LETTERS TO THE EDITOR.

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Electrical Method of Extracting Soot from Air in Flues.

ABOUT two years ago I observed that a body positively electrified to 100 volts became covered with soot in a day, while a negatively charged body remained comparatively clean.

I have reason to believe that the observation was first made by Lord Kelvin many years ago, but it does not seem to be well known.

Our laboratory mechanic, Mr. Black, has recently applied this to cleaning air by inserting in an air-flue a sheet of wire gauze connected to the positive 250-volt supply.

The electrified wire gauze is very efficient in extracting the soot from the air, and the method provides a simple means of cleaning the air supplied to large buildings in towns where the air is laden with soot.

GEORGE W. WALKER.

Physical Laboratory, The University, Glasgow, April 16.

Paradoxes and Principles.

YOUR critic has written his notice of my "Paradoxes of Nature and Science" (NATURE, February 7, p. 341) without giving reasonable care to the examination of the book, and has in consequence made a damaging statement as to fact which is so extravagantly untrue that it goes far beyond the limits of fair comment.

He says that I neglect general principles in the explanation of paradoxes, and tells me how they ought to be explained, "... by showing that the abnormal phenomena are determined by precisely the same laws as the normal phenomena; to 'explain' why a balloon rises it is necessary to propound the general principles of gravitational mechanics and to show that it rises for the same reason as a stone falls. But Dr. Hampson eschews general principles."

This is grossly untrue. My book teems with statements of and references to general principles "propounded" in explanation of paradoxes, exactly on the system recommended to me. I have not undertaken to explain the rising of balloons—a thing not regarded by me or my acquaintances as paradoxical—but I have explained **why** water stands in an inverted tumbler, and have done it exactly on the lines prescribed by your critic; propounding, p. 85, the general principle of fluid pressure, "gases, like liquids, are fluids, and transmit pressure equally in all directions. The air, then, transmits in all directions the pressure due to its own weight, and it thus presses upwards beneath ...," and, pp. 92, 197, the general principle of gravitational attraction:—"The ordinary meaning of the word 'weight' is an earthward-tending force which can be used as a measure of the quantity of material. It depends upon the mutual attraction between the material and the earth." "... the force ... must vary inversely as the square of the distance in correct agreement with the law of gravitation."

A few of the many other references to general principles invoked in explanation of paradoxes are as follows:—

P. 19, "Heat makes things expand."

P. 29, "It is a general law of nature that a moving body tends to keep moving straight on at the same speed."

P. 32, "... resists ... by virtue of the great law of inertia, the strong tendency possessed by all moving things to resist interference with their motion."

P. 33, "Like all other things, it tries hard to keep to its original direction of movement."

P. 78, "A fluid, when pressed upon, transmits the full pressure equally in all directions."

P. 93, "... its tendency at any moment is, in accordance with this law of inertia, to go straight on."

P. 97, "... the centrifugal force increases in proportion to the square of the velocity."

P. 116, "The general principle that weights, in descending, cannot produce more power than they consume in being raised the same height."

P. 118, "All things with which we are acquainted have some heat."

P. 149, "The principle that it requires heat energy to convert water into vapour ..."

P. 154, "Gases and vapours are very poor conductors of heat."

P. 170, "The sudden expansion and conversion into vapour require much heat."

P. 179, "The great law of the conservation of energy ..."

P. 212, "The doctrine that no element could by any means be changed into anything else."

P. 211, The persistence of matter, stated in sixteen lines.

If your critic does not intend to maintain the nonsensical proposition that a book for popular reading by the uninitiated should bristle with quantitative formulæ, how can he say that in writing the above and many dozens of similar passages I eschew general principles? Is this his "idea of scientific method"?

His criticism, as a guess, was, of course, not unlikely to be true of a book for such readers as I had in view. But when a critic has not time to read the book entrusted to him for judgment, would it not be fairer to the journal and to the author if he excused himself from the task of preparing a notice?

Of the value of his criticisms as to style and method, which it would take pages to discuss, I leave your readers to judge by the circumstance that the one statement capable of being definitely tested by a few quotations shows such complete carelessness about facts as to render the critic, if not malicious, certainly incompetent.

February 11. W. HAMPSON.

A SCIENTIFIC "principle" is a proposition assumed to be true universally, which is made the basis of deductions. I said that Dr. Hampson "eschewed general principles" in the sense that he does not expound these propositions or make them the basis of his "explanations."

In refutation of this statement Dr. Hampson quotes one paragraph and fourteen short sentences. (The *unquoted* reference to p. 211 is not evidence.) Presumably he considers these passages as convincing as any that he can find; certainly none could be more conclusive of the justice of my criticism. For of the fourteen sentences nine do not deal with principles at all; some of them state non-universal experimental generalisations, others particular cases of general theorems, of which no proof is offered. In the remaining five, two "principles" are mentioned, of which one, the conservation of energy, is merely named, but is nowhere propounded; the other "principle" is Newton's first law of motion.

In order to justify my contention decisively, it is really only necessary to point out (1) that for the last twenty years Newton's laws of motion have not been accepted as adequate principles of mechanics, and (2) that none of the attempts at stating the first of those laws is successful. However, I will make every possible concession and admit, for the sake of argument, that Newton's laws are "principles," and that Dr. Hampson has stated one of them. But then, where are the others? It is impossible to found mechanics on the first law alone. It is just because Dr. Hampson has neglected the second law, which introduces the conception of "force" and all its consequents, that his writings abound in confusion. Thus, in his longer quotation, which he holds up as a model of exposition, he has left the imagination of the reader to divine the nature and effects of "pressure" and "force"; it so happens that in this case the ambiguity is not serious, but elsewhere it is extremely serious. It is appalling to think in what mazes he would have entangled himself if he had not been so discreet (but inconsistent) as to omit Pascal's famous hydrostatic paradox from his list.

I repeat, then, that Dr. Hampson has attempted to explain the results of science without enunciating its principles. With fifteen quotations at his disposal he can produce no better evidence against that judgment than four inaccurate statements of a single antiquated principle which was never regarded as a sufficient foundation for even one of the many branches of physics with which he deals! THE REVIEWER.