

GAS IGNITION BY SPARKING.

The last report of the Chief Inspector of Mines in India contains an account of a remarkable explosion of fire-damp caused by a discharge of lightning in the new shaft at the Sitalpur coal mine, belonging to the Bengal Coal Company. The explosion occurred during a thunderstorm, and the evidence showed that a flash of lightning had, to all appearances, passed down the shaft causing disruptive discharges at certain points between the guides and the winding rope, rending the latter at two places situated respectively 228 ft. and 278 ft. from the surface. The distance between the winding rope and the side of the shaft was 5 ft. 4 in., indicating a spark gap of this width, and an intensity of discharge which could not fail to ignite the explosive mixture of gas and air known to be present in the shaft. There is apparently no limit to the vagaries of lightning, and the occurrence, rare as it is, presents no element of mystery.

It is, nevertheless, highly interesting as indicating possibilities; and one is naturally led to remember a considerable number of cases in which mysterious explosions have occurred in pits under conditions where human agencies seem to be excluded. In 1915, M. Ferey described in a paper read before the Société de l'Industrie Minérale phenomena of a similar character to the above. In a pit liable to sudden outburst of gas, for the sake of safety, shot-firing was carried out from the surface. During a storm, in the year 1905, shots went off in two places after the detonators had been connected to the conductors. These shots were situated respectively 1,490 and 1,410 metres from the firing station. Realizing the possible danger from this cause, the precaution was taken to cut the conductors at the bottom of the shaft and to connect them just before firing. Even under these conditions a shot went off spontaneously, owing, it is believed, to lightning. In explaining this phenomenon, M. Ferey says that it is necessary to remember that the electrical conductivity of the earth is not perfect, and that the capacity of a conductor is more effective if its extremity is earthed; while a comparatively feeble current is sufficient to explode a detonator.

We may, however, travel beyond the comparatively intelligible circumstances of lightning flashes during thunderstorms and consider certain more speculative views respecting the development of electrical conditions possessing elements of potential danger in coal mines. Let us begin with the electrification of dust.

In an illuminating paper, read by Mr. W. A. Douglas Rudge before the Royal Society of London, it was shown that the mere raising of a dust cloud produces a large amount of electricity, the sign of which depends upon the material used. Generally, acid particles become positively and basic particles negatively electrified. Again measurable charges of electricity are produced when particles of quartz, felspar, mica and other substances are rubbed against other particles of their own kind. Thus quartz rubbed upon quartz causes the particles to be positively electrified, and at the same time a negative charge is given to the air. Previously, in 1901, Hesehus had shown in Russia, that pieces of the same material when rubbed together become electrically charged with the same sign, while the dust abraded in the process receives a charge of an opposite sign. These charges are sufficiently persistent to be measurable with a suitable electro-scope. Thus a puff of air containing 5×10^{-9} gr. of

dust of mercuric sulphide gave a charge to a collector of several volts; while a centigramme of corn-flour, blown into a large room, charged the air to an extent which raised the charge on a collector to a potential of 200 volts, and the effect persisted for some time. The exact explanation of these phenomena is not clear, but the effect seems to be due to surface contact or friction. Neither is it at once apparent in what way these experiments can have any bearing upon pit explosions.

But interest in such phenomena is re-awakened by the evidence recently given in connection with the Minnie Pit enquiry at Halmer End just concluded. In the course of this investigation evidence was given as to the remarkable behaviour of the roof of the Bull-hurst seam, known as Bulldog, which by rubbing under earth strain in the roof, and also by falling upon similar pieces on the floor, developed flares and flashes which seem to be different from ordinary friction sparks, and were referred to by Dr. Wheeler in his evidence at the enquiry, as frictional electricity sparks.

We do not propose to express any opinion just now upon the theory of sparking of the Bulldog as the possible cause of the Minnie pit explosion. It is interesting, however, in this connection, to recall the circumstances attending the Bellevue explosion, Alberta, occurring at intervals between 1910 and 1911, some of which took place when nobody was in the pit. These were investigated by Mr. J. T. Stirling and Sir John Cadman, and are believed to have been due to sparks produced by falling stones, a view which was supported by the fact that a large fall of rock marked the point of origin of one of the explosions. Experiments showed that the hard siliceous roof gave a brilliant display of sparks on falling, and when struck by a hammer the surface of percussion glowed red hot for an instant, owing probably to the ignition of bituminous matter in the stone. The sparks obtained by friction of one stone upon another could be made to ignite coal gas, a result which has not yet been obtained with the Bulldog of the Minnie pit. Negative laboratory experiments of this kind, however, are scarcely conclusive, because it is impossible to deal with such large masses of material as are concerned in falls of roof in the mine. The problem is also complicated by the possibility of electrical action, as suggested by Dr. Wheeler in his evidence at the Minnie pit enquiry, and there is clearly a case for further enquiry as to the possibility of firing methane by rock sparking on what we may term the grand scale. There is no reason to doubt the evidence brought forward by eye witnesses as to the remarkable character of the sparks seen in the Minnie pit. The length of flame alone seems to preclude the idea of more frictional sparks, and if they were in fact of an electrical nature, a temperature exceeding the ignition temperature of methane might easily be reached. We may, in fact, recall the circumstances of the explosion at the Maindy pit, Glamorganshire, on November 8, 1896, where a similar explanation seems to be sufficient to account for the occurrence.

It is unfortunate that in investigations of this character it is generally necessary to rely upon the method of exhaustion of other possible causes, a perfectly sound procedure when all the factors are known, but a dangerous practice where knowledge is incomplete.

—“Colliery Guardian.”