NOTES ON THE DEPOSITION AND DEVELOPMENT OF THE GLACE BAY COAL SEAMS.*

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At the commencement of carboniferous times the north-eastern portion of Cape Breton was overlain by a deep clear sea, favorable to the growth of coral and the deposition of limestone and gypsum. At the close of the lower carboniferous age the sea became shallower and towards the end of the formation of the millstone grit we find the rivers depositing clay, coarse sand and gravel. The succeeding age was one of extensive vegetable growth; and the rising sea-bottom became in part a swamp where the successful growth of forests deposited great depths of bituminous matter. The vegetable matter from the land probably accumulated at certain times in the shallow sea in sufficient quantities to form coal seams. When the land slowly sank fine sediment was carried down by the rivers forming shales and sandstones. These are impregnated with fossil remains of plant life and in some cases fossil animal remains.

Later on the former conditions may have been reproduced by a further upheaval or shallowing of the sea. So with the action of time and pressure we have a formation composed of sandstones, shales and marls containing beds of coal. During the ages that have passed since the carboniferous times, part of the coal measures have been worn away, a large area sunk beneath the Gulf of St. Lawrence and the continuity of the beds destroyed by faulting. The strata has also been thrown into undulations, so the dip and strike of the coal seams vary very considerably at different parts of the Cape Breton coal fields. There is reason to suppose that this coal field is only the end of an immense coal area, now underlying the Gulf of St. Lawrence, extending to Newfoundland, and underlying the Magdalene Islands.

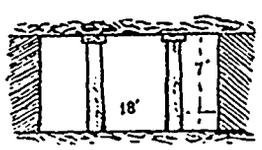
The Glace Bay coal beds, worked by the Dominion Coal Co., form an eliptical basin, the longitudinal axis running nearly due east and west. The greater part of this basin is under the sea; the western end only being available for mining operations. This portion is bounded on the north and east by the sea coast, and on the west and south by the anticlinals of Lingan and Cow Bay. The Lingan anticlinal is also a line of faulting, and it is as yet undetermined if there is a fault along the Cow Bay anticlinal. In this basin there are four seams of coal of considerable thickness that may be worked profitably. They are as follows:

	Approximate thickness.
Hub, coal	8½ feet.
Sandstones, shales and limestones	320 feet.
Harbor, coal	6 feet.
Sandstones, shales and limestones	400 feet.
Phelan, coal	7 feet.
Sandstones, shales and limestones	165 feet.
Emery, coal	5 feet.

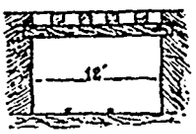
The inclination of the seams vary, but it is usually under six degrees. Of the six collieries hoisting in 1898, four were working the Phelan seam, viz., Caledonia, Dominion No. 1, Old Bridgeport and Reserve.

The question of where to locate the opening of a mine and what form of opening is best generally depends on the property. A thorough knowledge of the extent of the seam, its depth, inclination and thickness are required. These facts may be obtained by examining the outcrop, and boring through the overlying strata, and further verified by slopes and drifts. Usually in mountainous country, where the strata is at a considerable inclination, it is practical to work the coal by tunnels. But in this particular case the choice lies between shafts and slopes. The latter are adapted to seams at a considerable inclination, where the outcrop is on the property, and a cheap development required. Shafts are necessary when the seam is only slightly inclined or when two or more beds are to be worked from the same bankhead. They are also best adapted to mining on a large scale, when quick returns are not so important as the ultimate cost of raising coal per ton. The question of where to sink the shaft depends, to a great extent, on the amount of capital available for development. If the shaft is sunk well to the rise the cost of hauling the coal to the pit bottom is greater, but the cost of sinking less and an early output is available. On the other hand a deep shaft would allow of a less costly system of haulage, but would take more time and money. Up to the present the greater number of the Glace Bay coal pits have compromised by sinking a shaft from 150 feet to 180 feet deep, so at first a large part of the coal could be brought to the pit bottom by gravity. This plan will no longer be followed as the Dominion Coal Co. is engaged in sinking a deep shaft to work more than one seam. Usually the shaft has three compartments, two for hoisting the mine cars and one for a man lift. The dimensions will depend to a great extent on the shape of the mine cars, which is governed by the thickness of the seam and the character of the roof. The former regulates the height of the car and the latter the breadth, because a brittle roof will allow of wider workings and consequently wider cars.

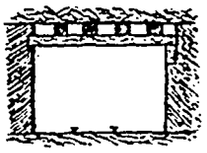
The question of the method to be employed in working the coal now arises. The chief systems are the long-wall and the pillar and stall. By the former all the coal is taken out by cutting along the wall or face of the coal, either commencing from the shaft and working out towards the boundary or by running tunnels or haulage ways to the boundary and working towards the shaft. This would be adapted to shallow seams, especially where there is a sufficient amount of splint slate, etc., in the coal to make supports, called gob-walls, for the roof. Usually, however, the roof is allowed to fall in, then if the surface property is of value there must be a sufficient depth of overlying strata to prevent the cave-in coming to the surface. By the pillar and stall method only part of the coal is removed by cutting out tunnels or rooms and leaving sufficiently large pillars of solid coal to support the overlying strata.

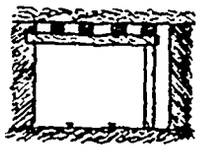


ORDINARY ROOM TIMBERING.



IN LEVEL WHEN NO PROPS CAN BE USED.


ROOF AND ONE SIDE BAD.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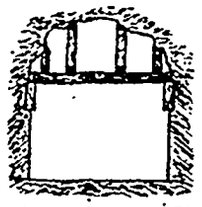
LEVEL OR DEEP AFTER FALL OF ROOF.

At the Glace Bay coal fields almost all the coal is mined in this way, for on account of the thickness of the seam and the small amount of rubbish in the coal they would have to allow the roof to cave in, when much damage would be done to the surface property. Of course it would be possible to support the roof by a system of blocks and heavy timbers, but such a method would be too costly. After sinking to the seam, levels are run out in the direction of the strike of the coal and the deeps, two or more run parallel or radiating from the pit bottom. Both deeps and levels are worked in pairs, that is two parallel tunnels usually 12 feet wide with a 12-foot wall between them. Every 66 feet they are connected by a 9-foot cross-cut, to allow the air to circulate and so ventilate the working face. A large part of the coal around the shaft is not mined but allowed to remain to prevent the settling of the ground under the bankhead and the surface buildings that are generally around the shaft. The rooms or stalls are cut off from the levels, and are worked towards the outcrop parallel to the plane of the coal.

They are about 18 feet wide with a 12-foot wall between them, and are connected every 66 feet by a 9-foot cross-cut. After working some distance down the deeps, levels are turned off as before, and rooms are commenced on this level to cut up

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