

3. Aug. 3.—Near the top of the Rotang Pass (13,000'), about 9 o'clock A.M., the lower half of a beautifully-coloured ring was seen for about half an hour.

4. Aug. 5.—Gondla (10,000'). At 3 P.M. a beautifully-coloured ring round the sun was seen on a very thin film of clouds in front of the sun. The blue was most distinct, and much purer than in the common rainbow.

5. Sept. 19.—While going down the Jhelum in a boat from Islamabad to Srinagar, I saw in the river the reflection of part of a coloured ring. Looking directly at the cloud, I saw the ring again on the white edge of a cloud. The sun was nearly setting.

6. Sept. 23.—At Baramula, at 4 P.M., I saw the same ring described above most distinctly, and making a complete circle round the sun.

7.—Marching out of Cashmere I was struck one morning by the appearance of the cloud being nearly the same as when I had before seen the circle in question. On looking carefully I could indeed see a faint trace of the ring.

8. Oct. 6.—At Peshawur (Punjab) I saw to the right of the setting sun about the sixth part of the coloured ring.

ARTHUR SCHUSTER

VISIT OF THE CHEMICAL SOCIETY TO THE ROYAL ARSENAL

IN response to an invitation from its president, Prof. Abel, F.R.S., the chemist of the War Department, nearly 500 Fellows of the Chemical Society visited the Royal Arsenal at Woolwich on Tuesday last. The presidents of most of the learned societies, together with other eminent men of science, were included in Mr. Abel's liberal invitation, so that during the day a constant stream of visitors flowed through the interesting workshops at Woolwich.

Beyond the ordinary attractions of the establishment, Mr. Abel had arranged to demonstrate the more important applications of science to warfare, and among these were included some experiments with gun-cotton and other explosives, the study of which he has made peculiarly his own. Indeed, the most attractive part of the programme from a scientific point of view was that carried out on the outskirts of the arsenal in the vicinity of the proof butts, where operations commenced by the firing of the big 80-ton gun. Col. Younghusband, F.R.S., R.A., the Superintendent of the Royal Gun Factories, as well as other heads of departments, had entered warmly into the spirit of the visit, and took considerable pains that every opportunity should be given the Fellows of witnessing the capabilities of this monster weapon. A charge of 250 lbs. of gunpowder, the grains of which measured nearly two inches cube, was introduced into the gun, and then the heavy bolt, or projectile, weighing 1,260 lbs. was rammed home. Those who were privileged to enter the chronoscope room, which is so small unfortunately, that scarcely a score of visitors could find room in it, were gratified with a sight of Boulanger's instrument for calculating the velocity of a cannon-ball in its flight, and as the thundering discharge was heard, this delicate apparatus proclaimed, simultaneously, that the projectile had been sent on its way at a velocity of nearly 1,500 feet a second, an impetus, it is said, sufficient to make a hole through the *Inflexible* iron-clad, with her twenty inches of armour and thick teak backing. The Boulanger instrument is easily explained. Placed in front of the gun, at an interval apart, are two wire screens, so arranged that the projectile in its flight tears through them one after another. From two magnets attached to the instrument hang two metal rods, and the instant the first wire screen is torn by the shot, a current of electricity is broken and the first of these rods falls. As No. 1 is in the act of falling, however, the second wire screen is broken by the shot releasing No. 2 rod, and this

sets in action a trigger which strikes No. 1 rod before it has yet completed its fall. If the shot has been slow in travelling from one screen to another, then rod No. 1 has, naturally enough, nearly fallen its entire length before it receives a stroke from the trigger; and the higher the mark is upon the rod No. 1, or in other words, the more it has fallen the less rapid has been the passage of the shot. After the mark is made one has merely to refer to a scale to get the velocity.

After the firing of the 80-ton gun came the gun-cotton programme, which Mr. Abel and Mr. E. O. Brown had arranged for the purpose of demonstrating in the first place the peculiar qualities of this explosive, and secondly its application to war purposes. To quote from this programme, Mr. Abel first gave "illustrations of some of the conditions which promote detonation of an explosive agent by a blow, or by the force exerted by an *initial detonation*." It was shown that gun-cotton refused to detonate except under very special circumstances, that is to say, neither a confined charge of gunpowder nor a small charge of unconfined mercuric fulminate brought about that result, which was only effected by a confined charge of fulminate, or by other masses of gun-cotton being detonated in its immediate vicinity.

Mr. Abel then went on to demonstrate the high speed at which detonation travels, the same being faster than any known agent, if we except electricity and light. A row of gun-cotton cakes half an inch apart, 36 feet long, was detonated at one end, and by crossing the row with several insulated wires connected with Noble's chronoscope (the wires being broken one after the other, as the detonation proceeded), it was proved that the velocity of the detonation exceeded 18,000 feet per second.

But it was the last of the gun-cotton experiments which proved the most interesting to the general body of visitors, as they illustrated the important uses of this valuable explosive. In these trials the gun-cotton was employed for the most part in a *wet*, and therefore *uninflammable* state, in which condition it detonates just as readily as when dry, provided a small charge of desiccated cotton is used to start the action. First of all, the value of detonation was shown in connection with cavalry raids in an enemy's country. Provided with a few pounds of gun-cotton and some fulminate fuses, a trooper might cut half-a-dozen lines of railway with very little ceremony, for, as Mr. Abel plainly showed, an eight ounce cake of the material exploded upon a rail, fractured the metals so completely as at once to block the line. In the demolition of wooden stockades, such as have caused us some difficulty in Perak lately, gun-cotton was shown to be equally efficacious, for a charge of wet cakes placed at the foot of such a structure on Tuesday last, levelled the same to the ground far more quickly than it takes to tell of the incident. Finally, a torpedo was fired under water constructed in the most primitive manner, by simply filling a large potato-net with gun-cotton slabs, and throwing it bodily into the water, a fuze and dry primer being contained in the middle of the charge.

After lunch, which the president had hospitably provided for his numerous guests, and at the close of which Dr. Hooker, C.B., P.R.S., took the opportunity of thanking Mr. Abel for the intellectual treat he had provided them with, the visitors had the satisfaction of witnessing the process of big gun making, a forging of fifty tons of glowing metal (the coil of one of the 80-ton guns) being worked under the monster 40-ton steam-hammer for their especial behoof.

The last sight of all was certainly not the least interesting. It was the run of a Whitehead torpedo under water, the machine, as our readers may know, being shaped in the form of a cigar and propelled through the water, rocket-fashion, by means of compressed air, which issues from its tail. The passage of this submarine monster the whole length of a canal, termed the torpedo

range, brought to the close a day which the fortunate Fellows of the Chemical Society will certainly remember as one of the most instructive and enjoyable in their varied experiences.

NOTES

It is with the greatest regret that we announce the death of Col. Strange, the Inspector of Instruments to the Indian Government, who died on the 9th instant. We shall give an obituary notice next week.

An impression has become general, through the statements of our contemporaries, that the Sub-Wealden boring has been permanently stopped. This is not the case; for at the last meeting of the committee it was determined to carry it on to a depth of 2,000 feet, and if funds continue to flow in with the success which has previously characterised this movement, the boring, it is hoped, will be carried to the greatest depth attainable. The boring has now reached a depth of more than 1,900 feet, and was to be recommenced this week; should, however, a greater depth than 2,000 feet be determined on, it will be necessary to enlarge and reline the hole, which will cost from 600*l.* to 700*l.* Arrangements are being made by which it is hoped that a continuous core may be obtained from the present depth to that of 2,000 feet. We believe the Government grant of a pound a foot for each foot bored ceases at 2,000 feet, and, looking to the important light the prosecution of this boring will throw, not only on many theoretical questions of modern science, but on so many doubtful points of practical interest to England, it is sincerely to be hoped that the advisability of continuing the grant will be seriously considered by her Majesty's Ministers.

We have received from Messrs. Allsopp and from Dr. Hassall letters referring to the statement noticed in our review of the work of the latter on Food (vol. xiii. p. 345), that the water used by the former in the brewing of their ales contains 7·65 grains of sulphate of zinc. Dr. Hassall expresses great annoyance that through some inadvertence on his part this unfortunate error, as it obviously is, should have been allowed to get into his book. He points out, what no doubt would be evident to most readers, that sulphate of zinc is a mistake for sulphate of potash. He assures us that no trace of so deleterious a substance as sulphate of zinc has been found in the water used by Messrs. Allsopp, and that their celebrated bitter beer consists solely of the products of malt and hops, and the constituents of pure spring-water. A further letter from Dr. Hassall, for which we have not space, will be found in our advertisement columns.

We are informed that Mr. J. E. Harting is engaged in editing for the "Transactions of the Norfolk and Norwich Naturalists' Society" ten unpublished letters of Gilbert White, which have recently come to light. The originals are in the possession of the Rev. H. P. Marsham, of Rippon Hall, near Norwich, and are addressed to his great grandfather, Mr. Robert Marsham, F.R.S., of Stratton Strawless, Norfolk. It is expected that this interesting publication will appear about the end of this month or early in April.

MR. STANFORD has sent us specimens of some very fine maps recently published by him. Two of these are Orographical maps of Europe and of England, and the public in general and educationists in particular ought to be grateful to Mr. Stanford for thus putting within their reach a style of map which has hitherto been peculiar to Germany. The maps are really admirable specimens of a very difficult kind of cartography, and we have only one fault to find with them. Unfortunately, the midland levels are coloured green, while the sea is coloured

blue, so that by gaslight the boundary cannot be distinguished. Why not have the nearest approximation to sea-level coloured white, the various higher levels of the land graduated shades of brown, and those of the sea by various shades of blue or green? This would be a simple and, we think, most intelligible plan. If the slight defect we mention—and it is only noticed under artificial light—were remedied, the maps would be nearly all that could be desired. The third map is a large-scale one, in four sheets, of British Guiana. The map is compiled from the surveys executed under H.M.'s Commission for 1841-44, and under the direction of the Geographical Society, for 1835-39, by Sir R. H. Schomburgk, revised and corrected to the present time by Mr. Cathcart Chalmers, Crown Surveyor of the Colony, and Mr. J. Gay Sawkins, Director of the Geological Survey of the West Indies and British Guiana, with additions by Mr. C. B. Brown. It will thus be seen that the map has been constructed on the latest and most trustworthy authorities. It is a curious fact that the boundaries between British Guiana and Venezuela on the one hand and Brazil on the other have never been properly adjusted.

WE have received a very important letter by Mr. Russell Government Astronomer at Sydney, which we regret that we have not space to reproduce *in extenso*. The letter refers to the excessively dry weather of Australia, which, indeed, has been so dry as to be really alarming, and reviews the results of rainfall observations made at Sydney during the last thirty-six years. This letter suggests to us that the unusual wet weather we have had here may be more than compensated by the excessively dry weather which has prevailed in Australia.

THE Duke of Richmond and Gordon stated in the House of Lords no Tuesday that the Vivisection question was under the consideration of the Government, but he could not say when any legislation would take place upon it.

A FEW days ago a meeting was held in Birmingham for the purpose of establishing a Philosophical Society, and it was found that the proposal met with very warm support. Some difference of opinion was expressed as to the propriety of including literary subjects in its programme, but the general feeling was in favour of keeping to a purely scientific course. A society of this kind is greatly wanted in this important centre, for science is represented there only by the Natural History Society, which, though it has done some good work, is found to have too limited a scope. With the prospect held out by the munificent founder of Mason's College for advanced scientific culture, there can be little doubt that such a society would do great good, and we wish it every success. A proposal for amalgamating the Natural History Society with the new Society has been made, and has been favourably entertained.

MR. R. W. CHEADLE is announced as having been successful in excavating from the well-known brick earth pit at Crayford a bone which was identified by Prof. Morris as the thigh-bone of a British species of lion. Mr. Cheadle found at the same time several rhinoceros' teeth in this cemetery of ancient life among the hop gardens of Kent.

PETERMANN'S *Mittheilungen* for March contains several important papers. H. Habenicht contributes a brief description to accompany a carefully, and notwithstanding its size, remarkably clear map of Europe, showing the distribution of the sedimentary rocks on that continent. A map of South New Guinea between 142° and 143° E. long. shows the course of the recently discovered Baxter River, accompanying which are accounts of the Macleay expedition and of Macfarlane and Stone's exploration of the Baxter River or Mai-Kassa. Lieut. Weyprecht continues his "Sketches from the Far North," in this part treating of the ice-pressure. The account of Lieut.-Col. Przewalsky's