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DRAINAGE TUNNELS AT ZEEHAN

The following is a report dealing with the question of Drainage on the Zeehan field. Several proposals were considered but the chief one enquired into was that to drive tunnel from McLean's Falls about 4 miles SW of the town to drain off the water in the upper levels of the mines around Zeehan.

The question is not so much one of whether or no certain advantages can be secured but whether the cost of securing then is warranted and the object has been to collate as far as possible the engineering facts so that some basis may be available to those with whom the provision of the required funds would rest, if the work was undertaken.

Dealing with these features it was found that the bottom of McLean's Falls is 345 feet below the collar of the New Mount Zeehan shaft. These heights were taken by the level from the New Mt. Zeehan shaft to the top of the Falls; from there to the bottom of the Falls the height was taken by aneroid which was checked carefully with the level during the progress of the work. The result can be relied on within a few feet.

The course of the main tunnel is shown on the Zeehan chart attached. It would start from the Falls and connect with the Col. North shaft. Thence to the New Mt. Zeehan shaft via the Florence; thence to the Montana, finally terminating at the Western shaft. Branch tunnels would go off to the other more important mines.

A section is also attached showing the relation of the level of the tunnel to the chief shafts of the field. Allowing 10 feet for tip head and 10 feet per mile fall the tunnel would come as follows:-

Zeehan Drainage

Below the bottom of

Col. North Shaft	(320ft deep)	215 feet
Spray No. 1	368 "	150 "
Austral Valley	200 "	125 "
Florence	198 "	125 "
New Mt. Zeehan	124 "	180 "
Oonah	450 "	25 "
Silver King	240 "	28 "

Above the bottom of

Montana No. 1	(803ft deep)	450 feet
Western	1000 "	580 "

The fall allowed, 10 feet per mile, is steep but if lessened the tunnel would need to be larger and there would be danger of sediment depositing.

The distances to be driven would be as follows:

		Total
To Col North Shaft 10230ft		10,230 feet
New Mt Zeehan via Florence	10,312ft	20,542ft (3m 71 ch)
Montana	3,234	
Western	2,112	25,888ft (4m 72 ch)

Branch Drives would be needed to other shafts as follows:-

Austral Valley	6,402 feet	
Silver King	3,696 "	
Spray	1,320 "	
Oonah	1,980 "	13,398
Total		39,286ft (7m 35ch)

The tunnel could be made the width of ordinary drives at the top, but 10 feet deep and 6 feet wide at the bottom. Passing points would need to be allowed about every 100 yards. The ties for the rails would be 4 feet from the bottom leaving the water channel below about 5 feet wide by 3ft 6in deep. This would carry off about 130 Tasmanian Head or 28 million gallons of water per diem, which should be ample.

A compressing plant for rockdrills and either compressed air or electrical haulage would be required to handle the trucks. Power for this could be obtained from the Falls.

For about 4,000 feet the tunnel would penetrate conglomerate; after that should come the ordinary slate country of the Zeehan field.

For a drive of the above dimensions the cost would probably amount to an average of £4 per foot for driving, timbering and equipping.

This gives the cost of driving as follows:-

To New Mt. Zeehan	£82,168
Other Connections	74,976
TOTAL	157,144

Equipment, rails for tramroad, air pipes etc would require another £10,000, so that the total cost would probably lie between £160,000 and £170,000.

Taking an average progress of 3 feet per day for 300 days in the year it would require 11 years to reach the Col North Shaft, 22 years to get to the New Mt. Zeehan and about 43 to complete the work. These periods could be reduced by working from intermediate shafts but the cost of this, entailing pumping and equipment for driving only two ends, would be extremely heavy.

When the results that would be secured by this lengthy thy and costly undertaking are considered, one fact stands out very clearly. Over a considerable area of the country to be tapped shafts are already down deeper than the level at which the tunnel would come in while over most of the rest of the area the major portion of the ground above has been worked out. For instance in the case of the Florence the shaft is down 198 feet and the tunnel would come only 125 feet below this. It is extremely unlikely that sufficient ore would be discovered between the tunnel and the present workings of the existent mines to warrant the cost of the tunnel while if the mineowners have to install pumps to drain their workings below the tunnel level, they will be averse to paying also for the use of the tunnel.

One aspect deserves consideration and that is the prospecting of the country through which the tunnel would advance. This would be of real value and might easily lead to the disclosure of new lodes but the chances are discounted heavily (1) by the probable presence of barren conglomerate for the first 4000 feet and (2) by the shallow depth of the tunnel as it approaches the central part of the Zeehan field. A depth of 300 feet here does not appear sufficient. To prove the extension downwards of present known lodes of depth of 500 feet would appear to be the minimum while to test the ground at depth for another zone of enrichment at least 1000 feet would be required.

A point of interest is whether in the event of sinking below the tunnel level the water in the mines could be intercepted and kept from percolating into the lower levels. This bears directly on an alternative scheme proposed a short time ago by Mr. Hodge to drive a tunnel from the Sunrise Mine to drain off the surface water. This tunnel would cut the Florence shaft at about 100 feet from the surface and the New Mt Zeehan at about 60 feet and would be 10,000 feet long to the Florence shaft. In some instances the water encountered on the Zeehan field may be called local water, i.e. it may be derived from soakage close at and not from springs of distant origin but at the Florence mine this is certainly not the case. In this mine the rush of water is strong and the quantity so much larger than in the neighbouring mines on either side that it would seem that a definite underground water channel, the presence of which many eminent geologists believe in, has been tapped. However, that may be, neither in this mine nor in the others

can one hope to intercept at 100 feet more than a small proportion of the water that would be encountered at, say 300 feet. Surface alteration as shown by the softer rocks extends on the Zeehan field to at least 300 feet in depth and these rocks are porous and permeable. In the case of the Florence where the water pumped was estimated at 1500 gals per minute, this quantity would account for a rainfall of 100 inches per ann over 348 acres. Under 10 acs would embrace all the Florence workings so that the balance must come in laterally and not vertically. As the workings drained the country an hydraulic gradient would soon be established in the surrounding rock and the water would miss the upper workings and appear in thoe below. All the evidence available as to the Florence points to a shallow tunnel here being of very little service while any scheme of work in the Argent Flat should be most careful of breaking into this deeplying river. When it is realised that 1500 gals per minute means over 2 million gals per diem or about as much as the Tasmania mine is now pumping the magnitude of the danger and difficulty here will be appreciated.

With the deeper tunnel a larger proportion of the water would be retained but it is unlikely that sufficient would be interpreted to lessen materially the quantity of water that would require to be pumped from any lower levels. There would, however, be a saving of power in the lesser height to which the water would require to be raised.

Another point that has been referred to is the advisability of dealing with the surface water of the Argent Flat. Any scheme that aids inquickly carrying away the surface water cannot fail to be an influence for good but it would be unwise to expect any big results from, for instance, running a concrete channel along the Argent Flat. Under normal conditions in Tasmania there is a heavy leakage from a water race when first cut but if muddy water is passed into the race the crevices silt up and the leakage is not heavy. In the case of the Argent Flat it is doubtful whether there would be much escape from the water channel itself. The seepage over the whole Flat would certainly amount to far more while the underground flow would be the main factor in shaft sinking. When it is realised that the catchment are of the Flat is about 1 square mile and that a considerable stream is constantly flowing out of it, it becomes clear that the loss by soakage cannot be very severe. It would be advisable to gauge the delivery of this stream before incurring any serious outlay in concrete or other channels.

The above conclusions show that a very large expenditure spread over a long period of time would be required if the drainage tunnel was undertaken while the result would be so imperfect and incomplete that it could in no sense be regarded as final. If it

was decided to attempt some combined scheme for unwatering the field and further testing it at depth, I consider that a central shaft would be preferable to the tunnel. The cost of this work would, however, be very heavy and it should be deferred until cheap power has been provided to deal with the pumping that would be required. The quantity of water encountered in the mines - with the exception of the Florence - is not great. Including the Florence and the 16 other most important shafts the total water horse power would only amount to about 650, if all were working. This would be equivalent to a demand for about 1000 horse power. Power can be secured on the West Coast for a capital outlay of about £20 plus an annual charge of about £8. It seems more reasonable to invest money in a power scheme which would be of permanent value whatever the mining results that accrued than in a tunnel scheme in itself incomplete and dependent absolutely on the vicissitudes of the mines it serves.

The problem of the Zeehan field is no easy one; the closer the matter is enquired into the clearer it becomes that an enormous amount of work has been done here both above and below ground by engineers as capable at their work as any in Australia supported by miners and tributors of more than ordinary acumen. Any scheme which proposes to follow after these men and win success from mines which they have closed down must be equipped with more resources than they possessed if it is have any hope of prevailing. I regard the provision of cheap power as more likely to prove advantageous to Zeehan than any system of tunnelling and as precedent to any scheme of mining development that may be proposed.

The survey work entailed above was carried out by Mr. J.H. Levings and I have to thank Mr. John Craze for valuable assistance to some of the estimates.

DEPARTMENT OF MINES
HOBART

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