

used. Accumulations of gas from blowers are still possible in the extensive standing pillar area, which is only inspected weekly. In parts of such old workings, and on the sides and roof of some of the haulage and travelling roads in the present workings, coaldust in quantity sufficient to be dangerous is still to be found.

*Taupiri Extended Colliery.*—The output during 1915 amounted to 161,394 tons, the largest from any North Island colliery. The principal mining operations are now being carried on at a distance of nearly one mile to the westward and north-westward of the upcast shaft.

The ventilation of the working parts of the mine has been considerably increased by an alteration in the driving-wheels of the double-inlet Sirocco fan, the output of which I found to be 85,200 cubic feet per minute. Safety-lamps and Imperial permitted explosives only are used. The floor of the travelling and haulage roads is regularly watered, but in a manner more resembling a flushing of the lower parts than by creating a mist by means of an atomizer, which is the orthodox method in England. The report-books appear to be well kept. The danger from coaldust in small quantities on the sides and roof is not sufficiently realized at this mine, in common with almost all the other coal-mines in the Dominion. It has been proved by experiment at the British experimental station at Eskmeals, Cumberland, that the finest dust is the most dangerous, and that such dust is found on the roof and sides. As little as half an ounce of coaldust per cubic foot of space is sufficient to intensify and carry on a violent explosion; no coaldust is actually safe unless it contains at least an equal proportion by weight of incombustible stonedust, or is intimately mixed with water at a proportion of one-third by weight.

During the past year considerable attention has been given to the cover at this mine. The down-cast shaft is 162½ ft. deep, 81 ft. of which is cylindereed mostly through running ground; and the upcast shaft is 204 ft. deep, of which 106 ft. is likewise cylindereed. The strata penetrated in each shaft was 80 ft. and 90 ft. respectively of permeable pumice sand and mud, underlying which is jointed clay-stone (fireclay), which forms the roof to the coal-seam. In the deeper portions of the mine an upper seam exists in the claystone, but this has been eroded in the shallow south-eastern section of the mine. The workings are situated under a plain which is intersected by the River Waikato, and depressed at Lake Hakanoa: geologically this plain covers a buried valley. The underlying coal-measures, which rise towards the shafts and the lake, are inclined at about 1 in 10, and have been eroded by the ancient river to such an extent that little or no rock-cover to the coal-seam remains in the south-east portion of the mine, as shown by the sections accompanying this report: the overlying formation now consists chiefly of pumice sand and mud, more or less saturated with water, which constitutes a dead weight without any supporting strength whatever.

About twenty years ago, under different management, mining was extended under Lake Hakanoa until at one point only 56½ ft. of cover existed between the roof of the workings and the lake-bed, above which the water-level is about 10 ft. On two or more occasions during these mining operations running sand was encountered at the roof of the coal-seam. In one case a dam was constructed as a precautionary measure.

Several years ago workings were also extended under the River Waikato to the rise and approaching the coal-barrier between the Extended and the same company's Ralph's Colliery. Above the face of a bord, situated almost directly under the eastern edge of the river, only 71 ft. of cover separates the roof of the bord from the river-bed. The cover in this immediate locality is in all probability nearly all pumice sand and mud, except for a few feet of coal, which has been left on the roof of the workings throughout the mine as a precautionary measure. It is important to note that in New South Wales all Crown coal leases now contain a provision that in all workings under the ocean, or under river, lake, estuary, or tidal waters no coal shall be worked with less than 120 ft. of good sound strata as a cover. In Great Britain a greater thickness than this is required, and the cover is specified to be solid rock. In those countries, therefore, the conditions as regards cover at the Extended Mine would not be permitted.

At the Taupiri Extended Mine the overlying fireclay where it is exposed in the deeper ground is extremely jointed, slickensided, and treacherous. At many places in the shallow workings under both river and lake water drips continuously into the mine, proving permeability of cover. On the 6th July, 1915, a serious fall occurred owing to decay and collapse of old mine-timber, at a fault-crossing, in a return airway traversing the most southern workings. Owing to the water contained in the pumice cover to the coal-seam, the fall rapidly communicated to the surface 64 ft. above, forming a funnel-shaped cavity of about 70 ft. diameter on the surface, and terminating in the airway beneath. A considerable quantity of sand and water containing surface vegetation descended into the mine, from which workmen were then withdrawn. Fortunately, this fall occurred on a strip of dry land between the river and the lake workings, as shown on the accompanying plan, otherwise the result would in all probability have been very serious. In consequence of the dangerous possibilities disclosed by this fall, and as the result of investigations regarding the character and thickness of the cover to the southerly mine workings under the river and the lake, Mr. Boyd Bennie, Inspector of Mines, with full concurrence of the expert advisers of the Mines Department, notified Mr. William Wood, the mine-manager, under section 56 of the Coal-mines Act, that the mine was dangerous, and requested him to construct an additional outlet from the mine as a means of egress for the workmen employed in the dip-workings in case of emergency from irruption of water, gas-explosion, or fire. An additional means of egress was not regarded by the Department as affording perfect security, but as a third shaft at the dip-workings at Ralph's Colliery had provided means of escape for eleven men after the 1914 explosion occurred, it was also considered a reasonable precautionary measure for the Extended Mine. To this request Mr. Wood objected, in consequence of which the case went to arbitration under section 57 of the Act. The case occupied many days and much conflicting expert evidence was given, the decision finally arrived at being that the mine was not so dangerous as to require an