making a brief exposure. In this way each plate contains its own data for orientation. The author thinks that the somewhat large discrepancies between this method and that by meridian circle observations is due to the jarring of the plate by stopping and starting the clock. Its value as an independent method, however, is recognized.

THE SOLAR ECLIPSE OF MAY 28, 1900.

THE committee appointed at the recent conference of astronomers and astrophysicists to consider the observations to be made at this eclipse has issued a circular letter asking for opinions as to the observations deemed advisable and what cooperation our American astronomers can render. The eclipse path extends from the Gulf coast to the Atlantic, but the duration of totality is short, only 1^m 13^s near New Orleans and 1^m 40^s near Norfolk, Va., according to the circular. The figures given by the circular of the English Nautical Almanac are a few seconds larger than these, 1^m $17^s.8$ west of New Orleans, and 1^m $45^s.6$ south of Cape Henry, Va. Some excellent points of observation may be found in Portugal and Spain, where the totality will range from 1^m 34^s to 1^m 19^s. European astronomers are likely to locate at this end of the line. American observers should cover thoroughly the path through the United States, which includes many places readily accessible. The U. S. Weather Bureau has issued a second bulletin upon the probable weather to be expected. This is based upon special reports made in May, 1898, the former report including those of 1897. A third report for 1899 is promised. The conclusion thus far is that the most unfavorable weather is to be expected on the Gulf and Atlantic coasts, and that the most favorable locations are in the northern parts of Georgia and Alabama, upon the southern end of the Appalachian Mountains.

WINSLOW UPTON.

PROVIDENCE, R. I., March 15, 1899.

NOTES ON PHYSICS.

THE EFFECT OF COMMUTATION ON THE FIELD OF DYNAMOS AND MOTORS.

MESSRS. EVERETT AND PEAKE, in a paper on 'The Effect of Commutation on the Field of Dynamos and Motors' in the London *Electrician* of December 30, 1898, find, by means of an exploring coil and instantaneous contact maker, that the effect of commutation is to produce somewhat regularly recurring ripples in the curve connecting E. M. F. and position of the exploring coil, the maximum of the ripples occurring at intervals equal to the width of a coil, decreasing in magnitude as the distance from the commutated coil increases and nearly disappearing before the interpolar gap is passed. These ripples were found to be more marked with narrow than with wide brushes, which is explained by the damping effect of the adjacent short-circuited coils acting as secondaries to each other. The ripples are also more marked for heavy than for light currents and for motors than for dynamos.

TELEGRAPHY AND MAGNETIC INDUCTION.

S. EVERSHED, in an article on 'Telegraphy by Magnetic Induction' in the same journal, deduces a formula for the mechanical energy available in a distant secondary circuit in which no capacity is used, in terms of dimensions, resistance, frequency, etc., and from this calculates that in the case of two circuits using together 1,000 kgm. of wire, each 1,000 meters square and 10 kilometers apart, with a frequency of 100 and 100 watts in the primary, there would be available in the secondary .34 ergs. per second. Experiment shows that 2.9×10^{-6} amp. gives easily readable Morse signals in an ordinary telephone, this being double the audible current (this presumably for a frequency of 400). He then finds that in the above case, but with frequency equal to 400, there is 12×10^{-6} amp., and that hence the readable signals could be produced with 250 kgm. of copper. For satisfactory audible signals the frequency must be at least as high as 400, and here the undetermined effect of absorption of these waves by the material of the earth comes in. If this proves serious it may be necessary to use lower frequencies and other forms of receivers. A receiver is described consisting of a tuned rectangle of wire, vibrating in a strong field, or, better, two rectangles vibrating synchronously, but in opposite directions. Such instruments are being used at Lavernock and Flat Holm as

relays to close call-bell circuits. They are of iridio-platinum wire, 3 mils diameter and 2 by 4 cm. dimensions; they have a frequency of 16 per second, and with a clearance of 2 mils .001 erg. per second is required to bring them into contact. This can be used at a distance of 10 kilometers with $\frac{1}{3}$ ton of copper and would be little affected by the absorption; it has not, however, been adapted to the transmission of Morse signals. The power used by the telephone is more than 600 times the power used by the rectangle in this case. F. C. C.

THE BEQUESTS OF THE LATE PROFESSOR MARSH.

THE will of the late Professor Marsh leaves his entire estate to Yale University, with the exception of $10,000 to the National Academy of Sciences. Its provisions are as follows: 1. The library which he had collected is to be placed in the Yale library, and all duplicates are to be given to the library of the Peabody Museum. 2. His home and the land surrounding it, nearly three acres on Prospect Hill, is given to the University to be used exclusively as a botanical garden 'and for no other purpose.' The garden is to be under the custody of a regularly appointed curator at a salary of $2,000. The house is either to be used as the residence of the curator or as a botanical laboratory, as his executors may see fit. In case the corporation does not wish to accept the house and grounds for this purpose Professor Marsh orders that they be sold and the proceeds added to the residuary estate. 3. His executors are ordered to sell all his pictures, paintings, furniture, bric-à-brac, silver and Oriental collections, the proceeds to be turned over to the University. 4. The gift is made to the University of a collection of 2,000 orchids and of all of his greenhouse plants. If not needed by the University these may be sold for the benefit of the estate. 5. The bequest is made of all of his scientific collections in paleontology, geology, zoology and archæology, to be kept in Peabody Museum. 6. He gives to the National Academy of Sciences of Washington $10,000 as a trust fund, 'the income to be used and expended for promoting original research in the natural sciences.' 7. The sum of $30,000 which, by the terms of the will of George Peabody, Professor Marsh was authorized to dispose of in his will, is left to the corporation of Yale 'to be expended by the trustees of Peabody Museum in preparing for publication and publishing the results of my explorations in the West.' 8. All the rest, residue and remainder of the property and estate real and personal, is given to Yale University to be used and expended by it for 'promoting original research in the natural sciences.'

The value of Professor Marsh's estate is said to be about $100,000, but may not prove to be as much. It will be remembered that somewhat more than a year ago Professor Marsh gave his extremely valuable collections in paleontology and other sciences to the University. It is estimated that these were secured at a cost of about $250,000. The Peabody Museum was given by Mr. George Peabody, Professor Marsh's uncle, through his influence. It should also be remembered that Professor Marsh never accepted any salary from Yale University.

SCIENTIFIC NOTES AND NEWS.

THE first Hodgkins gold medal given by the Smithsonian Institution has been conferred on Professor James Dewar, F.R.S., for his work on the liquefaction of air.

PROFESSOR HELMERT, of Berlin, has been elected a foreign correspondent of the Paris Academy of Sciences for the Section of Geography and Navigation. In the same section Père Colin, founder and director of the observatory at Tananarivo, Madagascar, was elected a corresponding member.

THE Paris Academy of Medicine has awarded its Lecaze prize (10,000 fr.) to Dr. Widal for his serum method of diagnosing typhoid fever.

IT is proposed, says the London *Times*, that a portrait of the late Dr. John Hopkinson should be placed in the Hopkinson Memorial Wing of the Engineering Laboratory at Cambridge University, the cost to be defrayed by subscription. A chimney piece which Mrs. Hopkinson has presented for use in one of the principal rooms contains a panel in which such a portrait could appropriately be placed. Mr. T. B. Kennington, who painted a portrait of Dr. Hopkinson some years ago, has suggested that instead of simply