

Report on
Manganese Deposits
near
Corbin, Montana.
G.N.Ry.

Advance copy with data to
Oct. 13, 1901.

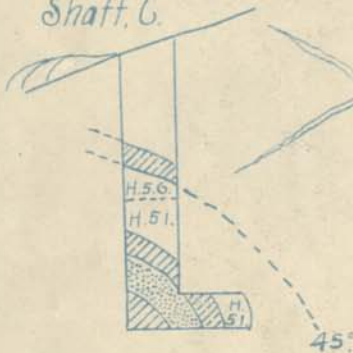
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R.N.Dickman.

Cut A.



Shaft C.



Cut B.



- MANGANESE CLAIMS -
WEST OF
- GORBIN -
MONTANA

J. K.
Bazaar.

L.
Atlantic.

Mangan-
ese

Bell

Snow Drift

Utah.

Black Bird A.

Spring Lode.

Clancy Creek.

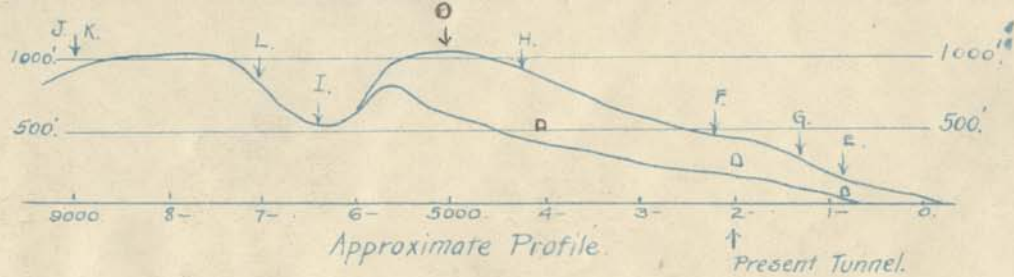
Search Light.

N.

Nevada.

General Harris

Leadville.



James J. Hill Papers
Minnesota Historical Society

Manganese Claims
near
Corbin Station, G.N.Ry. Montana.

Location and Topography.

These claims, as shown by the appended sketch, are located about four miles west of Corbin Station, Jefferson County, Montana. The present approach is by means of a fair wagon road five miles in length, which can be shortened and improved by a cut off, from a point about one and one half miles from Corbin.

Rail connection from Wickes Station would not probably exceed four miles in length, to the camp location to which ore would probably be delivered by tram. The difference in elevation between Wickes Station and this camp is 430 feet by the barometer, or slightly over a 2 % average grade.

The first three miles would consist of gravel and slide on the side hills. The last mile will contain some rock cuts and heavy work. The average character would be like that between Corbin and Clancy except in grade.

Geology.

It may, in a general way, be stated, that the lead or belt carrying the manganese ores, consists of a series of veins (three at least) in porphyry and near a granite-porphry contact. The belt is plainly traceable for a total of 13000 feet in length. Nearly all the surface work has shown manganese ores of value.

Examination.

The writer has visited the claims on six occasions between July 20, and October 15, 1901. and contemplates a final visit before Jan'y 1, 1902. The present report is based on the last visit and all results.

Briefly stated the belt is so large and the surface decomposition so deep reaching, that the final average character can be determined only by deeper and much more extensive work, the beginning of which is now well advanced and progressing in a satisfactory manner. The same applies to an assured statement of tonnage.

There is however every reason to believe that this work will develop valuable high grade deposits of manganiferous iron ores, for reasons to be detailed later. But one shaft, and that an old one, reaches any considerable depth.

At this point the ore found is low in silica and phosphorus. (See Snow Drift shaft.)

Details.

Of the easterly claims, the Leadville, Nevada and Searchlight all have old cuts and pits sunk in search of silver ores. All show mixed manganiferous iron ores. The work was inaccessible for proper sampling and insufficient in any event to be conclusive.

On the Searchlight a fresh cut indicates the presence of a vein. A sample shows:- "M".

Iron.	Manganese.	Silica.	Phos.	Chicago Val.
20.00	30.60	6.42	.068	\$ 8.14

Recent work in an old pit on the General Harris claim gives some promise of an iron ore rather low in manganese and in this country of hard ores, very desirable in a furnace mixture. While nothing can as yet be stated as to size or character of the vein, the indications warrant continuance of the work. Three samples near the surface result as follows:- "N".

	Iron.	Silica.	Phos.	Manganese.
No 1. P. Gibson.	55.54	6.24	.057	.49
No 2. Dickman.	54.30	3.30	.071	1.37
No 3. "	56.40	5.30	.047	.80

If ore of this character can be found in large quantity the influence upon the situation at Great Falls is almost beyond present calculation.

The Spring Lake and the Utah claims are located for camp purposes and surface rights. They fulfil the requisites as such. The mineral belt itself is covered by the claims Horse-Fly to Bazaar inclusive.

As best suited to all initial operations the principal prospecting work has been done on the Black Bird and Horse-Fly claims. The details of the work to October 15, 1901 are as follows. Refer to the Map and sketches appended.

Value of ores.

The following is a copy of a price sheet submitted July 19, 1901. by L.D.Doty Pur. Agt. Ill. Steel Co. For details address C.H.Foote 1st V.P.

Memorandum of Prices per ton of 2240 lbs, which will be paid for manganese ores delivered at the plants of the Illinois Steel Co. Chicago, Ills. (In calculations deduct \$7.00 per ton of 2000 lbs as rate from Great Falls, Mont.)

Prices apply to net dry weight.

based upon

moisture samples taken and dried at 212 degrees Fahrenheit and net dry weights figured and divided by 2240 for tons in lots of not less than five cars.

Prices are based on ores containing,
 not more than 8.00 % Silica.
 not more than .100% Phosphorus.

Deductions.

For each 1.00% Silica in excess of 8.00%—\$.15 per dry ton.

For each .02% Phos. in excess of .100%—\$.01 on each % manganese.

Payments.

Ore containing Manganese over		Per unit of	
		Iron.	Manganese.
	49 %	\$.06	\$.29
46% to	49%	.06	.28
43% to	46%	.05	.27
40% to	43%	.05	.26
37% to	40%	.05	.25
34% to	37%	.05	.24
31% to	34%	.04	.23
28% to	31%	.04	.21

By the use of this table there is appended to each analysis the Chicago value of the ore per dry ton of 2240 lbs.

Details of prospecting work.

Black Bird Claim.

Cut "A". See sketch with map. On outcrop of vein. Full width of vein matter not exposed. Ore somewhat mixed and as a whole siliceous in top layer. Lower layer contains clean lumps on separation and screening. See later comments on subject of separation and classification. Samples as follows:—

	Average of 4 ft. H.1.	Selected clean lumps. H.2.
Iron.	14.00	16.00
Manganese.	31.80	40.00
Comb. Units.	45.80	56.00
Silica.	20.15	2.01
Phos.	.067	.075
Chicago Value.	\$ 6.06	\$ 11.20

Of the above 40% of the material mined from 4 feet would approximate H.2. and the rest approximate H.1.

Cut and drift "B." The main part of this work is in float or wash from the outcrop. Solid ore just penetrated. (See sketch.) Filling taken separately by screening on 1 in. iron screen square mesh. Proportions not yet established.

Analyses of samples taken as follows:—

	Selected Lump.	Filling. H.4.
Iron.	H.3.	
Iron.	17.70	21.00
Manganese	36.25	21.75
Comb. Units.	53.95	42.75
Silica.	2.76	16.19
P Phos.	.111	.193
Chicago Value.	\$ 7.59	\$ -----

Shaft "C". See sketch. Thus far this shaft forms the principal work done which shows ore on the properties. It has been sunk to a depth of 45 feet and is still in soft ground. It indicates the promise and advisability of deeper work. The sketch and samples illustrate the conditions met. It will be noted that there is no assurance that the full width of the belt has been cut, but on my advice the work was stopped since solid ground was not immediately probable at any depth which could be reached with a windlass, and other surface work seemed better calculated to give desired data with the small force available.

The samples were taken and screened. They are described as follows:-

- H.5. Clean solid washed lump ore. Selected from dump.
H.6. Fine filling below 1 inch mesh and above 1/2 inch.
H.51. Lump ore above 1 inch forming of the whole 58.9 % "A".
H.51. Middlings between 1/2 and 1 inch washed clean. 11.8 % "B".
H.51. Screenings below 1/2 inch dry screening. 29.3 % "C".

	H.5.	H.6.	"A".	"B".	"C".
Iron.	15.20	21.00	15.75	12.65	17.15
Manganese.	37.60	18.65	34.37	25.56	23.56
Comb. Units.	52.80	34.65	50.12	33.21	40.71
Silica.	5.52	24.18	10.84	23.60	19.38
Phosphorus.	.993	.199	.087	.103	.158
Alumina.			1.29	5.06	3.47
Lime. CaO.			2.17	1.10	1.20
Magnesia. MgO.			1.15	2.77	2.48
Sulphur.			.03	.05	.10

Chicago Value. \$10.15 ----- \$ 8.60 -----

I am satisfied that some modification of screening or hand sorting will produce a product of from 35% to 40% manganese content and 55% combined units in ground similar to that in Shaft "C" and aggregate 40% of the ground mined.

What is shown above applies in general. All surface work shows the vein matter to consist of a soft fine filling (C) of silicious manganiferous iron ore. The oxides are highly hydrated and the soft material is invariably high in phosphorus.

A simple dry screening of the ore as it comes from the ground separates it into a lump above 1 inch which is invariably in mixed ground below .100 % phosphorus content. Data shown later indicates that as depth is reached and solid bodies encountered the ore will be lower in phosphorus, lower in water content and of a better commercial character. (See Snow Drift Shaft and Bazaar Cuts.)

Cut "D".

This pit near the east end line of the claim is opened entirely in float or wash. Clean lumps are however abundant and analyze as follows:-

	per cent.
Iron .	13.50
Manganese .	35.00
Comb. Units.	48.50
Silica.	18.18
Phos.	.092
Chicago Value.	\$ 8.58

Cut "F".

This cut, 150 feet above A.B.C.D. indicates a third vein beyond E. The vein matter is exposed in place. Sample shows:-

	per cent.
Iron.	16.00
Manganese.	41.00
Comb. Units.	57.00
Silica.	2.67
Phos.	.067
Chicago Value.	\$ 11.46

Horse Fly Claim.

Cut. "E."

The nature of the claim is the same as the Black-Bird. The surface trench E. indicates a second vein above A.B.C.D. Some ore exposed in place. Indication very promising. Selected lump gives following analysis:-

	per cent.
Iron	17.50
Manganese.	38.90
Comb. Units.	56.10
Silica.	3.29
Phos.	.056
Chicago Value.	\$ 10.52

Shaft. G.

This shaft made a very good showing, in amount of clean lump ore. It practically establishes the presence at this point, of a belt at least 150 feet in width, containing three veins of manganese ore. A careful examination of present conditions leads to the conclusion that at least 30 feet of this width is made up of manganiferous iron ore. Deeper work alone can determine their final average character. An improvement in character is anticipated. The ore in the bottom of this shaft is more solid and lower in phosphorus. H.50.

		per cent.
Lump Ore.	Iron.	16.65
	Manganese.	32.33
	Comb.Units.	48.98
	Phos.	.027
	Chicago Value.	\$ 7.49
Fine ore.	Iron.	17.95
	Manganese.	25.75
	Comb. Units.	43.70
	Phos.	.058
	Chicago Value.	-----

Snow Drift Claim.

Here is found an old shaft on an incline of about 45 degrees north, following a manganese lead, more or less solid to a depth of 60 feet. The ore at the bottom is about four feet in width and shows some little lime spar, but no quartz.

This is the only example of solid ore in porphyry to be seen on the claims. Sample H.10. "H".

	per cent.
Iron.	15.00
Manganese.	37.95
Comb. Units.	52.95
Silica.	6.68
Phos.	.019
Chicago Value.	\$ 10.25

Bell Claim.

Covers the lead as shown by float, but no work has been done.

Manganese Claim.

This claim contains a secondary deposit of "bog ore" covering from one to two acres. While chemically of a high grade, it is physically unfit for furnace use by reason of its fineness unless briquetted. As a smelter flux it might prove useful under light blast pressure.

Analysis of the material as follows;- H.12. at "I."		
	Dried at 212 F.	per cent.
Iron.		2.00
Manganese.		40.25
Comb. Units.		42.25
Silica.		6.15
Phos.		.085
Moisture	in original.	56.70

Atlantic Claim.

This claim shows no clean manganese ore. A lead of quartz gives the following results from the outcrop. "L"

	Decomposed pyrites.	Manganiferous quartz.
	Sample	
	H.16.	H.17.
Gold, Oz. per ton.	trace.	trace.
Silver do.	.74	.54

Bazaar Claim.

This claim contains what appears to be a limited blanket deposit resting upon granite. The ore is dense and hard in character and physically desirable.

Cut "K". shows a depth of 5 feet and a length of 20 feet. Beside it and of about the same dimensions is cut "J".

Samples result as follows;-

	Cut K.	Cut J.
	H.14.	H.15.
Iron.	2.00	34.00
Manganese.	58.15	23.10
Comb. Units.	60.15	57.10
Silica.	.44	13.28
Phos.	.014	.013

Chicago Value. \$16.98

Decided lack of uniformity is noticed in samples from the same bed and but a few feet apart. The deposit must be approached by a road entirely independent of the one to the Black-Bird and Horse Fly and systematic exploration is hence the prime essential.

General Conclusions and Recommendations.

Tonnage.

It can scarcely be stated that the development has, at this date established the presence of any definite, measurable tonnage, and yet the statement that 50,000 tons are present, is too probable of rapid proof, to be denied.

In proportion to the amount handled, the surface ores would not yield a large percentage of ores suitable for shipment to eastern points. Still with the use of proper screens and "log washer" it seems probable that initial development costs might in a measure be met.

In the smelting of precious metals, a manganese ore stands at best, on a par with iron ores as a flux, and I am of the opinion that a more profitable operation could be conducted near Neihart, at Running Wolf or in the Sweet Grass Hills.

The bearing of a deposit of this kind, if it proves to be as ample as indications now promise, upon a possible steel industry in Utah, Montana or on Puget Sound, is the main feature at this time. Basic Open Hearth practice would permit of the use of a 50% Ferromanganese containing even .500% Phosphorus, since an addition of 2% to the bath would mean only the addition of .010% phos. to the steel, when making rail ingots. On soft stock the effect would be very much less. It becomes merely a question of market and price delivered.

The question of coke becomes important. The writer is aware of but one low phos. coke available. This is the Horr coke which contains about .010 phos. maximum. If a market can be found for a high phos. ferromanganese this feature is lessened in importance, but the subject of coke should be thoroughly investigated and the writer has been unable to take this subject up in a proper manner during 1901.

As to the ore, I am of the opinion at this writing, that on very moderate depth the phosphorus content will decrease to a point, where it will come well within even the shipping requirements of remaining below .100% .

I anticipate for the ore an average grade of:-

Iron		15.00	per cent
Manganese		35.00	" "
Silica	under	8.00	" "
Phosphorus	under	.080	" "

Chicago Value

\$ 9.15

Shipment.

To ship this ore to Chicago would require a special concession on rates which does not seem to be warrantable.

Allowing a moisture content of 10% it would require the production and shipment of 2489 lbs. wet to make 2240 lbs in Chicago. At \$7.00 per 2000 lbs the freight on this would be \$8.71 to which must be added all mining costs and profits.

On the present average showing, with labor at \$3.50 for eight hours work underground, and proportionately high for surface work, the mining and hand sorting necessary to produce

an ore of sufficiently high grade for profitable shipment would not seem an attractive undertaking.

Use as flux.

Inquiry at the copper smelters gives no encouragement for the marketing of even a moderately siliceous ore for fluxing purposes. Under date of Sept. 6th, 1901. the American Smelting and Refining Co. at Helena offers \$3.00 per ton f.o.b. Wickes for ore assaying,

Silver	2.00 oz. per ton of 2000 lbs
Iron	22.00 per cent.
Manganese	29.60 " "
Silica	4.20 " "

not less than \$1.00 of this is for the silver.

The value of 2000 lbs of this ore in Chicago would be about \$6.50 and it hence plain that ores of a lower grade than this would find no profitable market at Helena. There would of course be some ores that would net the mining cost as flux and render sales advisable, when such ores were gained in connection with the production of ores of a higher grade.

Development plan.

Despite the above, and looking to the future, when the manufacture of ferromanganese and spiegeleisen may become desirable and profitable, I recommend the development of the property on the following lines.

" At a point south of cuts D. and E. there is a suitable site for the terminal of a tram to deliver ore to a railway terminal about 1000 feet to the east and some 200 feet below. At this point I recommend that a tunnel be driven in to crosscut all the veins. A tunnel 600 feet in length should accomplish this, and give a depth of 150 feet on the veins. Drifting to the west will then give at least 600 feet depth at map point F. and nearly 1000 feet at H. \$12000 to \$15000 will amply suffice for complete demonstration of all necessary points. "

Substantially as above this recommendation was given under date of Sept. 15, 1901. Recently a tunnel has been started at another higher point, which will cut the veins in from 275 to 325 feet at much less cost since the ground is softer. This is primarily what the writer wished to avoid, the desire being to find the ore in hard solid ground, from which higher grade ores could be expected, and advice on this line at greater cost seemed warranted. Under present plans much more extensive drifting to the west must be undertaken to accomplish the desired result, and before satisfactory stoping ground can be anticipated.

As calculated to turn a non-producer into a profitable operation, very liberal terms and low prices for the claims,

with ample time should be required. With these the writer is sanguine of successful outcome.

Comparative.

Among the manganese deposits in the writers knowledge the surface showing of the Corbin deposits, compares favorably even with the best Cuban properties. No deposit at Leadville Colorado showed so well at the same stage and but one smaller deposit in California gives equal promise and that on a much smaller scale.

Manufacture of Ferromanganese etc.

Without an accurate knowledge of the real ultimate conditions of production and average quality, and lacking the data on fuel that is so essential to calculations, the writer does not wish to offer estimates at this time. In general it may be stated that the materials are probably available and the margin sufficient to render the ultimate consideration of the matter promising.

Submitted.

Dickman & Mackenzie .

Chicago, Ills.
Dec. 5, 1901.

R. N. Dickman.

James J. Hill Papers
Minnesota Historical Society