

New Zealand (Trans. Zool. Soc., vol. iv., 1850), and subsequently by Darwin to the incoming of new species, as "the battle of life." He next entered upon the relation of the present discoveries in Australia to the law of Geographical Distribution in the new Tertiary or Quaternary periods of extinct and existing animals.

The wombat was a more characteristic Australian form of mammal than the kangaroo, for the latter is represented by species in New Guinea; and species of *Phalanger* range farther from Australia, though still bound to the same great natural, and mainly submerged, division of the earth's surface. But no kind of wombat, recent or fossil, has been detected out of Australia and Tasmania. The present Continental kinds, and species near akin to them, existed in Australia during a very long period, reckoned by the terms of historical time, if we may judge from the state of petrification of the fossils, and the great depths at which some have been met with in well-digging; where, after 30 ft. or 40 ft. of black rich soil have been bored through, such fossils occur at 100 ft. lower down in sandy drift, which has been accumulated to that or greater vertical thickness beneath the loam. On the assumption that air-breathing animals perished in a general deluge some 5,000 years ago, and that their dispersion then began anew from the exceptional few individuals preserved in the Ark, we must suppose the wombats then living in Australia to have contributed miraculously their pair or pairs to the Asiatic menagerie, and to have been as miraculously restored to their proper continent on the subsidence of the Noachian flood.

It is neither creditable nor excusable that so great a divergence should still be maintained, chiefly through theological teaching, in the ideas of the majority of men "of ordinary culture" as to the cause and conditions of the distribution of living species over the globe, from those suggested by the clear and multiplied demonstrations of Science. On this topic the author referred to a paper in "Annals and Magazine of Natural History," 1850, "On the Gigantic Birds of New Zealand, and on the Geographical Distribution of Animals."

THE CONNECTION BETWEEN COLLIERY EXPLOSIONS AND WEATHER*

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 twenty years in two ten-year periods, very slight resemblance was seen between the two curves. The number of accidents (all fatal ones) on which the statement was based was 1,369.

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

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| 1851-55 . . . 13. | 1856-60 . . . 15. |
| 1861-65 . . . 12. | 1866-70 . . . 21. |

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 connection with the Meteorological Office, were taken, and the curves for the barometer and thermometer were plotted for the three 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

* "On the Connection between Colliery Explosions and Weather," by Robert H. Scott, F.R.S., and Mr. W. Galloway. Read at the meeting of the Royal Society, April 18, 1872.

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 characterised by an equal number of explosions, the largest groups of accidents being reported when 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—

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| 266, or 48 per cent., | | might be attributed to the state of the barometer; |
| 123, " 22 " | | to the state of the thermometer; |
| 161, " 30 " | | 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 the depth of 50 fathoms being 55°, that of one of the depth of 200 fathoms 70°, and so on (speaking generally), it was shown that if the temperature of the air rose to 55° 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 are 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 occurred;" 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!"