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.]

A Shower of Sand-eels.

ABOUT 3 o'clock on the afternoon of Saturday, August 24 last, the allotment-holders of a small area in Hendon, a southern suburb of Sunderland, were sheltering in their sheds during a heavy thunder-shower, when they observed that small fish were being rained to the ground. The fish were precipitated on three adjoining roads and on the allotment-gardens enclosed by the roads; the rain swept them from the roads into the gutters and from the roofs of the sheds into the spouts.

The phenomenon was recorded in the local newspapers, the fish being described as "sile." I was away at the time, but, seeing the account, I wrote to Dr. Harrison, and thanks to him, and especially to Mr. H. S. Wallace, I obtained a sample of the fish, and I was able yesterday (September 5) to visit the place in the company of the latter gentleman.

From those who saw the occurrence we derived full information, which left no doubt as to the genuineness of what had been stated, and this we were able to put to the test, for a further sample was obtained from a rain-barrel which could have got its supply only from the spout of the shed to which it was connected. The precipitation of the fish, we were told, lasted about ten minutes, and the area involved Commercial Road, Canon Cocker Street, the portion of Ashley Street lying between these streets, and the adjoining gardens. The area measured approximately 60 yards by 30 yards, and was thus about one-third of an acre. It is not easy to say how many fish fell, but from the accounts it may be gathered they were numerous; there were apparently several hundreds.

There can be no question, therefore, that at the time stated a large number of small fish were showered over about one-third of an acre during a heavy rain accompanied by thunder; we were informed that no lightning was observed, and that the wind was variable.

All the examples which came into my hands from different parts of the ground and from the rain-barrel prove to be the lesser sand-eel (*Ammodytes tobianus*). They all, moreover, are about 3 in. in length, or 7.5 cm. to 7.9 cm. They are not "sile," a name usually given to the very small young of the herring. But the sand-eels are sea-fish, and it is evident that the sand-eels showered to the ground at Hendon were derived from the sea.

On sandy beaches around our coasts the lesser sand-eel is very common. As its name implies, it burrows into the sand, but in the bays it may often be seen not far from the surface swimming about in immense shoals—shoals which are characterised by the members being all about the same size.

The place where the sand-eels in question were deposited lies about one-quarter of a mile from the seashore, but it is probable that the minimum distance of transport was at least half a mile.

The only explanation which appears to satisfy the conditions, therefore, is that a shoal of sand-eels was drawn up by a waterspout which formed in the bay to the south-east of Sunderland, and was carried by an easterly breeze to Hendon, where the fish were released and deposited. It is significant that the area of deposition was so restricted, and that no other area

was affected. The origin and the deposition were therefore local.

We were informed that the fish were all dead, and, indeed, stiff and hard, when picked up immediately after the occurrence. This serves to detract from the possibilities of distribution being influenced by such an occurrence, but it is possible that other species would be able to withstand such an aerial method of dispersion. It is more than probable that the vortical movement of a waterspout would transport plankton. This was naturally not observed in this case, and the small creatures, including eggs and young stages, would likely be carried over a wider area.

A. MEEK.

Dove Marine Laboratory, Cullercoats,
September 4.

THE WATER-POWERS OF THE BRITISH EMPIRE.

FOR a number of years NATURE has been, on the subject of water-power in Great Britain, a *vox clamantis*. It has pointed out that while other countries—notably the United States, France, Italy, Switzerland, and even Canada—have possessed hydrographic services, there has been no co-ordinated effort—indeed, one might almost say, no effort of any kind—in this country to procure the information essential to the determination of its water-power resources and their extent and availability. It is true that a merely superficial review is sufficient to show that those resources cannot possibly vie with the vast stores of power locked up in the Alps, the Pyrenees, and the Rockies. Neither, in consequence of the plenitude of our coalfields, has there hitherto been any occasion to trouble in the least about additional, or alternative, sources of power supply. But the war, or rather its unexpected protraction, has of late completely changed the national outlook. The reckless prodigality with which our stores of solid fuel have hitherto been depleted can no longer be countenanced, and the certainty of ultimate exhaustion has to be faced before increasing scarcity causes prices to mount to unremunerative heights. The nation is learning economy, not only in food and clothing, but also in regard to its natural resources and mineral endowments. A salutary experience has been gained, and, though somewhat late in the day, it is satisfactory to know that the position is at last beginning to be fully realised and appreciated.

The Water-Power Committee of the Conjoint Board of Scientific Societies in their preliminary report, which was abridged in NATURE of September 5, p. 16, has taken a wide and comprehensive view of its functions. The committee has, the report states, "endeavoured to collect all the available relevant information" respecting the amount and distribution of water-power in the British Empire. Turning over the twenty-eight pages of the report, it must be affirmed that the information thus forthcoming is lamentably scant and imperfect. Throughout the length and breadth of the Empire two countries only—Canada and New Zealand—have recognised the fundamental importance of systematic investigation. Initiatory efforts on a small scale have, indeed, been made

in Tasmania, New South Wales, and South Africa, but as regards the rest of the Empire there is an entire lack of data upon which to form any trustworthy estimate whatever. No wonder that the committee confesses to a feeling of disappointment and concern.

A very commendable effort was made, in January last, by Mr. A. Newlands, a member of the committee, to direct public attention to the matter, and the statistics which he then put forward in a paper read before the Royal Society of Arts, though admittedly incomplete, serve the useful purpose of furnishing a basis for preliminary estimates in regard to the United Kingdom. As the information was summarised in *NATURE* of May 9, there is no occasion to dilate upon it here. The committee's comment is that "while the possible water-powers of the United Kingdom are comparatively small, yet, occurring as they do at no great distance from industrial regions, they are relatively valuable, and every effort should be made by close investigation to ascertain their commercial value at an early date."

The outstanding fact, however, about natural supplies of water-power is that their efficient and economic development depends upon the acquisition of extensive data, involving prolonged and laborious observation. It is not sufficient to take a few gauge readings, or to record variations in level over several months, or a year or two. If the investigation is to be of real practical value it must extend over a long series of years. And herein lies the difficulty of dealing, instantaneously, with a situation which by long neglect has been allowed to become acute. Not until hydrometric studies have completely determined the range of conditions from maximum flood to minimum flow can the design of headworks be safely taken in hand. So, even if observations be commenced to-morrow, a lengthy interval of time, as things are reckoned in these rapid days, must elapse before they are complete enough for action to be taken on them.

In these circumstances it is obvious that where the outcome is at all problematical, or the commercial advantages not strikingly attractive, there will be a reluctance on the part of private individuals to undertake the necessary research work. Scientific bodies, however willing to assist, are certainly not equipped with funds for the purpose. It is natural, therefore, to look to the State to finance such undertakings, the more so as the water-powers, when defined and available, should be exploited, not for individual or merely local benefit, but for the advantage of the whole community.

The committee's report advocates the principle of State initiative. It recommends that the British Government should bring to the notice of the Indian and Dominion Governments the necessity for a systematic investigation of all reasonably promising sources of water-power, and where such an inquiry would be beyond the capabilities of any governing body, the report recommends that it be dealt with by an Imperial Water-Power Board, the constitution of which should be of a widely repre-

sentative character. Finally, it suggests that "since it is unlikely that private capital will be available for many years for hydraulic development on any large scale, powers should be obtained for the State to assist or to undertake such development if thought advisable."

These are the main conclusions of the report, with the general trend of which we venture to think public sentiment and technical opinion will entirely concur. It now remains to be seen whether any action on the part of the Government will follow. Continued neglect of the matter can only be attended by consequences not merely inimical to immediate national interests, but also economically prejudicial to the welfare of succeeding generations. BRYSSON CUNNINGHAM.

PHYSICAL AND CHEMICAL CONSTANTS.¹

THE valuable publication before us makes one realise that the country is waking up, if slowly. It is very significant that only in the fourth year of the war a Government Department should be sufficiently alive and receptive to agree to issue a book of constants such as this, bearing as it does on a problem indissolubly bound up with the future of the race.

Both Germany and ourselves have been giving the closest attention to the commercial development of the various processes for the fixation of nitrogen. It was well known that Germany was ahead of us, and the Munitions Inventions Research Laboratory accordingly concentrated on the problem. Its staff soon realised that a detailed compilation of the physical and chemical constants involved was a virtual necessity. Hence the present publication, which is to be regarded as a first instalment of constants compiled by Dr. Todd and his colleagues under the direction of Dr. J. A. Harker, F.R.S., whose name is a guarantee, were one needed, of the soundness of the physics and chemistry of the publication before us, and for which we have nothing but praise.

Considerable skill has obviously been exercised in employing the material to the fullest advantage, more especially in those cases where a scrutiny of the literature served only to show that the data available were meagre. Careful acknowledgment is paid to the several well-known existing books of constants, happily now no longer confined to the German tongue.

But the present work is not to be regarded as a mere compilation of constants. It is a good deal more than that. There are many points in it of considerable technical importance which are very fully discussed, to which the attention of the practical man interested in such problems should be directed.

Half the book is divided into graphs, very clearly executed on a scale sufficiently generous to permit of their accurate and rapid use. In many of these virtually the full area of the page (11 in. by 8 in.) is employed.

¹ "Physical and Chemical Data of Nitrogen Compounds." Pp. 96. Ministry of Munitions, Munitions Inventions Department, Nitrogen Products Committee.