of the original act of congress, which speaks of 'other scientific and classical branches' as part of the object of the government grant of lands, — still the oft-repeated declaration of our founder, that he 'wishes to make such provision that every person can find opportunity here to pursue any study he desires,' would be our