

perpetual motion. That there are forces in nature which can and do produce it, is a matter of daily, yearly, and secular experience. If I am a perpetual-motionist in this sense, I am in good company. You will find that Sir W. Thomson, in the *Philosophical Magazine* for February 1854, described a machine by which a steam-engine or water-wheel could produce thirty-five times the heat commonly considered as equivalent to the force used; or the corresponding amount of cold. At that time, then, two years after his paper read to the British Association (to which you refer me), he certainly did not hold such an opinion with regard to the mechanical equivalent of heat as to exclude the possibility of such an engine.

The final judgment of the question I confidently leave to time and facts. When any of the "grand founders of a rapidly progressive science" can spare time from their investigations to refute my fallacies, I shall gladly retract them. H. HIGHTON

#### The Spectrum of the Aurora

In the sketch appended to my letter on this subject in last week's *NATURE*, I notice that the engraver has made the line at 4·1 much too sharp and definite in both spectra. It really shades off rapidly to the more refrangible side, at least in the spectrum of the vacuum tube, and possibly also in that of the aurora. Though much the brightest line in the auroral spectrum, it is not the most conspicuous in that of the tube, but the relative brightness of lines frequently varies much at different temperatures. The band at 8 in the auroral spectrum is also represented too narrow. Those who have practical experience with the spectroscope will appreciate the great difficulty of representing faint spectra correctly in a woodcut.

HENRY R. PROCTER

#### Science Teaching for the People

THE subject of Science Teaching in our elementary schools having been ably brought forward by Mr. Henry Ullyett in a recent number of your Journal, and the scientific instruction under the Science and Art Department, South Kensington, having been at various times the subject of consideration in it, I venture to ask for a short space in your columns in order to submit the following proposition for the consideration of your readers, many of whom, have, probably, special opportunities of coming to a correct judgment on the point. The question I wish solved is this: Is the spread of scientific education, under the auspices of the Science and Art Department, likely to be best promoted by the whole of the Department's assistance to any one town being dispensed by a single committee, by whom a central school shall be provided, of which all other schools established, or that may be established, in various districts of the town, shall be considered only as branches, and be subject to the control of the central committee, on whose books the names of all students would be borne, and through the one secretary of which all the returns and other communications to and from the Department would have to pass?

Is it not better that the schools established in various districts of a town, say in connection with each elementary school, should each have their separate organisation of committee and secretary, at least in so far as the teachers connected with each are different? In this town, in common with a great many others, the latter plan has been the rule, but a suggestion has now been made that all these committees should be amalgamated, together with those of the art-classes also, the plea being that it might lead to the erection of a central building for the purposes of an art and science school.

Now, however necessary for art it is that there should be a central building for the provision of higher instruction than can be given in the night classes, I cannot see that there is anything in the study of science that demands greater facilities than can easily be provided by any district school, and the possession of which is indeed required by the Science Directory before any science school receives the approval of the Department.

Why, then, the science committees should be asked to unite in this town alone, by which a most dangerous precedent would be established, I cannot understand, for I do not believe that such a course would be beneficial to the town at large, while it would be very prejudicial to the interests of the existing district schools, and of any persons wishing to commence teaching in future.

Perhaps some of your readers will favour us with their views on the question I have stated, which I venture to think involves a principle of very general interest to the science schools of the kingdom.

A MEMBER OF A SCIENCE COMMITTEE

#### A Rare Moth

It may be interesting to know that the rare and beautiful moth, *Psephenophila Galii*, appeared somewhat plentifully in the neighbourhood of Derby during the past summer. I have in my possession a fine male and female which were captured at Long Eaton, some few miles from Nottingham, whilst flying in company over a bed of geraniums. Is not this the first recorded instance of their appearance in this locality? *Zenzera Esculi* also appeared in unusual abundance in the same garden, upwards of fifty specimens being taken by one person. W. H. G.

#### Measurement of Mass

WILL you allow me a few words in explanation of a sentence in my last letter, which has strangely been misunderstood by Prof. Everett. In defending the system which makes the standard pound a unit of force on the ground that although not the most philosophical, it simplifies the conception of mass which is always difficult for beginners, I said, "The assumption of a hypothetical force of gravity not dependent on latitude, seems to stand on the same footing as the employment of a mean solar day," meaning, of course, that just as we assume (for convenience) that a solar day is the same length at whatever period of the year we take it, so we may assume a mean force of gravity (the actual force of gravity in latitude 45°) which is the same all over the earth. Such an assumption will enable us to explain the unfamiliar notion of mass by the familiar one of weight, and when it does become necessary to take into account the variation in the force of gravity at different points of the earth's surface, the correction is easily made.

Prof. Everett seems to think that I suppose that the average length of the apparent solar day is not the same at all places on the earth. Will you allow me to quote the following passage from the original in support of my first assertion, that Prof. Everett's tacit assumption that everybody knows what mass is, is less likely to lead to clear ideas than the explanation given by Deschanel. He says—"Un corps a une masse plus grande qu'un autre lorsque la même force lui imprime une vitesse plus petite, et réciproquement, . . . si nous considérons en particulier le poids d'un corps, on aura, entre ce poids, la masse et l'accélération de la pesanteur, la relation fondamentale,

$$P = Mg$$

Cette formule nous montre que dans le même lieu le poids est proportionnel à la masse, parce que  $g$  a la même valeur pour tous les corps. Il n'en est pas de même quand on passe d'un lieu à un autre; mais comme après toutes les variations sont extrêmement petites, en réalité la masse et le poids sont deux quantités toujours sensiblement dans le même rapport. Toutefois il faut se rappeler que ces deux expressions correspondent à des notions distinctes, et, abstraction faite de toute évaluation numérique, la masse d'un corps est quelque chose qui lui est propre et qui est indépendant du poids. La pesanteur n'existerait pas qu'il n'en serait pas moins vrai qu'une sphère de plomb a une masse plus grande qu'une sphère de liège de même diamètre. Nous reconnaissons ce fait ordinairement à ce que la poids de la première sphère est plus grande que celui de la seconde; mais à défaut de la pesanteur, l'emploi de toute autre force pourrait nous conduire au même résultat." W. M. W.

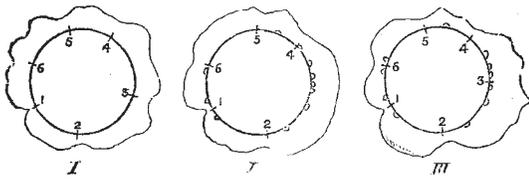
#### PHOTOGRAPHS OF THE ECLIPSE

PERMIT me to call your attention to the position of the woodcut illustrating my remarks on the Eclipse Photographs. The south point is where the north should be. As what I have now to say refers to the picture I shall feel obliged if you will permit its reinsertion in its true position.\* With reference to the power of the light of the Corona, I used the word *actinic*, not *active* as printed.

The readers of *NATURE* may perhaps be glad of the opportunity to compare for themselves tracings of the American and of my own photographs, which I now give in outline in illustration of remarks in your second article

\* This vexing mistake was due to a blunder of the printer in reversing the block after it had been placed on the machine. Its re-insertion this week will rectify the mistake.—E.

on the Eclipse Expedition. In Mr. Lockyer's article it is stated:—"Now at Syracuse Mr. Brothers also photographed rifts, three rifts, but the sketches did not record a single one;" forgetting, evidently, that at Syracuse no



I From Prof. Watson's Drawing.

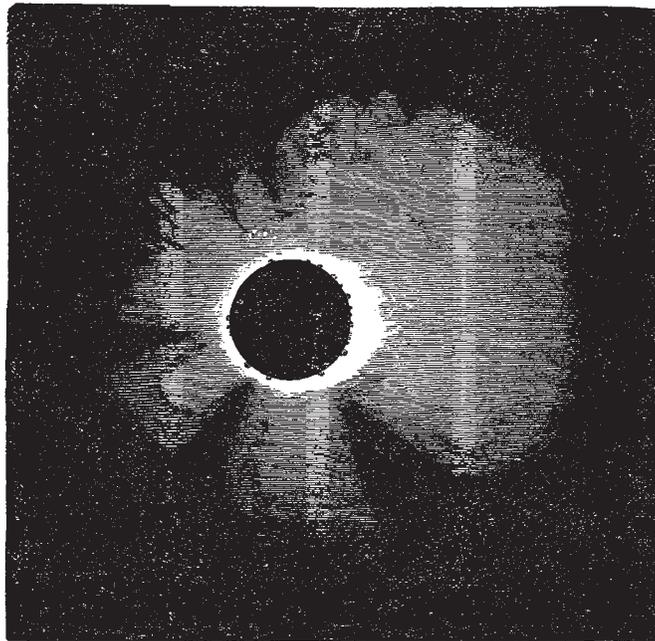
II From American Photo. taken at Cadiz.

III From Photograph taken at Syracuse.

attempt was made to sketch the Corona either by our own party or the Americans. At Agosta Mr. Brett was stationed, but as the Eclipse was only visible there for about *five seconds*, of course in that time no artist could pretend to make a drawing. It happens, however, that

Prof. Watson was at Carlentini, and being favoured with a clear sky he succeeded in making a very careful drawing, which I had the good fortune to see and compare with my photograph No. 5 a few days after the Eclipse. An outline of this drawing I now give, so that it may be compared with the photographs made in Spain and at Syracuse.

There are two or three points which must be considered in comparing drawings and photographs. The photographs will differ according as they are made with a camera or telescope, and the drawings will differ according as they are made with the aid of a telescope or without. With the telescope the field of view is limited, and the eye is naturally attracted chiefly by the intense light of the red prominences and the corona near the moon's limit. Naked-eye drawings ought to be as valuable as photographs, but I doubt if any two artists will ever be found to make sketches agreeing in every particular. On photography must we depend for settling doubtful points of this nature, and it seems to me in this case to be absolutely settled that three rifts are identical. The outline sketches speak



THE LATE ECLIPSE, AS PHOTOGRAPHED AT SYRACUSE

for themselves. A pair of compasses applied to the points for need by lines drawn from the moon's centre to the centres of the depressions (or rifts) in the corona, will show whether or not the places of the three gaps are the same.

It may be said that Lord Lindsay's photographs taken five miles from the station occupied by the American observers in Spain, do not show the rifts. This, I think, must be accounted for by the presence of cloud. The cloud may have been so thin as to be quite invisible in the feeble light of the Eclipse, but yet sufficient to prevent the photographic delineation of the rifts. Three of my photographs were taken through cloud, and they show us traces of rifts. The fifth plate shows three distinctly, and less plainly five or six others.

Professor Watson's drawing shows two gaps corresponding with 1 and 6 in both photographs, and depression in the corona agreeing very closely indeed with my picture.

This evidence seems to me to be absolutely irresistible as to the identity of the great rifts in the corona.

In explanation of the way the outline drawings have

been made, I may say that the points marked from 1 to 6 have been pricked through the photographs, Professor Watson's drawing having been reduced to the same scale as the photographs, and pricked off in the same manner.

A. BROTHERS

#### EXPEDITION OF THE "DUQUESNE"

M. RICHARD, master in the Royal Navy, directed the Expedition, and is now attached to the Lille aeronautic station for the Department of the North. I have interrogated him and elicited from him the following details, which can without inconvenience be placed before the eyes of the general public. The French Republican Government having in view the promotion of general knowledge, as well as the defence of the national integrity, did not object to any communication which is not directly connected with warfare.

The aërostat, "Le Duquesne," was despatched from Paris on January 9, at three o'clock in the morning, before a large attendance, among them some members of the French Institute. The