attraction—and in one other fact, which is this. It is absolutely impossible to prove that *any stroke at all* would have occurred at the house if the attractive conductor had not been present. Granted, we (opponents) say, that your conductor, if in good order, *may* be the means of averting the terrific force of the explosion from the non-conducting materials of the building when once the stroke has been developed, we nevertheless prefer that our houses should receive *no stroke at all*. We infinitely prefer to run the extremely unlikely chance of ever being visited by a lightning-stroke to the practice of deliberately inviting such a stroke to our houses, and of trusting to the excellence of the rod-manufacturer's arrangements to avert any portion of its effects from the inmates and the structure.

Holding, then, as we do, that the principle of the lightning-rod, *quâ* its necessary exposure of additional elevated metal on a building, is vicious, and that nothing of a beneficial nature due to the preventive power of its point (if it have one) can obliterate this dangerous tendency, the undoubted disadvantages of the system, due to the defects in practice that habitually accompany the employment of rods, appear to be minor points. But the reviewer's reasoning on this branch of the subject is worthy of remark. He says (p. 52): "The failures incident upon defective work—as all unbiased and properly-trained thinkers are aware—are amongst the weightiest of the arguments that tell in favour of the employment of conductors." This sentence is wholly beyond my own reasoning power. Because (*cæteris paribus*) an apparatus is liable to failure on account of being defectively constructed, *therefore* it should be employed! He goes on to say:—"In a very large majority of the cases in which accidents have occurred to buildings which have been furnished with lightning-conductors the mischief has actually been traced by competent inquiry to some easily recognised fault or deficiency of construction." Allowing that even in *all* cases in which these disasters had occurred this statement were true, what does it show? Why, simply the very cheap sort of perception known as *wisdom after the event*. The manner in which, after the blow has happened, ingenious excuses are constantly made for the unfortunate conductors, which previous to the event had never been found fault with, is to the opponents of rods one of the most amusing and least edifying circumstances that environ the use of these instruments. But I would now venture to submit a few statistics derived from researches specially made by me during the last five years in regard to strokes and accidents in connection with lightning-rods. Up to date I have collected the fullest details of 320 well-authenticated cases. In 204 of these, or 64 *per cent.*, injuries either to rods, constructions, or persons, occurred. In 151 cases, or 47 *per cent.*, there were injuries either to constructions or to persons. Out of these 151 incidents, 71 contain in their records no allegations as to the existence of faults, either in the rod or in its "earth," until *after the event*, and the remaining 80 furnish no record of such faults being found *either before or after the event*. And indeed the whole of the results of my researches afford evidence (and especially in regard to the "earths" of rods) that failures and accidents more frequently happen with rods in what is deemed good order, than with those considered after the event to have been in bad order.

The reviewer in his enthusiastic advocacy of lightning-rods advises his followers not to be content with single, or even a few, rods on their houses, but to cover them with "a broadly-cast net of metallic meshes and lines." And he concludes with the following sentence:—"The free and frequent use of the testing galvanometer is the natural consummation of the beneficent work which was initiated by Franklin 130 years ago. Without this instrument the lightning-conductor is a hopeful and very generally helpful expedient. But with the galvanometer it is now assuredly competent to take rank as a *never-failing protection*." These *dicta* aptly conform with the reviewer's tactics in respect of the practical question of the *cost* of lightning-conductors. Here again, as in the case of the preventive power of points, he never mentions the subject. He seems to think that persons of common sense are capable of throwing "a broadly-cast net of metallic meshes and lines" of the purest copper over their houses, and of entertaining at frequent intervals the services of electrical testers to attend to these meshes and lines, without first counting the cost. He is perhaps unaware that (according to Sir William Thomson) the Glasgow manufacturers think it cheaper to insure their factories rather than to employ lightning-rods. But surely in regard to the statement that the use of the galvanometer makes the lightning-conductor a "never-failing protection," there is some little obscurity in the premises and conclusions. It is well known that rod advocates recommend the use of the galvanometer principally in order to test the resistance of the rod's "earth." If this resistance should prove to be above a certain standard, they say that the rod is not only useless, but dangerous. How is the mere fact of the *knowledge* that a rod is useless, or that its earth-resistance is too great, a "never-failing protection"? And what remedial measures can possibly obviate the dryness of the ground? One might as well say that the services of a physician who, having tested his patient's state of health, should tell him that he was in a bad way, and should then dismiss him, constituted a "never-failing protection." In the case of the rod the only protective feature appears to me to lie in the probability that most persons who were also "unbiased and properly-trained thinkers," on being informed that the galvanometer had demonstrated their rods to have a too great "earth" resistance, would immediately pull them down. But obviously this is hardly the reviewer's meaning.

ARTHUR PARNELL

53, Fulham Park Gardens, November 17

Government Scientific Books

SHORTLY after the commencement of the publication of the "Scientific Results of the Voyage of H.M.S. *Challenger*" by the Government, the late Mr. T. C. Cobbold, M.P. for Ipswich, inquired in the House of Commons whether, inasmuch as this expedition was undertaken with the nation's money for national scientific purposes, a copy of the volumes as published would not be presented to the public libraries supported by public rates, &c. The Government reply was that the expense of supplying the work gratis to such libraries in the different towns throughout the country would be too large.

I should like to ask whether it would have cost anything like the 87,500*l.* which the Government has recently paid for only two pictures from the Blenheim collection, and whether the ratepayers throughout the country have not a far greater right to be supplied (through their libraries) with the opportunity of seeing and studying the results of their own scientific expeditions than the remote opportunity of seeing these two 87,500*l.* paintings at Kensington.

I see by your advertisement that the tenth volume, at 50*s.*, of the "*Challenger* Reports" is just published. What chance have thousands like myself of ever seeing them. Our public museum library cannot afford to purchase them, though I have little doubt but that our town, with its 50,000 inhabitants, has more than paid for a copy of the Reports in its share towards the expense of the Expedition and the publications resulting therefrom.

As a country ratepayer I must protest against this centralisation of all the great works in art and the benefits and results of scientific expeditions in London. Some of your correspondents have complained that such *national publications* are not supplied to great national libraries abroad, but how is it that even we who have had to pay for them cannot ever get a sight of the results of such interesting and important national scientific expeditions. "Cannot afford it" is the Government reply, but how then can they afford 87,500*l.* for two paintings for the national galleries? I do not grudge the expenditure of the people's money for the latter, only when set off against the "cannot afford" for the former.

W. BUDDEN

Ipswich, November 18

P.S.—I have the two volumes of Sir C. W. Thomson's "Voyage of the *Challenger*," but they have only tended to create a greater desire to see the complete "Government Reports," a wish, alas, which, from the expenditure of the 87,500*l.* for pictures by the Government, is further off than ever.

Peculiar Ice Forms

ABSENCE from town prevented me from seeing NATURE of November 6, in which there is a letter (p. 5) signed B. Woodd Smith with the above heading.

Possibly Mr. Smith's very ingenious explanation of the cause of the columnar form of the shallow stratum of ice he so well describes may be the correct one; yet perhaps I may be permitted to offer a very different solution of the difficulty connected with this very curious ice formation.

I have frequently noticed, both on lakes having deep water