foregoing outline shows some of the principal points described in the lecture. The subject is a far extending one, and it is more important at the present time to obtain accurate data than to suggest theories; many other interesting points have, in fact, already been determined. The lecturer noted that the above experiments had been made in the Davy Faraday Laboratory.

ANDRÉE'S BALLOON EXPEDITION.[1]

ALTHOUGH the fact is not stated, this is a translation, and a singularly literal one, of the French original. It is to be regretted that obvious printer's errors or slips of the pen were not corrected; for example, "1892" for "1882" on p. 14, "south" for "north" on p. 280, and the somewhat serious misstatement of Andrée's last message on p. 10, which is the least excusable, as a facsimile with correct translation attached is given on p. 306. On p. 168 the translator computes 5000 cubic metres at 17,658 cubic feet instead of 176,580. A somewhat infelicitous if not unintelligible paraphrase of marking a pigeon's feathers with an india-rubber stamp, is fixing on labels by the aid of india-rubber wafers (p. 233). It must be stated, on the other hand, that the English edition is much better printed than the French, especially as regards the extremely interesting plates, and that it contains an effective coloured frontispiece showing the departure of the balloon.

The narrative is in two parts. The first, by M. Lachambre, describes the balloon and the process of its manufacture, the transport of the material to Dane's Island in 1896, the erection of a shed, the inflation of the balloon, the long waiting for a favourable wind, the deflation and return. The second part, by M. Machuron, the nephew and partner of M. Lachambre, describes the transport of the enlarged balloon to Dane's Island in 1897, the repair of the shed, re-inflation, and the casting off on July 11. Both authors describe their own work clearly and well. They have nothing to say as to Andrée's plans, his theory of circumpolar prevailing winds, or his probable fate. But the technicalities of balloon construction, and the dexterous manipulations of the delicate fabric as it was prepared far from workshops or extraneous help, are lightened by the ingenuous impressions of the two intelligent Parisians suddenly transported into so strange a world.

The balloon *Ornen* was constructed as a sphere sixty-six feet in diameter with a conical appendage. It was furnished with two lateral valves for releasing the imprisoned gas at will, a large automatic valve to let the gas escape whenever the internal pressure exceeded a certain limit, and a rending flap intended to be used to prevent bumping on finally alighting, and so constructed that a rope attached to a small grapnel, on being thrown to the ground, would tear a great rent in the side of the balloon, deflating it instantaneously. The cubic contents were 160,000 cubic feet; but this was increased for the second attempt to 176,000 cubic feet. The material used was pongee silk of double, triple, or quadruple thickness, according to the part of the balloon and the strain to which it would be subjected. The silk was prepared in pieces of about 18 inches in width, and the balloon was made up of horizontal zones, the joints of each successive zone being alternate, as in brickwork. When completed the whole was thoroughly and repeatedly varnished inside and outside. While both Andrée and the manufacturers were confident of the gas-retaining power of such a construction, we understand that some experienced aeronauts view it with great suspicion, and greatly prefer the old system of vertical gores. The wicker car was fitted up with marvellous ingenuity, and attached by a ring to a cord net thrown over the balloon. A cap of varnished silk on the top of the

FIG. 1.—The top of the balloon, showing the joinings of the pieces.

[1] "Andrée and his Balloon." By Henri Lachambre and Alexis Machuron. With coloured frontispiece and 44 full-page illustrations from photographs. Pp. 306. (Westminster: Archibald Constable and Co., 1898.)

balloon protected the net from snow. Andrée's plan was to keep the balloon within a few hundred feet of the ground by the use of heavy guide-ropes dragging over the ice or through the sea, a device which serves as an automatic regulator of height.

The erection of the balloon-shed, gas-generators, and the inflation of the balloon in the far north of Spitsbergen formed a very neat piece of engineering, of which the Paris firm and their Swedish colleagues may well be proud. We may recall the facts of the departure. The balloon glided through the demolished north side of its shed at 2.30 p.m. on Sunday, July 11, 1897, and slowly swept northwards across the bay and over the low hills on the horizon. The last authentic pigeon-message received runs: "July 13. 12.30 p.m. 82° 2′ N. lat., 15° 5′ E. long. Good journey E. 10° S. All well on board. This is the third pigeon-post.—ANDRÉE."

Beyond this all is conjecture; but before adopting pessimistic views as to the fate of Andrée, Strindberg and Fraenkel, we should remember how few believed in July 1896 that the *Fram* would ever return. There is still hope for the crew of the *Ornen*.

HUGH ROBERT MILL.

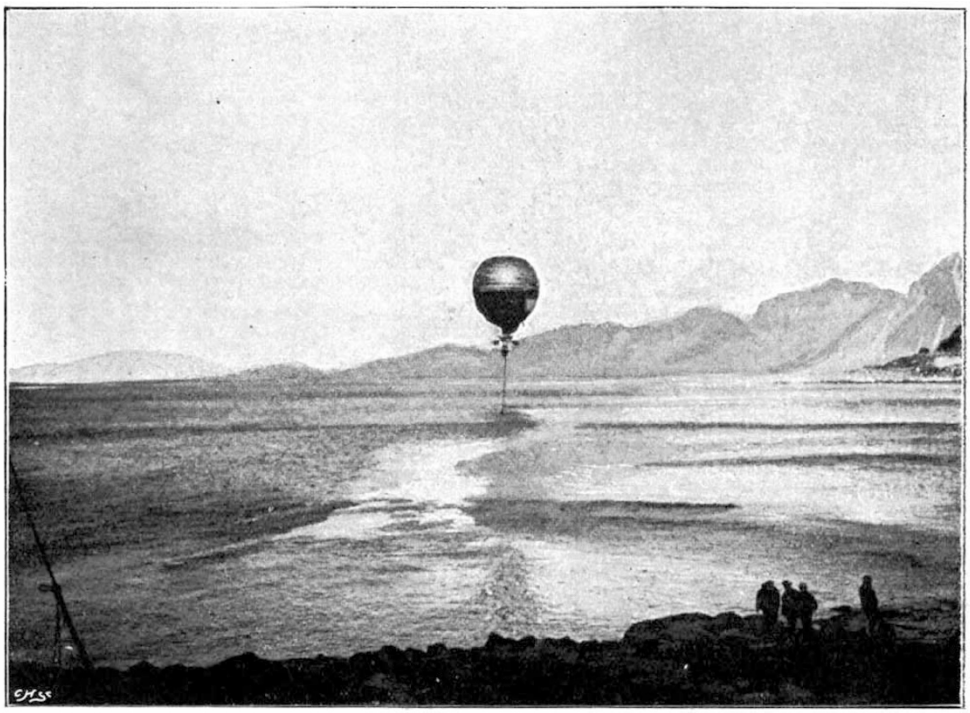

FIG. 2.—The balloon on its departure, showing guide-ropes.

THE BENEKE PRIZES.

THE Philosophical Faculty of the Georg-Augusts-University of Göttingen has just published the following information concerning the Beneke prizes for the years 1897 and 1901. On March 11, 1898, the birthday of Carl Gustav Beneke the founder of this prize, it was announced that no communication had been sent in for the prize competition for the year 1897. At the same time the Philosophical Faculty set the following problem for the year 1901.

The principle of continuity, or more exactly the representation by functions which can be indefinitely differentiated, has for a long time been regarded as a general valid foundation for the mathematical treatment of natural phenomena. Such a groundwork as this was quite naturally introduced by the discoverers of the differential and integral calculus. More recently, however, the progress of mathematical investigation has shown generally that this is founded on a great number of implicit suppositions to which we, in consequence of the inaccuracies of our sensitive perceptions, are not bound. Further, the assumption of the molecular constitution of matter is from the first in contradiction with well-known laws.

The Faculty wishes to receive a work of real scientific interest in which such questions will be treated in a general intelligent way, and in which a minute examination will be made regarding the admissibilty in relation to the appropriateness of the usual mode of representation. Communications may be mathematically or philosophically and psychologically inclined, and historical studies are desired but not demanded.

Papers competing for this prize must be written in a modern language, and will be received by the Dekan of the Philosophical Faculty up to August 31, 1900. A motto should be written on the title-page of the work and on the outside of a sealed letter which must accompany it, containing the name, profession, and address of the sender. In no other way can the name of the author be communicated. It is further requested that the address of the sender should be also written on the title-page, in case the prize should not be awarded to it. The first prize amounts to 3400 marks, and the second to 680 marks.

The prizes will be awarded on March 11, 1901, at a meeting of the Philosophical Faculty in Göttingen. The communications to which prizes are awarded remain the property of the authors. The prize problems, for which the competitive papers must be sent in by August 31, 1898, and August 31, 1899, will be found given in the *Königlichen Gesellschaft der Wissenschaften Geschäftl. Mittheilungen*, 1896, S. 69, 1897, Heft. 1, S. 26.