

abundant than in the strata above (Calp) and below (lower limestone with shale partings). I would also draw his attention to the papers published by the Boston Society on the island of Cuba, which I suspect might throw some light on the subject. As suggested in previous writings I suspect that the cherty zones in the Irish Carboniferous Limestone, especially that between the Fenestella Limestone and the Calp, must have some connection with vulcanicity.

Years ago Jukes got chert from Queen's Co., Limerick, Clare, etc., examined by Sorby, and I think I remember that he published about them.

GEOLOGICAL SURVEY OF IRELAND.

G. H. KINAHAN.

RE "EXPLOSIVE SLICKENSIDES."¹

SIR,—I should like, if I may, to add a few facts which seem to closely bear upon the subject of Mr. A. Strahan's interesting article in the August Number of your MAGAZINE. They are these:—In driving, exploring, or "opening-out" headings in certain seams of coal, loud reports are very frequently heard, which are often accompanied by the bursting-off from the sides of the excavations of large blocks or masses of coal. The noise made by such "explosions" or reports may be likened to artillery, and often causes men to run out of the place with alarm. Now, these "bumps," as the miners term them, generally occur in situations where the strata are much faulted by dislocations, and increase in importance with depth or thickness of cover. They probably happen most frequently and loudest in single drifts or headings, or those formed in advance of the general workings of the mine; and it is where these excavations are formed in the lower part of the coal-seam that the "bumps" are heaviest and produce greatest effects. Such an instance occurred a few years ago in one of the pits of the Moira Collieries close here, when a sudden and very severe bump completely displaced and shattered a single-brick "brattice"-wall (or partition, dividing the excavation longitudinally for ventilating purposes) for a length of about 24 feet. This wall was, as it were, completely *blown* out, and the men in the place were "jumped-up" off the floor, but not hurt. The wall was about three feet high and built with mortar. Again, in excavating the main roadways in the solid coal in the thicker seams of South Staffordshire, very severe bumps take place, and have been known to suddenly displace hundreds of tons of coal, by throwing them off the sides into the road. But in the ordinary course of coal-getting, especially by the method called the "Longwall" (*i.e.*, where all the seam is extracted by one operation), loud reports with bumps are of every-day occurrence, and now and again they have the effect of knocking out the props and sprags (wooden supports to roof and sides) and bring down a quantity of stuff. Also, during the operation of "holing" (under-cutting the coal-seam preparatory to breaking it down), the coal will keep on bursting itself off in little fragments from the face of the excavation with loud explosive reports, often putting the men's candles out. When the coal does this, it is said to have plenty of "life" in it, or "it keeps talking to you."

¹ See Prof. T. McKenny Hughes' article, *ante*, pp. 511-512.

When in the mine alone and all work is suspended, I have frequently heard strange and unearthly (?) sounds, such as rattlings, scratchings, knockings, etc.—noises called “nackings” by the men. In Yorkshire I have heard of bumps of such magnitude taking place as to throw down large areas of roof in worked-out parts of the pit, and which created a blast in the air of the mine strong enough to knock men over, upset tubs, blow open doors, put out lights, and cause much havoc.

Subterranean rumblings, as is well known, have for several years been heard, and felt too, beneath and in the vicinity of the town of Sunderland; but these are considered to be due, not to coal-mining, but to the dissolution of the magnesian limestone by water which is constantly being pumped through it.

Now, it appears to me, that there is one common cause for all these “explosions,” “bumps,” “nackings,” etc., which is simply this: the upsetting, by the excavation, of the equilibrium of the strains or pressures holding everything fast and firmly together—the removal of the support thereby causing the rocks to get relief and to fly off or apparently to explode. I look upon the phenomena as *miniature earthquakes* in fact.¹ I question very much whether gas has anything to do with these bumps, etc., even in coal-mines, but that they act upon the gas is exceedingly probable. The phenomena are certainly often very striking, and would seem to be worthy of much more attention than they have received. With Mr. Strahan’s last paragraph I quite agree.

W. S. GRESLEY, F.G.S.

OVERSEAL, 8 Sept. 1887.

THE DATE OF THE ICE AGE.

SIR,—Some time ago you inserted a letter of mine in which I contended that a high eccentricity of the earth’s orbit and winter aphelion would not produce all the effects which Dr. Croll assigned to them. I venture now to give some reasons for thinking that the Glacial Period did not occur so long ago as Dr. Croll’s theory supposes. His principal maximum of eccentricity took place 800,000 years ago, while the last large maximum was about 210,000 years ago. Can the Ice Age have been as remote as this?

I have just returned from a visit to the Lake District, the glacial phenomena of which have been very fully described by Mr. J. Clifton Ward. The traces of ice-action along the sides of the mountains bordering the Valley of Borrowdale are remarkably numerous and well-defined. The sides of these mountains are usually steep and pretty bare, and the rainfall of the district is enormous. At Seathwaite, situated at the head of the valley, Sir John Herschel gives the annual rainfall at 141 inches, and Ramsay at 113 inches. No doubt the rocks are hard volcanic rocks which would stand a good deal of wear; but would the ice-markings be as

¹ I recollect seeing it stated in a newspaper a few years ago that the wife of the colliery manager was dislodged from her seat in the house in Nottinghamshire at the same moment that a very heavy “bump” occurred in the workings of the colliery below, which at the time was, by some, attributed to an earthquake.