

dom, and it is found that where telephones alone are useless because of the induction of adjacent wires, the instrument acts admirably. The undulatory current produced by sonorous vibrations is so intense that a person speaking about a foot away from a transmitter has been heard ten feet from an ordinary telephone in Manchester thirty-six miles away by wire, and this although the induction from some thirty adjacent wires had to be overcome, and we may add that the intensity of the sound may be largely augmented by employing increased battery power.

Four carbon pencils are nicely centred and loosely held in four blocks of carbon, *abcd*; two opposite blocks, *a* and *c*, are connected in circuit with a battery and the primary wire of an induction-coil. The efficiency of the arrangement is now made complete by having a telephone in the secondary circuit. The carbon blocks are mounted on a thin wooden diaphragm, and consequently are not seen in Fig. 3, which represents one form of the finished instrument.

For some months past an interesting and highly successful operation has been made every Sunday. One of these trans-

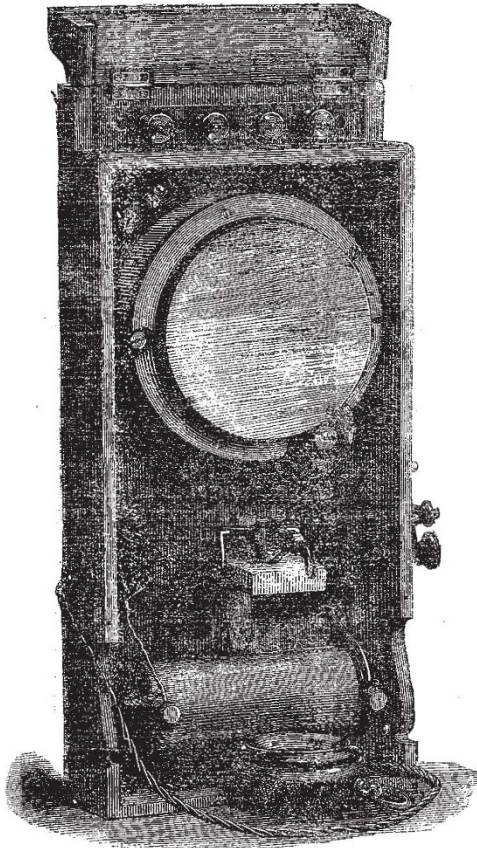


FIG. 3.

mitters is fixed in the pulpit of one of the Halifax places of worship. Its position is not over-favourable, being half hidden so as to escape attention, and thus to some extent its efficiency is interfered with. In the nether regions, where the organ-blowing apparatus is found, a Clamond's thermo-electric pile is placed, and one of the first duties of the sexton on a Sunday morning and evening is to light a gas jet under the pile. In this way a sufficient supply of electricity is obtained to work exceedingly well at a cost of less than 2d. per Sunday in gas consumed. On the outskirts of the town several houses have telephones in the secondary circuit, one of these belonging to an invalided lady, and the service, from the opening voluntary to the parting benediction, is heard plainly by every one. The rendering of the music is especially fine, sounding to the observer, sat at ease in an arm-chair, as if proceeding from a neighbouring room with the door slightly ajar.

WILLIAM ACKROYD

### Colour-Blindness

WHEN your able reviewer Prof. Pole so plainly intimates, in *NATURE*, vol. xx. pp. 477 to 480, that he does not consider any of the theories of colour-blindness he has mentioned to be altogether sufficient for the observed facts, and that he may return to the subject in a future number, I trust he may then take some notice of my views, as honoured by the Royal Society, Edinburgh, in vol. xxviii. of their *Transactions*.

At all events, it is much to be hoped that in his own future descriptions, he will define his colours more accurately than by the naked eye estimations and names of even those who are allowed to possess normal vision. For, as I have shown in the paper above alluded to, there are physical distinctions, amounting to more than the oppositions of black and white, and reacting on colour, between many pigments generally reputed by the world to be all of the same colour to the eye.

To speak therefore of green, or red, or brown is nothing; but it is what green, and what red, and what brown that must be settled, as a preliminary to any further safe observation on the subject.

PIAZZI SMYTH

15, Royal Terrace, Edinburgh, September 19

### The Carving of Valleys

IN the course of a recent visit to Loch Maree, I observed an interesting geological phenomenon in a glen on the east side of the loch, which is traversed in ascending Ben Slioch, from Kinlochewe, and which is called, I understand, Glen Beansdale. This glen, in its lower part at least, follows the line of division between the "fundamental gneiss," which rises in a gradual slope on the north side, and the "Cambrian sandstone," which on the south side forms a fine cliff, terminating at the base in a long steep "débris line." The stream, which is of considerable size, originally ran close to the foot of this cliff until it reached the wide valley which contains the loch; but at some period a large "bergfall" of rocks from the sandstone cliff has dammed up the original bed, and diverted the stream into a new course, diagonally across the gentle slopes of gneiss, which previously formed the north side of the glen. This new course is marked, first, by a small depression or gully in the flow of the glen, and secondly, in the middle of this, by a narrow ravine with vertical sides, just wide enough to contain the stream which foams at the bottom.

There is nothing in itself very remarkable about this diversion of a stream; but the point which gives the case its interest is that an inferior limit can be fixed for the time at which the diversion took place. For, on descending into the secondary depression above mentioned, I was able to trace the glaciation, or planing down by ice of the edges of the gneiss (which was admirably clear on these slopes) right down to the brink of the little ravine containing the stream, thus showing conclusively that the diversion had taken place *before* the glacial period, and so long before that the stream had time to cut a channel sufficient to guide the glacier in its flow, and divert it from the work it would otherwise have accomplished in clearing away the remains of the berg-fall, and re-opening the old river-course. Thus it will be seen that in the new channel we have an example of the work which can be done by a mountain stream during a period dating back at least beyond the glacial epoch; while the old channel exemplifies the work done in the same time by the various agencies of "sub-aërial waste"—rain, wind, frost, &c.—with-out a stream to assist them, either by direct erosion of its owa or by sweeping away the *débris* which they had brought down.

What, then, are the phenomena presented by these two cases? In the first, the only work which can really be ascribed to the stream is the cutting of the deep narrow gorge at the bottom of which it now runs; for with regard to the wider depression above (itself a mere furrow in the main flow of the glen), it is impossible to say how much has been due to the planing action of the ice. In the second, the bottom of the old channel, if there be any power in "sub-aërial waste," should be choked by the *débris* which has come down from its sides, whereas I was easily able to detect live rock within a few feet of the tiny runnel which now drains the gully, and which itself picks its way among stones and boulders that are clearly nothing but the cumbered bed of the old-world torrent.

The question I wish to ask is whether the study of these two examples is not sufficient to produce something like a conviction that the modern school of geologists (as worthily represented by