sands of that division. To whatever division, however, of the Bagshots these beds may be assigned eventually, the occurrence of fossils in them is, I think, worthy of record.

53 Warwick Square, November 25. R. S. HERRIES.

The Ffynnon Beuno and Cae Gwyn Caves.

SINCE writing my note, as published in NATURE of November 3, p. 7, I have paid another visit to the British Museum, and seen a second implement from the Denbighshire caves, presented by Dr. Hicks and Mr. Luxmore. It is a small and highly-finished scraper, exactly agreeing with the Neolithic scrapers of Icklingham and Mildenhall, and with small scrapers found in caves of confessedly very late date. This scraper is quite sufficient to condemn any pre-Glacial theory, and it enables me to emphasize my former remark that the cave contents, instead of belonging to the earliest Palæolithic class, belong to the *very latest*. I do not believe that a similar scraper has ever been found in any *really old, or even moderately old, Palæolithic river gravel*. Such scrapers were only made in the most recent of Palæolithic times.

Mr. G. H. Morton is not justified in his remark (Nov. 10, p. 32) that my former letter afforded "a remarkable instance of rushing into print and giving an opinion on a subject with which the writer was unacquainted," for I have studied the drifts of Wales for twenty years, and during that time I have never failed to make one or two visits a year to Wales. I have also examined nearly every cave in North and South Wales, and handled the shovel and pickaxe myself. From the experience I have obtained during this time, I say the drift in front of the Denbighshire caves is *not in its original position*, but *distinctly and obviously relaid;* and I even doubt whether before it was relaid it was a true Glacial gravel at all.

I will "read up the literature of the subject" if I get time: in the meantime there is no great harm done in expressing an opinion from a study of some of the real objects, even if that opinion is "not worth anything" and "of no consequence," as Mr. Morton concludes. WORTHINGTON G. SMITH.

Meteor.

ON Tuesday night, November 15, a wonderfully fine meteor was seen at Falmouth, and being out star-gazing at the time, I was fortunate enough to see it. I was looking towards that part of the Milky Way between Auriga, Perseus, and Cassiopeia, when suddenly a curved train of light flashed out; but, instead of just going away, it remained visible for quite eight seconds; meanwhile the lower extremity burst into a brilliant mauve "cone" of light, about a quarter the size of the full moon. So bright was it that it lit up the roadway, quite overpowering the lamps.

It was a grand sight, and I sincerely hope other eyes than mine saw it. B. TRUSCOTT.

4 Alma Crescent, Falmouth.

MODERN VIEWS OF ELECTRICITY.[1]

PART III.—MAGNETISM.

V.

WE next proceed to consider electricity in a state of *rotation*. What happens if we make a whirlpool of electricity? Coil up a wire conveying a current, and try. The result is it behaves like a magnet: compass-needles near it are affected, steel put near it gets magnetized, and iron nails or filings get attracted by it—sucked up into it if the current be strong enough. In short, it *is* a magnet. Not of course a permanent one, but a temporary one, lasting as long as the current flows. It is thus suggested that magnetism may perhaps be simply electricity in rotation. Let us work out this idea more fully.

First of all, one may notice that everything that can be done with a permanent magnet can be imitated by a coiled wire conveying a current. (It would not do altogether to make the converse statement.) Float a coil attached to a battery vertically on water, and you have a compass-needle: it sets itself with its axis north and south. Suspend two coils, and they will attract or repel or turn each other round just like two magnets.

As long as one only considers the action of a coil at some distance from itself, there is no need to trouble about the shape of the particular magnet which it most closely simulates; but as soon as one begins to consider the action of a coil on things close to it, it is necessary to specify the shape of the corresponding magnet.

If the coil be a long cylindrical helix like a close-spired corkscrew, as in Fig. 16, it behaves like a cylindrical magnet filling the same space. But if the coil be a short wide hank, like a curtain-ring, it behaves again like a cylindrical magnet, but one so short that it is more easily thought of as a disk. A disk or plate of steel magnetized with one face all north and the other face all south can be cut to imitate any thin hank of wire conveying a current. It will be round if the coil be round, square if it be square, and irregular in outline if the coil be irregular.

There is no need for the coil to have a great number of turns of wire except to increase its power: one is sufficient, and it may be of any shape or size. So when we come to remember that every current of electricity must necessarily flow in a closed circuit, one perceives that *every current of electricity is virtually a coil of more or less fantastic shape*, and accordingly imitates some magnet or other which can be specified. Thus we learn that every current of electricity must exhibit magnetic phenomena: the two are inseparable—a very important truth.

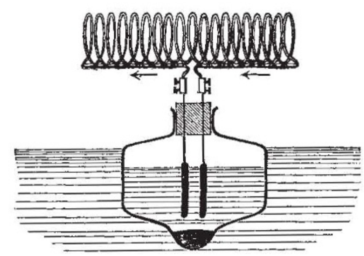

FIG. 16.—Floating battery and helix acting as a compass-needle.

There is one detail in which the magnetized disk and the coil are not equivalent, and the advantage lies on the side of the coil: it has a property beyond that possessed by any ordinary magnet. It has a penetrable interior, which the magnet has not. For space outside both, they simulate each other exactly; for space inside either, they behave differently. The coil can be made to do all that the magnet can do; but the magnet cannot in every respect imitate and replace the coil: else would perpetual motion be an every-day occurrence.

Now I want to illustrate and bring home forcibly the fact that there is something rotatory about magnetism—something in its nature which makes rotation an easy and natural effect to obtain if one goes about it properly. One will not observe this by taking two magnets: one will see it better by taking a current and a magnet, and studying their mutual action.

A magnet involves, as you know, two poles—a north and a south pole—of precisely opposite properties: it may be considered as composed of these two poles for many purposes; and the action of a current on a magnet may be discussed as compounded of its action on each pole separately. Now how does a current act on a magnetic pole? Two currents attract or repel each other; two poles attract or repel each other; but a current and a pole exert a mutual force which is neither attraction nor repulsion: it is a rotatory force. They tend neither to approach nor to recede; they tend to revolve

[1] This Part is an expansion of a lecture delivered at the London Institution on January 5, 1885. Continued from p. 13.