Operations of the Nevada Wonder Mining Company During Four Years of War

By E. E. CARPENTER

The World War caused various fluctuations in the operating costs and profits of silver mines in the Western States, as a result of the increased cost of labor and materials and the coincidental rise in the price of silver. The effect on net profits is shown in the information available in the reports of operations during recent years of the Nevada Wonder Mining Co., from which sundry interesting comparisons may be made.

The production of silver from this mine decreased gradually from 1915 to 1919 in consequence of the depletion of the ore-reserves and the necessity for treating ore of lower silver content. The higher price of silver offset the increased costs and permitted this lower-grade ore to be worked at a profit. Had it been possible for the mine to continue producing ore averaging 20.84 oz. silver and 0.176 oz. gold—the tenor of 58,124 tons treated in 1915—the enhanced price for silver would have enabled the payment of greatly increased dividends. Like the great majority of silver orebodies, however, this one had been bottomed at a comparatively shallow depth. The stopes in the immediate vicinity of the Nevada Wonder shaft produced only a small tonnage below the 600-ft. level, although the Extension orebody was continuous for 1000 ft., from the 300 to the 1300-ft. level of the Nevada Wonder shaft; the former corresponding to a depth of 100 ft. from the outcrop of the lode, thus giving the orebody a vertical depth of 1100 ft. from the surface. However, it is fair to mention that over two-thirds of the bullion was derived from ore that was mined within approximately 500 ft. of the outcrop.

During the year 1918 the company treated 49,710 tons of ore for a total net operating profit of $179,548, equivalent to $3.61 per ton. The average content was 0.103 oz. gold and 13.23 oz. silver per ton, showing a decrease of 0.038 oz. in gold and 3.42 oz. in silver as compared with the preceding year. The average price for all the silver sold was $0.966 per ounce. Table No. 1 affords a comparison of the metal content and value of the ore produced from 1915 to 1918 inclusive. The gold content decreased gradually, showing a total decline of 41.5%, while the silver content decreased 36.5%. The value of silver increased from a nominal quotation of 50 to 96.6 cents per ounce, or 93.2%. The ore treated in 1918 would have had a value of only $8.75 if mined during 1915, as compared with the actual realized value of $14.93.

Table No. 1—Content and Value of Ore

Year	Gold. oz.	Silver, oz.	Value per ton	Average price of silver
1915	0.176	20.84	$13.97	$0.500
1916	0.159	18.72	15.40	0.647
1917	0.141	16.65	16.65	0.817
1918	0.103	13.23	14.93	0.966

Having compared the contents and value of the ore during this period of four years, it will now be useful to compare all the costs in connection with the mining and milling operations. Table No. 2 compares the direct, indirect, and total mining costs. The tonnage treated each year did not vary sufficiently to account for any considerable variation in costs, which must therefore be attributed to changing labor and market conditions. The lower direct cost for 1918 as compared with 1917 was caused by a decrease in development work, which was discontinued largely both downward and laterally, after the vein had been explored for 4500 ft. along its course and to a depth of 2000 ft. Had it not been for this change in policy about the middle of the year, the cost for 1918 would have been greater than for any preceding year. The average amount of development work during this four-year period was approximately 750 ft. per month.

Table No. 2—Mining Costs

	1915	1916	1917	1918
Direct cost	$3.33	$4.46	$5.41	$4.48
Indirect cost	0.83	0.83	0.97	1.04
Total cost	$4.16	$5.29	$6.38	$5.52
Average cost per foot of development work	$7.70	$9.31	$11.05	$11.65

Note: Transportation to mill was not included.

The direct per-ton cost of mining was divided as follows:

Table No. 3—Mining Cost, Segregated

Year	Labor	Supplies	Explosives	Power	Total
1916	$2.966	$0.713	$0.569	$0.212	$4.46
1917	3.587	0.990	0.580	0.254	5.41
1918	2.997	0.699	0.511	0.271	4.48

The corresponding direct cost for milling is shown in the following table divided under the three headings: labor, supplies, and power.

Table No. 4—Milling Cost, Segregated

	Labor	Supplies	Power	Total
1915	$0.705	$1.166	$0.394	$2.265
1916	0.753	1.641	0.367	2.761
1917	1.052	2.031	0.435	3.518
1918	1.108	2.002	0.482	3.592

Table No. 5—Combined Mining and Milling Costs and Profits

	1915	1916	1917	1918
Total mining cost per ton, including transportation	$4.19	$5.33	$6.43	$5 58
Total milling cost per ton	2.81	3.31	4.12	4.26
Marketing cost per ton	0.27	0.26	0.23	0.25
Total cost per ton	$7.27	$8.90	$10.78	$10.09
Average value per ton	$13.97	$15.40	$16.55	$14.93
Loss in tailing per ton	0.82	1.13	1.80	1.22
Recovery per ton	$13.15	$14.27	$14.75	$13.71
Less total cost per ton	7.27	8.90	10.78	10.09
Profit per ton mined and milled	$5.88	$5.37	$3.97	$3.62

Note: The high loss in tailing in 1917 was caused by treating sulphide ore before concentrators had been secured.

Table No. 5 shows the total mining and milling costs, direct and indirect, cost of transportation to mill, marketing, taxes, and depreciation; in fact, all charges properly made on mining account. The average value of the ore, loss in tailing, recovery, and the all-important item of profit-per-ton of ore treated, are also shown.

An effort to show the increased cost of producing an ounce of silver led to the compilation of Table No. 6. The ratio of gold to silver remained fairly constant, so the value of all gold produced each year was deducted from the total cost for the corresponding year; the then remaining cost of operation represented the cost of producing the silver. Dividing this cost by the number of ounces produced gives the figures, under the caption 'cost per ounce of silver after deducting the value of gold', which show a gradual increase from 18.2 to 64.6 cents.

Table No. 6—Summary of Cost of Producing Silver

Year	Gold, oz.	Silver, oz.	Value of gold	Value of silver	Total cost	Total cost less value of gold	Cost per ounce of silver after deducting value of gold	Recovery per ton Gold	Recovery per ton Silver	Average price of silver	Tons milled
1915	9,800	1,123,398	202,612	561,700	407,182	204,570	0.182	0.169	19.30	0.500	58,124
*1916	10,933	1,243,753	226,006	805,237	624,576	398,570	0.320	0.151	17.20	0.648	72,241
1917	7,513	816,853	155,255	667,685	588,913	433,658	0.539	0.135	14.64	0.817	55,800
1918	4,877	601,665	100,444	581,165	489,044	388,600	0.646	0.098	12.10	0.966	49,710

*15 months.

These figures, of course, apply to one particular mine, which unfortunately faced a gradual decrease in the grade of ore treated during the four years considered. It is a fact, however, that a number of other silver mines in Nevada were working under similar conditions.

Magnesia Cement to Protect Mine-Timbers

By W. C. PHALEN

*For mines that are situated in out of the way places, where timber is scarce and its price high, the problem of protecting it from fire is important. Scarcity of timber for mining purposes commonly exists in the more arid parts of the country, where, also, mine-timber is most likely to become dry and inflammable, and where, therefore, the risk from fire is accentuated. Any effective and cheap method of securing adequate protection of such timber at the lowest possible cost is worthy of careful investigation. The use of magnesite cement has been suggested in this connection.

The necessary qualities for any substance for this use may be summarized as follows: It should be resistant to abrasion, to impact, and to structural stresses. It should be durable when subjected to the action of the elements, and stable to any minor derangements of the base on which it is placed. It must be relatively unaffected by changes in temperature, or by the action of water, and should adhere to the material on which it is placed; and it should also be free from shrinkage cracks due to setting of the material.

Magnesite cement appears to fulfil these conditions. Its elasticity is the outstanding quality that makes it particularly desirable. The quality of adhesion and elasticity is easily proved by applying a ½-in. layer to a 1-in. board which first has been covered with metal-lath. Such a board, about 8 ft. long, may be repeatedly deflected 3 in. in the centre without breaking the bond to the board or causing any cracks to appear in the magnesia cement. The ability to resist fire as well as the possession of insulating qualities are also desirable characteristics of magnesia cement.

Magnesite cement should be applied in two coats, each ¼ in. thick, on various surfaces such as wood-lath, metal-lath, sheathing-board, brick, hollow tile, or stone. Care should be taken if lime is present, unless this has been rendered, or has become inert, as with very old walls. The first coat is made to a consistence that works easily under the trowel, and is applied in the usual manner. No water should be added to the liquid chloride as it would alter its density, and injure the work. The second or finishing coat is then applied. The aggregates are dif-different in each, and no other dry material should be added to them as they come to the trade. The cement may be applied in zero weather without damage. Setting is quite slow under such conditions, but it ultimately becomes hard. It should always be applied to a dry surface except that under certain conditions it is desirable to apply a solution of magnesium chloride first.

The temperature is of importance. If the temperature is over 50°F., only so much of the first coat should be applied in one day as can be covered with the second coat. In this way, the finishing coat is applied before the first coat has become hard. If the temperature is below 50°F., the finishing coat can be applied 24 hours after the first coat is applied.

Abundant supplies of magnesite occur in California and Washington, in close proximity to regions of large mining operations. The cost of transportation of such material would, therefore, be correspondingly reduced. Magnesium chloride is also an essential ingredient in making magnesia cement. Supplies of by-product magnesium chloride, produced in connection with the solar evaporation of salt along the Pacific Coast, have been largely wasted heretofore. Any development of a magnesia cement industry on the Pacific Coast ought to stimulate greatly the conservation of this chloride as well as the demand for Western magnesite, if the suggested use for magnesia cement is found practicable. Such use should also tend to place Western magnesite on a more secure basis by enlarging what is peculiarly a domestic application, and in which, moreover, there would be little danger of serious foreign competition.

*From Reports of Investigations, Bureau of Mines.