Thus at Karang Sago, where was situated the Dutch eclipse party, Dr. W. van Bemmelen, assistant director of the Batavia Magnetic Observatory, observed the changes in the magnetic declination and in horizontal intensity, and he reports the occurrence of "an extremely interesting magnetic effect." He has courteously sent me an extract of his observations, made during several days before and on the day of the eclipse, and there certainly appears evidence of a magnetic effect in both elements different from that observed on the days prior to the eclipse.

At Sawah Loento, the site of the Massachusetts Institute of Technology party of Boston, the variations in magnetic declination were observed by Mr. G. L. Hosmer on May 17 and 18. Comparing the two days' results for the interval of the eclipse, there is indisputable proof that something different occurred on the day of the eclipse than on the day before. Namely, at this station, situated so close to the magnetic equator, the range of the diurnal variation of the magnetic declination is about one minute of arc. The magnetic effect during the time of the eclipse was of about the same amount, so that a steady *decrease* of east declination resulted during the time of day when, normally, there is a steady *increase*.

There was but one magnetic observatory directly within the belt, viz. the one at Mauritius, and this was situated not far from the place of beginning of the eclipse. No special magnetic observations were made at this place, however, but regular photographic curves giving the variations in the magnetic elements were obtained. The declination and the vertical intensity curves apparently do not show any disturbance that could easily be picked out and referred to the eclipse. Regarding the horizontal intensity curve—the more sensitive one—Mr. Claxton states "that the original curve shows slight tremors between 7.15 and 7.50, and occasionally between 8.5 and 9.0 a.m." I have plotted this intensity curve on a larger scale, and find that the curve shows no very marked disturbance that might be readily referred to the eclipse, with the exception of one producing an easily perceptible bulge in the curve amounting to about 3–4 units in the fifth decimal C.G.S. units and lasting about 30 minutes. Anyway the effect, if there be one, is very minute, and will not be so readily separated from the usual diurnal variation as in the case of the two previous stations. Whether this is due to the fact that owing to the vicinity of Mauritius to the beginning of the eclipse the minute eclipse magnetic storm did not have time to develop itself or was just in the embryonic state cannot be said.

The magnetic effect observed at Karang Sago and at Sawah Loento does not appear to have extended very far outside the belt of totality, it being scarcely appreciable at the Batavia magnetic observatory.

My grateful and appreciative acknowledgments are due to all who have participated in this interesting investigation—one, to my mind, of fundamental importance to the theory of the diurnal variation of the earth's magnetism as elaborated by Schuster and von Bezold.

L. A. BAUER.

U.S. Coast and Geodetic Survey, Washington, D.C.,
December 30, 1901.

The Roots of the Equation $u = \tan u$.

IN many treatises on optics it is stated that the roots of the equation, $u = \tan u$, were calculated by Schwerd. Verdet ("Oeuvres," t. v. p. 266), says:—"These roots have been calculated by Schwerd, who arrived at the following values: $u_1/\pi = 1{\cdot}4303$, $u_2/\pi = 2{\cdot}4590$, . . . " up to u_7/π. Preston ("Light," p. 255, second edition) says:—"The values of u corresponding to the maximum values of the illumination have been given by Schwerd as follows:—" The values given are precisely the same as Verdet's. Rayleigh ("Encyc. Brit.," vol. xxiv. p. 430, art., Wave Theory) gives a method for calculating the roots of the equation, and remarks that they were obtained in another manner by Schwerd. (There is a misprint in Rayleigh's value for u_4). Other references might be added.

Will someone kindly indicate where Schwerd gives the results referred to?

In his "Beugungserscheinungen" he shows that the roots of the equation are approximately the values of $(2n+1)\pi/2$, obtained by giving integral values to n; and he remarks (in § 63, p. 28) that for values $n=1$, and $n=2$, the true values of u differ by 12°·5 and 7°·5 from $3\pi/2$ and $5\pi/2$, respectively. In table i., at the end of the book, he gives values of the expression for the intensity, $\sin^2 u/u^2$, for values of u increasing by 15°; and at the foot of the table he states that the first and second maxima are at 257°·5 (*i.e.* 270° − 12°·5) and 442°·5 (*i.e.* 450° − 7°·5). Further details I have not found.

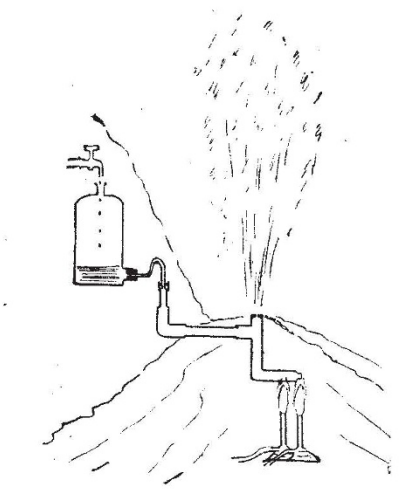
It may be remarked that the roots of the equation under consideration were given long before Schwerd's time. In Euler's "Introductio in Analysin Infinitorum" (Lausanne 1748) the question is fully discussed. See t. ii., cap. xx., prob. ix.

C. A. CHANT.

University of Toronto, December 27, 1901.

A Model Geyser.

IF the following working model, which was the outcome of a good many trials, is in any way original it may prove of interest, as it works automatically and with excellent effect as a geyser of regular period, suitable for a lecture table. The figure needs but little description. A small aspirator with a bent glass tube exit acts as an intermittent syphon. The water is discharged into a half-inch iron pipe, the long horizontal limb of which measures some 13 centimetres. The glass syphon tube slips through a rubber ring at the top of the pipe (gauge fitting), or a cork would doubtless answer the purpose. The lower closed end of the tube is heated by the equivalent of about four ordinary Bunsen burners, and should be placed as shown, as if placed



under the exit, steam is generated too fast and the water may be blown back into the aspirator. Water drips into the aspirator at such a rate that the syphon discharges about 300 c.c. of water once in every ten minutes. A jet of steam some six feet high and water some two feet high results, with many appropriate gurglings. The diameter of the exit is about 6 millimetres. Of course the apparatus is concealed; a large circular tin canister to which the iron pipe is screwed forms a good foundation and serves to keep the water off the burners. Furnace clinker, which is not wholly unsuitable, forms a readily obtainable material for completing the external features of the geyser.

Felsted, January. A. E. MUNBY.

Birds Capturing Butterflies in Flight.

WITH reference to Mr. Latter's letter in NATURE of November 16, 1899 (vol. lxi. p. 55), which has been brought to my notice, I would say that the supposition that birds do not attack butterflies in flight is not strictly correct.

The common King Crow (*Dicrurus ater*, I believe) invariably captures butterflies on the wing; I have seen these birds scores of times do this. Their usual prey seems to be a small deep yellow butterfly with black on the tip of the wings, but I have occasionally seen other butterflies so captured by them.

India, December 18, 1901. A. E. MCKAY.