

Hill to the west, and Arthur's Seat to the east, which are greenstone eminences not far distant.

As to the agent producing the grooves, the general impression from their up and down hill course seemed to be that they were caused by the ploughshare in times gone by, when the locality might have been under cultivation for grass.

The probabilities against these grooves being due to glacial action rest chiefly upon their not being smoothed or polished, and their course curving over the rotundity of the upper surface of the boulders, and the starting of some channels by sudden indents in the stones. It may, however, be stated that the overlookers on the works think that some of the boulders lie too deep to have been marked by the old kinds of plough, and that these lie also in undisturbed subsoil, below the loam on the surface.¹

The evidence on this subject indicates that No. 1 grooved Boulder and No. 2 were both about three feet below the surface, No. 10 was one foot, and No. 11 was eight inches; while, again, Nos. 7 and 8 grooved Boulders just appeared on the level of the original slope of the ground.

The Secretary of the Institution has informed me that the grounds have not been used for agricultural purposes since the building of the Hospital in 1738. Previous to that event it was common land, called Heriot's Croft, and was probably meadow land when purchased by Watson's Trustees from those of Heriot's Hospital.

NOTICES OF MEMOIRS.

I.—MEMOIRS OF THE GEOLOGICAL SURVEY.

WE have much pleasure in stating that Part I. of the Memoir by Mr. W. Whitaker, B.A., F.G.S., on the Geology of the London Basin, has just been published. It occupies over 600 pages, and includes an account of the Chalk and the Eocene beds of the Southern and Western Tracts, lying in the counties of Berks, Bucks, Essex, Herts, Kent, Middlesex, Surrey, etc., with parts, by H. W. Bristow, F.R.S., Director, T. McK. Hughes, M.A., F.G.S., and notes from other members of the Geological Survey of England. We hope, in a future number, to give a more extensive notice of Mr. Whitaker's work, which, from the amount of detailed information on the Geology, together with the appendices on the Bibliography, Well Sections, and Fossils, cannot fail to be of great practical as well as scientific value.

¹ An eminent Scottish Geologist writes to the Editor that "the true glacial striae in the neighbourhood of Edinburgh all go from west to east; whereas the direction of the striae on the erratics, examined by Mr. Black, appear to go from north to south." This, he thinks, "looks like the plough." "Striated pavements of Boulders," he adds, "are great rarities; Hugh Miller has recorded a single instance."—Lyell's *Elementary Geology*, p. 147. Chambers' Papers, *Proceed. Royal Soc. of Edinburgh*, April 20th, 1857.

II.—COLLIERY EXPLOSIONS AND WEATHER. Being an abstract of a paper read before the Royal Society on the 18th May, drawn up by ROBT. H. SCOTT, F.R.S., Director of the Meteorological Office, and W. GALLOWAY, Esq.

AFTER a preliminary reference to previous papers on the subject, and especially to the diagrams published by Mr. Joseph Dickinson and by Mr. Bunning, of Newcastle-on-Tyne, the authors of the paper referred specially to Mr. Dobson's paper, published in the reports of the British Association. They showed that the periodicity alleged by him to exist in these explosions had no real foundation in fact, for on plotting the dates of the explosions for the last 20 years in two 10-year periods very slight resemblance was seen between the two curves. The number of accidents, all fatal ones, on which this statement was based, was 1369.

In the progress of this inquiry it had come out that the number of serious accidents, involving the loss of 10 lives or more, had materially increased during the last 5 years, the numbers being—

1851-5 XIII.	1856-60 XV.
1861-5 XII.	1866-70 XXI.

These numbers appear to be well worthy of remark.

For the special purpose of the paper the continuous records from Stonyhurst, one of the observatories in connexion with the Meteorological Office, were taken, and the curves for the barometer and thermometer were plotted for the 3 years 1868-70. The records of fatal explosions were obtained from the published reports of the inspectors, while the dates of the non-fatal accidents were obtained from the inspectors themselves, who, almost without exception, replied to the communications addressed to them, and furnished the desired information. Mr. Dobson, in his paper, having spoken of the explosions occurring principally at the commencement of a storm, the authors showed that it was not in some cases until two or three days after the barometer had reached its lowest point that the accident happened. They showed also why, during a period of continued violent oscillation of the barometer, the passage of each successive barometrical minimum is not characterized by an equal number of explosions, the largest groups of accidents being reported where a serious break occurred after a period of calm weather. The effect of a high temperature of the air in interfering with ventilation, and especially with natural ventilation, was also explained, and it was shown how the first hot days in spring were marked by explosions.

The actual dates of the explosions for the three years in question were then compared with the meteorological records, and it was shown that out of 550 explosions—

266 or 48 per cent. might be attributed to the state of the barometer;
123 or 22 per cent. to the state of the thermometer;
161 or 30 per cent. remained unaccounted for on meteorological grounds.

The next point touched upon in the paper was the action of a more or less impure ventilating current in increasing the explosive

character of the air in all parts of the pit, and possibly in causing an explosion in a place which would have remained safe had the ventilating current itself remained pure. It was shown how, when an explosive mixture had been formed in places, and under conditions similar to those described, some time—possibly several days—must elapse before the contents of such an accumulation of dangerous gases shall have been rendered innocuous again.

The effect of warm weather in stopping natural ventilation was explained, the natural temperature of a mine of a depth of 50 fathoms being 55 degrees, that of one of the depth of 200 fathoms 70 degrees, and so on. Speaking generally, it was shown that if the temperature of the air rose to 55 degrees, natural ventilation must cease in shallow pits; and similarly in other cases. Accordingly, if a warm day occurs in the cold season of the year, and the furnaces are not in action, an explosion is very likely to occur.

These statements were illustrated by one instance of a fatal explosion, the cause of which had been declared by the inspector to be inexplicable, the pit having strong natural ventilation. It appeared, however, that the explosion occurred on a warm day, while the inspector visited it twice on colder days after the explosion, so that the state of ventilation which he witnessed had no reference to that which must have prevailed when the accident happened.

The paper concluded by stating that it appeared that the evidence fairly justified the view that meteorological changes were the proximate causes of most of the accidents, it being remembered, as has before been observed, that the records contain no account of the number of times when the pits have been too dangerous for the men to go down, and so explosions have not happened. Whatever be the meteorological changes, it is absolutely necessary to keep a most careful watch over the amount of air passing through the workings.

Thirty years ago, George Stephenson said, in a letter to the South Shields Committee, referring to explosions—"Generally speaking, there has been some fault in the ventilation of the mines when accidents have happened," and the same opinion is held by many of the most experienced authorities at the present day. In this matter the one cry, whether we look to security against explosion, or to the affording to miners an atmosphere which they can breathe without injury to health, is—"More air."

REVIEWS.

I.—PALAONTOGRAPHICAL SOCIETY. VOL. XXV. Issued for 1871. June, 1872.¹

A GAIN it is our pleasant task to record the issue of another annual volume of the publications of this most useful Society, which devotes its funds to the illustration of British fossils of all ages, and has already issued many monographs and hundreds of plates of Mammals, Reptiles, Molluscs, Crustacea, Echinodermata, Radiata, Fossil plants, etc., etc.

¹ The notice of vol. xxiv., issued for 1870, will be found in the *GEOL. MAG.*, Vol. VIII., 1871, p. 175.