

## PRACTICAL GEOLOGY.

ON THE PRACTICAL APPLICATION OF GEOLOGY TO CERTAIN DEPARTMENTS OF RAILWAY-ENGINEERING, WITH A DESCRIPTION OF A METHOD OF MAKING WORKING-MODELS.

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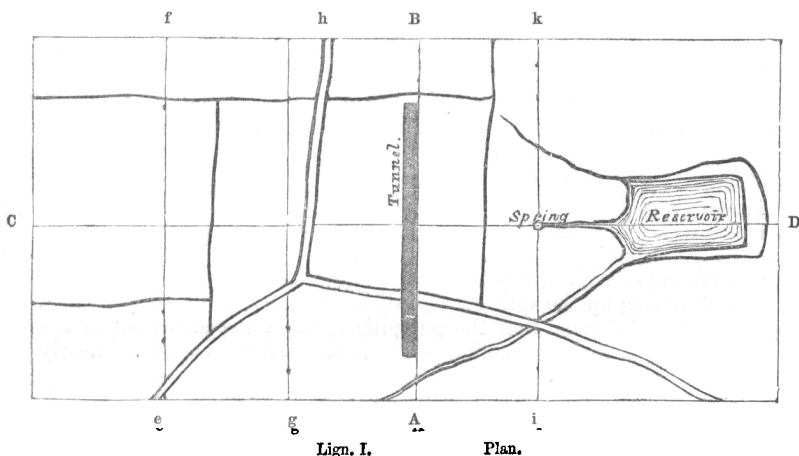
SIR,—Although the following is not purely geological, perhaps you will not consider it inadmissible in your journal, as it tends to illustrate a system of making geological models and sections of large tracts of country for engineering-purposes.

It is a well-known fact that hundreds of thousands of pounds might have been saved in the construction of our railways, if time had been taken to study in detail the geology of the country traversed, instead, as was the case in 1844 and 45, of laying down the projected lines on the ordnance map from the nearest turnpike-road, when travelling at the rate of eight or ten miles an hour, or even, as was very often done, in the office, without seeing the ground at all. Innumerable slips, wet cuttings, wet-tunnels, &c., might have been avoided by a slight diversion, based on geological knowledge. For instance, take a line running along a narrow gorge of some small river or stream in a northerly direction, and suppose the rocks on each side to have the same dip from west to east. Now, if the railway be made on the west side, in side-cutting it is obvious there will be slips, if the angle of inclination of the strata is greater than the angle of repose; and certain that the cutting will be a wet one, requiring a flat slope, and involving expensive drainage; whereas, if the railway was projected on the opposite or east side of the gorge, it is highly probable that the cutting would be perfectly dry, and that the slope would stand nearly perpendicular.

In 1843, the Leeds and Thirsk Railway Company projected a tunnel through the Bramhope Hills, from which issue the springs and streams that partly supply the Eccup Reservoir, belonging to the Leeds Water Works Company. In 1845, Mr. Seather, of Leeds, the engineer for that company, instructed me to make a model of the portion of country lying between Eccup Reservoir and Otley, for the purpose of illustrating the geological and engineering evidence required in opposing the railway-bill before the Committees of both Houses of Parliament; and by which we succeeded in getting a clause introduced for compensating the Water Company for any loss of water they should sustain through the railway-works.

The following is the plan I adopted in making the model, which embraced about twenty square-miles of country. In the first place, I made a ground-plan showing the principal roads, streams, springs, &c.; I next took cross sections of the range of hills, twenty chains apart, and parallel to each other; also, a longitudinal section through the centre, at right angles to the line of strike of the rocks, as well as to the cross sections.

Having obtained these data by means of the theodolite, level, and chain, the plan was plotted and transferred to a board, which formed the base of the model; this board had upright sides and ends, of uniform height, nailed on to it, something like a drawer.

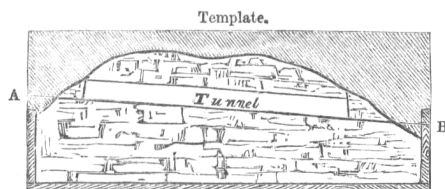


A B, Cross Section.

C D, Longitudinal Section.

e, f, g, h, i, k, Cross Sections.

After the sections were plotted to the proper scale, they were transferred to sheets of tin and cut out, the counterpart of the section forming a template; by leaving a notch each side to rest on the upright sides, this template would be used after the manner of a plasterer's mould; an inspection of the section A B will make this plain. The

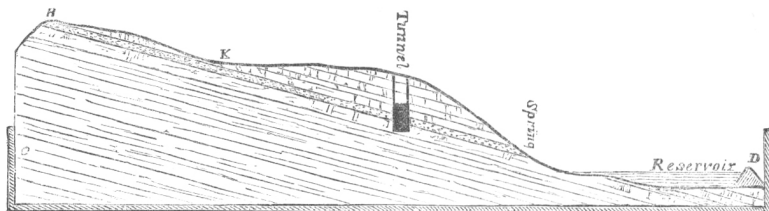


Lign. 2., Cross Section on A B.

surface, by means of these templates, was made exact at each line of cross section, and by means of occasional levels, and from memory, the portions between were filled in. The tunnel portion was cut out in wood, and removeable, for the purpose of showing the position of the tunnel, as shown in section A B.

In taking the longitudinal section from C to D, the outcrop of the strata was carefully marked, its dip ascertained with a clinometer, and it was afterwards carefully plotted on the section, as shown in the

sketch C D. Now, it is plain, from a mere inspection of the longitu-



Lign 3., Longitudinal Section on C D.

dinal section C D, that the rain falling on the country between H and K will percolate through the soil and fissures of the rocks until it meets an impervious bed, along which it will run, and issue at the outcrop as a spring, as shown in the cut. This bed being cut through by the railway-works, the water was intercepted and carried into the tunnel, drying up the spring; a prediction that was verified by the fact. I have been informed that the pumping of the water alone, out of the tunnel, during the construction of the works, cost the contractor nearly as much as all the other works relating thereto put together.

#### ABSTRACT FROM MM. VON HAUER'S AND HORNES' REPORT CONCERNING THE ERECTION OF THE MONUMENTAL BLOCK IN COMMEMORATION OF LEOPOLD VON BUCH.

Communicated by COUNT MARSHALL, of Vienna.

It will be remembered that, on the motion made by M. E. Ehrlich, Keeper of the Provincial Museum at Linz (September 20th, 1856), the section for Mineralogy, Geology, and Palæontology of the Congress of German Naturalists and Physicians, then meeting at Vienna, resolved by unanimous acclamation, that an erratic block of granite, situated near Losenstein, between Steyer and Weyen (upper Austria) should be converted into a monument commemorative of the illustrious geologist, Leopold von Buch. In consequence of this resolution, MM. von Hauer and Hornes formed, with M. Ehrlich, an executive committee, opened a subscription with a maximum amount of five florins (about ten shillings) and took every measure to ensure the success of the enterprise by enlisting contributions at home and abroad. The success proved to be beyond expectation. H.S.H. Archduke Stephan and the illustrious Baron de Humboldt expressed their assent in the most flattering terms; Baron Schetcheustael, at the head of the mining department in Austria, and Baron Beust, occupying the same official station in the kingdom of Saxony, have been most active in promoting the subscription within their spheres.

As soon as Sir Roderick I. Murchison had received notice of the project by a letter from Director Haidinger, he answered that, if the amount of the subscription should prove insufficient for the intended monument, he himself was ready to fill up the deficit from his own funds. The French Geological Society proved not less active in pro-