all calculations of dimensions depend, and therefore it will be valuable as an introduction to works concerned with special practical applications of the rules described and exemplified. Moreover, it should play a useful part in schools, by illustrating the concrete applications of abstract geometrical principles. The large number of original examples will be found of great assistance by teachers, and the questions, selected from papers set by the principal examining bodies, will prove of service as tests of the students' capabilities in working out mensuration problems.

Of a less detailed character is the Rev. Dawson Clarke's primer, intended "for the use of schools, and Woolwich, Sandhurst, and Home Civil Service candidates." The book is a collection of rules and formulæ, with examples to explain their use, and numerous exercises selected from various examination papers. It particularly appeals to students who learn the rules of mensuration in order to utilise their knowledge in the examination-rooms of the Civil Service Commissioners; but it is, also, a concise text-book which other students will find serviceable.

Physical Measurements. By Frank C. Weedon. Pp. 232. (London: G. Gill and Sons, 1895.)

THIS volume is another help towards the establishment of rational methods of instruction in elementary science. It is a laboratory manual of practical physics for organised science schools under the Department of Science and Art, and other secondary schools. Of the educational value of the course contained in the book, there can be no doubt; for the experiments (which are of a character suited to beginners) follow a natural order, and are such as will develop the faculties of observation, investigation, and common sense; in fact, they will lead the student to think as well as learn. The book is divided into three sections, dealing respectively with measuring and weighing, relative densities, and experimental mechanics. Experiments on these matters elucidate the fundamental principles which form the basis of a scientific education. The knowledge cannot be labelled "Sound, Light and Heat," or "Magnetism and Electricity," and therefore superficial critics, and syllabus-bound teachers, think it is not Physics. We are of the opinion, however, that experimental work in measuring and weighing, constitutes the foundations of physics. The student who is able to weigh and measure carefully, and to observe and think accurately, knows more of the realities of physical investigation than if he had spent a dozen years in learning scraps of information about other people's contributions to knowledge.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The New Actinic Rays.

A BRIEF account of some experiments which I have been making in my laboratory at Blythswood, in connection with the new photographic rays, may, I hope, be of interest to the readers of NATURE.

Three or four years ago I constructed a very powerful Wimshurst electrical machine. It has 128 plates, three feet in diameter, and is driven by an electric motor of about 1½ horse-power. With this machine, which was specially built for quantity, I can obtain a torrent of sparks a foot and a half or two feet long: and it occurred to me to try to obtain photographs, after the manner of Röntgen, but without the intervention of a vacuum tube.

A thick sheet of lead was placed upright between the poles of the electric machine, as a screen, and was connected to the ground, the two poles being insulated. A sensitive dry plate was put into the camera dark slide, with a metallic object to be photographed (a steel washer with holes in it), and this was connected, by a wire which passed out of the dark slide, to the ground. The whole was wrapped up in four folds of a black velvet focussing cloth, and was put, in some cases between the negative pole and the lead screen, and in other cases between the positive pole and the lead screen, the plane of the slide being perpendicular to the line of discharge. In all cases good strong negatives were obtained with exposures of about twenty minutes. The machine was arranged to give a silent brush discharge during the experiments.

I next tried similar experiments with the dark slide containing the sensitive plate quite out of the line of discharge, and with the plane of the plate parallel to the line of discharge, and obtained equally good results. It seems, therefore, that the vacuum tube is not essential to the production of the Röntgen rays. With reference to this, however, I am not so sure, as I think I may have been deceived by using isochromatic plates—at all events I am engaged in further experiments either to confirm or the contrary. BLYTHSWOOD.

Blythswood, Renfrew, February 10.

WITH reference to Mr. Porter's letter regarding the amount of electric energy and exposure required for obtaining photographs by the Röntgen method, I may mention that against his photograph taken with a 3-inch coil and four minutes' exposure, I can instance a successful human foot that shows the bones very distinctly almost up to the ankle-joint, in taking which I used a 10-inch coil working at about half power without Leyden jars, and for which fifty-five seconds' exposure proved ample.

For living physiological subjects, it is very important to shorten the exposure as much as possible, and to attain a minimum in this respect, very high vacua and considerable E.M.F. are requisite.

Again, for an extensive subject, a large tube placed at a considerable distance from the subject is required, and more electric energy is needed for this than for a small subject, for which a smaller tube in closer proximity will suffice.

66 Victoria Street, S.W. A. A. C. SWINTON.

HAVING made some experiments on the lines laid down by Mr. Gifford, of Chard, I think the two enclosed photographs will prove of interest, as showing perhaps that Mr. Gifford's method of dispensing with a Crookes' tube introduces elements of another character. Both these negatives were taken without a tube, using the discharge from the terminal of a small Tesla transformer. In each case a metal plate was placed behind the film in communication with the other terminal of the coil. Under these conditions a stream of "discharge" passes from one terminal through the photographic film.

The interesting point is that not only does the outline of the coin come out, but also the impression. And that in the case of the florin the coin was placed *behind* the film. The same sparking appearance as described by Mr. Gifford is evident.

From the fact that it is immaterial on which side of the photographic film the coin is placed, it is evident, I think, that we have here to do with a "contact" phenomenon, and not with Röntgen's rays at all. SYDNEY D. ROWLAND.

38 Wimpole Street, W., February 2.

"The Astronomical Theory of the Glacial Period."

As it was my two letters which initiated the interesting and not unfruitful discussion now going on in your pages on the above subject, I think it right to say a few words in reply.

The object of my letters was to point out (perhaps I did it in somewhat too heated language) that Sir Robert Ball, whose personal and official distinction give his words exceptional weight, had in his work entitled "The Cause of an Ice Age" given fresh currency to a discredited theory, and further that when this had been pointed out, he had refused to take any notice of his critics, and continued to publish his book.

In his letter to you, Sir R. Ball (if I do not misunderstand him) entirely breaks away from the position maintained in his book, and gives up the case there argued, definitely and completely. While Prof. Darwin, who had given the book the advantage of his friendly recommendation and countenance, tells us he is now reluctantly compelled to take the other side.