MINERAL RESOURCES OF NEW ZEALAND.

PART VIII.

The resistance to the passage of an air-current through the above system will evidently be less than through an airway 6 ft. × 3 ft. 6 in., say, 12,000 ft. in length. The generosity of this hypothetical length will insure that the power shall be sufficient to deal with any exceptional atmospheric conditions.

$A = 6 \times 3.5 = 21$ square feet.

$S = (2 \times 6 + 2 \times 3.5) \times 12{,}000 = 208{,}000$ square feet.

$$V = \frac{4{,}000}{21 \times 1{,}000} = 0.187 \text{ thousands of feet per minute.}$$

$k = 0.0217$.

p = pressure in pounds per square foot to set up the desired current.

$$p = \frac{k S V^2}{A} = \frac{0.0217 \times 208{,}000 \times 0.187 \times 0.187}{21}$$

$= 8.25$ lb. (nearly),

and theoretical horse-power required $= \frac{8.25 \times 4{,}000}{33{,}000} = 1.$

A Blackman fan to do the work could be landed in the colony for £110. A water-motor capable of driving it with a head of 80 feet would be included in this price. A steam engine combination would cost the same.*

A Hayes fan of rough-and-ready construction could be put up—according to the inventor—for a ten-pound note. In most mining districts small engines capable of driving this could be picked up cheaply, and the compressed air supplied to the mine could be used as the motive power. Such a combination, however, could not be expected to show a high efficiency. Let the efficiency of the fan be 40 per cent., and that of the engine 25 per cent., then 10 horse-power will be required at the compressor. Assuming steam to be the power used for driving the latter, and a consumption of 2½ lb. coal per b.h.p., we have extra coal consumption due to fan $\frac{2\frac{1}{2} \times 10 \times 24}{2{,}240}$ tons per day, or slightly over a quarter of a ton. The price of coal at the mine in question is 8s. 6d. per ton, so that the cost of running fan and engine will be: Coal, 2s. 2d. per diem; oil, waste, etc., 2s. per diem; total, 4s. 2d. per diem. If water-power be used, the cost will be even less. Put briefly, it may be said, without fear of challenge, that it would take less to run the fan than to operate one machine drill.†

Second, as to the forcing of portions of the main current into dead ends. Wabner‡ shows that a jet which will itself discharge 8 cubic feet into the atmosphere at a pressure of 45 lb. per square inch will, if turned into a pipe 2 in. in diameter connected with the main airway, and not more than 35 ft. long—deliver 220 cubic feet per minute. A jet sufficient to pass 50 cubic feet will, if similarly fixed into a 6 in. pipe, deliver 1,500 cubic feet through 35 cubic feet of piping, 800 cubic feet through 200 ft. of pipe, and 500 cubic feet through 350 ft.; that is to say, if we assume the extreme case of two machine drills working at a distance of 350 ft. from a main airway, the quantity of compressed air which would be required to insure the blind heading being properly ventilated would be less than two-thirds of that required to run one drill.

If compressed air is used, however, in the ordinary wasteful way, and to the extent which some managers would have one believe, then enough air is blown to waste to run five additional drills. All that is necessary is to fit air-pipes of light, galvanized iron, which can be fixed by means of small dogs to the cap and one leg of every third or fourth set. A small attachment could be soldered into one length, consisting of a short piece of small pipe bent in line with the main pipe, with a suitable connection to the compressed-air pipe-line. This 6 in. pipe could be carried to within 20 ft. of the face in perfect safety.

The Economic Value of Pure Air, etc.

A shareholder in a quartz mine of any size should take steps at the earliest possible opportunity to make himself acquainted with the conditions under which his employees are working. He should make an informal but thorough inspection of his property, going into every blind working, and bearing a hand at whatever is going on there. He would find that he seemed to tire very quickly, and perspired profusely. He might contract a violent headache; at the least, he would feel generally most uncomfortable. He would probably be told that his discomfort was due to the fact that he "is not used to it," but if he had any commonsense at all he would realize one reason why quartz miners do less work than their brothers and cousins above ground. Is it not more than reasonable to suppose that if given pure air miners would have a larger individual output? This much he would be able to see for himself; possibly, also, he would note that men cannot do good work with blunt tools, or with no tools at all, and that much time may be lost by men who have to wait till some particular implement comes in turn to their hands. As regards anæmia—the effect of which on a man's work need not be enlarged upon—and silicosis, he had better apply to some local medical man for information.

A Possible Secondary Effect of Improvements in Ventilation.

Quartz miners actually work shorter hours than any other class in this country. They spend forty-six hours per week on their employer's premises, but from this must be deducted at the least half an hour per day for "crib" (lunch). The usual procedure is to fire a round of holes and to take "crib" while the "smoke" is clearing away. They are usually slow in returning to the face, and the thirty minutes often spins out to forty-five. They have good reason for their slowness, too, for even after that lapse of time the atmosphere in the face is frequently very foul.

As a matter of fact, the hypothetical forty-three hours is still further whittled down by the time spent in going to and returning from the face. This is provided for by legislation, and the reason is that quartz mining as carried on at present is a most unhealthy occupation, and it is not too much to expect that, if the work is made as healthy as that of, say, a bushman employed at a sawmill, the quartz miner will be prepared to put in a full eight hours at the face.*

One obstacle to the discontinuance of this system of paying men for eating their meals is the fact that most mines are worked in two or three shifts. In many cases this could be avoided, and a large majority of the men put on "all day shift." At some mines the change has been made. It is known to all miners that more work is done on day-shift than on any other. The reason for this is rather obscure, but the fact is well established, and the point is certainly worth noting by a shareholder who takes an interest in the economical working of the mine in which his money is invested.

Treatment of Employees.

It is most essential for economical working that goodwill should prevail between mine-owners and men. A miner who is well disposed can, in certain cases, save his employers many a pound by spreading bagging before shooting down the stone, and he can frequently economize with explosives and stores generally. He can also effect a considerable saving by preventing the loss of tools by being buried up by filling in the stopes or underfoot in the levels. As already touched upon, he can note and report every trifling change in the nature of the stone. He can refuse to shield incompetents and loafers, in addition to himself achieving a maximum output.

Working contractors supply their own explosives and candles, and find they can pay their wages-men 1s. a day over ordinary rates. In some cases they even pay more, but clauses are sometimes inserted in the contracts prohibiting this.

* The W. G. is rather high for this type of fan.

† A ten-drill compressor requires 130 i.h.p.

‡ "Mine Ventilation," pp. 132-34, q.v.

* See also C.

(To be Continued.)