

That letter was written in answer to some specific questions regarding the explosion put to me by the Minister of Mines.

3. Had you seen the ground at the time you wrote that letter?—Yes.

4. You have visited the mine subsequently, since writing that letter?—Yes.

5. And did you see anything on your second visit to induce you to qualify anything in that letter?—Yes, slightly, as I say in the beginning of the evidence given by me at the Coroner's inquest, which I will read to you. [Evidence given at inquest proceedings read by witness, as follows.]

"HAROLD BAILY DIXON, sworn, saith: I am Professor of Chemistry in the University of Manchester. I adhere to the opinion expressed in the letter from me to the Minister of Mines dated 15th September, 1914. I was not then, however, acquainted with the fact that gas in large quantities had been discovered in the mine. I have again inspected the mine since that report. The seat of the explosion can be identified now within a small area. At my former inspection it was evident that up to No. 5 level the force of the explosion had been outward. When I got up as far as the cabin at No. 6 the force of the explosion is away from the shaft in the direction of Taupiri West. It is clear, therefore, the explosion must have started between those two points, or have come into the main haulage-road from No. 5 level, or somewhere between those two points. Yesterday I inspected the area to the north of the haulage-road and found gas in the old workings. I found a stopping and a door blown towards the main haulage-road. The initiation of the explosion must have come from beyond that—that is, inside that door. Since there is a fall there (the old fall) and gas making there at the present time, it seems there are the exact conditions required for an explosion, for it is known that a man went in there with a naked light. The gas-explosion so initiated stirred up the dust along the roads and ignited it. The explosion of dust was propagated along No. 5 level to the main haulage-road, where it spread in both directions, reaching the downcast Ralph's shaft, but dying out towards the west through lack of pure coaldust. The amount of dust in this mine would ordinarily be described as small—that is, in the mine generally. A great quantity of dust is not necessary in a lignite-mine to produce an explosion, or in any mine. For the last three years I have been a member of the Home Office Committee which has been experimenting on a large scale with a view of finding out what kind of flame will ignite coaldust so that it will propagate an explosion along a gallery, and, secondly, what means are effective in stopping an explosion from being propagated. With ordinary bituminous coal it is not easy to start a coaldust-explosion. We have found that a concussion and an intense flame are both required, the concussion to stir up the dust so as to form a cloud in the air and the intense flame to ignite it. We have made our experiments in a model steel mine, 7 ft. 6 in. in diameter and 1,000 ft. long. We have found that a blown-out shot, produced by a discharge of blasting-powder blown out of a cannon, gives the concussion and intense flame necessary for the stirring-up and ignition of the dust. This may be also effected by firing a mixture of fire-damp and air, which gives the concussion and intense flame. The amount of dust we have found necessary to put along the steel gallery in order to propagate an explosion is less than 1 lb. per lineal foot of the gallery—that is, when stirred up, about $\frac{1}{2}$ oz. of dust per cubic foot of air. This amount of dust would look exceedingly small lying in a mine—it could hardly be noticed. We have found different coaldusts to differ rather considerably in their power of being ignited. Two days ago I made some tests with powdered coal from this mine. It is more inflammable than any coal I have yet tested. At the Home Office Experimental Station we have been trying the effect both of inert dust and of spraying with water, and we find that both remedies are effective, provided that you add enough incombustible dust or enough water. I should not endorse the statement that watering is out of date in England. I know a good many mines where it is carried on. Watering to be effective must be thoroughly done; merely watering the roads may be useless. It must be sprayed so as to fall anywhere where the dust might be. We have had the floor quite wet, and yet an explosion has gone through it. Coaldust floating on water can be raised up and fired. Inert dust must be well distributed—that is, thrown about so that it falls on to ledges, the roof, and timbers. There are two essential things with regard to the incombustible dust: first, it must be so fine that it is raised up when the coaldust is raised; and, secondly, it must be harmless to the miners. There are many dusts which can be finely divided and are harmless to breathe in small quantities. The cleaning-up of very dusty mines where a large quantity of dust is being continually made must be systematically carried out, or otherwise there will be too great an accumulation of coal and inert dust. From time to time the floors have to be swept up and fresh inert dust added. I have seen the dusting carried out practically at the Altofts' Mine, in Yorkshire; the powdered shale is taken in a tub and thrown by hand, the tub travelling along with the air-current, and the cloud of shaledust will settle, like the coaldust, on ledges, and so on. With regard to other precautions, the Home Office has just instituted severe tests for safety-lamps, and the test for permitted explosives is a very severe one. In England we hope by the use of secure safety-lamps and permitted explosives to stop even the initiation of an explosion, but we are urging proprietors and managers to render coaldust harmless by adding inert dust or by watering, or by a combination of the two, for sometimes that is more feasible than either of the other two alone. Sometimes the floor can be watered without any damage while the roof cannot, and *vice versa*. I do not know any case where an explosion has taken place where the inert-dust remedy has been used.

"By Mr. Macassey: There have been several electric lamps that have passed the Home Office tests.

"By Coroner: No large amount of gas-mixture would be required to start a dust-explosion—probably a few hundred feet of such mixture would suffice to start such an explosion. It would not be a pure gas-explosion after the flame had travelled, say, 50 ft. Some dust was