bottled enough samples for analysis up to a height of 6 ft. 6 in. from the floor. We went round the lower end of the rising bords, and there was no doubt about the quantity of gas present. There was 40 chains of bords filled with a gaseous mixture. I can show you those bords on the plan. They are 14 ft. wide, and average 10 ft. high. The area in question would be a cul-de-sac for gas. Towards the roof there was no ventilating-current. If you get gas at the bottom of a rising unventilated bord which has been a dead end, or is communicating with another bord falling in the opposite direction, you may rest assured that if there is a gas mixture down at the lower end of the inclined bord it is full right up to the top or apex.

119. Is it not on the same principle that if you go through a bord and find gas on the ground you need not look for it up above ?—You are perfectly right. There was 40 chains of bord 14 ft. wide and 10 ft. high full of a gaseous mixture; I cannot state exactly what percentage of gas was in the mixture; but there was 350,000 cubic feet of gaseous mixture above 5·6 per cent., the minimum explosive limit. I think nobody would dispute either the quality or the quantity I found. The most explosive proportion of firedamp when mixed with air is about 10 per cent. The limits of the explosive-point are from 5·6 to about 16 per cent., although the margin is somewhat in dispute. The samples that I took on the floor at the very bottom, according to Dr. Maclaurin's analysis, went 1·8 per cent. of methane (CH_4). It must be remembered that the report of the analyst is generally slightly less than the actual percentage taken in the mine, because there is bound to be some little leakage in the sample-bottle. At the bottom of the bords where we began to test for gas, the samples contained, according to the analysis, 1·8 per cent., 3·7 per cent., and 1·65 per cent. Then, at the level of my cap it was 5·4 per cent. and 9·4 per cent., about the most explosive mixture: but I did not go nearer the roof because we could not have lived there. We only tested our way up the foot of the bords because we would not have survived if we had gone farther up towards the top. These samples were not taken to ascertain the maximum percentage of gas present, but to prove that the foot of the poorly ventilated bords did contain gas. I could have got 10 per cent. of gas, the most explosive mixture, in every bord by going up a little farther.

120. You tested low ?—Yes. None of these samples contained afterdamp—the analyses shows that.

121. You measured the accumulation of gas: supposing you could measure the total emission after the explosion, would that measured by you be the whole amount emitted in those six days ?—No.

122. Was there any afterdamp when you tested at all ?—No, my samples were remarkably free from afterdamp.

123. *Mr. Brown.*] What was the percentage of oxygen ?—17 per cent. was the lowest.

124. *Mr. Wilford.*] If there was ventilation after the explosion, would some of the gas be removed as well as the afterdamp ?—Yes. It is more easy to remove the firedamp than the afterdamp.

125. That is to say, any computation of 350,000 cubic feet would be rather under the mark ?—To the extent of the amount of gas that had been carried away by the ventilation. There was ventilations of sorts after the explosion, otherwise my samples would have contained afterdamp. No doubt the indifferent ventilation carried away firedamp too. That is easily understood, as I got some firedamp in the main return.

126. Then, you say that from your test there is no question whatever that there must have been more gas there than you have measured ?—Given off since the explosion during those six days—certainly.

127. Can you tell me how much gas it is necessary to have to start an explosion ? I understand that you must have a concussion and a flame ?—An ignition of gas, a concussion, rising the coaldust. An ignition of gas to give the concussion which raises the dust. Professor Dixon went into that matter very thoroughly, and he is an expert upon the subject. He said a very small quantity of gas will cause an explosion.

128. Are there any authorities on the subject ?—Yes; there is no doubt that a very small quantity of gas is sufficient to cause an explosion. The highest authority on the subject is Sir R. A. S. Redmayne, Chief Inspector of Mines in Great Britain. He has written a work on the ventilation of mines, printed in 1911, and on pages 216 and 217 he lays down this principle.

129. Will you read us what he says on the point; I am anxious to know just how much gas it is necessary to have to cause an explosion ?—Professor Dixon, who is an authority upon the subject of dust-explosions, says that a very small quantity will start an explosion.

130. You are not contradicting the Professor ?—No, he is an authority on the subject of coal-dust explosions, but Sir R. A. S. Redmayne is a higher authority—I believe the highest authority in the world—regarding explosions in mines. He says: "Now, a mixture of 9½ vol. of dry air to 1 vol. of firedamp contains exactly the proper proportion of oxygen necessary to affect complete combustion of the firedamp, and ought therefore to be the most explosive mixture that can exist—one through which the flame would be expected to travel with the greatest rapidity. But that part of the mixture through which the flame has passed expands under the influence of the heat of combustion, and drives the still unconsumed part in front of it; the velocity so acquired by the latter must be added to the normal velocity of the propagation of the flame. The pressure due to the combustion of the above mixture when ignited in a closed space is equal to 102·6 lb. per square inch, and the calculated temperature of combustion is 3,902° F. The resulting damage from the explosion of, say, a few hundred cubic feet of such a mixture in a mine can therefore be well imagined." He goes on to say that, "It has been very generally observed that—(1) Little damage is done near the point of origin of the explosive flame, and for, say, 50 to 80 yards therefrom; (2) then great damage is evidenced; (3) and after the cessation of the advancing explosion there is evidence of a 'back-lash' or rebounding force."

131. Supposing you describe it in your own words ?—As Mr. Fletcher says, the flame seeks for oxygen—the flame travels where there is the freshest air: it rushes forwards and then backward—so that the track of an explosion in a mine gives uncertain evidence of the point of origin. It will travel wherever there is oxygen.