Line, still we are constrained to think that the south-west monsoon is still part of the same system. If the monsoon was independent of the trade, there must be a belt of high pressure between the two; and of this there is absolutely no trace.

We must therefore look to some explanation other than the conception of an independent circulatory system over the Bay of Bengal; but materials are at present wanting to form a definite conclusion on the point at issue. There are two ways by which the question could be settled.

A few sets of observations of cloud-motion on ships coming up the Bay from southward, would almost infallibly give decisive results. If the upper clouds over the west winds, just north of the Line, come from the south or south-east, the surface wind has been drawn across the equator; but if, on the contrary, the clouds drive more and more from the north of west the higher they are, then the circulation over the Bay of Bengal is not fed directly by currents which have crossed the line.

A set of daily weather charts for the whole Indian Ocean would also clear away many doubts. When differences of pressure are small, and winds are variable, charts of mean monthly isobars, and of resultant winds, are very delusive; for the average relation of pressure, wind, and weather, may be quite different from that on any actual day.

The materials at present available point unmistakably to some connection between the anomalous wind and weather in the southern portion of the Bay, and the local area of low pressure over Southern India. It is very conceivable that the whole width of the south-east trade does not cross the equator with an unbroken front; but that for some reason or other a great local eddy may be developed in the Bay of Bengal. No river ever flows regularly, but is broken up into ripples and backwaters; and though there are many differences between the flow of water and of air, still there are certain properties common to the motion of every fluid.

Very few English meteorologists care much for theoretical discussions of air motion; but the Indian workers use mathematics freely in their investigations. Mr. Dallas calculates the flow of a current of air from 10° S. latitude to 10° N., according to the formula given by Mohn and Gulberg. He takes a gradient directed N. 30° E., across the Arabian Sea, and notes the difference both of force and direction between the observed and calculated winds. No doubt there is a certain accordance between the results so obtained; but still there are errors, which, taken with other things, suggest that the theory is still imperfect.

According to the formula—a modification of Ferrel's theory—when air flows northwards down a gradient, the angle between the wind and the gradient should decrease as we approach the equator, disappear altogether on the line, and then gradually increase as we proceed further north. But in practice the trade keeps steadily in the south-east from about 20° S. almost to the equator, then turns rather suddenly to south-west, and the monsoon advances steadily in that direction from about 5° to 20° N. In the opposite monsoon, the north-east winds run steadily from about 20° N. down to the line, and then turn rapidly to north-west.

It is well known in our own latitudes that, though the wind rotates in contrary directions round cyclones and anticyclones, the sweep of the wind is usually less than the curvature of the isobars would suggest. For instance, if an anticyclone lies to the north of Great Britain, all the winds will often be from about north-east instead of sweeping gradually from north-east through east to south-east. This and many other similar observations point to a north-east and south-west set of the winds all over the northern hemisphere, which has not yet been accounted for by any theory.

In conclusion, we may remark how thoroughly the author has discussed the subjects of his memoirs; though some will doubtless differ considerably from him in the theoretical portion of his work. India presents a field for research unique from that in any other part of the world; and those who are acquainted with the magnificent equipment, order, routine, and system of inspection inaugurated by Mr. Blanford, will feel confident that every year will add to our knowledge of a region that presents the most fascinating problems to the student of atmospheric dynamics. RALPH ABERCROMBY.

NO. 2 MUSEUM, KEW.

THE Museum of Monocotyledonous Products in the Royal Gardens, Kew, better known, perhaps, as No. 2 Museum, which was recently closed for rearrangement, has been again opened to the public. The entire collection has been classified according to the plan of the "Genera Plantarum," so that the whole of the collections contained in Museums Nos. 1 and 2 are now arranged according to the system adopted by Bentham and Hooker.

A new room which was added to the Museum a few years since has now been utilized; this has given space that was much needed for the proper display of the products of such important natural orders as *Scitamineæ*, *Bromeliaceæ*, *Amaryllideæ*, *Liliaceæ*, *Palmeæ*, *Aroideæ*, *Cyperaceæ*, and *Graminaceæ*. In the first named order, a large number of valuable economic plants are included, such as ginger, turmeric, cardamoms, arrowroot, bananas, and others; while in *Liliaceæ* we find sarsaparilla, asparagus, onions, squills, medicinal aloes, and New Zealand hemp. All these have had much more space given to them than hitherto, and the fine collection of native New Zealand garments made of the indigenous hemp (*Phormium tenax*), which are rapidly becoming scarce, are now opened out and fully shown. A very large increase of space has been given to the *Palmeæ*, and as it is one of the most important orders to mankind generally, especially in tropical countries, it was but fitting that this unique collection of palm products should be fully displayed. In such a series as that at Kew it is difficult to particularize any one exhibit as more important than another, but we may draw attention to the fine set of specimens illustrating the coco de mer, or double cocoa-nut of the Seychelles (*Lodoicea sechellarum*). This comprises a fine series of fruits, including a model of the fruit in which the nut is inclosed, made and presented by the late General Gordon, of the so-called double or usual form, as well as quadruple, sextuple, and others, besides seeds showing the mode of germination, very fine male spadices, and carved shells. The series of products of Palmyra palm (*Borassus flabelliformis*) is also a very complete one, comprising sections of the trunk, both longitudinal and transverse, toddy collecting apparatus and various manufactures from the leaves.

In the *Graminaceæ*, which was very much crowded throughout, a large increase of space has enabled the interesting collections of maize, sorghums, sugar-cane products, rice, and the numerous grains of India, to be easily examined, while in the *Cyperaceæ* the Indian mats from the culms of *Cyperus Pangorei* and *C. tegetum* and other products of the order have been opened out, and now form a striking series.

APPARATUS FOR EXPERIMENTS AT A HIGH TEMPERATURE, IN GAS UNDER HIGH PRESSURE.[1]

A DIFFICULTY often experienced in laboratories is how to raise a body to a high temperature while surrounded by a gaseous atmosphere under considerable pressure.

[1] Translated from *La Nature*, February 11, 1888.

The apparatus which I constructed several years ago makes it possible to bring bodies to a temperature approaching that of the fusion of platinum, whilst maintaining them in a gaseous atmosphere, of which the nature and pressure may be varied at will.

This apparatus (Fig. 2) is composed of a mass of steel

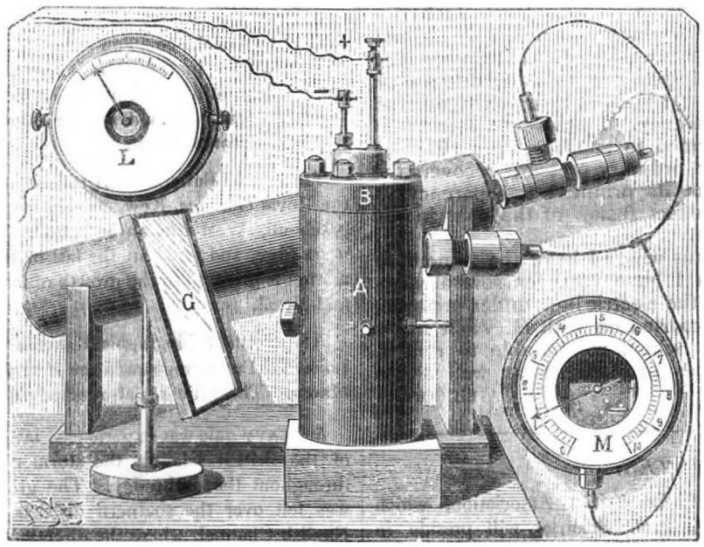

FIG. 1.—Apparatus of M. Cailletet. A, mass of steel with cylindrical bore, with its stopcock B (see the details in Fig. 2); G, mirror permitting the reaction to be seen; M, manometer; L, amperemeter.

A, in which there has been hollowed out a cylindrical space of about a quarter of a litre capacity. This species of test-tube may be closed by means of a metallic stop-

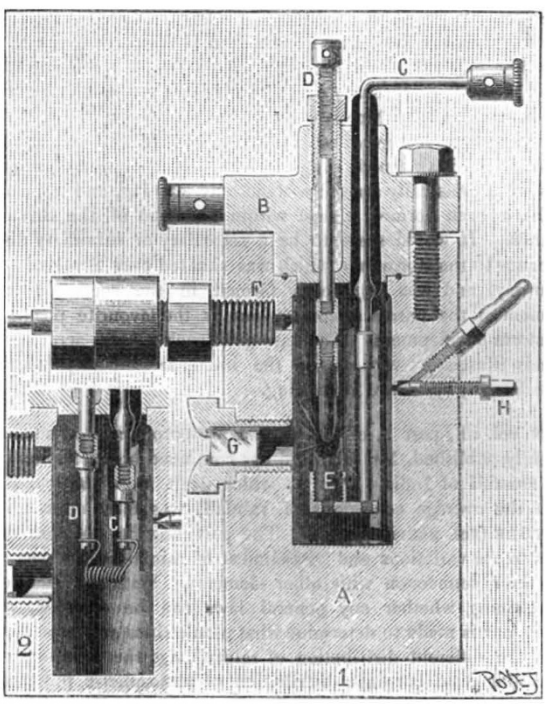

FIG. 2.—Explanatory figure :—(1) Arrangement for obtaining the electrical arc. The insulated charcoal is shaped in the form of a crucible. (2) Arrangement with wire of platinum rolled spirally.

cock, B, furnished with screw. Two copper wires are fixed to this movable portion; the one, C, is insulated, whilst the other, D, is in contact with the metal. At the ends of these two wires there is fixed, according to the requirements of the experiment, either a sheet of platinum moulded into the form of a crucible, or a wire of platinum rolled spirally, a kind of receptacle for the body experimented on, and which is brought to the desired temperature by the passage of an electric current. Two or three accumulators are sufficient for these experiments. A fragment of gold, placed in the spiral, melts in a few seconds. When it is desired to maintain the temperature long, the exhausted accumulators are replaced by others in readiness, simply by use of a commutator. The high temperature developed by the electric arc may also be turned to account; in that case two charcoal rods are arranged, of which one, movable, is fixed to the extremity of a screw, D, capable of being adjusted from the outside in order to place it in communication with the other charcoal rod, E, insulated and shaped in the form of a crucible.

The block of steel is pierced by an orifice, F, connected by a metallic capillary tube with the reservoir which contains the compressed gas. A window furnished with a thick glass, G, allows the phases of the experiment to be followed by looking in an inclined mirror, so as to be secure from all danger in case of the glass breaking. Lastly, the gases contained in the apparatus may be collected, by means of a stopcock at the screw H, in cases where it is desirable to analyze them.

The gas used for the experiments is compressed previously in a holder by means of the mercurial pump, a description of which I have already published; it is also easy to employ the carbonic and sulphuric acid furnished by commerce.

A metallic manometer fixed to the apparatus renders it possible to ascertain that the pressure of the gases exercises an energetic cooling influence upon the bodies which are heated by the electric current.

Thus, the current which causes the fusion of the wire or sheet of platinum produces only a sombre red temperature when the pressure is sufficiently great. I have been able to lessen this cause of cooling, by placing the body on which I was experimenting in a small test-tube, which resists the motion of the gases, and which is not repre-

sented in the figure. I have repeated, with this apparatus, the classical experiment of Hall on carbonate of lime. A fragment of chalk, heated in a spiral of platinum, diminishes sensibly in volume, while it is being changed into a hard body of a brownish-yellow colour, which dissolves slowly in acids, at the same time liberating carbonic acid. Also, our fellow-worker, M. Debray, has long since shown that Iceland spar can be carried to a high temperature in carbonic acid without being changed, and without losing its transparency. I have also found that a crystal of spar transformed to chalk on the surface by the action of heat under ordinary pressure recovers the lost carbonic acid, but not its primitive transparency; I have not been able to effect fusion of the spar in the course of my experiments.

To sum up, the apparatus which I have the honour to make known, and which I have used for several years past, in experiments upon the electric light under pressure, researches which I have carried on with M. Violle in his laboratory at the Normal School, will be able to render, I hope, numerous services to chemists as well as to mineralogists. L. CAILLETET.

NOTES.

AT the Bath meeting of the British Association, which will begin on September 5, Prof. Schuster will preside in Section A (Mathematics and Physics); Prof. Tilden in Section B (Chemistry); Prof. Boyd Dawkins in Section C (Geology); Mr. Thiselton Dyer in Section D (Biology); Colonel Sir C. W. Wilson in Section E (Geography); Lord Bramwell in Section F (Economic Science and Statistics); Mr. W. H. Preece in Section G (Mechanical Science); and General Pitt-Rivers in Section H (Anthropology).

THE Croonian Lecture of the Royal Society will, at the request of the Council, be delivered this year by Prof. W. Kühne, of Heidelberg. As is well known, Prof. Kühne has for many years devoted attention to the endings of nerves in muscle, and in the Croonian Lecture he proposes to dwell on the light thrown on the nature of muscular contraction and nervous action by the study of these nerve-endings. Since the rooms of the Royal Society are not well adapted for showing illustrations to large audiences, the lecture, which will be largely illustrated, will be delivered, by the permission of the Managers of the Royal Institution, in the lecture theatre of the Royal Institution. The date fixed is Monday, May 28, at 9 p.m.

IN reply to a question put by Lord Herschell in the House of Lords on Monday, Lord Cranbrook stated that he had come to the determination to recommend the issue of a small Royal Commission to inquire as to the necessity for a Teaching University for London, and he hoped that at no great distance of time it would be able to report upon the subject.

IN accordance with the rule which empowers the election of nine persons annually "of distinguished eminence in science, literature, or the arts, or for public services," Prof. A. W. Rücker, F.R.S., has been elected a member of the Athenæum Club.

THE Royal Meteorological Society's ninth annual Exhibition of Instruments will be held at the Institution of Civil Engineers, 25 Great George Street, Westminster, in conjunction with the Society's meeting on Wednesday, the 21st inst., and will be very interesting and instructive. The Exhibition is devoted to apparatus connected with atmospheric electricity. A most valuable collection of some fifty photographs of flashes of lightning from all parts of the world will be shown, as well as some curious effects of damage by lightning, including the clothes of a man torn off his body by lightning, &c. The Exhibition will remain open till Friday, the 23rd inst. Persons not Fellows, wishing to visit the Exhibition, can obtain tickets on application to Mr. W. Marriott, Royal Meteorological Society, 30 Great George Street, S.W.

A PLANT of the common coffee (*Coffea arabica*) is now loaded with ripe fruit in the palm-house at Kew. Seldom, even on tropical plantations, is a tree to be seen with such a crop. Such an object-lesson should not be missed by those who take an interest in economic botany.

THE March Bulletin of Miscellaneous Information, issued from the Royal Gardens, Kew, contains papers on Forsteronia rubber, patchouli, West African indigo-plants, vanilla, streblus paper, urera fibre, and tea. In the last of these papers valuable information is given as to the growth of tea in Jamaica, Madagascar, and Natal.

AN excellent biographical sketch of the late Asa Gray, by James D. Dana, appears in the *American Journal of Science* for March. The article is also issued separately.

A HEAVY gale was experienced last Sunday in nearly all parts of the British Islands, the storm continuing in many places throughout the entire day. The greatest violence of the gale was felt over the southern districts of England and in the English Channel, where the direction of the wind was from the south-west and west. In Ireland, Scotland, and the North of England, the direction of the wind was easterly, the central area of the disturbance passing completely over the middle of England from west to east. At 8 o'clock on Sunday morning the centre of the storm was close to Pembroke, where the barometer was reading 28·57 inches, and at 6 o'clock in the evening it was over Lincolnshire, the barometer reading 28·8 inches. The storm afterwards crossed the North Sea, and at 8 o'clock on Monday morning the centre had reached Holland, and was still travelling in an easterly direction. At Greenwich the anemometer registered a pressure of 31 pounds on the square foot at 5 p.m. on Sunday, which is equal to an hourly velocity of about 80 miles. The feature of especial scientific interest with respect to this storm is the sudden manner in which it appeared on our coasts: it practically arrived without any warning, and appears to have been formed almost within the area of the British Islands. It would seem to be a secondary or subsidiary disturbance to the storm area which was situated over Scotland on Saturday, and was apparently formed in the south-western segment of the parent cyclone, which is the favourite position for storm development. The passage of such a storm across our islands illustrates very clearly the immense difficulty which underlies any system of forecasting.

IN vol. iii., part 2, of the Indian Meteorological Memoirs, recently published, Mr. Blanford has continued his discussion of the rainfall of India. Part 1, which dealt more particularly with the average conditions of rainfall, was fully noticed in NATURE (vol. xxxvii. p. 164). The part now in question relates to the variations and vicissitudes of rainfall in past years, and their connection with other elements. With the view of ascertaining whether any general laws can be detected, an endeavour is made to determine what peculiarities are associated with the different distribution of rainfall, *e.g.* the variations of prevailing wind currents, distribution of atmospheric pressure, and the frequency and courses of cyclonic storms. The periodical recurrence of droughts and famines since 1769 is recorded, and, from general conclusions drawn, it appears that serious droughts occur in Southern India at intervals of nine to twelve years, and that they generally happen about a year before the sunspot minimum. In Northern India, droughts sometimes occur in years of maximum sunspots.