History of the Minnie Moore Mine, Blaine County, Idaho

Victoria E. Mitchell

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Morrill Hall, Third Floor
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Staff Report 00-12
June 2000
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INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the U.S. Bureau of Land Management (BLM), Idaho State Office, as part of a project to identify and describe inactive and abandoned mines in the state of Idaho. Work on this project included preparing detailed histories of selected mines on BLM-administered lands in Idaho. The information in this report is from a number of published and unpublished sources in the Idaho Geological Survey's mineral property files. Where not otherwise noted, most of the mine production data is drawn from the U.S. Geological Survey's (USGS) annual volumes on Mineral Resources of the United States (1882-1923) and the equivalent volumes produced by the U.S. Bureau of Mines (USBM) (Mineral Resources of the United States, 1924-1931, and Minerals Yearbook, 1932 to present). Information on underground workings and mine equipment is generally from the annual reports of the Idaho Inspector of Mines (IMIR), published from 1899 to 1979. After 1974, the Mine Inspector's office was known as the Mine Safety Bureau, a section of the Idaho Department of Labor and Industrial Services. Detailed accounts of mine operations are, for the most part, drawn from annual reports made by the companies to the State Inspector of Mines; these reports were required by law and the information contained in them formed the basis of the Mine Inspector's annual reports. Reports of recent developments are taken from the Idaho Geological Survey's (IGS) annual reports on the developments in mining and minerals in Idaho (from 1984 to present) or from similar reports produced by the Survey's predecessor, the Idaho Bureau of Mines and Geology (IBMG) from 1975 to 1984. Other published sources are referenced in the text. A complete bibliography is included at the end of the report. Where direct quotations are taken from source materials, the original spelling and grammar are preserved even in cases where they do not conform to currently accepted usage.
History of the Minnie Moore Mine, Blaine County, Idaho

Victoria E. Mitchell

The Minnie Moore Mine is near the mouth of Minnie Moore Gulch (formerly Galena Gulch), a tributary to the Big Wood River (Figures 1 and 2). This area is in the Mineral Hill mining district in Blaine County and lies just west of Bellevue at an elevation of 5,300 feet.

The mine is in the Milligen Formation near the contact with the Croesus stock (Figures 3 and 4). The rocks in the mine include dense black argillite, fine-grained quartzite, and calc-silicate rocks composed of varying amounts of garnet, wollastonite, diopside, quartz, and calcite. In general, the bedding strikes northwest and dips southwest, but there are considerable local variations in both strike and dip due to local folding. A sill-like body of quartz diorite intruded the Milligen above the mineralized zone (Hewett, 1930).

The main ore minerals were galena, sphalerite, tetrahedrite, and chalcopyrite. Mineralization was associated with a zone of coarse sediments overlain by a dense argillite (Hewett, 1930). Other veins worked on the property include the Bergman and McIrvin veins (believed to be extensions of the Minnie Moore vein), and the Contact, Singleterry, Old Telegraph, and Gray Copper veins (which dip more steeply than the Minnie Moore vein). The veins at the nearby Queen of the Hills Mine are parallel to the latter group (Figure 5). All the veins are offset by faulting (Anderson, 1950). Examination of the published descriptions of the mineralization at the Minnie Moore suggests that the mine is probably a stratabound lead-zinc-silver deposit.

7Idaho Geological Survey, Main Office at Moscow, University of Idaho, Moscow.
Figure 1. Topographic map of the lower Wood River area near Bellevue, showing the location of Minnie Moore Gulch (U.S. Geological Survey Fairfield 1:100,000 topographic map).
Figure 2. Topographic map of the Minnie Moore Mine and vicinity. Shaded areas show dumps near major workings (U.S. Geological Survey Bellevue 7.5-minute topographic map).
Figure 3. Geologic map of the Minnie Moore Mine and vicinity. Dm = Milligen Formation; Pdu, Pdm, PPdl = Dollarhide Formation; Pwh, PPwe = Wood River Formation; Kqd = quartz diorite; Qa = alluvium; terrace gravels and alluvium (unlabeled) are along the river. Scale approximately 1:125,000 (Worl and others, 1991).
Figure 4. Surface and subsurface map of the Minnie Moore Mine (Anderson, 1950, Figure 3).
Figure 5. Diagrammatic cross-section across the Minnie Moore and associated "Footwall" veins. Line of section is N. 35° E. (Anderson, 1950, Figure 4).
According to Anderson (1950, p. 15-16):

The Minnie Moore ore body is a gently inclined, blanket-like body, continuous and unbroken down dip, except where offset by post-mineral faults and cut by post-mineral dikes. The ore body has varied considerably in thickness and grade from place to place and the thicker and richer parts may be deduced by referring to the stopped areas (Fig. 5 [Figure 6]). The individual stopes represent flattened and somewhat irregular lenses of ore with lengths and widths up to 400 feet and thicknesses up to 18 feet. The full length of the ore zone is about 1,200 feet.

The ore consists, in order of abundance, of galena, pyrite, sphalerite, gray copper, chalcopyrite, and arsenopyrite in a gangue of siderite, quartz, calcite, and crushed country rock. Siderite is the most abundant of the vein minerals and occurs along parts of the vein in massive extensive sheets up to 10 feet thick. Pyrite, sphalerite, chalcopyrite, and arsenopyrite are present in relatively small amounts. The ore contains an average of 1/2 to 2 ounces of silver to each per cent of lead.

The vein shows an interesting distribution of ore and gangue minerals. According to the Walkers\(^2\), the ore body is divisible laterally into three zones with the ore in each of somewhat different character. In the western zone (Fig. 5 [Figure 6]) the ore body consists of a band of massive siderite several feet thick with not more than 2 per cent lead and 4 to 6 ounces of silver to the ton. The eastern zone consists of sulfides in a gangue of calcite and crushed country rock, with no siderite. The middle zone is intermediate in character, with a gradual change from low-grade siderite ore on the west to higher grade non-siderite ore on the east, with decreasing amounts of siderite between. The mineable ore is confined to the middle and eastern zones which have a joint width of about 800 feet. The difference in character between the eastern and western sides of the ore body is said to persist from the outcrop to the lowest level at which ore has been mined. The Walkers use this zonal distribution as clue in the search for the continuation of the ore body beyond the explored area.

Of the ore mined, 90 per cent is said to have been milling ore averaging 10 per cent lead and 20 ounces of silver to the ton. The remainder, direct shipping ore, contained about 60 per cent lead and 100 ounces of silver to the ton. The direct shipping ore is reported to have formed bands and lenses of solid galena a few inches to 10 feet thick either as a complete vein filling or with milling ore.

The Minnie Moore ore body has been mined for a distance of 1,400 feet down dip with no observable change in character, grade, or abundance of the ore. In this distance the ore body had been interrupted by four post-mineral faults; namely, the Upper and Lower Relief faults (small with little displacement), the Rockwell flat fault (200-foot displacement), and the Minnie fault zone beyond which the ore body has not been recovered although three separate segments have been found along the fault zone. Where cut off by the Minnie fault between the 900 and 1,100 levels, the ore body occurred as three lenses. The more westerly lens was about 60 feet wide, up to 18 feet thick, and contained galena and gray copper in massive siderite. The ore averaged 8 per cent lead and 16 ounces of silver per ton. The middle lens, which was 60 feet to the east, measured 65 feet wide and up to 10 feet thick. It contained both milling and direct shipping ore in non-siderite gangue. The third lens, 60 feet beyond the second, measured 75 feet wide and contained up to 6 feet of massive galena in a non-siderite gangue.

The Minnie Moore was discovered in 1880. According to local history, galena was found in the dirt dug up from a badger hole about 200 feet east of what would become the main shaft (Hewett, 1930). The earliest account of the mine is as follows (Strahorn, 1881, p. 56):

2R. T. Walker, geologist for United States Smelting, Refining & Mining Co., and W. J. Walker, whose geologic work on the Minnie Moore was presented in a private report to which Anderson had access.
The Minnie Moore, two miles from Bellevue, shows a vast body of galena near the surface, worth $100 per ton, and is believed to be one of the great mines of Wood river. From July to November of this year it sold 300 tons of ore on the dump for $85 per ton. The vein has been stripped for 500 feet and shows from four to six feet of solid galena. Three tunnels are being driven into the hill to strike the vein at depths ranging from 150 to 200 feet.

Ex-postmaster Moore of Salt Lake City, last season furnished Daniel Scribner, a prospector, a few dollars as a "grub stake," and in December (1880) the latter found the Minnie Moore. Scribner sold out his half within a week for $11,500, and Moore held his interest until August, 1881, when he sold to Grayson, the California mining operator, for $50,000. Moore is therefore numbered among the hundreds who have derived a competence in Wood river from an investment not to succeed a few hundred dollars.

In November 1880, the only work on the property was a trench about 50 feet long and 8 to 10 feet high that exposed a lens of galena 35 feet long and 2.5 feet thick. In 1881, a shaft was sunk on the lens, showing the ore extended at least as far as the 45-foot depth of the shaft. Henry E. Miller purchased a half-interest in the property for $10,000. Between May 9 and November 30, 1881, the Minnie Moore shipped 217 tons of ore averaging 101.62 ounces of silver and 67 percent lead (Hewett, 1930).

Shipments from all the Wood River mines were limited in the early 1880s. Transportation by wagon was expensive, and many of the mine operators concentrated on development work while they waited for the railroad to be built up the Wood River. In 1880, David Falk and Alonzo Wolters (operating as the Wood River Smelting Company) put up a smelter in Hailey. Production rose greatly the following year as a number of the mines around Bullion shipped ore to Hailey. In the winter of 1880, another promoter raised enough money to finance a larger smelter. The Philadelphia Mining and Smelting Company opened for a ten-day test on October 8, 1881. The following year, the Wood River mines produced over $1 million of metals, and a fifth of that production was handled by the Philadelphia smelter. The smelter capacity was doubled in an effort to secure more of the ore produced in the area. In May 1883, the Oregon Short Line reached Hailey, and by August 1884, it had been extended to Ketchum (Wells, 1983).

The Minnie Moore was sold in 1884 to Dent, Palmer & Co., a company that was said to have a director of the Bank of England among its principals. (See Table 1 for companies and individuals operating the mine.) According to Hewett (1930, p. 220):

On the date of sale to Dent, Palmer & Co., February 25, 1884, the principal workings consisted of the main inclined shaft, 160 feet deep, two levels eastward to a maximum distance of 205 feet, and three levels westward to a maximum distance of 80 feet. As there had been little stopping, it was clearly the purpose of the owner to explore the deposit rather than to ship ore. In an area 125 feet long and 100 feet wide the vein was estimated to contain 3,699 tons of ore averaging 100 ounces of silver to the ton and 68 per cent of lead. With the price of silver at $1.14 an ounce and of lead at $1.00 a ton, the gross value of the reserves was $673,329. In this condition the mine was sold for $450,000.

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3 According to Wells (1983), the Minnie Moore was discovered on September 22, 1880; Lindgren (1900) places the year as 1879. Wells's date seems the most likely, since Hewett (1930) reports that only a minor amount of work had been done on the property by November 1880.
Table 1. Companies and individuals operating at the Minnie Moore Mine.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Officer</th>
<th>Date Incorporated</th>
<th>Charter Forfeited</th>
<th>Year(s) at Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>J.W. Moore (1/2 interest)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1880-1881</td>
</tr>
<tr>
<td>Daniel Scribner (1/2 interest)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1880</td>
</tr>
<tr>
<td>Mr. Grayson of California (1/2 interest)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1881-</td>
</tr>
<tr>
<td>Henry E. Miller (1/2 interest)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1881-1884</td>
</tr>
<tr>
<td>Dent, Palmer &amp; Co. (England)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1884-1900</td>
</tr>
<tr>
<td>Minnie Moore Mining Co., Ltd.</td>
<td>I.E. Rockwell, C.R. Carpenter</td>
<td>1</td>
<td>1</td>
<td>1900- (?)</td>
</tr>
<tr>
<td>Minnie Moore Mining Co., Ltd.</td>
<td>Charles M. Schwab (60 percent interest)</td>
<td>1</td>
<td>1</td>
<td>1904-1906</td>
</tr>
<tr>
<td>Idaho Consolidated Mines Company, Ltd.</td>
<td>J.P.H. Cunningham, President; I.E. Rockwell, Manager</td>
<td>1</td>
<td>1915</td>
<td>1906-1915</td>
</tr>
<tr>
<td>Minnie Moore Mines Co.</td>
<td>I.E. Rockwell, President-Manager</td>
<td>June 27, 1912; reinstated: April 1, 1926</td>
<td>Dec. 1, 1920; 1927(?)</td>
<td>1912-1927(?)</td>
</tr>
<tr>
<td>Federal Mining &amp; Smelting Co.</td>
<td>F.H. Brownell, President</td>
<td>Sept. 24, 1903</td>
<td>Merged with ASARCO — May 11, 1953</td>
<td>1923-1924; 1931-1935</td>
</tr>
<tr>
<td>Harold Boecricke</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1924-1925</td>
</tr>
<tr>
<td>unnamed lessee</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1926</td>
</tr>
<tr>
<td>Minnie Moore Syndicate</td>
<td>operated through Hecla Mining Co.</td>
<td>1</td>
<td>1</td>
<td>1926</td>
</tr>
</tbody>
</table>
Table 1 (continued). Companies and individuals operating at the Minnie Moore Mine.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Officer</th>
<th>Date Incorporated</th>
<th>Charter Forfeited</th>
<th>Year(s) at Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walker and Walker/W. J. Walker (owner)</td>
<td>W.J. Walker</td>
<td>1</td>
<td>1</td>
<td>unknown (pre-1950)-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(post-1964)</td>
</tr>
<tr>
<td>Silver Star-Queens Mines, Inc.</td>
<td>N.T. Davis, President</td>
<td>Nov. 22, 1929;</td>
<td>Nov. 30, 1942;</td>
<td>1949-1970(?)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reinstated: Feb. 4, 1946;</td>
<td>Nov. 30, 1946; Nov. 30, 1970</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>reinstated: Jan. 7, 1945</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carl Johnston</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>1978-3</td>
</tr>
<tr>
<td>unknown operator</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>1980</td>
</tr>
<tr>
<td>Exxon Minerals Company</td>
<td>R.M. Ingram, President</td>
<td>division of Exxon Corporation</td>
<td>1</td>
<td>1983-1986</td>
</tr>
</tbody>
</table>

1Information not available in Idaho Geological Survey’s files.
2Silver Star-Queens Mines, Inc., was taken over by Samson Oil & Mineral Co. in October 1959
3Last known owner of the property.

However, silver prices were declining, and the mine owners began looking for ways to cut costs. The miners at the Minnie Moore went on strike on July 20, 1884, protesting the fact that they had not been paid. Ten days later, they won a settlement that postponed threatened wage reductions. Early the next year, the union lost a similar fight when military intervention was threatened. Wages were reduced by twelve percent (Wells, 1983).

During the time it owned the mine, Dent, Palmer & Co. explored the Minnie Moore thoroughly down to the old 900 level. It was during this period that the mine produced most of its ore (Hewett, 1930). When the Minnie Moore shaft reached the 500 level, a “pinch” in the orebody was interpreted to mean the bottom of the vein had been reached (Anderson, 1950). The “pinch” apparently occurred because the vein was cut off by a fault.
(Hewett, 1930). By 1886, the ore was mined out down to the 500 level, and the mine was closed. Later in the year, the mine was leased, and work resumed on the shaft. The downward extension of the orebody was discovered within 100 feet (Anderson, 1950). The lessees developed a large ore shoot on the 360 level west. In 1887, this orebody was described as a lens of massive galena 90 feet long, which had been explored 60 feet up by a raise. At its widest, it was 14 feet thick, but it narrowed to 3 or 4 feet on the edges. The last ore mined by Dent, Palmer & Co. came from the west end of the 800 level (Hewett, 1930). The Minnie Moore shaft was sunk to the 900 level, where the vein ended against the Rockwell fault (Anderson, 1950). No ore was found on the old 900 level (Hewett, 1930), and the vein was not found on the other side of the fault. With all the ore above the fault mined out, the mine closed in 1889 and was allowed to flood (Anderson, 1950). Net smelter returns for the mine between 1886 and 1889 were $1,433,306. Operating expenses for the period were $784,310, and the company spent $16,454 for new equipment and $6,725 for mining claims, leaving an apparent profit of $625,865. Accurate figures are not available for earlier production (Hewett, 1930).

Output in the entire area decreased as the price of silver continued to fall. In 1888, with the price of silver down to $0.94 an ounce, production from the Wood River region was almost half what it had been the previous year. With the falling production, the Philadelphia smelter closed in 1888. After that, the cost of shipping ore by railroad to distant smelters ($10 or more per ton) often exceeded the cost of the actual smelting ($6.50 to $7.50 per ton). Such costs, coupled with declining silver prices, made mining low-grade ores uneconomic (Wells, 1983).

Lindgren (1900, p. 198-199) visited the district in 1899 and described the Minnie Moore as follows:

This, one of the most celebrated of Wood River producers, is located in Galena Gulch, one-half mile from Broadford and 250 feet above the river. A large dump and a dilapidated shaft house mark its position. The mine was discovered in 1879, accidentally, it is said, by means of a badger hole, the croppings being very ill defined. In 1881 it was sold by Mr. Miller, of Bellevue, to an English company, by whom it was worked until 1887, since which time it has remained idle. At the time of the sale the shaft was 152 feet deep and an exceptionally fine body of galena was exposed. The cause of the shut down was not ascertained. Doubtless the mine was not in bonanza, but it is claimed that the last month of the work realized a profit of $3,700, and that labor troubles occurring in the district at that time, as well as an influx of water, were largely responsible for the closing. Reports of an intended reopening of this property were current in 1899.

The gross yield of the mine between 1881 and 1887 is variously stated as from $5,000,000 to $6,000,000. The total yield is generally given as $7,000,000. The figures are not exact and may be exaggerated, but a great deal of metal was certainly extracted from the mine. In 1885 and 1886 the aggregate output amounted to 10,000,000 pounds of lead and 400,000 ounces of silver.

---

4 The dates in this section do not agree with those listed in other sources.

5 Gross smelter returns for the period up to 1902 were estimated as $7,316,600 by I.E. Rockwell, who had access to the books of the Hailey sampler where the ore was handled in the early years.
The developments consist of a shaft 1,100 feet deep, at an incline of 40°. The shaft is located 400 feet from the western end line of the claim, and most of the workings are confined within 500 feet.

The vein strikes WNW. and dips 40° SSW., with poorly defined outcrops. The country rock is black calcareous slate, though the diorite contact, which cuts obliquely across the gulf, approaches near the vein. Some of the levels reached the diorite, though no stopes were in that rock. The hanging wall is reported as well defined; the footwall less so. The ore consists of galena, with some tetrahedrite and a little pyrite, in coarse crystalline siderite; also a little quartz. The average value of ore is reported to be 100 ounces silver and 60 percent lead per ton. The ore bodies were pretty continuous down to the deepest level. Three lenticular bodies were found, the shaft being located on the middle one. The largest body was found on the 360-foot level. The largest stope showed a mass of practically solid galena 16 feet wide and 80 by 60 in the other two dimensions. This galena assayed 110 ounces per ton. The 500-foot level was the poorest. Regarding the pitch of the ore shoots, few definite data are available. They are reported to have pitched steeply southeast, touching the Relief claim adjoining westward above the 500-foot level. On Relief ground, the western extension of the claim, similar ore has been found. The Relief is developed by a 300-foot shaft near the mine. The production is reported as $50,000.

In November 1900, the mine was sold for $30,000 to I.E. Rockwell, C.R. Carpenter, and associates. The new owners began pumping out the mine and doing exploration work. The continuation of the orebody beyond the Rockwell fault was located in June 1902 in a raise from the south crosscut on the old 900 level (Hewett, 1930). The 1902 IMIR (p. 9-10) described these events:

The Minnie Moore Mine, Irvine Rockwell, general manager. This is one of the most famous of the Wood River mines and has a production record of $6,500,000 up to the time of its closing down several years since. Some two years ago a Chicago company undertook to re-open the mine and expended upwards of $100,000 in pumping out the water, putting in new machinery and in re-opening the shafts and drifts. During the present year the mine has once more become a shipper, gives employment to one hundred men and is paying handsome dividends. Much of the credit for the good results shown are due to the indefatigable work and unfailing faith of General Manager Rockwell, and James McPherson, the active foreman in charge of the underground workings. The old town of Bellevue, among the most famous of Idaho’s pioneer camps, has taken a new lease of life due solely to the resumption of work at this great producer. This mine ships approximately one car load per day, which is valued in excess of $100 per ton.

The incline shaft extended to a depth of 1,100 feet. The vein could be traced on the surface for several miles (Figure 7). The largest concentrations of ore occurred in wide lenticular bodies, or “loops.” The appearance of jet-black slate, crushed rock, and calcite crystals were signs that the miners were approaching such an orebody (Lakes, 1903).

The 1903 IMIR credited an upsurge in mining activity in the Wood River area to the “bonanza” discoveries made at the Minnie Moore during the previous year. This work was described as follows (1903 IMIR, p. 19-21):

After taking the water out of the mine a little intelligent cross-cutting at the 900-foot level proved that through the blundering management or want of conception of the rudiments of geological knowledge, the old company had left an ore reserve containing a gross value of approximately two million dollars above the bottom level of the mine, and about seventy feet to the south where it had been thrown by an incipient fold. The accompanying diagram will illustrate the nature of this disturbance [Figure 8]. All the work to the right of the line A. B. was done by the old company and included

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Figure 7. View of the Wood River mining district from Penobscot Hill, south of the Minnie Moore Mine. Note the trace of the Minnie Moore vein and its proximity to the contact with the Croesus diorite (Lakes, 1903, p. 271).
Figure 8. Cross section of the Minnie Moore Mine through the Minnie Moore shaft, showing geology and approximate location of the working levels (unlabeled boxes shaped like tunnel openings). The crosscuts extending from the Minnie Moore shaft are on the ninth (900) and tenth (1000) levels (Bell, Robert, 1904, Report of the mining districts of Idaho for the year 1903, p. 20).
hundreds of feet of drifting in the limestone beds at the ninth and tenth level. The work to the left of the line, after finding the vein going down again on its normal dip, has been done by the present management, and disclosed a normal repetition of the famous bonanza ore bodies that produced so richly for the old company above the ninth level.

The main ore body opened by the present company has been completely blocked out above the 1,000-foot level, and followed by a winze to a considerable depth below. During the progress of this work the mine has produced about half a million dollars worth of ore, and is said to have reserves still in sight valued at a million and a half.

The main ore shoot now exposed is 350 feet long, of first and second class ore; the first class ore at the 1,000-foot level is clean steel galena from a foot to nine feet wide.

The mine is shipping thirty cars a month at the present time, about half of which is mined from the first class streak, and samples 70 per cent lead and 110 ounces silver per ton.

The second class ore is concentrated four tons into one, and runs about 55 per cent lead and 60 to 70 ounces silver, and the general showing of the property at the present time strongly indicates that it may repeat, and probably discount, its former record of production, for the fissure is just as clean cut at the lowest point now exposed, and the ore just as clean and high grade in both silver and lead, as it was in the upper levels.

All the ore thus far produced by the Minnie Moore mine has come from one short claim, less than 1,400 feet in length, and it seems unreasonable to suppose that such a limited segment of such a fissure should contain its only profitable ore bodies.

A stretch of territory covering this great vein for two miles has been secured by the Idaho Consolidated Mining Company, who are actively developing the property at the present time, with surface manifestations of mineral in the way of great shoots of gossen iron ore, sprinkled with lead minerals, and copper carbonate that are far superior to the surface evidences of ore at the Minnie Moore, and it will not be surprising to hear of them discovering a match for the old bonanza in the near future.

The Consolidated Virginia Mining Company (Alturas Mining Co.), who also own a choice property on the great fissure close up to the Minnie Moore, are doing some intelligent development work and also have a very bright prospect of success.

In November 1903, the west end of the new 900 level reached the Minnie fault. The fault was found later on successively lower levels.

In 1904, the Minnie Moore was by far the largest producer in the Wood River area, recovering over 5 million pounds of lead and 450,000 ounces of silver (Table 2 shows published production statistics). The workings were extended from the 1000 level to the 1200 level and "brought into bonanza." The company produced ore on all levels from the 900 to the 1200. The 1904 IMIR credited the lower levels of the mine with producing high-grade silver-lead ore with a gross value of over a million dollars between 1900 and 1904. During December, the mine shipped 300 tons of first-class ore that averaged 70 percent lead and 110 ounces of silver per ton. The mine paid $250,000 in dividends during the year. In July, 60 percent of the stock in the Minnie Moore Mining Co. was sold to C.M. Schwab for $800,000 (Anderson, 1950).

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6The Idaho Consolidated Mining Co. was operating the Relief property, which adjoined the Minnie Moore to the west. The property was later consolidated with the Minnie Moore.

7The original text read "Consolidated Virginia Mining Company" and was hand-corrected to "Alturas Mining Co." The Alturas Mining Co. was operating the Consolidated Virginia claim, which lay to the north of the Relief claim.
Table 2. Production from the Minnie Moore Mine, 1881-1926.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ore (tons)</th>
<th>Old Tailings (tons)</th>
<th>Gold (ounces)</th>
<th>Silver (ounces)</th>
<th>Copper (pounds)</th>
<th>Lead (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1881(^1)</td>
<td>217</td>
<td>—</td>
<td>—</td>
<td>22,047</td>
<td>—</td>
<td>290,780</td>
</tr>
<tr>
<td>1884(^1)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>3,276,000</td>
</tr>
<tr>
<td>1885(^1)</td>
<td>4,079</td>
<td>—</td>
<td>—</td>
<td>369,149</td>
<td>—</td>
<td>5,287,980</td>
</tr>
<tr>
<td>1886(^1)</td>
<td>4,955</td>
<td>—</td>
<td>—</td>
<td>447,149</td>
<td>—</td>
<td>5,351,506</td>
</tr>
<tr>
<td>1902(^2)</td>
<td>1,202</td>
<td>—</td>
<td>—</td>
<td>107,779</td>
<td>—</td>
<td>1,337,662</td>
</tr>
<tr>
<td>1903(^3)</td>
<td>6,295</td>
<td>—</td>
<td>—</td>
<td>413,885</td>
<td>—</td>
<td>5,003,555</td>
</tr>
<tr>
<td>1904(^4)</td>
<td>24,300</td>
<td>—</td>
<td>—</td>
<td>469,538</td>
<td>—</td>
<td>5,373,583</td>
</tr>
<tr>
<td>1905(^5)</td>
<td>14,580</td>
<td>—</td>
<td>—</td>
<td>283,639</td>
<td>—</td>
<td>3,103,325</td>
</tr>
<tr>
<td>1906(^6)</td>
<td>11,350</td>
<td>—</td>
<td>—</td>
<td>72,500</td>
<td>—</td>
<td>530,000</td>
</tr>
<tr>
<td>1907(^7)</td>
<td>—</td>
<td>386</td>
<td>—</td>
<td>5,463</td>
<td>—</td>
<td>70,022</td>
</tr>
<tr>
<td>1908(^8)</td>
<td>—</td>
<td>3,000</td>
<td>—</td>
<td>8,320</td>
<td>2,496</td>
<td>54,912</td>
</tr>
<tr>
<td>1909(^9)</td>
<td>—</td>
<td>10,210</td>
<td>21.45</td>
<td>26,593</td>
<td>581</td>
<td>215,897</td>
</tr>
<tr>
<td>1910(^)</td>
<td>—</td>
<td>8,728</td>
<td>20.53</td>
<td>40,238</td>
<td>—</td>
<td>315,250</td>
</tr>
<tr>
<td>1911(^)</td>
<td>—</td>
<td>1,790</td>
<td>5.40</td>
<td>4,234</td>
<td>1,069</td>
<td>33,782</td>
</tr>
<tr>
<td>1912(^)</td>
<td>29</td>
<td>—</td>
<td>0.30</td>
<td>947</td>
<td>153</td>
<td>13,348</td>
</tr>
<tr>
<td>1913-1918(^8)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1919(^9)</td>
<td>—</td>
<td>10,000</td>
<td>30.80</td>
<td>28,503</td>
<td>6,974</td>
<td>184,276</td>
</tr>
<tr>
<td>1920(^)</td>
<td>—</td>
<td>4,274</td>
<td>17.03</td>
<td>17,148</td>
<td>1,766</td>
<td>120,079</td>
</tr>
<tr>
<td>1921(^)</td>
<td>509</td>
<td>—</td>
<td>0.57</td>
<td>8,733</td>
<td>1,355</td>
<td>91,749</td>
</tr>
<tr>
<td>1922(^)</td>
<td>303</td>
<td>—</td>
<td>2.00</td>
<td>3,030</td>
<td>477</td>
<td>23,032</td>
</tr>
<tr>
<td>1923(^)</td>
<td>7</td>
<td>—</td>
<td>—</td>
<td>535</td>
<td>45</td>
<td>8,171</td>
</tr>
<tr>
<td>1924(^)</td>
<td>464</td>
<td>—</td>
<td>2.00</td>
<td>3,917</td>
<td>279</td>
<td>40,534</td>
</tr>
<tr>
<td>1925(^)</td>
<td>1</td>
<td>—</td>
<td>—</td>
<td>58</td>
<td>6</td>
<td>1,209</td>
</tr>
<tr>
<td>1926(^)</td>
<td>43</td>
<td>—</td>
<td>0.51</td>
<td>1,972</td>
<td>614</td>
<td>24,916</td>
</tr>
<tr>
<td>Total</td>
<td>68,337</td>
<td>38,388</td>
<td>100.59</td>
<td>2,556,237</td>
<td>15,815</td>
<td>30,751,568</td>
</tr>
</tbody>
</table>

\(^1\)Data from Hewett (1930).
\(^2\)Production given only for lead and silver; other metals not reported.
\(^3\)Tonnage of ore not reported.
\(^4\)Recorded production was 528,798, but a footnote states that the number should probably be 5,287,980, as shown here.
\(^5\)Material shipped during this period came mostly from the Queen of the Hills dump.
Schwab operated the mine on the company account until August 1905. It was worked by lessees for the rest of the year. The mine was still the largest producer in the district, but the output was less than the previous year because more development work was needed to locate new ore. However, the orebody terminated against the Minnie fault on the lower levels, and exploration beyond the fault did not locate the vein (Anderson, 1950). The workings at the mine consisted of a 1,000-foot inclined shaft with a slope of 40 degrees, a 250-foot shaft, and drifts on each level. The mill was equipped with jigs and Wilfley tables and could treat 100 tons per day (tpd). The 1905 IMIR (p. 20-21) described the year's events as follows:

The great Minnie Moore bonanza, while whittling away on its eight million dollars of production, has encountered another aggravating displacement of its ore body.

The disturbance this time appears to be a profound fault movement that has shifted the upper ore horizon out of its normal plane.

The property has been examined and expected by some noted geological talent during the year, whose conclusions seem to have swung off the line of investigation looking to the rediscovery of the rich ore bodies for which the mine has been noted in an opposite direction to that which has been formerly followed. The ore bodies are being looked for in the foot-wall country and several new ore courses have been encountered in that direction, carrying pay mineral, but no important bodies have been encountered so far. The theory is brought from Utah and applied to the Minnie Moore that the solutions which formed the ore ascended through narrow, vertical footwall cracks to the point of favorable precipitation, which is argued to have been in the replacement of narrow dikes of basaltic igneous rock.

This line of investigation and theory of origin is not shared by a good many practical men who are acquainted with the underground conditions of the property. It, however, has many points of probability, and embraces the supposition that the Minnie Moore ore course is simply one of several ore channels in the zone of fissured and mineralized country rock that is estimated at 1,000 feet or more wide, and embracing the Queen of the Hills vein within its limits.

The Minnie Moore production for 1905 is cut down materially as compared with 1904, as the shipments since the middle of the summer have been very light. The property has been worked by lessees, and the development feature by contrast, employing a force of about thirty men. The company are fully alive to the freakish action of this famous bonanza, and the present suspension of rich ore production, it is to be hoped, is only one of the temporary interruptions for which the property has been noted.

That such an ore channel should suddenly be cut off and annihilated at such a comparatively shallow depth is contrary to extensive mining experience, and it seems only a question of persistent exploratory work, to bring the property into bonanza conditions again.

On the adjacent Relief claim, the Idaho Consolidated Company found a vein of milling ore containing bunches and streaks of high-grade material below the limestone beds that formed the footwall of the Minnie Moore vein. This discovery was considered so important that the Minnie Moore Company started to crosscut through the footwall limestone opposite one of the big ore stopes in the Minnie Moore.

The Alturas Mining Company sank a vertical, two-compartment shaft on the Consolidated Virginia claim. Plans called for this shaft to be 370 feet deep and tap the Minnie Moore vein 900 feet below its apex. Although the current thinking in the district
was that proximity to the Minnie Moore justified extensive development, Alturas was unable to unravel the structural problems on the property, and the company switched its operations to another part of the district.

Lessees operated the Minnie Moore until March 1906, when two men were accidentally killed in the Singletery raise (Hewett, 1930). Most of the high-grade ore shipped by the lessees came from the surface workings. After all the ore had been mined out down to the Minnie fault, the mine was sold back to I.E. Rockwell and associates (Anderson, 1950), whose Idaho Consolidated Mines Company had been operating the adjacent Relief property. Idaho Consolidated put in a new shaft house, which was to contain a large electric hoist, and prepared to sink a deep shaft on the Relief claim to develop the Minnie Moore vein and to look for more ore in the Minnie Moore workings. The mill treated tailings from the dump. The 1906 IMIR (p. 23-24) described the year’s activities at the mine:

The principal cause of the falling off in production was due to the failure of the Minnie Moore mine, which had been the chief producer. This famous property, with a record of mineral output that exceeds eight million dollars in gross values, again experienced serious physical troubles in its lower levels. The vein was cut off by a fault more pronounced than any preceding disturbance in the mine and beyond which the management was unable to pick up the ore body, although a lot of development work was done to that end.

The mine was worked by lessees in the early part of the year, which cleaned up its developed ore resources above the fault and made quite a large shipment of high grade ore. Since then the mill has been operated quite steadily on a large accumulation of tailings, from which seventy-five cars of low grade concentrates were shipped containing about ten per cent lead and thirty ounces silver per ton.

The 1906 IMIR (p. 24-25) also contained a lengthy discussion about the Idaho Consolidated Mines Company:

This company is a recent consolidation of interests and is in excellent financial condition for the prosecution of a long campaign of development. It now includes the Minnie Moore mine among its assets and all the old stockholders of the Minnie Moore, including the Schwab interest, are stockholders in the new organization.

It has a very extensive tract of mineral territory, nearly ninety per cent of which is practically virgin and unproven with many fine blossoms of gossen ore that may mean rich silver-lead ore bodies at depth.

Mr. Irwin E. Rockwell is president of the new company and also general manager in present charge of the work, and with his characteristic energy will proceed to explode some scientific theories of how pre-mineral faults evaporate rich ore bodies on their downward course into the earth.

In this he will have a hearty support and encouragement of many practical men familiar with the Minnie Moore bonanza whose ore bodies have been followed down successfully for nearly 1,200 feet, and the electric juice he is going to turn loose on this famous vein has a fine prospect of reviving a "beautiful" mineral corpse back to its previous life and vigor of profitable production.

Between July 1904 and March 1906, most of the exploration work was done on the lower levels. This included exploration beyond the Minnie fault and the footwall crosscut on the 1000 level. During the same period, mining operations below the old 900 level yielded ore valued at $1,100,000 (net smelter returns), and a small stope on the
Singleterry vein produced $31,000. After March 1906, the mine was allowed to flood (Hewett, 1930).

New pumps were installed in the Minnie Moore in November 1907 (Hewett, 1930). Meanwhile, the company did extensive development work on the Relief claim and greatly expanded the mill (Figure 9). This work was described in the 1907 IMIR (p. 54-61):

A new roomy, 3-compartment incline shaft is being sunk on the Relief claim 1,200 feet north of the Minnie Moore shaft that is opening an entirely new zone of ore deposition and is showing eminent promise of successful results. This new shaft was not started blindly, as under Mr. Rockwell's management the Idaho Consolidated formerly did a large amount of development work on the Relief claim and disclosed considerable milling ore. This development also included a drift extended on the course of the Minnie Moore vein from the 800-foot level to a point directly under the dip of the new shaft, where a fine body of milling ore was found.

This new shaft has disclosed two distinct veins where only one was expected and proves the occurrence of important ore values in a well defined vein in actual contact with the overhanging diorite, as well as the original Minnie Moore vein at its normal distance in the limestone formation underneath the diorite, where it has recently been tapped at the 600-foot level. Its identity is complete and shows splendid evidence of mineralization, including the usual iron spar gangue and an undetermined brown, jaspery mineral with some rich galena ore that was one of the marked characteristics of the rich galena shipping ore bodies in the Minnie Moore development.

In addition to these sparry associations, the vein recently struck in the bottom of the new shaft is further absolutely identified as the proper Minnie Moore vein by the fact of its being associated with a narrow included dike of intrusive igneous rock, like that at the Croenats, and which was formerly a sure indicator of pay ore. This dike is a smooth grained, blue-gray rock that may be altered basalt or diabase. It so much resembles the blue-gray limestone walls of the fissure as not to have been a conspicuous feature or even recognized in the earlier history of the Minnie Moore, but this association with the rich ore bodies of the Minnie is the one thing which the geologists brought out, and incidentally, I would mention, is a connecting feature of rich ore deposits of marked importance in Idaho mining history, notably in the Coeur d'Alenes and in Owyhee County, where the famous Hecla mine and the Trade Dollar mines are conspicuous examples.

The accompanying diagrams will give a general idea of importance of the new shaft development of the Idaho Consolidated Company's Relief claim (Figure 10).

I personally examined the conditions there presented and thought with the management, when the first vein was struck at the 500-foot level, that it was the Minnie Moore vein which had made the contact at this point. Instead of this being the case, however, it proves to be an entirely new vein and the one on which the extensive shoot of milling ore is developed from the surface crosscut on the Relief claim.

This ore shoot has been developed 420 feet in length, and varies from 1 to 18 feet wide, containing average values of between $8 and $9 per ton in gold, silver, lead and zine. When the shaft was carried to the 600-foot level, however, and the true Minnie Moore vein encountered in its normal position 85 feet under the contact, its characteristic markings were so distinct as to put its identity beyond question.

At this point the old vein has been drifted on over 200 feet since it was out and continues to carry the characteristic little dike of intrusive, igneous rock, iron spar, and a strong showing of the brown jaspery mineral and white calcite bands for which the bonanza ore channel was noted, together with a good minable width of fine concentrating ore and occasional kidneys of clean, high-grade galena.

These interesting disclosures greatly magnify the property's chances of success with further development and warrant all that the management has so far done and an energetic continuance of its plans.

The intrusive dike rock accompanying the last vein cut is a particularly interesting feature, as it became a byword with the later operation of the Minnie Moore mine that where there was no dike rock
Figure 9. Minnie Moore mill in 1907 or 1908, showing the new addition under construction (Moore, F. Cushing, 1910, Eleventh annual report of the mining industry of Idaho for the year 1909, opposite p. 28).
Figure 10. Plan and vertical section of the workings on the Relief claim on January 1, 1908, showing the relationship to the Minnie Moore (Bell, Robert N., 1908, Ninth annual report of the mining industry of Idaho for the year 1907, p. 56).
in the vein, no ore need be expected, but that its occurrence in the ore channel was a synonym of rich mineral values near at hand.

I have frequently argued that it was unlikely that the profitable mineralization of this famous contact, which can be plainly followed for miles in length with numerous splendid surface manifestations of other ore bodies, would be confined to the original Minnie Moore claim, and it looks now as if this suggestion was well warranted and may soon result in very profitable realization of new ore bodies.

The recent panic has affected the plans of this company like those of other development enterprises throughout the State, and resulted in a temporary suspension of the operation at the mine, at least until the new hydro-electric power plant of 750 horse power capacity, with which the property is being provided, is completed, which will probably be along towards the early summer. This installation is being made under the direction of Mr. A. J. Wylie of Boise, one of the ablest hydraulic engineers in the West, and the machinery is being supplied under contract by the Westinghouse Electric Company and is of the latest and most substantial pattern. This plant is situated between Bellevue and Hailey, only a short distance above the new mill, and embraces the whole flow of Wood River under a 38-foot head, which will give an ample independent power for all requirements of the enterprise, with some to sell for the operation of neighboring mines.

In the meantime the property is undergoing equipment with a new milling plant of 250 tons daily capacity, the building for which is already completed and the machinery already on the ground and now in process of installation.

This new mill presents another bold and original move on the part of the management, as it embraces new principles in ore concentration. Besides the extensive body of milling ore exposed in the contact vein above the 400-foot level of the new shaft, which embraces a uniform mixture of massive coarse grained iron sulphides with lead and zinc sulphides, the Idaho Consolidated Company have on hand 140,000 tons of old mill tailings for immediate use in the new mill when completed. Forty thousand tons of these tailings will run 2.2 per cent lead, 6 ounces silver, and 11.5 per cent zinc, and 100,000 tons will run 2 per cent lead, 6 ounces silver, and .03 ounce in gold, with very little zinc. The better grades of milling ore now exposed in the mine at the 500, 600 and 800-foot levels will, of course, have to await its further development, but a good margin of profit can be figured out of the mineral available for the milling plant now in process of construction, according to exhaustive investigations and practical tests. This new mill is divided into two units. On one end it embraces an ordinary wet process of crushing, close classification and concentration on Willey tables, and one James slimer that is 35 feet long and is said to really separate slime.

The greatest innovation at this end of the mill is the introduction of new triplex rolls built by the Triplex Roll Company of Denver, Colorado, which is a simple, plain Cornish roll with a third roll running in a vertical position between the two main crushing rolls and called an idler, as its motion is entirely applied by the main driving and crushing rolls. The virtue of this third roll is to increase the capacity of the rolls, extend the life of the shells and make a more uniform product, and an automatically balanced face which wears uniformly smooth without any chance of grooving. This device has been successfully tried out and operated steadily for over 2 years. Its simplicity is its greatest recommendation, together with the feature of wearing itself and the crushing rolls with a smooth face free from grooves. The accompanying cuts will illustrate this new device [Figure 11].

On the opposite side of the mill a Dry Process of concentration is being installed which embraces, besides the same crushing devices, a Barlett-Snow revolving dryer and Sutton, Steele & Steele dry concentrating tables and classifiers. This is something also brand new in ore separation, but is being built on an absolute guarantee that it will discount any wet method of concentration heretofore tried. It embraces a classifying device called a vibromoter ore sizer that furnishes an evenly sized product in 7 to 10 classes of pulp, ranging from 40 to 173 mesh and finer, using silk mesh cloth in place of wire screens, and which is treated on a dry concentrating table that differs from all previous attempts at dry concentration, according to the statement of the manufacturer, in the fact that it accomplishes the results
THE TRIPLEX ROLLS, HOUSING REMOVED.

DETAILS OF TRIPLEX ROLLS ILLUSTRATING THE CROSSED LINES OF CRUSHING AND SMOOTH WEARING EFFECTS OF THE IDLER.

Figure 11. Photograph of the Triplex roll crusher, with its housing removed, and sketches illustrating its operation (Bell, Robert N., 1908, Ninth annual report of the mining industry of Idaho for the year 1907, p. 59).
for which it is designed and will make a clean separation of mineral varying only 1-2 of 1 per cent in specific gravity.

This new table resembles in appearance an ordinary well known type of wet concentrating tables, the separation in this case being effected by the reciprocating movement of the tables with the introduction of a mat of air under slight pressure, the air being used for cushioning the ore particles and to give perfect mobility so as to permit of the most exact separation. It is said to be easily controlled and cheaply handled. A common domestic cloth top was used which is said to show practically no wear after months of use on the finer sizes of product, on account of the protecting cushion afforded by the air filling. In addition to the size and concentrating table, the complete process embraces a di-electric separator for cleaning zinc and iron. This, however, is not considered necessary in the present installation. This process has been thoroughly tried out at Butte, Montana, where a 150-ton plant was equipped and has been in successful operation for 6 months at the La France mine . . . and has produced a very much cleaner and superior product from this complicated mixture of base sulphide than has ever been approached by any wet methods tried . . . These results seem incredible but are vouched for by the highest authority. If they can be repeated here, they will mean a revolution in the concentration methods of the West where high precious values prevail associated with the base ores and will certainly be watched with a great deal of interest. As this mill embraces a splendid unit of up-to-date wet concentration machinery, the two processes will make an interesting battle ground for superiority at this point. Literature on this dry process, which seems to be based on the flour milling, bolting cloth method of separation, can be had from its manufacturers, Messrs. Sutton, Steele & Steele of 194 North Jefferson street, Dallas, Texas . . .

The new Idaho Consolidated mill has been built near the Wood River valley bottom at Broadford, at the mouth of Galena gulch, and about half a mile below the mine (Figure 12). Everything about it and the company's other equipment is very substantially done with first-class material and is well warranted, as the enterprise, in my opinion, makes a sufficient mineral showing at this date, considering its past history, and the fact that so far it has been the principal source of Wood River's mineral wealth, to justify the continued expenditure of a quarter of a million dollars in further development. From its appearance I should say that the present showing in the principal workings when opened up in mining condition should yield a product sufficient to carry the future development required and supply a handsome margin besides.

In 1908, Idaho Consolidated completed the new mill and operated it for three months on old tailings. The results were not thoroughly satisfactory, and the company planned to make improvements. The new 1,200-horsepower hydroelectric power plant was completed. The company continued to dewater the Minnie Moore and Relief shafts. Plans called for connecting the incline shaft on the Relief claim to the 800 level of the Minnie Moore after the mines were drained.

Both sections of the mill were operated in 1909, and lead and zinc concentrates were produced from old tailings. Profits from the sale of these concentrates were apparently enough to finance the work on the mine and the improvements to the mill. By December 1, the Minnie Moore was pumped out to the 1000 level, but exploration efforts during the year were confined to the Singlerterry vein in the footwall (Hewett, 1930). The company planned to dewater the mine to the 1200 level and to explore heavily in the area beyond the Minnie fault. The 1909 IMIR (p. 28-29) described this activities:

The unwettering of the mine has been accomplished by the use of two Henry Worthington 2-stage turbine pumps, coupled in tandem on the column pipe 400 feet apart. These pumps are each operated by
Figure 12. Looking westward over Bellevue toward Minnie Moore Gulch in 1907. A—location of the new Minnie Moore mill; B—Minnie Moore shaft; C—Relief shaft (Bell, Robert N., 1908, Ninth annual report of the mining industry of Idaho for the year 1907, opposite p. 60).
35 horse power motors, and have been running for fifteen months without any material repairs. These pumps were specially built for this particular job, as they are required to operate in an incline shaft.

The company owns a very fine power plant, located about a quarter of a mile from the mill on Wood River, where an abundance of water is had under 38-foot head. This plant was installed by Mr. A. J. Wiley of Boise, and is strictly modern in every respect, consisting of 2 units of 400 horse power each. The current is generated at 6,600 volt tension by Westinghouse generators, directly connected to Morgan-Smith horizontal turbines, controlled by Lombard governors. The current is transformed for use in the mine and mill to 220 volts.

The old steam hoist at the Minnie Moore shaft has been converted to electric drive, as has also the compressor for the mine. Some very interesting experimental work has been carried on at the mill in connection with a dry concentration process, but the question of classifying the material sufficiently close has entailed so much expense that the process is not yet perfect, but the saving was extremely good where the material was properly classified.

Another improvement in mill practice, which is conspicuous in the wet unit of this plant, is found in connection with the use of the Callow screen, where the efficiency and capacity is greatly increased by the use of a high pressure spray, acting directly upon the top of this screen.

A crushing unit is being added to this mill to accommodate the ore from the mine as soon as it is unwatered and ore developed. A grade has been excavated from the top of the ore bins, in the crushing plant, to the mine, on which an electric trolley line is being installed.

In 1910, the Idaho Consolidated mill operated from May 15 to September on old tailings, and the resulting lead-silver concentrate was shipped. The company also did about 2,000 feet of development work through the Minnie Moore shaft, mostly on orebodies in the footwall of the Minnie Moore vein. On October 1, work was suspended and the property went into receivership. Lessees on the property developed considerable ore of commercial grade in the same part of the mine where the company had last been working.

In 1911 and 1912, crosscuts and drifts were opened on the 380 and 470 levels from the Allen shaft. No ore was produced from the mine during the year, although the mill processed old tailings. The 1912 IMIR (p. 76-77) described the structural complications in the Minnie Moore:

With the aid of some old-time practical miners, who had been employed in the former operations of this mine, and with the advice of expert geological talent, it was discovered that the Minnie Moore vein had made a horizontal fold at the 900-foot level and that the 1,000-foot level was entirely under it and in the footwall formation.

A little cross-cutting and raising from the 1,000-foot level disclosed these conditions and opened up the downward continuation of the ore body on its normal dip beyond the fold, from this new work, ore to the value of $1,500,000 has since been extracted of the same high grade character for which the mine was formerly noted, when the famous ore channel was again cut off by a north-south vertical fault, below the 1,000-foot level, and since that time it has not been recovered, in spite of the expenditure of considerable development capital in an effort to find it.

The problem, however, has been pretty well threshed out by Mr. Rockwell and all the movement theories reduced to a narrow limit, and it is believed by the present operators of the property that they are in close touch with the solution of the earth movement puzzles that robbed them of their ore body and they think they will recover it in the near future from the development plans now under consideration.

The extensive work which has been performed in the pursuit of this famous ore channel has discovered other ore resources in the property including a large vein in the foot-wall, rich in zinc, which,
while of a complicated nature, it is believed contains a large tonnage of mineral that can be profitably separated for the zinc contents, by modern flotation methods.

In 1913, the Minnie Moore shaft began to cave, and it was abandoned soon after that (Hewett, 1930). Workings by this time totaled about 15,000 feet in length. (See Table 3 for exploration and development work done at the mine.) Little work was done at the mine in 1913, but Metals Milling Co. remodeled the mill to process the tailings from the Queen of the Hills Mine. Zinc and lead concentrates were shipped. The mill continued to reprocess tailings, mostly from the Queen of the Hills, until 1921. The 1914 and 1915 USGS Yearbooks credit the Minnie Moore with producing ore during those years, but this probably referred to the material processed by the mill. Some exploratory work may have taken place at this time, but the mine was mostly idle until 1923.

There was practically no activity at the property in 1916. Minnie Moore Mines Co. started liquidation proceedings during the year, but the process dragged on well into the next decade. Large shipments were made from reprocessed tailings in 1919 and 1920. In 1920, the shipments from the Minnie Moore were the largest made from the district. The mine produced a little ore in 1921 and again shipped material from the dump in 1922.

In April 1923, Federal Mining & Smelting leased the Minnie Moore. The company built a new mine camp, including a blacksmith shop, carpenter shop, change room, hoist house, and headframe (Figure 13). Equipment installed included an Ottumwa double-drum electric hoist with a 100-horsepower motor, which was rated for 1,500 feet, a electric belt-driven Chicago Pneumatic 19x11x12\textsuperscript{4} compressor with a capacity of 985 cubic feet, and a 450-gallon Byron Jackson four-stage centrifugal pump directly connected to a 75-horsepower motor (for the inclined shaft). The buildings and equipment were worth $30,000. The three-compartment Allen shaft was dewatered and retimbered to the 600 level. After that, the company sank the shaft to the 900 level and began crosscutting to the Minnie Moore vein.

In February 1924, the crosscut reached the west extension of the 800 level of the Minnie Moore, about 1,500 feet west of the old shaft. This connection was used to begin dewatering the old Minnie Moore workings. Federal drove about 1,000 feet of crosscuts, drifts, and raises on the 600 and 700 levels before forfeiting its lease on June 16. At that time, Federal estimated that the Minnie Moore had 3,317 feet of workings\textsuperscript{8}, including 820 feet of inclined shafts, 221 feet of inclined raises, and 2,497 feet of tunnels, crosscuts, and raises. Federal’s claim list included the Queen of the Hills in its holdings, but the company apparently did not do any work on that mine.

On June 26, 1924, Harold Boerick of Philadelphia leased the surface plant from Federal and the mine from its owners. Boerick began work in the mine where Federal had

\textsuperscript{8}The diameter of the cylinders and the length of the stroke of the piston in the compressor, in inches.

\textsuperscript{9}Presumably, this is the total length of workings that were accessible at that time.
Table 3. Development work, number of men employed, and operating companies at the Minnie Moore Mine, by year.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Men Employed</th>
<th>Tunnels (feet)</th>
<th>Sinking (feet)</th>
<th>Cross-cutting (feet)</th>
<th>Drifting (feet)</th>
<th>Raising (feet)</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913</td>
<td>10</td>
<td>---</td>
<td>---</td>
<td>2,000(^1)</td>
<td>---</td>
<td>---</td>
<td>Minnie Moore Mines Co.</td>
</tr>
<tr>
<td>1923-1924</td>
<td>24</td>
<td>230</td>
<td>327</td>
<td>514</td>
<td>181</td>
<td>Federal Mining &amp; Smelting Co.</td>
<td></td>
</tr>
<tr>
<td>1924</td>
<td>40</td>
<td>---</td>
<td>---</td>
<td>920</td>
<td>---</td>
<td>Harold Boericke</td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td>40</td>
<td>225</td>
<td>---</td>
<td>2,425</td>
<td>377</td>
<td>Harold Boericke</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>40</td>
<td>360</td>
<td>---</td>
<td>900</td>
<td>---</td>
<td>Minnie Moore Mines Co.</td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>30</td>
<td>1,500(^2)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>Minnie Moore Syndicate</td>
<td></td>
</tr>
<tr>
<td>1936</td>
<td>12</td>
<td>---</td>
<td>---</td>
<td>700</td>
<td>---</td>
<td>Minnie Moore Mine Development Co.</td>
<td></td>
</tr>
<tr>
<td>1937</td>
<td>20</td>
<td>---</td>
<td>---</td>
<td>1,500</td>
<td>---</td>
<td>Minnie Moore Mine Development Co.</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Combined figure for crosscutting and drifting.
\(^2\)Figure is for total development; no breakdown was given as to type of work.

left off on the 800 level. Between July 1 and August 1, a crew of twelve men set a new state record for the length of tunnel driven in a month. The crew drove 386.5 feet through solid granodiorite in a drift off the 800 level of the Allen shaft. The raise was 5 feet wide by 7 feet high, with a grade of 6 inches to 100 feet. The Minnie Moore was the largest producer in the district, shipping several lots of concentrate that were jiggered from dump ore.

Early in 1925, a “sensational” strike of mill ore was said to have been made at the Minnie Moore, but no ore was shipped from this discovery. Development work through the Allen shaft continued throughout the year, but the faulted orebody was not located beyond the Minnie fault. On December 31, operations were suspended, and Boericke forfeited his lease.

The owner kept the pumps running in the mine and began working to refinance the property for further development. Between February 2 and May 25, an unnamed operator performed a large amount of diamond drilling and crosscutting, then returned the mine to its owner. On June 26, exploration work was resumed by the Minnie Moore Syndicate, which was controlled by Hecla Mining Co. The Syndicate did over 1,500 feet of development work, but failed to locate any commercial ore. On November 11, the Syndicate forfeited its option. By that time, the president of the Minnie Moore Mines Co. had succeeded in refinancing the mine, and development continued without interruption.
Figure 13. Federal Mining & Smelting Co.'s surface plant at the Minnie Moore Mine in 1923 (Campbell, Stewart, 1924, Twenty-fifth annual report of the mining industry of Idaho for the year 1923, p. 57).
This work included sinking a winze from the lowest level. A small lot of ore was shipped from the mine during the year.

Development work continued until May 1927. This effort failed to locate the vein, and the mine was abandoned. The buildings were dismantled, and all the equipment was removed from the property. At this time, the mine had about 5,000 feet of accessible workings, including an 800-foot inclined shaft that gained a vertical distance of 600 feet.

Small lots of ore were shipped from the mine in 1928 and 1929. Late in 1931, Federal Mining & Smelting again acquired the Minnie Moore on a long-term development and operating agreement. Federal examined the mine soon after the acquisition and made plans to develop the property when metal prices recovered to more normal values. (Prices for all metals hit all-time record low values in 1932.)

According to Anderson (1950), Federal began sinking the Rockwell shaft near the mouth of Minnie Moore Gulch in 1932; this date is at variance with all other references. Unlike the older shafts on the property, which were inclined along the vein, the two-compartment Rockwell shaft was vertical. Federal’s 1934 annual report (p. 22) discussed the work at the mine:

Under the agreement with the Minnie Moore Mines Company, Bellevue, Blaine County, Idaho, entered into in 1931, prospecting and development of the property were commenced in June of this year. A shaft 500 feet deep was completed in December, and the work of crosscutting the vein system is in progress.

Although the company felt it was too early to tell what the results of this exploration would be, it was “fairly hopeful” that the vein would be relocated. However, the effort was not successful, and the property was surrendered in May 1935.

During 1935, Stratton & Stratton (reorganized late in the year as the Minnie Moore Mine Development Co.) reached an agreement with the owner and made plans to begin an exploration program. Twelve men worked on the project in 1936 and twenty the following year. The crosscutting and diamond drilling program was under the direction of Oscar H. Hershey. By September 1937, the Hershey crosscut was 2,200 feet long, 1,500 feet of which had been driven in 1937. The crosscut was driven from the 450 level of the Rockwell shaft toward an area southeast of the old workings, looking for the faulted extension of the Minnie Moore vein (Anderson, 1950). The work was suspended in October.

Work resumed on the Hershey crosscut in the summer of 1938 “under a change of organization” (IMIR). At some point, work on the crosscut was diverted to the southeast toward an area where a geophysical survey indicated a large body of ore. The Bergman lateral failed to locate this orebody. However, it did discover the Bergman vein, a probable eastern extension of the Minnie Moore vein (Anderson, 1950). Discovery of the Bergman vein probably occurred in 1939, but it apparently did not contain much commercial ore.

10The 1932 IMIR gives a date of February 1932 for the date Federal acquired the property, but this is contradicted by Federal’s Annual Report for 1932.
An average of fifteen men were employed at the mine during the year. (Figure 14 shows the mine camp and headframe.)

Considerable exploration work was done in 1940, still trying to locate the extension of the Minnie Moore vein. However, the work on the Bergman lateral had exhausted the company’s funds. In 1941, the mine was again allowed to flood (Anderson, 1950). Old tailings were shipped from the property between 1941 and 1944; shipments in 1943 totaled 758 tons.

In 1949, the Silver Star-Queens Mines Company began rehabilitating the Rockwell shaft in order to gain access to the lower levels of the Queen of the Hills Mine (Anderson, 1950). The company had to replace the headframe, which had collapsed into the shaft, and retimber the shaft for forty feet below the collar. In addition to work on the Queen of the Hills, the company diamond drilled a hole from the Hershey crosscut to the 1000 level of the old Minnie Moore workings. This hole was used to drain the old workings through the Rockwell shaft (Anderson, 1950).

Anderson (1950, p. 14) described the workings on the Minnie Moore as follows:

The Minnie Moore has been developed by three inclined shafts, the Minnie Moore, Relief, and Allen; and by one vertical shaft, the Rockwell. The Minnie Moore shaft, the original working entry, has a slope length of 1,100 feet on a 30° angle. From it are 11 levels with an inclined winze, the 1012 winze, sunk from the 1,000-foot level. The Minnie shaft is caved and beyond repair. The Relief shaft, about 700 feet to the west of the Minnie Moore, is a single compartment shaft inclined at 20° with a length of about 800 feet. It has five levels and is still open. The Allen shaft, which is about 800 feet west of the Relief, has three compartments and is sunk to a depth of 850 feet at an angle of 35°. This shaft also has five levels and a two-compartment winze; (the Boerschke), which gives an additional depth of 325 feet. This shaft is also open. All three shafts closely parallel the Minnie Moore vein. The Rockwell shaft, about 1,700 feet east of the Minnie Moore, is a two-compartment shaft 500 feet deep with levels at 250 and 450 feet, workings on the 450 level, which include the Hershey crosscut and the Bergman lateral and drifts, and are by far the most extensive.

During 1950, Silver Star-Queens acquired the Minnie Moore property under lease and bond. The lease was for 25 years and called for a 10 percent royalty until the owners had been credited with seven million pounds of lead. This was in addition to the working agreement made the previous year for use of the Rockwell shaft. During the year, the Rockwell shaft and the workings connected to it were dewatered, and the company began cleaning out the 250 and 450 levels.

On October 16, 1951, Silver Star-Queens began work under Defense Minerals Administration (DMA; later Defense Minerals Exploration Administration, or DMEA) contract No. Idm-E152. The total amount of the contract was $133,837, with 50 percent government participation (for a total of $66,918). Phase I of the contract was an extension of the Hershey crosscut, which was completed by the end of the year. The crosscut was extended 373 feet, and 70 feet of the work was done under the DMA contract. Phase II called for driving a lateral from the Hershey crosscut to the old Minnie Moore workings. By the end of the year, 250 feet of work had been done on this part of the contract. A third part of the contract involved work on the Queen of the Hills.
Figure 14. Surface plant of the Minnie Moore Mine and headframe on the Rockwell shaft (c. 1939; Campbell, Arthur, 1940, Forty-first annual report of the mining industry of Idaho for the year 1939, p. 164).
In 1952, the company explored below the 450 level of the Rockwell shaft, with the results of this work reported as "now down 50 feet in ore" in February 1953. Forty-two railroad cars and one truckload of ore were shipped from the property during the last half of 1952; presumably, this included ore from both the Minnie Moore and the Queen of the Hills workings. Work continued on the company’s DMEA contract during the year.

During 1953, the company connected the Hershey crosscut with the 1000 level of the old Minnie Moore workings. The old tunnels were caved, but the company began rehabilitating them. Forty-eight railroad cars and one truckload of ore were shipped, but no mention was made of how much was produced by each mine. The company’s DMEA contract was active during at least part of the year, but apparently expired before the year’s end.

Work continued on the property for the next several years. A second DMEA contract was awarded in 1955. Most of the work on this project was apparently directed toward exploring the Queen of the Hills veins, although the work was probably conducted through the Rockwell shaft. Large shipments of ore were made from the property every year between 1956 and 1959. None of it was attributed to the Minnie Moore, but Silver Star-Queens’ lease on the Minnie Moore remained in effect.

A "breccia blowout" on and above the 850 level of the winze that opened off the Rockwell shaft forced the company to close down operations in June 1959. (The company stated that the blowout made it too difficult and too expensive to stabilize the workings.) In October Samson Oil and Mineral Company of Fort Worth, Texas, acquired control of the company through stock purchases. Silver Star-Queens continued as the operating company, although the company’s officers were replaced by the new owners.

Some prospecting was done at the Minnie Moore in 1960. In 1961, drifting and diamond drilling were carried out from the 450 level of the Rockwell shaft. On August 21, 1961, Silver Star-Queens entered into a contract with Federal Resources Corporation for Federal Resources to explore the property on a contingency basis. Silver Star-Queens discontinued all its mining activities for the duration of this contract.

Federal Resources did diamond drilling and drifting on the property in late 1961 and early 1962, but most of this work may have been on the Queen of the Hills. In April 1964, Federal Resources completed construction of a 250 tpd flotation mill. Tailings from the Minnie Moore were processed at the mill during both 1964 and 1965. Federal Resources continued to operate the Silver Star-Queens property until 1971, but if this included any work on the Minnie Moore, it was probably minor.

In 1978, Carl Johnston purchased the Minnie Moore for $250,000. In 1980, a company based in Hailey reprocessed material from the dump.

High-grade silver ore was accidently uncovered at the mine around the middle of 1983. A contractor who was breaking up rock for riprap to line river banks discovered the vein in holes being drilled for blasting. Soon after the discovery, Exxon Minerals obtained an interest in the property. In 1984, Exxon conducted a major land acquisition program in

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11Not the same company as Federal Mining & Smelting Co., which operated the mine in the 1920s and 1930s.
the Hailey area, reopened old mines to obtain geologic information, and did drilling and extensive surface exploration. The company continued its exploration program in 1985.

A year of low petroleum prices forced most of the oil companies in the U.S. to make drastic cuts in programs and staffing in 1986. Exxon was no exception, cutting capital expenditures by 25 percent and laying off over a quarter of its employees. The company apparently dropped its exploration work in the Hailey area at this time. Figure 15 shows the mine area and tailings pond as they appeared in the summer of 1994.

Total recorded production from the Minnie Moore between 1881 and 1947 was 96,197 tons of ore and 41,499 tons of reprocessed tailings. This material yielded 139 ounces of gold, 2,580,974 ounces of silver, 23,495 pounds of copper, 31,250,301 pounds of lead, and 640,419 pounds of zinc. These numbers must be considered a minimum. No accurate information is available prior to 1886, and it is highly unlikely that all production from leasing operations in the early days of the mine is included in the tabulated data. In addition, no production was recorded for the Minnie Moore during the period after 1950, when Silver Star-Queens Mines and Federal Resources were operating both the Minnie Moore and Queen of the Hills mines. Although undoubtedly small, any ore found while rehabilitating and exploring the Minnie Moore workings was not separated from the ore shipped from the Queen of the Hills mine. Finally, no information is available on the metals obtained from the tailings shipped from the property in 1980.
Figure 15. Minnie Moore tailings dump in 1994, looking east from the hoist house at the Rockwell shaft. The foundations of the mill can be seen on the right side of the picture, and the town of Bellevue is just behind the trees on the far side of the tailings pile (photograph by Earl H. Bennett, Idaho Geological Survey).
References


Idaho Geological Survey’s mineral property files (includes copies of company reports to the Idaho Inspector of Mines).


Idaho Mine Inspector’s annual reports (IMIR) on the mining industry of Idaho, 1899-1970.


