"wonders of the deep," in the shape of a square wooden box with a glass bottom, which on being set on the water and looked through, obviated the surface ripple, and permitted a clear view into the coral caverns, some of which, by the way, were of great beauty, natural aquarium tanks, hoary with mosses and sea-blooms, floored with coral sand and shells, and tenanted by curious fishes of the most brilliant and varied hues.

The huge rounded bosses of green growing coral among which the surf-breaks resembled much the moss-covered granite-boulders of a boggy Scotch glen. Here we found banks and beds of the coral sand where it is formed at our very hands.

The scales and half scales were here in a most perfect state, and seemed to make up almost the entire mass of sand. It was easy now to see the principal source of coral sand—at least at Santa Cruz—and that what is seen on the beach is merely what is found out here in a more finely divided state.

Over all the reef about us, growing plentifully, was the living weed which supplies these scales—the vegetable tissue covering the calcareous interior being of a dull-green like the living coral itself. I procured a specimen of the growing weed, and also of the sand from these beds where it is first formed and from the beach; but unfortunately I have lost these. I can only send you some of the dried skeleton, and append a rough sketch of it for the benefit of readers. JOHN MUNRO

West Croydon

Floating Radiometers

IN Mr. Crookes' paper reported in NATURE, vol. xiii. p. 489, occur the following words: "The envelope turned very slowly a few degrees in one direction, then stopped and turned a few degrees the opposite way." Assuming that this is rightly reported, it is inexplicable to me how Mr. Crookes could have written it. For, as the lawyers say, it is "void from ambiguity." The whole question between Mr. Crookes and Dr. Schuster appears to me to turn on the one point ignored by the former. When the rotation of the envelope began, in which direction was the first oscillation? To say that the envelope first turned in one direction and then in the other is simply to say that it oscillated, which, while it is a shorter mode of expressing the same thing, is an equally useless expression. The very nerve of the problem lies in the point omitted. If the first oscillation of the envelope was in the direction opposite to that of the mill, it is surely incontestable that the kick, which caused it, could not be the effect of any external force acting on the discs only.

Valentines, Ilford C. M. INGLEBY

Preece and Sivewright's "Telegraphy"

IT is neither usual nor becoming for authors to question the judgment of a reviewer in dealing with their works, and although I think that in your number (vol. xiii. p. 441) you have treated the little work by Mr. Preece and myself with some severity, I do not propose to depart from this wholesome rule. Nevertheless, I think it but right to point out that the reason why the scientific part of the subject was so far left out was because this had been already dealt with in another work of the same series. Prof. Fleeming Jenkin's text-book on "Electricity and Magnetism" had appeared before that on "Telegraphy" was undertaken. In the former "the part of science" had been so ably treated that it became unnecessary and would have been out of place to go over the same ground in a practical text-book which was to appear in the same series. J. SIVEWRIGHT

On the Nature of Musical Pipes having a Propulsive Mode of Action

IN the concluding paragraph of my last paper (NATURE, vol. xii., p. 146), I brought under notice the remarkable difference in the effect of increased diameter upon the two great classes of pipes, regarded by me as referable to the fact of the mass of air in the pipe being in the one class (that of pipes with reeds of wood or metal) under the influence of a propulsive current, and in the other class (that of pipes with reeds of air, or flue-pipes), under the influence of an abstracting current; the distinction thus manifested on the mode of action will, if clearly apprehended, enable us to reconcile many apparent anomalies in the behaviour of pipes perplexing to inquirers.

Considering a current simply as flowing, that is to say without the energy which the word propulsive implies, the nature of a tube or conduit is to cause friction between the walls of the tube and the particles of the substance flowing through the tube whether of air or of water. The friction of air upon air is also a calculable effect. In organ-pipes of the class now in question we have to recognise that we are dealing primarily with a current, with a true transport of air through a tube, a current propelled, abruptly arrested, and in a secondary stage converted into vibration; therefore all the conclusions arrived at concerning the propagation of waves of vibration in tubes are suggestively applicable here, and in practice we find these conclusions verified.

As regards ordinary tubes or conduits, Seebeck, following Regnault and Kundt, has shown (NATURE, vol. i. p. 456) that the effect of friction in retarding the velocity of a wave *in propagation* is not so insignificant as might be supposed; it is greatest upon those of tones of highest pitch, and it increases according as the diameters of the tubes are less. In musical pipes of the propulsive class exactly the same relations are preserved, and if two pipes of different diameters give the same pitch-note, then the pipe of larger diameter will prove to be of greater length, in fact the opposite of the law obtaining in pipes of the abstracting class. In a narrow pipe the friction is in excess, with an increased diameter the current gains greater freedom, and coincidently, that inner motion vibration is less impeded. Pipes of this class, for brevity here called propulsive in action, the trumpets, posaunes, bassoons, oboes, have this characteristic that the whole of the wind used passes through the body of the pipe and makes its exit at the upper orifice. In flue-pipes on the contrary the amount of wind actually passing up the interior of the pipe is scarcely noticeable. The form of trumpets and the like is conical, but the oboe has a special feature, its tube is very slender, slightly enlarging upward, until at the top it suddenly expands into a terminal shape called a bell. An actual comparison will afford the clearest illustration of the effect of form.

Two pipes of the standard pitch 256 vibrations per second:—

TRUMPET.
Sounding Mid C.

Diameter at root of reed	$\frac{3}{8}$ in.
Diameter at upper orifice...	3 ,,
Length from tip of reed	$23\frac{3}{8}$,,

OBOE.
Sounding Mid C.

Diameter at root of reed	$\frac{3}{8}$ in.
Diameter at upper orifice...	$\frac{3}{4}$,,
Length from tip of reed	$21\frac{1}{4}$,, (including bell)

The oboe bell is not ordinarily reckoned in the effective length, yet it is not altogether to be disregarded; from its juncture at the tube and up to the rim 3 inches, with diameter expanding from $\frac{3}{4}$ to $1\frac{1}{2}$ inches. The influence of narrow bore will be best exhibited by comparing with these the orchestral oboe where the bore commences at $\frac{3}{16}$ and the note C is given by that portion without the bell, and which will measure from the finger hole to the tip of the reed only $19\frac{1}{2}$ inches. In the Chinese organ, or "Little Shang," which, when in proper condition is most perfect in relation of tube to pitch, the pipe sounding C octave above oboe measures $9\frac{3}{8}$ in length, including the beak, and the bore of the tube is barely $\frac{1}{4}$ inch, being cylindrical, not conical. The reed tongue is so very small that a larger bore would be disproportionate, the column of air seems well suited to the strength of the reed, the pitch does not quite accord with our organ or our concert pitch, but that will not affect the argument. What I am anxious to point out is that these varying relations of pipes result from a natural standard, which underlies all empirical changes. The true standard for all instruments of the propulsive