

employed to express. . . . The lines of force of the static condition of electricity are present in all cases of induction. . . . No condition of quality or polarity has as yet been discovered in the line of static electric force, nor has any relation of time been established in respect of it." "No relation of time to the lines of magnetic force has as yet been discovered" (*Ibid.*, 3253).

Finally, on pp. 439 and 440 of "Experimental Researches" (vol. iii. edition of 1855), he gives in detail, too long for quotation here, his views of the different phenomena, which, it seems to me, fully support the position I have taken in this matter.

NELSON W. PERRY.

Cincinnati, O., Feb. 17.

Supposed Aboriginal Fish-Weirs in Naaman's Creek, near Claymont, Del.

IF the substituted letter of Mr. Hilborne T. Cresson to the *American Antiquarian*, published in your issue of Feb. 14, had ever been printed before, certainly I should not have received the impression that Mr. Cresson once fancied he had discovered the remains of pile-dwellings at Naaman's Creek, on the Delaware. The differences between the two versions are very striking to whoever takes the trouble of comparing them. I never before understood that Mr. Cresson regarded the version of his letter published in the *Antiquarian* in November, 1887, as "an atrociously garbled version" of it. I supposed he only complained of certain bad mistakes in the proof-reading, such as the substitution of "cave" for "cove," etc. Mr. Cresson's memory has played him false in regard to what he wrote to me when he kindly forwarded to me a selection of the objects discovered at the three "stations." On referring to the notes that accompanied the specimens, I find that he calls them "pile-structures." The fact is, that I supposed Mr. Cresson had changed his mind in regard to what these structures actually were; and as I had formed the opinion upon first reading what he had printed respecting them, that they were merely remains of Indian fish-weirs, I simply made that statement. I found nothing in what Professor Putnam had stated in the "Reports of the Peabody Museum" (vol. iv. p. 44) in regard to Mr. Cresson's discoveries to give me any different impression. Mr. Cresson's letter to me, to which he refers, containing the request that I should adopt his corrected views, came too late, as I wrote to him, because my manuscript was already in the printer's hands. That I should have drawn such inferences about Mr. Cresson's opinions does not seem to me so "inexplicable" as it does to him.

HENRY W. HAYNES.

Boston, Feb. 16.

MR. H. T. CRESSON, in his letter published in *Science*, Feb. 14, seems to want to get away from his own assertion, and so takes the opportunity to abuse the editor of the *American Antiquarian*. If you will allow me to quote the very words which he used in his letter, and which were published in the *Antiquarian* exactly as they were written, without any change whatever, your readers will see what his position was in the year 1887, though he seems to have changed his opinion since that time. The words are as follows:—

"The results so far seem to indicate that the ends of the piles embedded in the mud, judging from the implements and other *débris* scattered around them, once supported *shelters of early man that were erected a few feet above the water*—the upper portions of the *piles* having disappeared in the long lapse of time that must have ensued since they were placed there—(the flats are covered by four and one-half feet of water on the flood tide; on the ebb the marsh is dry and covered with slimy ooze several feet in depth, varying in different places). Three different *dwellings* have been located, all that exist in the flats referred to after a careful examination within the last four years of nearly every inch of ground carefully laid off and examined in sections.

"The implements found in *two* of 'the supposed *river dwelling sites*' are very rude in type, and generally made of dense argillite, not unlike the palæoliths found by my friend Dr. C. C. Abbott in the Trenton gravels.

"The character of the implements from the other or third supposed *river dwelling* on the Delaware marshes are better finished objects made of argillite, indicating a greater antiquity than ordinary surface found Indian relics. At this *pile dwelling* a human tooth has been found and fragments of a jaw bone, ends of scapulæ, etc. It is my intention later on to present my specimens to the Peabody Museum of Ethnology and Archæology at Cambridge, Mass."

The above is a quotation from the letter published in the *American Antiquarian* in 1887. Mr. Cresson desires the readers of *Science* to compare the two letters. In order that they may do so, I quote a part of the letter which appeared in *Science*, Feb. 14 (see p. 116, near the bottom of the page). It is as follows:—

"The results, so far (1877), seem to indicate that the ends of piles embedded in the mud, judging from the implements and other *débris* scattered around them, had once served as supports to structures intended for *fish-weirs*, these in all probability projecting a few feet above the water, and were no doubt interlaced with wattles, or vines, to more readily bar the passage of fish from the creek into the river. The upper portion of these *wooden structures* has entirely disappeared in the long lapse of time that has ensued since they were placed there. . . . At slack water it forms a low mud-bank slanting toward the creek. Three different *stations* were located, probably all that exist, in the bed of the creek referred to. This opinion is based upon careful examinations, made within the past four years, of nearly every inch of ground in the neighborhood of the wooden stake-ends, by dredging in sections between certain points marked upon the creek's bank. The implements found in one of the *stations* are generally made of argillite, with a few of quartz and quartzite. Some were very rude in character, and not unlike the palæoliths found by Dr. C. C. Abbott in the Trenton gravels. Objects of stone and pottery rather better in finish than those at *station A* have been found at the two other *stations*, B and C."

This is a quotation from *Science*, the sentences being consecutive. The Italics will show the words and clauses which in one letter convey one impression, and in the other letter convey an entirely different impression.

Mr. Cresson charges the editor with putting in the words "shelters of early man that were erected a few feet above the water," "three different dwellings," "two of the supposed river dwelling sites," "The character of the implements from the other or third supposed river dwelling on the Delaware marshes are better finished objects made of argillite, indicating a greater antiquity than ordinary surface found Indian relics. At this *pile dwelling* a human tooth has been found and fragments of a jaw bone, ends of scapulæ, etc." Now, the editor of the *American Antiquarian* does not pretend to be ingenious enough to fabricate such sentences, and interpolate them into a letter. It is beyond the skill of an ordinary man to interpolate remarks of that kind. If these words are not contained in the copy which Mr. Cresson says he kept, why did not Mr. Cresson change the wording, or request that it should be corrected, in the two years that have elapsed? Professor Haynes quoted from the *American Antiquarian*, supposing that Mr. Cresson's own words were to be relied upon. The statement went into "The Critical and Narrative History" on the strength of Mr. Cresson's own words. The editor of the *Antiquarian* at the time said nothing about the "find." If Mr. Cresson wishes to withdraw from the position taken, he is at liberty to do so, but he should not charge the editor of the *Antiquarian* with "garbling" or changing his letter, unless he can prove it.

Mendon, Ill., Feb. 18.

STEPHEN D. PEET.

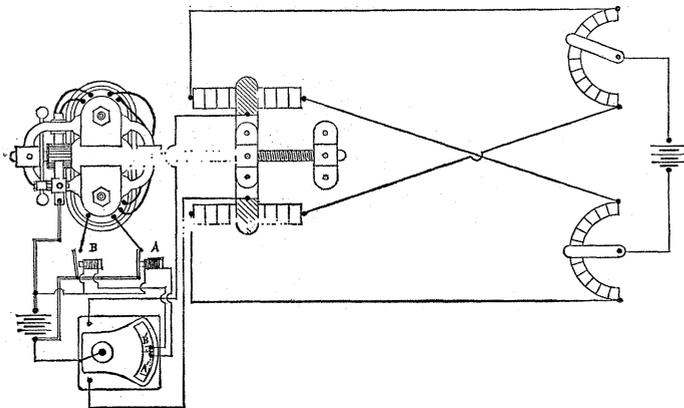
The Fiske Range-Finder.

I WAS much interested in the description of the Fiske range-finder, which appeared in *Science* on Jan. 24. There is much credit due Lieut. Bradley A. Fiske for the ingenious manner in which he has applied a most beautiful electrical combination to a practical purpose, and there is no doubt that its range of usefulness will extend beyond the realms of gunnery practice.

While reading the article, an idea came into my mind, which may also have occurred to Lieut. Fiske, and been rejected as im-

practical; yet I think I will speak of it, as I see no reason why it could not be applied with success, and still further increase the effectiveness of the range-finder. The object is to make the range-finder self-recording, to automatically adjust the balance, and to avoid the need of a third operator. The method is extremely simple. First, the "slider" is provided with a nut through which a spindle revolves, the spindle being the continuation of a small motor-shaft. The fields are wound with two coils in such a manner, that, when the circuit is closed through one, the motor revolves in a particular direction, and, when closed through the other, in the opposite direction; moving the slider backward or forward, as the conditions might require, to establish the balance. The motor is fed from one cell of storage or other battery, at about two volts potential.

The operating mechanism is equally simple. Two small magnets, *A* and *B*, are connected to the same cell that supplies the motor, and the return wire of each terminates in a drop of mercury, *A'* and *B'*, located each side of the galvanometer-needle, so that the least movement to one side or the other will cause contact with the globule of mercury. The circuit thus being closed through the needle to the other pole of the battery, the



corresponding magnet becomes energized, attracting the armature, which closes the corresponding circuit of the motor. The object of the magnets *A* and *B* is to reduce the sparking at *A'* and *B'*, and they might possibly be dispensed with. They were to be wound with considerable resistance, that the current might be so small as to prevent any trouble at *A'* and *B'* by burning or sticking of the contacts.

There are other arrangements whereby the above result might be accomplished, but I send this, as it may be of some interest should this plan of automatically adjusting the balance not have been previously thought of.

J. F. DENISON.

New Haven, Conn., Feb. 15.

Soils and Alkali.

PLEASE grant me the use of your paper to reply to the article by Dr. Stockbridge in your issue of Jan. 17, on soils and alkali. When the bulletin was written, it was thought best to preface it with some general statements about soils. With this end in view, I collected, condensed, and arranged, from the sources at my command, the facts of the first eight pages of the bulletin. There never has been any claim made to originality in these eight pages. The facts were collected simply to make the bulletin more intelligible to the farmers. As far as I knew, I tried to give credit to every one for his work. The domain of science is too large, and human life is too short, to have any one mind even comprehend it. It was explained to Dr. Stockbridge that I did not collect all the material myself, and, if any of the matter was his, due credit would be given him. This should convince any man that I acted in good faith in the matter. He makes some very broad assumptions, that are not warranted in this day, age, and generation: 1st, That he has a patent right on German and other foreign publications, and that no one else has access to them; 2d, That no one else can translate them; 3d, If he translated them, and any one afterwards uses the facts, credit must be

given to Dr. Stockbridge, and not to the author. When I use the facts of Dietrich, Hoffman, Liebenberg, or any other man, and I give him credit, my duty ends then: Dr. Stockbridge has no claim to them, even though he may have translated them.

The statements in the eight pages referred to are commonplace, and are found in any good modern text-book that treats of the subject.

Nitrification is described in great detail in Part II. of the third supplement to Watt's "Dictionary of Chemistry" (p. 1397); also in Bloxam's "Chemistry" (p. 173) and Storer's "Agriculture" (vol. i. p. 298). The word "microbe" ("little life") was first used by Sédillot. The latest investigators are Warrington, Schlösing, and Müntz. The per cent of ash in plants is given in "How Crops Grow," by Johnson (p. 30); "How Crops Feed," by the same author (p. 364); "Chemistry of the Farm," by Warrington (p. 2). "Aschen Analysen Von Landwirtschaftliche Producten," by Wolff, gives 5 per cent of ash. "The Geological Survey of Ohio, 1870," p. 368, the average of 151 analyses, gives 4.84 per cent of ash. It has been thought that the transpiration of plants has been worked out in greater detail than any other subject. Nearly every possible condition has been investigated by some one. The law of transpiration from the upper and lower portions of the leaves has been worked out by Guettard, Unger, and Bonnet. The relation between the number of stomata and the rapidity of transpiration has been experimented upon by Von Höhnel and Garreau; the amount in wet and dry weather, by Moldenhawar; the effects of light and darkness, by Wiesnar and Van Tieghem; how transpiration is influenced by the liquid absorbed, by Sénébiér, Sachs, and Burgerstein; the pressure in the growing plant during transpiration, by Meyen, Sachs, and Von Höhnel; even the effect of the different rays of the sun, by Wiesner; and the age of the leaves, by Höhnel and Dehérain. The amount of water transpired for wheat, barley, oats, beans, red clover, rye, peas, etc., has been determined by Hellriegel, while Sachs, Hofmeister, and Hales have determined the amount transpired from the grape-vine, sunflower, cabbage, etc.

The facts about the fineness or division of soil are stated in Williams's "Applied Geology" (p. 111). In "Chemical Bulletin, No. 10, Department of Agriculture," under the head (p. 10) "The General Fertility of Soils depends Principally on Their Texture," is the following language: "These qualities depend altogether on the state of division of the soil and of its geological origin" (see "Soils of the Farm," by Scott and Morton). When the same statement has been made by so many authors, it is difficult to state positively the source of information; but in two instances I had the references marked.

He quotes me:—

O'BRIEN (p. 9).

The heat comes from three sources: Solar heat, as the sun's rays; heat of chemical decomposition within the soil, and the original heat of the earth's interior. The latter cannot be of any value to plants; the heat of chemical decomposition is not of any value, except in a few special cases. The sun, therefore, remains the only source of heat of practical importance in relation to the production of crops from the soil.

In Dana's "Manual of Geology," 1879, p. 714, this language is found:—

The earth has three prominent sources of heat: (1) The sun; (2) The heat of the earth's interior; (3) Chemical and mechanical action.

In making the application of these facts to plants, what other conclusion could be arrived at?

He quotes me:—

O'BRIEN (p. 4).

Oats, rye and buckwheat thrive with the lowest amount of organic matter, requiring from one to two per cent. Wheat and tobacco seem to require most among the common agricultural products, and do their best upon soils containing from five to eight per cent of organic matter.

The text-book of geology by Geikie, 1885, p. 326, in speaking about the organic matter in soils, says,—

It is the experience of practical agriculturists in Britain that oats, rye, will grow upon a soil with one and one-half per cent of organic matter, but that wheat requires from four to eight per cent.

I added to the statement in the geology, "buckwheat and tobacco;" the one being proverbial for growing on poor soil, and the other for requiring a rich soil. The order of arrangement that I used is found in Loudon's "Encyclopædia of Agriculture," eighth edition.