

# History of the Harmony Mine, Lemhi County, Idaho

Victoria E. Mitchell

Staff Report 97-7  
April 1997

Idaho Geological Survey  
Morrill Hall, Third Floor  
University of Idaho  
Moscow, Idaho 83844-3014

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## INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the U.S. Forest Service, Region IV, 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 mines in Region IV that had significant recorded production. The information in this report is from a number of published and unpublished sources in the Idaho Geological Survey's mineral property files.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 the annual reports prepared by the companies for 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 Harmony Mine, Lemhi County, Idaho

Victoria E. Mitchell<sup>1</sup>

The Harmony Mine is in the McDevitt mining district at the head of Withington (sometimes misspelled as Worthington) Creek on the east slope of the Lemhi Range (Figure 1). The mill and the main camp were located at an elevation of about 7,000 feet, but the mine buildings and the portal of the main haulage level were located 1,200 feet higher up the mountain (Figure 2). The mine was connected to the mill by an aerial tram.

The ore is in shear zones in dark, argillaceous quartzite of the Yellowjacket Formation (Figure 3). The property had at least six mineralized zones. These trended northwest and were not quite parallel to each other, resulting in branching and merging of some of the veins (Anderson, 1956). The strike of the orebodies was N. 40° W., and the dip was 60°-65° W. The best ore shoots averaged 5 feet thick and 80 feet long. The main ore mineral was chalcopryite, which was partly altered on the upper levels to bornite and chalcocite (Gardner, 1930).

Ore was first discovered in the vicinity of the Harmony Mine about 1870, when many areas in the West were being heavily prospected (Gardner, 1930). However, little work was done on the property until it was acquired by Harmony Mines Co. in 1916. (Table 1 lists the companies operating at the mine.) The company shipped copper ore in 1916 and 1917. According to the 1917 IMIR (p. 71-72):

[N]ear the head of Worthington Creek the Harmony Mines Company took over an interesting group of claims, locally known as the Anderson Group, which was

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<sup>1</sup>Idaho Geological Survey, Main Office at Moscow, University of Idaho, Moscow.



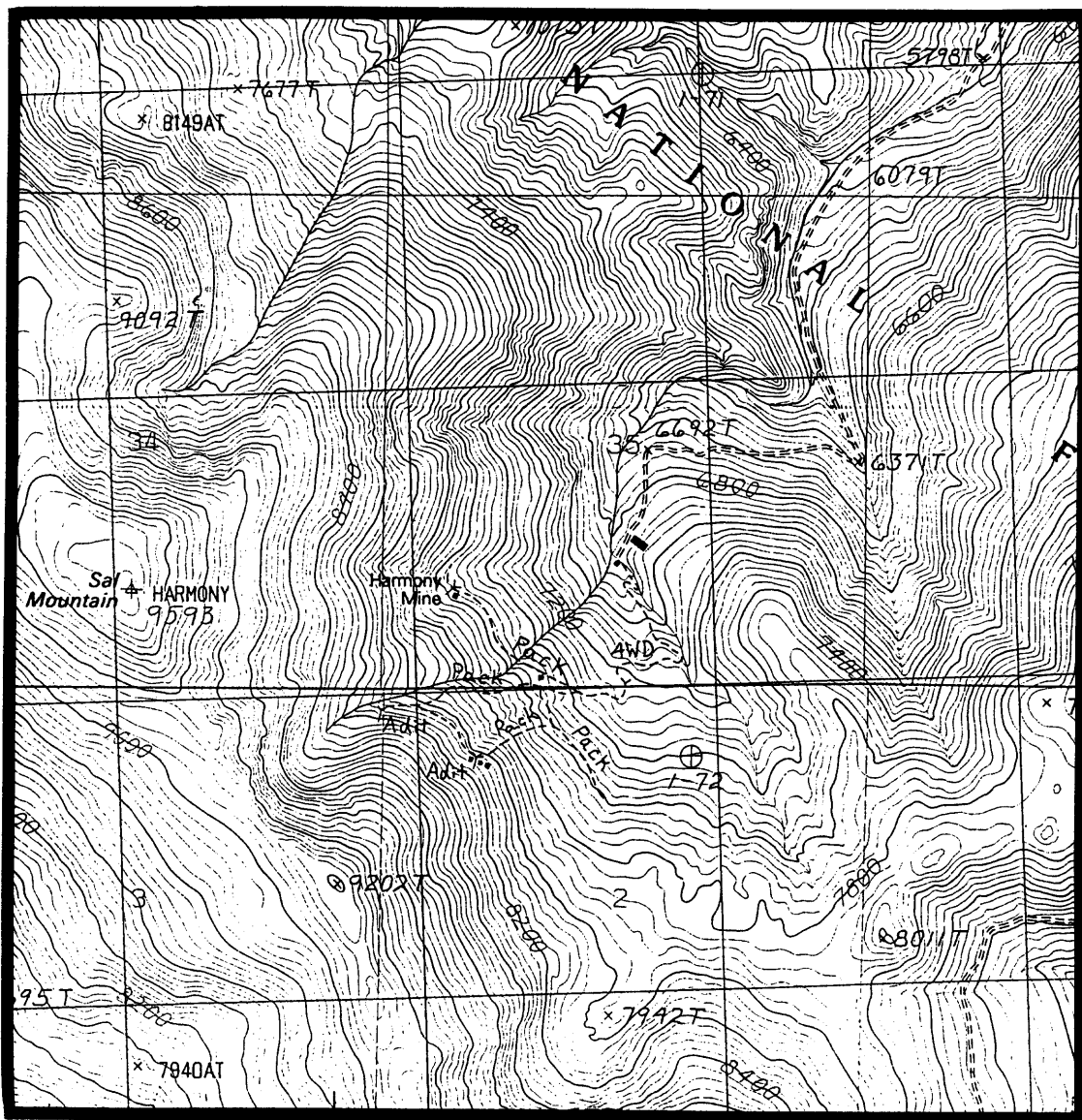


Figure 2. Topographic map of the Harmony Mine and vicinity, Lemhi County, Idaho (U.S. Geological Survey Sal Mountain 7.5-minute topographic map).





Figure 3. Geologic map of the Harmony Mine and vicinity, Lemhi County, Idaho. Yy = Middle Proterozoic Yellowjacket Formation; Yl = Middle Proterozoic Lemhi Group; Tc = Eocene Challis Volcanics; Tibd = Early Tertiary intrusive basalt and diorite; Tbz = Pliocene to Eocene Bozeman Group and related valley fill rocks; QTg = Quaternary alluvial and pediment gravels; Qf = Quaternary alluvial fan deposits; Ql = Quaternary landslide deposits; Qm = Pleistocene till; Qa = Quaternary alluvium. Heavy lines are faults: ball-and-bar symbols mark downdropped blocks on normal faults; sawteeth are on upper plates of thrust faults (Ruppel and others, 1993).

Table 1. Companies operating at the Harmony Mine.

| Company Name              | Officer                | Date Incorporated | Charter Forfeited | Year(s) at Mine |
|---------------------------|------------------------|-------------------|-------------------|-----------------|
| Harmony Mines, Inc.       | A.W. Nieman, President | April 8, 1916     | 1936              | 1916-1936       |
| Noranda Exploration, Inc. | J.O. Hinds, President  | Dec. 24, 1973     | still active      | 1991            |

energetically developed during the year, and made a production during the last four months of the year of 10 carloads of crude ore, which gave shipping results of from 6 to 12 per cent copper, with a little gold and silver per ton.

The property carries a series of steep pitching fissure veins and in its upper tunnel development exhibits some very handsome chalcopryite ore. The property was equipped with an air compressor plant of 570 cubic feet capacity and an aerial tramway a mile long, and was shipping two carloads of ore a week at the close of the year. The ore being shipped at present is all from the 100-foot level, but a new cross-cut tunnel now being driven and already in 850 feet will develop an additional depth of 400 feet on the series of fissures that traverse the large group of claims owned by this company, on which six distinct veins are recognized, and with their favorable geologic environments give excellent promise at this time of proving an important source of copper ore value.

In 1918, the company did 700 feet of drifting and made several shipments of copper sulfide ore. A new vein of "rich milling ore" discovered during the year added to the mine's reserves (1918 IMIR, p. 77).

The company did 1,176 feet of drifting in 1919 and shipped a small amount of ore. (Table 2 lists development work and men employed at the mine, and Table 3 gives mine output and economic data for selected years.) Most of the work during the year was to locate and block out ore, but major production was deferred because the ore needed to be concentrated before it was shipped. In November, the company began construction on a 100-ton mill. The 1919 IMIR described the year's work at the mine (p. 100):

A few miles further east from the Pope-Shenon property in the same general formation, the Harmony Mines Company has been pushing an active campaign of development and new equipment throughout the year. This property has a series of five parallel fissures outcropping near the crest of a high mountain summit at the head of Worthington Creek canyon, about 12 miles south of Salmon City. The No. 1 vein of this series has been cut at a depth of 350 feet and discloses an ore body that has been drifted out several hundred feet in length and of good stoping width. Even at this considerable depth this ore course is largely oxidized and shows conspicuous manifestations of sooty chalcocite. Other veins of the series, however, up to 10 feet in thickness show a strong development of chalcopryite. The main cross-cut tunnel is being driven to intersect the

Table 2. Development work, men employed, and operating companies at the Harmony Mine, by year.

| Year | No. of Men employed | Tunnels (feet)     | Sinking (feet)   | Cross-cutting (feet) | Drifting (feet) | Operator              |
|------|---------------------|--------------------|------------------|----------------------|-----------------|-----------------------|
| 1919 | 10                  | 1,500 <sup>1</sup> | 100 <sup>2</sup> | 1,400 <sup>3</sup>   | ---             | Harmony Mines Company |
| 1920 | 30                  | 1,287 <sup>1</sup> | 117 <sup>2</sup> | 1,170 <sup>3</sup>   | ---             | Harmony Mines Company |
| 1921 | 10                  | 911 <sup>1</sup>   | 30 <sup>2</sup>  | 881 <sup>3</sup>     | ---             | Harmony Mines Company |
| 1922 | 35                  | ---                | ---              | ---                  | 50              | Harmony Mines Company |
| 1923 | 20                  | ---                | ---              | 159                  | 28              | Harmony Mines Company |
| 1924 | 25                  | 342.8              | ---              | 179.5                | 173.3           | Harmony Mines Company |
| 1925 | 5                   | 100                | ---              | 50                   | 50              | Harmony Mines Company |
| 1926 | 16                  | 2,350              | ---              | ---                  | 350             | Harmony Mines Company |
| 1929 | 18                  | ---                | 160              | ---                  | 450             | Harmony Mines Company |
| 1930 | 18                  | ---                | 50               | ---                  | 430             | Harmony Mines Company |
| 1931 | 4                   | ---                | 90               | ---                  | 60              | Harmony Mines Company |

<sup>1</sup>Total development for the year.

<sup>2</sup>Combined figure for sinking and raising.

<sup>3</sup>Combined figure for crosscutting and drifting.

<sup>4</sup>Work done by contract labor.

whole series at a maximum depth of 800 or 900 feet and is already over 800 feet in length. The property is equipped with a very substantial aerial tram with which to transport the crude ore down to the mill site in the canyon 1,200 feet vertically below, at which point a concentrating mill of 100 tons daily capacity is in process of construction and nearly completed. This plant has been designed by O. B. Offstrand, a competent metallurgist and construction engineer of Salt Lake City. Its general features embrace a rock breaker Hardinge mill, Dorr classifiers and six Wilfley tables to which flotation cells are to be added and it is expected that the mill will be completed and put in operation early in the spring.

The mill was completed in 1920, and considerable copper concentrate and crude ore were shipped during the year. Mine workings totaled about 5,000 feet.

The mine was closed throughout 1921 due to low copper prices, but the mill was upgraded to 150 tons per day (tpd) and oil flotation cells were added. The company claimed its standard recovery rate with this setup was 90 percent.

Table 3. Mine output and economic data for the Harmony Mine for selected years, 1919-1923.

| Year | Tons of ore           | Average value per ton | Total mining cost per ton | Transport and treatment costs per ton | Copper recovered (pounds) | Gross returns |
|------|-----------------------|-----------------------|---------------------------|---------------------------------------|---------------------------|---------------|
| 1919 | 52                    | \$42.80               | \$10.00 <sup>1</sup>      | \$17.00                               | 11,128                    | \$2,225.60    |
| 1920 | 120                   | \$30.00               | \$ 4.63                   | \$16.00                               | 24,855                    | \$3,591.59    |
| 1921 | 2,412.3               | \$45.00               | \$ 2.50                   | \$11.00                               | 93,740                    | \$10,440.43   |
| 1922 | 4,500 <sup>2</sup>    | 3                     | 3                         | \$ 1.50 <sup>4</sup>                  | 142,484.06                | \$12,452.98   |
| 1923 | 13,195.5 <sup>5</sup> | 3                     | 3                         | \$ 1.70 <sup>4</sup>                  | 548,384.19                | \$74,044.73   |

<sup>1</sup>Cost for the ore actually mined and shipped.

<sup>2</sup>The mine shipped 365 tons of concentrate during the year. The average grade of the ore mined was 3 percent copper, and the recovery rate for the mill was 90 percent.

<sup>3</sup>Not given.

<sup>4</sup>Treatment costs only.

<sup>5</sup>The mine shipped 1,227.239 tons of during the year. The average grade of the ore mined was 3.102 percent copper, and the recovery rate was for the mill was 87.7 percent.

The company resumed operations early in 1922 and maintained capacity production for most of the year. The mine was the largest copper producer in Lemhi County. More than 1,000 tons of copper concentrate was shipped, and the mine had reserves of about 45,000 tons of ore. The mine had five tunnels, six shafts, one raise, four crosscuts, and four drifts, for a total of approximately 6,000 feet of workings. The lengths of the tunnels were: No. 1, 2,000 feet; No. 2, 640 feet; No. 3, 210 feet; No. 4, 410 feet; and No. 5, 1,000 feet. The mine was equipped with two Chicago-Pneumatic electrically driven compressors (capacity 550 cubic feet), two B & B wire-rope aerial tramways (2,400 feet long and 2,800 feet long) that connected the mine and mill, thirty mine cars, and fourteen rock drills. Haulage was by mule. The mill, which the company rated at 175 tpd, had primary and secondary crushers, a Hardinge ball mill, two Dorr classifiers, ten Wilfley tables, two K & K flotation cells (a 12-foot and a 6-foot), and two Aikens classifiers.

During 1923, the Harmony produced a large quantity of copper concentrate, which was hauled to Salmon and shipped to the smelter at International, Utah. The ore consisted of chalcopryite, chalcocite, and pyrite. In addition to maintaining capacity production, a large amount of development work was done, mostly on a lower tunnel to give additional depth on the ore. A third compressor was added to the mine. The company's description of the workings (reproduced with the original spelling and punctuation) was:

- Tun'l No. 1. 1100' Long on Income Group. Part x cut Part Drift.
- Tun'l No. 2. 180 x cut to Anderson Vein, 300' Development on Vein.
- Tunl No. 3. 170 x cut to Contention. 100' Level. 190' " " "
- Tun'l No. 4. 700 ft Drift on Contention & Leapyear veins. 200' Level.
- Tun'l No. 5. 750 ft x cut. 1550' Drift on Contention and Leapyear Veins 300' Level.

The mine also had 602,743 cubic feet of stopes above the 300 level.

When Ross (1925) visited the mine in 1923, he described the workings (p. 38):

The principal underground workings are on the Contention claim, and comprise three levels, known as the 100-foot, 200-foot, and 300-foot levels. On the 100-foot level there is a crosscut tunnel 265 feet long and a drift 160 feet long with a stope above it. The portal of the 200-foot level is 78 feet vertically farther down the mountain than that of the 100-foot level, and there are 1,000 feet of drifts and crosscuts on this level. The 300-foot level is the haulage level of the mine, and its portal is 95 feet vertically below the portal of the 200-foot level. Stopes and raises connect the 200-foot and 300-foot levels, and there is a small stope on the 100-foot level. The 300-foot level comprises over 2,500 feet of drifts and crosscuts. These three levels and the principal workings in other parts of the property are shown on Plate V [Figure 4].

In addition to the main mine, whose workings are outlined above, the Harmony includes the Anderson and Income workings, and several small shafts and cuts. The portal of the Anderson workings is 425 feet above and about 2,000 feet west of the portal of the 300-foot level of the main mine. The Anderson workings comprise about 510 feet of drifts and crosscuts now open, with stopes above, one of which extends about 100 feet to the surface.

The portal of the Swift tunnel, the principal tunnel on the Income group, is at about the same altitude and somewhat over 3,100 feet southeast of the tunnel of the 300-foot level of the main mine. The Swift tunnel is about 900 feet long, and there are shallow shafts and short tunnels above it.

According to Ross, the Harmony shipped 842 tons of crude ore and 1,502 tons of concentrate between 1916 and 1922. The crude ore contained 0.68 ounce of gold, 130 ounces of silver, and 132,297 pounds of copper. The concentrate, which was obtained by milling 16,408 tons of ore, contained 915 ounces of gold, 793 ounces of silver, and 621,655 pounds of copper. The smelter returns for forty-two shipments made in 1923 showed the concentrate averaged 22.7 percent copper, 1.58 ounces of silver and 0.01 ounce of gold per ton, 19.8 percent silica, 25.4 percent iron, and 24.7 percent sulfur.

The Harmony operated part of the year in 1924 and shipped several hundred tons of copper concentrate to International, Utah, although the output of copper was only about one-seventh that of the previous year. The company was developing the lowest level of the mine, but was forced to suspend operations until it could raise sufficient money to continue the work.

There were no ore shipments in 1925, but development work continued. According to the 1925 IMIR (p. 155):

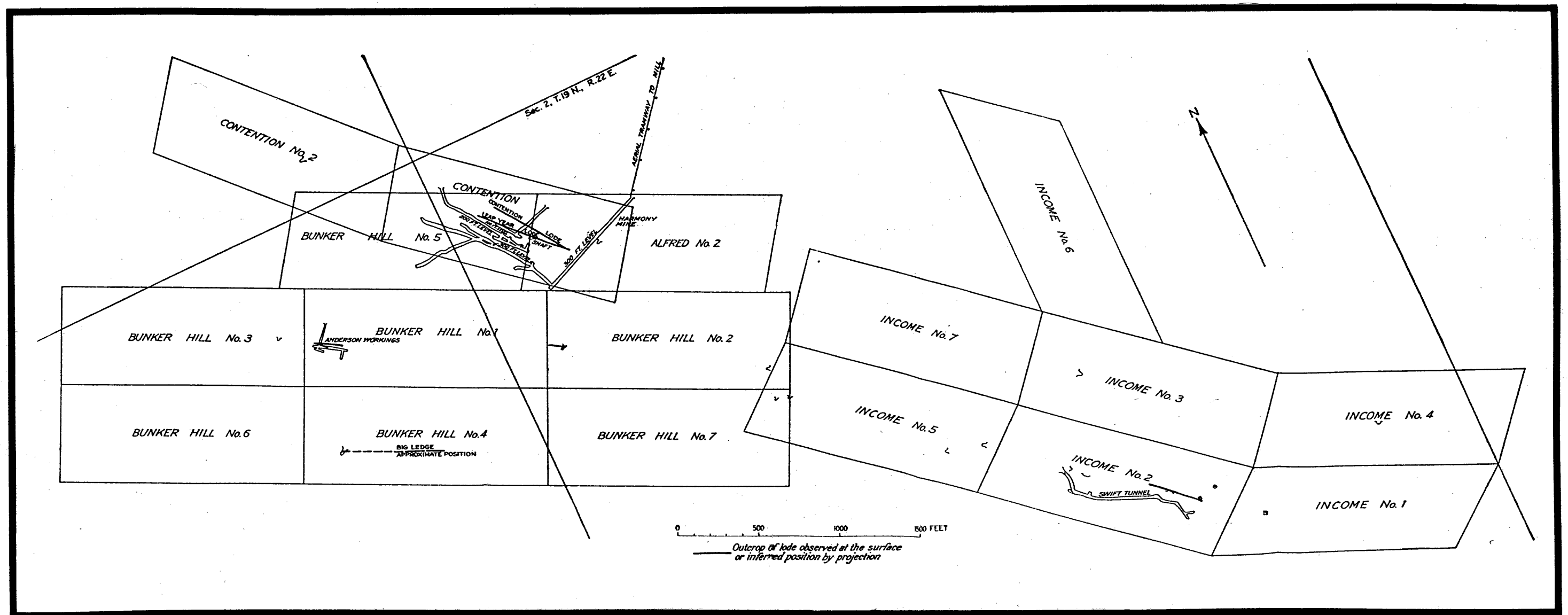


Figure 4. Sketch map of the claims, lodes, and mine workings at the Harmony Mine (Plate V from Ross, 1925).

The largest development enterprise in Lemhi County during the year was that of the Harmony Mines Co. This company completed its financial arrangements and, in June, started driving a 1700-foot crosscut, which will intersect the vein at a depth of 600 feet below the lowest level in the mine. The work was continued without interruption, and in September it was reported that the tunnel had intersected a good showing of ore at a distance of 950 feet from the portal, and that geological conditions were very favorable.

In 1926, about 950 feet of work was done on crosscuts and drifts, but the mill was not operated. The company shipped one lot of copper concentrates, left from former operations, to International, Utah. Most of the work done in 1926 was on the lowest level. Early in the year a large body of high-grade copper ore was discovered 600 feet below the old lower level; the company explored this discovery. The tramway was moved to the new tunnel, a storage-battery locomotive was installed, and the production and milling of the ore began in December. The mine had three compressors (an 800-cubic-foot Ingersoll-Rand, a 350-cubic-foot Chicago-Pneumatic, and a 210-cubic-foot Chicago-Pneumatic), a 6-ton Mancha storage-battery locomotive (later reports list fifteen 2½-ton ore cars as well), and two aerial tramways (one 1,800<sup>1</sup> feet long, the other 1,900 feet long). Seven of the claims were patented during the year.

The mine was active for three months in early 1927. New ore-bins and a sorting plant were added to the mill, and construction of a new aerial tramway was completed. Underground exploration work continued. A small tonnage of ore was mined and milled, and the resultant concentrate marketed. Work was then suspended while the company tried to sell bonds to finance its operations.

In 1928, the mine produced 900 tons of copper ore, and one car of copper concentrate was shipped to International, Utah, for smelting. The company did nearly 600 feet of development, chiefly tunneling and drifting. The mill was rearranged during the latter part of the year to send a finer feed to the ball mill, and a filter was installed to dewater the concentrates. Various changes were said to have increased the capacity of the mill 50 percent. However, according to the IMIR (p. 152), "the company's principal activity appeared to be that of raising more funds."

The mine was operated continuously in 1929, and the mill ran four months. More than 4,800 tons of copper ore was treated, and 187,822 pounds of copper was recovered. Development work consisted of 620 feet of sinking, drifting, and raising. Much of this work was on the 900 level, and sinking to the 1000 level was in progress. Ore was mined between the 800 and 900 levels. Also, a raise was started from the 800 to the 300 level, and some development work was done on the orebody on the 300 level. A 450-horsepower diesel generator was installed at Baker, Idaho, and 8 miles of copper transmission line were strung to the mine. In addition, new equipment was added to the mill. According to the 1929 IMIR (p. 174):

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<sup>1</sup>Company reports give the length of this tram as 1,800 feet. Published reports state 800 feet.

This company has been in almost continuous operation since 1916, and its property is one of the most completely equipped mines in Lemhi County. Its 1929 expenditure was one of the largest in southern Idaho. The stockholders in this company are to be complimented for their fortitude.

When Gardner (1930a, 1930b) visited the mine, he described the mining and milling operations and outlined the costs. The layout of the mill is shown in Figures 5 and 6. The orebody was being mined by shrinkage stoping (Figure 7), and most of the work was done by contract labor. Gardner noted that, during cold weather, the ore was hauled only during the day shift and that all the ore was removed from the bins at the head of the tramway before the tram was stopped. This was because the ore would freeze if it sat in the bins for more than a few hours.

In 1930, the mine operated for about 5 months. The mill ran only 14 days. During that time, it treated 736 tons of copper ore containing chalcopyrite and pyrite, produced chiefly by four lessees; 34,564 pounds of copper was recovered from the concentrate. About 150 feet of development was done at the mine before it was closed.

Lessees did a small amount of work at the Harmony in 1931. One car of copper concentrate, left from former milling operations, was shipped. At that time, the mine had about 10,485 feet of workings, consisting of 555 feet of shafts, 525 feet of raises, and 9,405 feet of tunnels, crosscuts, and drifts. The mine had seven tunnels, six shafts, five raises, seven crosscuts, and ten drifts. The No. 1 tunnel, which was 825 feet below the surface, was 2,650 feet long; the No. 2 tunnel, which was 300 feet below the surface, was 1,325 feet long; the No. 3 tunnel was 890 feet long; the No. 4 tunnel was 260 feet long; the No. 5 tunnel was 220 feet long; and the No. 6 tunnel was 1,000 feet long. The principal vertical shaft was 130 feet deep, and the principal winze was 135 feet long (presumably in projection) and gained a vertical depth of 825 feet.

Copper prices hit an all-time low of 6.3 cents per pound in 1932. The IMIR cited press reports as saying the diesel engine and electric generator were dismantled and removed from the property. The mine never reopened.

In 1991, Noranda Exploration ran a geochemistry and geophysics program at the Harmony and submitted a plan of operation to drill a single core hole. The results of this program are not known.

The mine was visited by an Idaho Geological Survey geologist in 1994 as part of a program to evaluate inactive and abandoned mines in southern Idaho. Figure 8 shows the mill building as it appeared at that time.

Between 1916 and 1931, total recorded production from the Harmony Mine was 47,826 tons of ore. This material yielded 38 ounces of gold, 2,050 ounces of silver, and 1,815,353 pounds of copper.



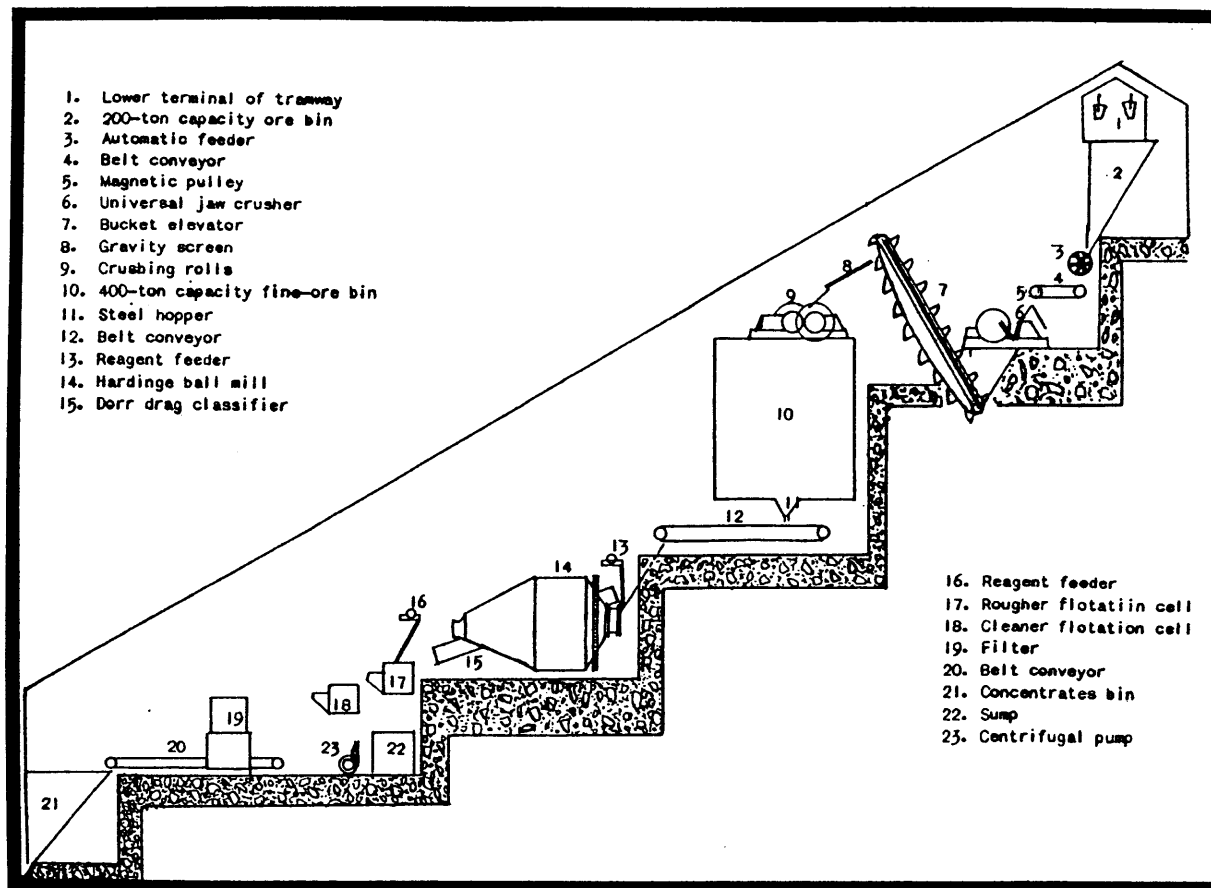


Figure 5. Side view of the Harmony mill, showing the position of the machines (Figure 2 from Gardner, 1930b).

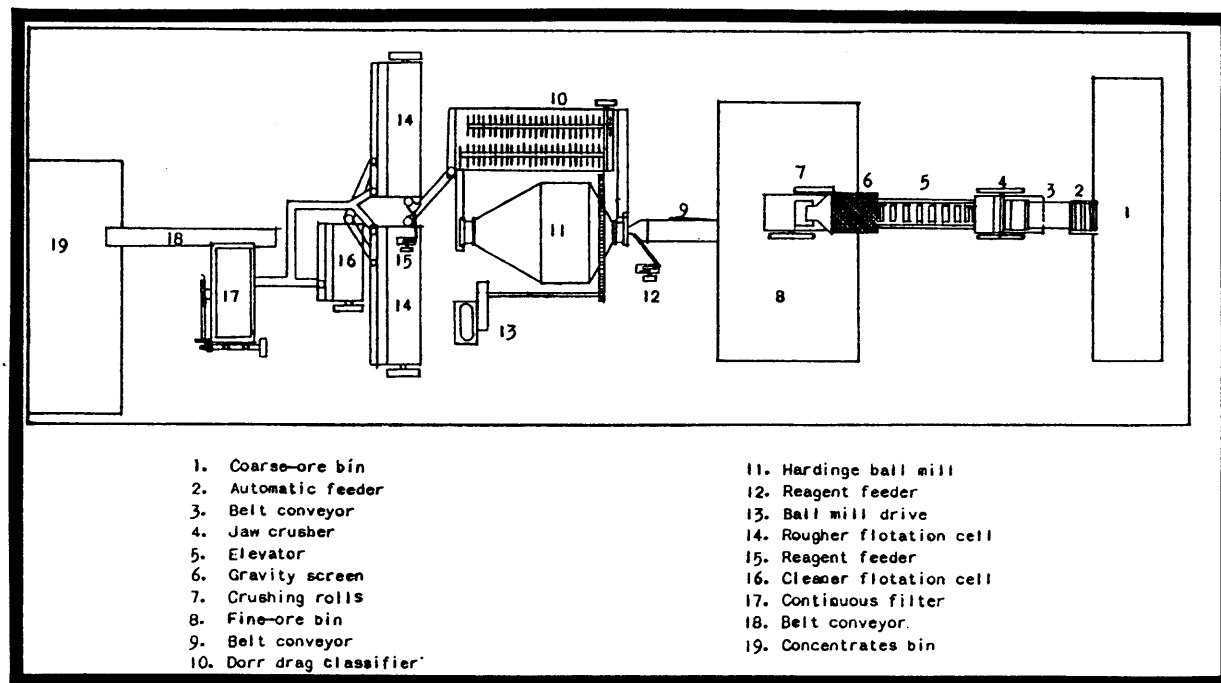


Figure 6. Plan of the Harmony mill (Figure 3 from Gardner, 1930b).

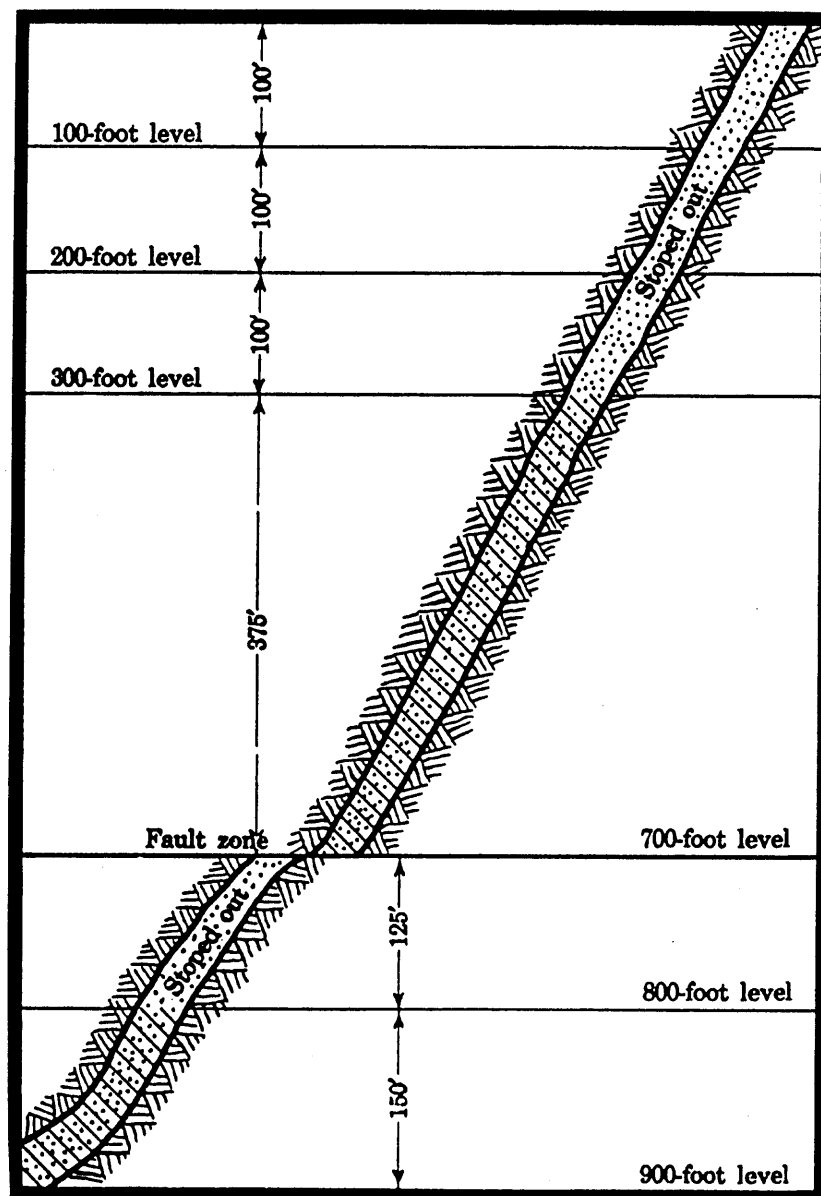


Figure 7. Cross section of the Harmony Mine from the 900-foot level to the surface (Figure 1 from Gardner, 1930a).



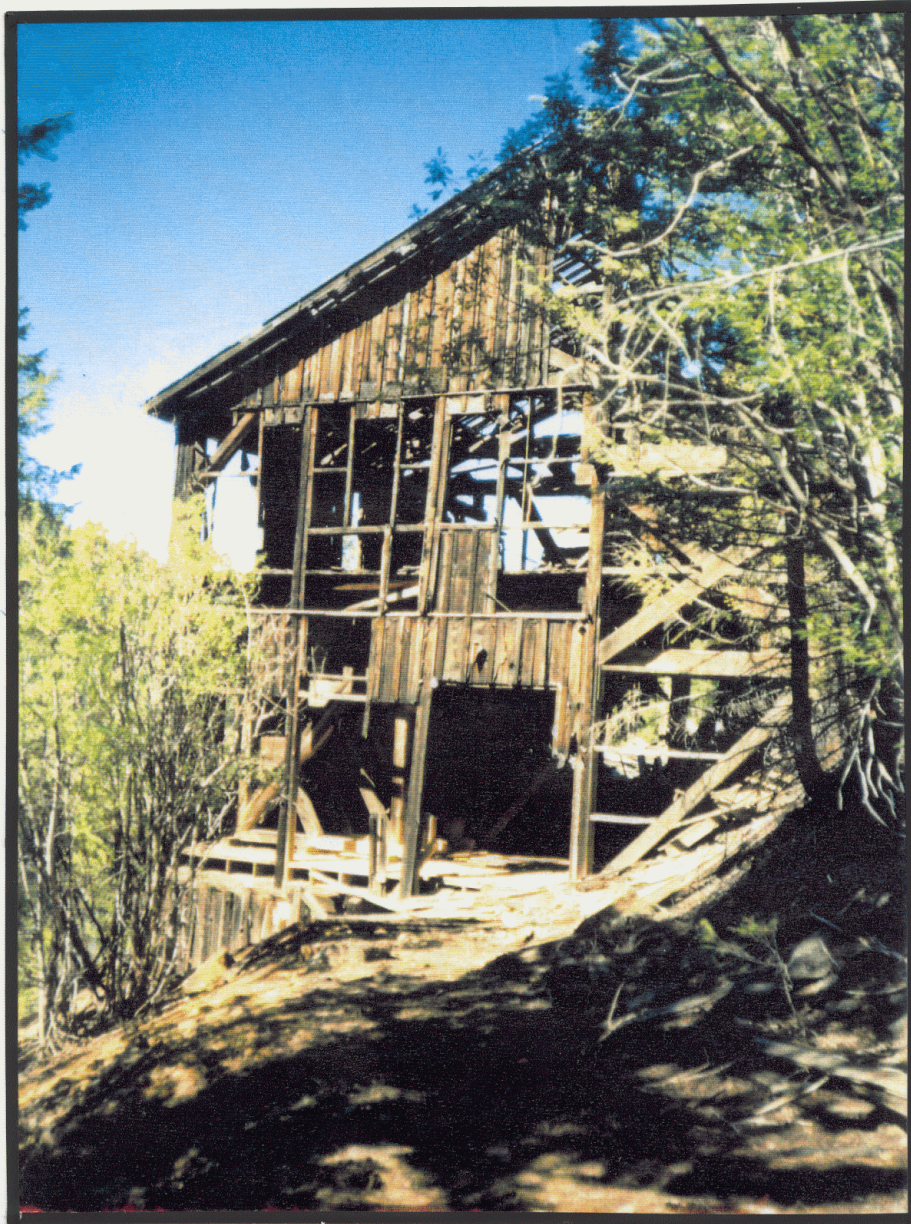


Figure 8. Harmony mill building (1994) (Idaho Geological Survey photograph by Falma J. Moye).



## References

- Anderson, A.L., 1956, Geology and mineral resources of the Salmon quadrangle, Lemhi County, Idaho: Idaho Bureau of Mines and Geology Pamphlet 106, 102 p.
- Gardner, R.D., 1930a, Mining practice at Harmony Mines Co., Baker, Idaho: U.S. Bureau of Mines Information Circular 6240, 8 p.
- Gardner, R.D., 1930b, Milling methods and costs at the Harmony Mines, Baker, Idaho: U.S. Bureau of Mines Information Circular 6285, 18 p.
- Idaho Geological Survey's (IGS) annual reports on Regional Developments in Minerals, Mining, and Energy in Idaho, 1975-1992.
- Idaho Geological Survey's mineral property files (includes copies of company reports to the Idaho Inspector of Mines).
- Idaho Inspector of Mines' (IMIR) annual reports on the Mining Industry of Idaho, 1899-1970.
- Ross, C.P., 1924, A new copper district near Salmon, Idaho: Engineering and Mining Journal-Press, v. 118, no. 6, p. 205-208.
- Ross, C.P., 1925, The copper deposits near Salmon, Idaho: U.S. Geological Survey Bulletin 774, 44 p.
- Ruppel, E.T., J.M. O'Neill, and D.A. Lopez, 1993, Geologic map of the Dillon 1°x2° quadrangle, Idaho and Montana: U.S. Geological Survey Miscellaneous Investigations Series map I-1803-C.
- U.S. Geological Survey (USGS)/U.S. Bureau of Mines (USBM) Minerals Yearbook chapters for Idaho, 1900-1990.