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THE MECHANICS OF MINING.

For the following paper, read by D. W. Robb, M. C. S. C. E., A. S. M. E., before the Canadian Mining Association, we are indebted to the Canadian Engineer:

The general public seem to regard mining much in the same light as a search for Captain Kidd's treasure, mysterious, difficult and uncertain, but having discovered the mine, the fortune has only to be picked up. This belief is, perhaps, unfortunate, since it leads to the loss of money and faith, and tends to produce distrust of all mining ventures. Yet this gambling spirit, which seems inherent in humanity—the desire to acquire wealth with little labor, is, perhaps, not an unmixed evil, because, if all enterprise was limited to absolutely safe investment, very few mines would be discovered. The mining engineer knows only too well that, notwithstanding the comparatively strong light that may be thrown upon, and even into, the bowels of the earth by geological science and prospecting experience, aided by the diamond drill, nature's secrets are so various and intricate that there is still much chance work. The present paper will not deal with the problem of finding a mine, but with the successful operation of it after it has been found.

While a few mining properties have been, and will be, developed which pay handsomely, in spite of bad management and crude mechanical appliances, by far the greater number of mines of all kinds depend for success or failure upon the method of operation, and even in those which will stand a certain amount of waste, there is no reason why they should not be made to pay better by good engineering. While the mining engineer should be qualified to lay out and conduct purely mining operations, such as location and arrangement of pits, shafts, drainage, ventilation, etc., he is not usually an expert mechanic. He may understand the general principles of steam engines, pumps, air compressors and electric machines, but his calling does not require him to study the details of each of the numerous forms of these machines, and he has not the constant opportunity to become familiar with the peculiar advantages and disadvantages of each, so that he can readily choose the details of his plant, with a clear perception of how they may be combined, to give the best results, with the highest economy in fuel, labor and repairs.

The mechanical part of mining consists in providing the best and cheapest methods of drilling and removing rock or ore, transporting, screening, crushing, milling or otherwise preparing the mineral for further use; pumping, ventilating and other operations, which may be accomplished by the use of machinery. First of all comes the power necessary to drive this machinery; this must, in the present state of the mechanic's art, be obtained either by means of steam or water power. Whether steam or water will be used must be determined by circumstances; where water power is not available, steam must be used, but in other cases there may be a choice. Where both water power and steam are available, care should be exercised in making the choice. To the superficial observer water power may

be attractive, because the water is free of cost, whereas fuel costs money, but it should be kept in view that the cost of building and maintaining dams and other incidental expenditures is frequently so large that the interest on capital and cost of maintenance is equal to, or even greater in some cases, than the cost of fuel, and if the stream of water is insufficient or irregular, steam may have to be used to supplement it, or the interruption of work would entail heavy loss. Having decided upon the kind of power to be employed, the next question is the selection of apparatus. If water-wheels, whether they shall be of the turbine or re-action type; if steam is to be used, whether the boilers are to be water tube or some other type, engines simple or compound? These are questions which should be decided by a competent and experienced mechanical engineer for each individual case, as they are governed by the conditions, e.g., whether the head of water is to be high or low; whether one large engine or a number of smaller ones must be employed; whether the steam is to be carried a long distance or used near the boilers, and other circumstances too numerous to mention. In small and medium-size mining operations, a mistake is often

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