

36 deaths fell into this class. Two persons were killed by falls of ground, eight in shaft accidents, seven in miscellaneous accidents, and two by the blowing up of a thawing house. Mr. Corkill classifies 38.9 per cent. of these fatalities as being "due to fault of the injured persons," while 72.2 per cent. (including, of course, the previous figures) can be placed at the door of managers and the workmen.

There is no statutory definition of the serious accident. For convenience sake Mr. Corkill has placed in the category of "serious" all accidents by which a miner was incapacitated for more than seven days. Of these there were 84 in Ontario mines during the year. Twenty-six of this total were surface accidents. From falls of ground four men were injured. Shaft accidents accounted for nine serious accidents; explosives for 10, and miscellaneous accidents for 37. Here again it is to be noted that nine men suffered for their carelessness in drilling or picking in old holes.

Among the specific acts of negligence on the part of mine managers are the following:—

Failure to erect and maintain approved thawing houses.

Failure to instal safety cross-heads.

Neglect of efficient sealing, of proper ventilation, and of enforcement of regulations as to riding in buckets, blasting missed holes, etc.

Neglect of maintaining auxiliary ladder-ways while sinking shafts.

On the other hand, the workmen sinned in the following respects:—

Careless handling of explosives.

Drilling into missed holes.

Irregular tamping.

Riding in buckets and skips.

Failing to keep shaft guard-rails in position.

Neglect of proper sealing of walls and roof.

As Mr. Corkill points out, the manager shares the responsibility with the careless workman when he fails to report promptly any breach of the provisions of the Mining Act.

The urgent need of means for testing and regulating the character of explosives is strongly emphasized. Careless storage, careless handling, and irregular use of explosives can be controlled to an extent. But it is practically impossible for the Inspector to take steps against the sale of dynamite that is improperly manufactured.

The bulletin contains strong recommendations as to the establishment of mine hospitals, particularly at Porcupine, where already the Dome Mines, Limited, has set a good example.

Accidents in metallurgical establishments, and in quarries are fully tabulated and analyzed.

Bulletin No. 9 is by far the most complete presentation of the year's accidents that has ever been issued in Canada. Its appearance in pamphlet form is a

step in the right direction. Particularly to be commended is Mr. Corkill's effort to allocate generally the moral responsibility of each accident.

#### VERTICAL VERSUS INCLINE SHAFTS.

Mr. J. M. Nicol, writing in the latest bulletin of the Mexican Institute of Mining and Metallurgy, discusses the relative merits of vertical and incline shafts. His remarks are prefaced with the statement that there is in Mexico a general prejudice against the latter type. This holds for Canada as well. It is, therefore, appropriate to follow Mr. Nicol's argument. The metal mining field alone is considered.

Dealing first with prospecting, or exploration, shafts, the advantages of sinking to the dip of the vein are summed up as follows:—

The vein can be followed through every change of direction without the subsequent cross cut. The ore extracted lessens the expense of sinking. The work of sinking is easier owing to the more friable character of the vein matter as compared with the wall rock.

Against these advantages are to be set several disadvantages: First, more water is encountered usually in sinking on the vein, and during the sinking water is harder to handle than after fixed pumping stations have been established.

Second, sinking pumps are given hard duty, are difficult to repair, and may give serious trouble when handling water carrying sharp quartz grit.

Third, variations in the dip imply unfavourable hoisting conditions when sinking on the vein, and may render the shaft useless for later operations.

Fourth, if the ore body in which the shaft is sunk is large and valuable, either pillars of ore must be left or expensive timberings installed.

On the other hand, it is claimed that the vertical shaft can be driven more rapidly, timbered more easily, unwatered with greater facility, and that hoisting can be conducted with greater facility.

After thus summing up the pros and cons, Mr. Nicol proceeds to commend, for first exploration work, an incline shaft driven at a constant angle in the foot wall, only short cross cuts being required to tap the vein. This implies less pumping, and more rapid actual development. Further, stoping operations can be carried on at an early stage without entailing subsequent complications and loss.

For shafts sunk exclusively for drainage purposes, and these are most frequently necessary to unwater old workings, Mr. Nicol suggests the use of the core drill wherever possible, using air-lifts to extract the water.

Touching next on permanent shafts, designed for the handling of the mine output, the advantages of the self-dumping skip, as compared with the cage, are pointed out. Veins that are nearly vertical are, of course, not considered; nor are cases where there is