roburite was lightly tamped with coal-dust, the same as the gunpowder-shots. (3.) No fresh dust was put in for this experiment, and the cannon was fired two hours after the previous experiment. The dust was ignited, and there was a considerable explosion, but the flame did not reach the top of the shaft. (4.) Dust was ignited, and the fiercest explosion of all followed, a large volume of flame rushing from the mouth of the shaft and ascending about 30ft. into the air.

"The shaft in which these experiments were made was acting as an upcast for a pumping-shaft half a mile distant, so that the air was travelling apparently in the direction of the blast, but the air seemed to reverse whilst the dust was being put down by means of a riddle ¼in. mesh, so that it is difficult to say what speed of air might be passing at the time of each explosion; it would not exceed a velocity of 50ft. per minute.

"The greatest distance traversed by the flame on these experiments was 65 yards, limited, of course, by the depth of the shaft. The violence appeared to increase as the explosions progressed up towards the mouth of the shaft, and would no doubt have reached the surface, however deep the shaft might have been. The following is an analysis of the ventilation of the shaft, taken during the progress of these experiments:—

"Oxygen	20·56
Nitrogen	79·20
Carbon-dioxide	0·15
Sulphur-dioxide	0·09
	100·00

"*Results C.*—There was no ignition of the dust in any of the six trials in this pit. The cause of this is by no means clear, but it may be attributed partly to the wet condition of the shaft, and partly to the fact of the large dimensions of the shaft, which may have prevented the heat given off by the gunpowder-shots being sufficiently confined to effect the ignition of the dust.

"The shaft where these experiments were carried on was in course of sinking, and is connected with another sinking-shaft close by by means of a cut-through in a coal-seam at the depth of 100 yards. The cannon was fixed on a scaffold at the latter depth. The pit sides were wet and dripping, but the lower part of the pit below the scaffold was full of water. A coke fire was placed on the scaffold, causing the experimental pit to act as an upcast, the current of air passing being only at the rate of 30ft. per minute.

"*Results D.*—(1.) Dust was not ignited; both cannons fired. (2.) Both cannons were fired in quick succession. Dust was ignited at first shot, and there were three separate rushes of wind and dust out of the mouth of the shaft, the last being followed by a large body of flame rising about 30ft. above the pit-mouth, and continuing three or four seconds. (3.) Dust was not ignited; both cannons fired. (4.) Dust was ignited, and there was violence in the pit, but the flame did not reach the top; one cannon missed fire. (5.) Dust was ignited, and a large body of flame rushed out of the mouth of the pit, ascending about 40ft., and displacing the wood and framework at the top of the pit. Both cannons were fired in quick succession, but the dust fired at the first.

"These experiments proved to be by far the most important and conclusive. A scaffold was fixed at a depth of 180 yards, and two cannons side by side attached to it. At this depth there was a small arched way leading to another pit—pumping-shaft—21 yards distant; this was lined with bricks, its sectional area being 10ft. There was a similar arched way of larger dimensions at the bottom of the two pits. The experimental shaft was upcast for the other, and the air passing up it was visibly charged with vapour from the water lodged below. Its speed was about 100ft. per minute, but this speed was much reduced when the air was charged with dust, to the extent of reversing from time to time. The ventilation went direct through the openings to the experimental shaft, and was quite free from firedamp.

"*Results E.*—(1.) No violence other than was due to the two shots. (2.) Dust was ignited at first shot; there was no violence in the pit, but the flame did not reach the surface. (3.) Dust was ignited by the first shot, but the flame did not reach the surface on the second shot. There was a great rush of dust from the mouth of the pit, and, after an interval of ten seconds, an explosion and a large body of flame was projected about 20ft. high. (4.) and (5.) Dust was not ignited, and no unusual violence. (6.) There was unusual violence, but no flame appeared at the surface. One cannon missed fire.

"*Results F.*—(1.) No unusual violence. (2.) and (3.) Dust not ignited, and no unusual violence. (4.) Dust ignited, but no flame reached the surface; one cannon missed fire. (5.) No flame, but considerable violence. (6.) Dust was not ignited, and no unusual violence; one cannon missed fire. (7.) Dust was ignited, followed by a continuous roar and a rush of flame, completely filling the mouth of the pit, and ascending 60ft. into the air. This was the most violent explosion since the commencement of the experiments. It is difficult for any one who did not witness this experiment to realise the extent of the explosion. The flame continued to issue from the pit for five or six seconds, followed by dense smoke. The violence of the explosion carried away some of the woodwork 37ft. about the pit-mouth. Only one cannon was fired.

"These experiments conclusively prove that blasting with gunpowder in dry and dusty mines may cause serious disasters in the entire absence of firedamp. It is impossible to clearly explain why many of the experiments failed to cause explosions or ignite the dust, but the fact that at intervals these did occur perfectly justifies the above conclusion. The English Royal Commission on accidents in mines left this subject in doubt. Indeed, the conclusion they arrived at was calculated to give the impression that in the entire absence of firedamp coal-dust was not dangerous (see page 36, final report Gorswood Hall experiments). They say, 'But the most decisive of the results were not of a nature to warrant the conclusion that flame could be carried along to a great distance by coal-dust in the complete absence of firedamp.' The French Commission was entirely adverse to the view which the present experiments prove. The German experimenters were more disposed to