

From a consideration of the foregoing results the following deductions may be made:—

- 1. That no quantity standard—viz., a minimum of a certain quantity of air per man per minute—is applicable to all mines or to all the ventilating districts of one mine, for it will be seen that in the case of Taupiri Extended No. 6 dip west there was the least air circulating per man per minute in any of the mines—viz., 139 ft.—of all the measurements taken, yet the oxygen-contents of the return air were 20·75 per cent., almost the highest in the series. Obviously any standard should be in the oxygen-contents—i.e., a quality standard.
- 2. That the New Zealand law (copied from the British law) that no lamp or light other than a locked safety-lamp shall be allowed or used in any seam where the air-current in any return airway from the ventilating district is found normally to contain $\frac{1}{2}$ per centum of inflammable gas is entirely too lax as a qualification for the installation of safety-lamps. It will be seen that in no case at either colliery did the return air contain that quantity of inflammable gas, yet the conditions necessary for a disastrous explosion have occurred at Kaitangata and Ralph's (adjoining the Extended). The statutory provision appears to overlook the possibility of blowers and accumulations of gas in old workings therefrom, and that the contents of the mine-air vary greatly. I generally find an appreciable increase in return air from occluded gas towards the end of a shift—i.e., if much coal has been broken during the shift.
- 3. The air throughout the Taupiri Extended Colliery is permanently saturated to the extent of at least 94 per cent.*, and the coal contains water to the extent of 13·14 per cent., yet notwithstanding this the dust contained in the mine is so highly inflammable and combustible that after the Ralph's explosion, in which the dust was proved to have taken a very considerable part, without the aid of a microscope it was impossible to find the least trace of charred particles in the mine. Experiments by Dr. Maclaurin to determine the inflammability of Ralph's (and Taupiri Extended) coal proved that the relative distances to which flame was projected by such coaldust in comparison with dust from some other mines were as follows:—

Ralph's or Taupiri Extended (brown coal)	...	...	...	...	20
Westport-Stockton, New Zealand (bituminous)	...	...	...	...	16
Aberdare, New South Wales (bituminous)	...	...	...	...	13
Wales (anthracite)	...	...	...	...	2½

The sample of the first-named contained 13·14 per cent. water and 1·56 per cent. ash. Notwithstanding the humidity of the mine-air and the hydrous nature of the coal at Ralph's colliery, the subsequent dust-explosion was of great violence, nearly every one of the forty-three bodies recovered being mutilated. These facts may be of interest as serving to prevent undue importance being attached (in England especially) to the alleged advantage of humidity in mine-air as an allayer of coaldust and preventive more or less of coaldust-ignition.

(c.) EYE ACCIDENTS TO COAL-HEWERS OWING TO FLYING FRAGMENTS OF COAL.

During 1902 attention was first officially drawn to the prevalence of eye accidents by Mr. E. R. Green, Inspector of Mines for the Southern District, who reported that during 1899, 1900, and 1901 twenty-two coal-miners met with accidents to the eyes, principally resulting in ulceration of the cornea, the eyesight being badly affected in six cases, while in four others the sight of one eye was lost. At that time shields constructed of wire gauze, 8 by 8 mesh (to an inch), and about 5 in. by 3 in., the edges being bound by leather, were occasionally worn by hewers at Kaitangata when flying coal was expected. On the recommendation of Inspector Green a notice *re* eye accidents was printed on calico and exhibited at most of the New Zealand collieries. This notice was drafted by Dr. James Fitzgerald, eye specialist, of Dunedin. Extracts therefrom accompany this report.

The following is a summary of eye accidents owing to flying coal during 1915 and 1916:—

Inspection District.	Number of Eye Accidents causing Loss of Work.		Number of Days off Work.	
	1915.	1916.	Maximum for any Case.	Average per Case.
Northern (North Island)	38	32	171	18·13
West Coast (Nelson and Westland)	8	7	140	26·46
Southern (Canterbury, Otago, and Southland)	12	10	118	33·36
Totals	58	49		

In some cases the total loss of an eye was suffered. In the Northern District the eye accidents amounted to 17·71 per cent. of all accidents at coal-mines during 1915 and 1916.

* The relative humidity of the mine-air is not appreciably due to artificial methods of watering to allay coaldust, the haulage-roads and travelling-roads being only occasionally watered.