

Report
of the
Smelter Survey Committee and Sub-committee
of the
State Mining Association
on
Possible available ores
in the
Front Range Counties
John T. Joyce,
State Mine Commissioner, Chairman
1929

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Smelter Survey Committee Report to State Mining Convention.

At the last State Convention of the Colorado Mining Association, held in Denver in January 1928, a motion was adopted authorizing the appointment by your president of a committee of five members to act with the commissioner of mines, who was to be its chairman, to make a survey of mining conditions in the state for the purpose of ascertaining approximately the present available and probable future tonnage from its mines and prospects, with a view of securing the construction of a modern reduction plant combining concentration, flotation, smelting and other improved metallurgical features at Denver or some other central point in Colorado, in order to improve pre-marketing conditions, so that many of our mines capable of producing a daily tonnage of complex sulphide ores too small to justify the erection of concentration mills thereon or were not blessed with sufficient custom mills within their districts, might have a place to ship their products and have them treated at a profit as they are now doing in Utah, Montana, Arizona and other neighboring states of the western mining fields. In pursuance thereof your president appointed the following members as such committee, to-wit: John R. Wolf of Boulder county, W. L. Patrick of Clear Creek and Gilpin counties, R. J. Walter of Denver, A. E. Moynahan of Park county, R. M. Henderson of Summit county, and the state commissioner of mines as chairman. The first meeting of the committee was held May 3, 1928, when its organization was perfected by the election of the following officers: J. T. Joyce, state commissioner of mines, chairman; R. J. Walter, vice chairman, and A. E. Moynahan, secretary. After reviewing prevailing conditions, discussing tentative plans of procedure, etc., the meeting adjourned to meet on June 6th, at which time a definite plan of action was outlined and adopted as follows: Mr. Wolff was designated to make a survey of the mines of Boulder county, Mr. Patrick of Clear Creek and Gilpin counties, Mr. Moynahan Park county, Mr. Henderson Summit county, Mr. Walter and the chairman for other counties and to obtain information as to the methods employed and results obtained from such plants in Utah, Arizona and other states.

Their reports submitted at subsequent meetings follows:

	Tons
Mr. Wolf for Boulder from 40 mines daily - a total of	360
Mr. Patrick for Clear Creek and Gilpin from mines daily	1710
Mr. Moynahan for Park county from several mines	157
Mr. Moynahan's report was for available ore, not future.	

	Tons
Mr. Henderson for Summit county (number of mines not given):	
Breckenridge, 150,000; Kokomo, 100,000;	
Montezuma, 50,000 - 300,000 tons annually or, daily	<u>820</u>
	3047

The foregoing reports are based upon the possible and available tonnage from the mines of said counties, both working and idle - assuming that a favorable market is established as aforesaid at Denver or some other favorable central point in Colorado. Much of it comes from working mines whose daily tonnage is an established fact. But by far the greater part would come from idle mines and based upon very careful, conservative estimates and from statements obtained from the owners of these properties - the committee decided that a recheck was desirable as it was necessary to correct as near as possible the inaccuracies that are liable to occur in estimates and probable excesses from exaggerated views of owners which as is well known, are quite common. Accordingly, a recheck committee was appointed, consisting of Mr. Walter, Mr. J. O. A. Carper, who kindly volunteered his services, and the commissioner of mines as chairman. This sub-committee has now completed its work. To do the things required, trips requiring some time was necessary into the various mining camps and districts, entailing considerable expense. Up to date no money is available for such purposes.

Since the legislative appropriation for the State Bureau of Mines, outside of the salaries and traveling expenses of its employees, runs from \$1,000.00 to \$1,250.00 per annum for office supplies, equipment and other necessary running expenses, barely enough to permit it to properly function, it can readily be seen that no funds were possible from that source. Accordingly, late in the summer a request was made of the Board of Directors of the metal Mining Fund for a sum of not to exceed \$500.00 for the purposes mentioned. This request was generously granted as soon as moneys were available through the State Auditing Board. Unfortunately, it has not become available up to date, thus the work so far performed by your committee and its sub-committee has been done gratuitously, each member of both committees defraying his own expenses in attending meetings, printing, mailing literature and doing the work required of him. So that up to date, with the exception of one small printing bill, not one penny of expense or indebtedness has been incurred by your committee for the performance of this work.

While the work of this rechecking committee was also hampered by illness of some of its members and deaths in the families of two, it has not been idle and as far as its work has progressed, it is able from its partial recheck, to report as to possible future daily tonnage in round numbers of ore in value of \$9.00 to \$15.00 per ton, or a general average of \$12.00, as follows:

Boulder County	200	tons	daily
Clear Creek County	700	"	"
Gilpin County	300	"	"
Park County	500	"	"
Summit County	800	"	"
	<u>2500</u>	"	"

In addition to the foregoing it is reasonably safe to state from a review of reports submitted by the late lamented mine inspector, T. R. Henchen, to the State Bureau of Mines, that at least 1,000 tons per day of this class of ore is possible from the counties of Grand, Routt and Moffat, which are known to contain many mines that could not ship this class of ore because of inadequate transportation facilities, but which are now available to such a plant through the construction of the Moffat Tunnel. Larimer county may also be added to the list.

It must be borne in mind that these figures represent the future possible tonnage from the mines of the counties mentioned, the greater number of which by far are now idle. The committee is convinced that as soon as a central reduction plant is assured, through which their products could be marketed, at least 50 per cent thereof would at once resume operations and developments on a systematic basis to be followed by the major part of the remainder in rapid succession.

After a careful review of these figures the committee feels that an estimate of the immediate available supply may be conservatively fixed at about 20 per cent, placing the available supply by the time such a plant would be ready to operate at 500 to 700 tons per day. The completion of the recheck work will doubtless add 300 to 400 tons daily to this estimate. Thus an average daily tonnage of at least 1,000 tons can be considered as dependable.

In addition to the foregoing, Mr. E. W. Keith, consulting engineer and one of the best known zinc experts of the West, kindly volunteered to aid the committee in its labors. Under date of May 18, 1928, he wrote the committee in which he fully and comprehensively reviews the zinc ore conditions in Colorado, and strongly sets forth the advisability of an electrolytic plant in Colorado. As Mr. Keith is to address you later on this subject, and the main object of this report is reference to possible ore supply, I will read only a short paragraph from his letter touching upon that particular phase:

"It may be of interest to quote a resume of a survey of the crude zinc ore existing here that contains over 12½ per cent zinc which I compiled in 1920. The totals at that time were as follows: In tons:

Over 12½%	Over 17½%	Over 20%
7,500,000	4,460,000	3,027,000

Since then there has been much more ore defined than has been extracted. Also, for reasons I did not then include the Eagle county possibilities. It is safe to say that the present moment there is a potential tonnage of ore available containing the defined average of 15 per cent zinc with 6½ per cent lead, 4 ounces of silver per ton, that totals the 7,500,000 tons, still exclusive of Eagle county.

Again under date of November 20, 1928, Mr. Keith wrote the committee on this subject, from which I quote the following paragraph:

"The present daily production from state sources is about as follows in concentrate of better than 50 per cent zinc grade in each case:

Leadville, Colo., Zinc Lead Mill	75 tons
San Juan, Sunnyside Mill	75 tons
Rico	25 tons
Summit County, Wellington Mine	25 tons
	200 tons

Reports received at the State Bureau of Mines at the end of the year would indicate that the total of the figures submitted by Mr. Keith as to daily production should be increased by 25 to 50 tons.

It must be remembered that Mr. Keith's figures, submitted above, have reference only to ores in which zinc is the dominant factor, and represents the production of concentrates from only four mills treating practically only ores produced from the counties in which they are located; namely, Dolores, Lake, San Juan and Summit. The total metallic zinc produced in Colorado for 1927 (we have not the exact figures for 1928), was in round figures about 75,000,000 pounds or 37,500 tons; or, about 103 tons of metallic zinc per day of 365 days. Seven counties outside of the four above named produced in 1927, about 14,000,000 pounds or 7,000 tons of metallic zinc.

This would also add about 50 tons daily of ore or concentrates, and bring the total actual daily output at this time close to 300 tons from the mines of Colorado. There can be no doubt that the zinc output for 1929, from many old and new properties now about ready to begin production, will increase this figure by at least 30 per cent, bringing the total daily output of 50 per cent ore or concentrates close to 400 tons.

All this suggests the propriety, in fact, the crying need of an electrolytic plant in connection with a general reduction plant. The marvelous success of the electrolytic zinc process will be explained by other speakers during this session. Therefore, your committee will not touch upon its technique, but confines itself to the needs thereof and the sources of the assured supply.

There is a strong move under way, with assurances of success, for the construction of an electrolytic zinc plant at Los Angeles, Calif., to treat the zinc ores and concentrates of Arizona, New Mexico and southern California and northwestern Mexico. The assured supply of metallic zinc from these sources is given at 86 tons per day, and possible supply at 170 tons. Compared with a Colorado plant, the result would be as follows:

Los Angeles plant -- Assured 86 tons daily -- possible 170 tons.
Colorado plant -- Assured 150 tons daily -- possible 300 tons.

Thus while it is impossible to determine accurately the future tonnage of the mines of this or any other state, the committee is convinced that there is ample ore for one or more of such plants, including an electrolytic plant at Denver or some other central point in the state of Colorado.

For thirty years prior to 1919, in which the smelting plants in Denver and Salida were closed, the average annual production of our mines was in round numbers, \$38,000,000, the mining industry was flourishing and prosperous. In that year our mineral production dwindled to a little over \$21,000,000, a decline slightly over \$17,000,000 below the general average. In 1921 the smelting plant at Pueblo was closed, and that year our annual production suffered a further reduction of about \$8,000,000, making a total decline of over \$25,000,000 in the space of three years, and of \$22,000,000 below 1918.

This decline was proportioned throughout all mining districts of the state, and it is unreasonable for anyone to assume that the majority of these mines became practically simultaneously depleted within this short space of time. It was the abandonment of these plants which marked the real beginning of the downward trend of the mining industry in Colorado. We suffered more from this cause than from all the ill effects arising from post-war depression. It was not post-war depression, but the abandonment of smelting operations at the plants mentioned which caused the suspension of operation of the greater number of our low grade mines for the reason that they were deprived of a place to ship their crude ores or concentrates and ultimate marketing except at heavy and, in many cases, extortionate freight and smelter charges.

It is true Colorado suffered from post-war depression because it was universal, but our neighboring states have recovered while we still lag. From the finding of the committees it appears that ores in sufficient quantities that are susceptible to profitable treatment by such modern metallurgical processes are abundant in the counties mentioned, without considering many other districts throughout the state, from which large supplies could come, but we have not the necessary metallurgical plants anywhere in the state to treat and reduce and ultimately market them.

Direct information obtained from correspondence between the State Bureau of Mines and the International Smelting Company at Salt Lake City and a visit made by Mr. Walter, a member of the committee, to the Utah plants during the past summer, may be briefly but substantially summarized as follows:

The Tocoale, Utah, plant of the International Smelting Company was constructed in 1924, and began operations in November of that year on a 500-ton basis combining concentration, principally by selective flotation and smelting. The situation confronting them at that time was very similar to that which confronts Colorado today. In most of the Utah mines there was a preponderance of zinc-lead sulphide ores too low grade to market. Many of the mines were idle and others were preparing to close, but with the building of the Tocoale plant they all became active and in less than six months, in order to meet heavy increase in production, the plant was increased to a daily capacity of 1,000 tons and the annual output of Utah increased over \$16,000,000 in 1925.

Recently, the U. S. Smelting and Refining Company has modernized its plant at Midvale, Utah, by adding an up-to-date concentration plant embracing flotation and other modern improved metallurgical features, with a daily capacity of 350 tons. These plants are purchasing and treating complex sulphide ores running as low as \$8.00 to \$12.00 per ton, at a flat treatment charge ranging from \$4.00 to \$4.25 per ton.

As further evidence of the successful handling of extremely low grade lead-zinc-copper sulphide ores of the same character of our Colorado mines, the following is quoted from a paper read by Mr. Howard I. Young at the annual meeting of the American Zinc Institute held at St. Louis, April 16 and 17, 1928:

"In the Salt Lake valley these complex ores come from more than forty mining districts located in Utah, Colorado, Nevada, Idaho and Oregon. The Tintic, Park City and Bingham districts ores are concentrated at the International Smelter, located at Tocoale, at the U. S. Smelter, located at Midvale, and at the combined metals at Bauer, Utah. The distances from the mines to the concentrating plants in the above instances, are from sixteen to eighty-five miles. The Complex Pioche, Nevada, ore is concentrated at Bauer, near Tocoale, Utah, a distance of more than 325 miles from the mines. An average assay of this crude ore is six ounces silver, 6 per cent lead, and 15 per cent zinc."

Mr. Young stated he wired Mr. Elton requesting average grade ore and concentrates at this time, and received the following reply:

"Composite six mills Salt Lake valley now treating approximately four thousand tons daily feed; average assay, zinc 7 per cent, lead 8 per cent, silver six ounces, gold .06 ounces, copper .3 per cent, making a zinc concentrate of following composite average analysis: Zinc 52.3 per cent, lead 3.4 per cent, silver 6.2 ounces, gold, .01 ounce, copper, .4 per cent, besides lead and iron concentrates for copper smelters."

It might be well to state here that the Mr. Elton mentioned in Mr. Young's paper is the present manager of the plant of the International Smelting Company at Tocoale, Utah.

All this naturally suggests a question. If the plants of Utah, or any state, can successfully treat complex ores of a grade as low as that mentioned in Mr. Elton's wire, why cannot the same be done here, with every necessary requisite within easy reach; water, electric power, fluxing material and inexhaustible coal fields at our door?

Thus, from the foregoing, which is based on facts, dates, surveys and statistics that are well known by those familiar with our state's history and its commercial and industrial enterprises, it is shown that we have the mines, the ores, the field and every other needed factor to keep an up-to-date reduction plant, combining concentration, flotation, electrolytic and smelting with other improved processes in keeping with advanced modern metallurgy, in continuous operation for generations to come. But the plant itself is lacking and that alone is all that is lacking to restore Colorado to its former greatness as a mineral-producing state.

Respectfully submitted,

JOHN T. JOYCE,

State Commissioner of Mines,
Chairman

A. E. MOYNAHAN, Secretary

Colorado Mineral Production U. S. Bureau of Mines

	1859 - 1928	1929
Gold	\$ 706,294,000	\$ 4,369,632
Silver	514,385,000	2,508,689
Copper	43,426,000	1,495,008
Lead	212,156,000	3,159,189
Zinc	147,788,000	3,944,248
Coal	674,500,000	28,000,000
Tungsten	19,300,000	150,000
Radium	18,000,000
Petroleum	26,000,000	2,900,000
Molybdenum	7,933,000	3,500,000
Vanadium	5,750,000	600,000
Fluor Spar	1,900,000	14,000
Iron	3,800,000	100,000
Manganese	4,000,000	126,000

\$2,380,292,000 \$ 50,866,766

Grand Total \$2,431,158,766

To the Chairman and Members of The Colorado
Mining Association, Denver, Colorado

Gentlemen:

We, your Sub-committee appointed by you to recheck the reports made by your committee authorized at the annual meeting held in January, 1928, find that the report of said committee, as far as it relates to all grades of ore, is substantially correct.

Your Sub-committee has gone over the committee's report with the utmost care, and largely at its own expense, has, by personal visitation to the more prominent camps of the several front range counties, endeavored to verify the earlier report, or, if there were discrepancies of any nature, to correct such.

Your Sub-committee also requested the co-operation of the local county or district associations and the State Mining Inspectors for the several districts, with the result that the greatest possible assistance was accorded it by the officers of each; that the actual conditions maintaining in each district might be definitely determined, local formal meetings were held at Alma, Breckenridge, Georgetown, Idaho Springs and Boulder, and informal meetings at many of the smaller camps, at all of which the utmost courtesy and co-operation were extended.

Committees of the most conservative, as well as best informed men of each district, were appointed to co-operate with your Sub-committee.

Considering the reports of the district committees, in conjunction with the results of personal investigation and the reports of the several state district mine inspectors, your Sub-committee feels that it might properly divide ore occurrences into three classes - viz.: positive, probable and possible, with a further distinction between smelting and mill ore, fixing the minimum value of the former at twenty dollars per ton, whether crude ore or concentrates, as being profitable if a modern reduction works were available at Denver or some point easy of access to the front range counties.

Your Sub-committee finds positive ore from Park County, one hundred and fifty-seven tons daily; Summit County, one hundred and sixty tons; Gilpin and Clear Creek Counties, one hundred eighty tons; Boulder County, fifty tons; or an aggregate of five hundred and forty-seven tons per day.

Should a plant such as those at Tocoile, Midvale or Bauer, Utah, be established where ores of lower grade might be classified and separated into grades, your Sub-committee finds the probable tonnage available from the several counties, as follows:

Park County, five hundred tons,
Summit County, eight hundred tons,
Gilpin and Clear Creek counties, one thousand tons,
Boulder County, two hundred tons,
or a total of twenty-five hundred tons daily of ore averaging ten dollars per ton.

As to possible ores, your Sub-committee finds the report of your original committee, consisting of Mr. Wolff of Boulder County, Mr. Patrick of Clear Creek and Gilpin Counties, Mr. Walter of Denver, Mr. Moynahan of Park County, Mr. Henderson of Summit County, with Mr. Joyce, State Mine Commissioner as adviser, to have been well founded, and may be divided as follows:

Boulder County, three hundred sixty tons,
Clear Creek and Gilpin counties, seventeen hundred ten tons,
Park County, five hundred tons,
Summit County, eight hundred twenty tons;
the reports from Park and Summit counties being positive and probable ore,
with no report as to possible ores.

The late Mr. T. R. Henahan, State Mine Inspector for the district of Grand, Routt and Moffat counties, reported that at least one thousand tons of ore of commercial grade could be produced daily from that district if transportation and treatment plants were available. With the completion of the Moffat Tunnel, satisfactory all year transportation has been provided.

Your Sub-committee finds that complex ores, containing Gold, Silver, Copper, Lead and Zinc, are now being treated at the plants above mentioned, and originate in some instances, at points as remote as the state of Oregon. The bulk of the ore, however, originates in Colorado, Utah and Nevada.

M. R. J. Walter (metallurgist and former smelter manager) of the Sub-committee, had made several visits to the plants of the United States Smelting, Mining & Refining Company at Midvale and the International Smelting Company at Tocoale, Utah, the last of which was subsequent to his appointment on this committee, and summarizes his report as follows: The U. S. Plant has been remodeled, with the addition of a three-unit flotation concentrating plant of 850 tons daily capacity operating at capacity, and purchasing ores at a fixed price for elements contained, without penalties, and deducting a treatment charge of \$4.00 to \$4.25 on ores assaying from \$8.00 to \$12.00 per ton.

At the International plant, a modern flotation and smelting plant treating 1,000 tons per day, running to capacity, on low grade and smelting ores, and making an average treatment rate of \$4.25 per ton, with a rate covering both freight and treatment on the low grades from Park City, Utah, of \$4.00 per ton, purchasing on a per cent basis of assay value.

Mr. E. W. Keith, an authority on zinc ores, markets, etc., wrote the committee on May 8, 1928, stating the amount of zinc ore available and strongly advised an electrolytic zinc plant for Colorado.

The total metallic zinc recovered from Colorado ores in 1928 was, in round figures, 75,000,000 pounds. 1929 will probably show a material increase as old and new properties increase their production.

It appears to your Sub-committee that the conservative statements quoted above, verified by personal contact, justifies it in endorsing any movement looking to the establishment of a modern plant of at least 500 tons daily capacity, at some point along the front range, as such would not only encourage the small operator, but would provide him with an immediate market for his mine output, would in many cases enable the operator to increase production even though modestly financed, and would encourage the building of modern concentrating plants at central points for the accommodation of smaller operators, which, in turn, will encourage the development of additional properties now dormant by reason of lack of market.

As a confirmation of the recommendation expressed above, your Committee finds that since its investigations began, an ore purchasing company of this state has already added to its equipment a flotation unit and is now in the market for complex ores, and your Committee is advised that operators are receiving highly satisfactory results from shipments sent.

Your Committee would also call attention to the fact that there is now a number of mills operating or idle, which could readily be converted into flotation plants if a market were easily available for the purchase of concentrates.

Your Sub-committee wishes to express its thanks to Mr. C. W. Lerchen of Idaho Springs, Mr. John R. Wolff of Boulder, Mr. R. M. Henderson of Breckenridge, Mr. H. S. Bushnell of Georgetown, Mr. E. H. Moynahan of Alma and Mr. F. L. Patrick for the courtesies shown and aid given in reaching its conclusions; also to the Commissioner of Mines and his deputies, particularly to Mr. George Becker for his untiring assistance.

Your Sub-committee further reports that in the gathering of the foregoing data, it has had the sum of One Hundred and Fifty Dollars out of an appropriation of Five Hundred Dollars, authorized by the Metal Mining Fund.

Dated: Denver, Colorado, December 11, 1929.

Respectfully submitted,

JOHN T. JOYCE,
State Mine Commissioner, Chairman.

R. J. WALTER,
Representing The Colorado Mining Association

J. O. A. CARPER,
Independent

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