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COAL DUST, ITS RELATION TO COLLIERY EXPLOSIONS, AND HOW TO DEAL WITH IT.

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As hundreds of tons of coal pass daily down the main roadways of a niee it is obvious that by the shaking the coal receives, large accumulations of coal dust of a very fine nature become scattered over the timber, sides and floor of the roadways. Deep mines should theoretically be more dusty than shallow ones, the temperature of the strata is higher and consequently the intake air is heated more than in a shallow mine, and is really more dry, because it is able to absorb a larger quantity of moisture before becoming saturated. The air current thus dries the dust and blows it about, the lighter and more dangerous particles being carried on to the roof timbers and the remainder to the sides and floor, the latter being the least dangerous.

Pure coal dust is more or less pure Carbon, with volatile matter and ash, its nature varying according to the composition of the coal from which it is formed.

The first mention of coal dust as a dangerous element in connection with mine explosions was made by Mr. Buddle in his report on the explosion at Wallsend Colliery, England exactly 103 years ago. He stated that the mine was dry and dusty and that the survivors who had been further from the seat of the explosion were burut by red hot sparks of coal dust which had been ignited by the flame of the explosion and carried along by the force of the current.

The next mention of coal dust seems to be in the year 1844 when Messrs Furaday and Lyell gave their report on the Haswell Colliery explosion which occurred in that year. These gentlemen in their decision were certain that the coal dust accumulated in parts of the mine greatly extended the fire damp explosion.

After the year 1844 several persons investigated the matter, but it was not until the year 1876, when Mr. Wm. Galloway read his first paper before the royal society, that general attention was directed to the important part that coal dust plays in aggravating fire damp explosions. Subsequent experiments by Mr. Galloway by several members of the North of England Institute, a committee of the Chesterfield Institute, Sir. F. Able, Mr. Hall, and particularly by the Prussian Fire Damp Commission, demonstrated that, under certain conditions, the presence of coal dust in a fine state of division is a source of great danger in dry mines in which blasting is carried on without special precautions. Upwards of 300 experiments were made by the Prussian Fire Damp Commission at Neunkirchen, near Saarbruckers, and it was considered that the following conclusions were warranted by the results obtained.

1. The presence of coal dust in more or less abundance in the immediate vicinity of the working face, gives rise to more or less elongation of the flame projected by a blown out shot, whether small amount of fire damp be present or not.

2. In the complete absence of fire damp, the elongation or propagation of the flame is generally of limited extent, however far the deposits of dust may extend in the mine roadways.

There are however certain descriptions of coal dust which, if ignited by a blown out shot, will not only continue to carry on the flame even to distances extending considerably beyond the confines of the dust deposits, but will also give rise to explosive phenomena or results, in the complete absence of any trace of fire damp, which in character and effects are similar to those produced by some other dusts in air containing 7 per cent of fire damp.

3. All the phenomena produced by the burning of and propagation of flame by coal dust are intensified by the presence in the air of small proportions of fire damp. Certain dusts, which, under favourable conditions, appear to have the power of propagating flame to an indefinite extent in a dust laden area, the air being free from fire damp, will, if only sparsely suspended in air containing fire damp in some proportion below 3 per cent, render such a gas mixture susceptible of explosion by a blown out shot.

4. Special experiments in which the branch gallery described as opening into the main gallery near its extremity, was charged with a fire damp mixture, (retained by brattice cloth,) demonstrated that a coal dust ignition or explosion developed in the complete absence of fire-damp, can communicate ignition to an explosive gas mixture existing at a very considerable distance from the point of first ignition.

There is much diversity of opinion on this question of coal dust, and special stress is laid on the fact that the occurrence of a blown out shot is indispensable to the production of any and all the effects of ignition, propagation of flame, or explosion to which coal dust can give rise and many gentlemen emphasise the fact that the part played by coal dust is not nearly so dangerous as it might appear from the superficial examination of the already mentioned Saarbrucken experiments.

When the terrible calamity which occurred at Seaham colliery in September 1880 was officially enquired into, the suggestion was very decidedly put forward by the miners representatives that the coal dust which existed in large quantities in some parts of the mine and especially near the spot where it was surmised that the explosion had originated, might have had much to do with the accidekt. Indeed the opinion was strongly entertained by some that it was entirely due to the ignition of coal dust, in the absence of gas, by flame from a blown out shot. The Home Secretary consequently requested Sir. F. Abel to make experiments with samples of dust collected in different parts of the mine and the results obtained led them to an extension of experiments with