

## PLATINUM NEAR CENTENNIAL, WYOMING

By FRANK L. HESS

### INTRODUCTION

During the winter of 1923-24 numerous accounts of platinum discoveries near Centennial, Albany County, Wyo., appeared in the press. Startling claims were made regarding the value and quantity of the ore. As commercially valuable deposits of platinum are rare, Charles W. Henderson and the writer spent four days in June, 1924, examining the new prospects. These lie within the Medicine Bow quadrangle on the west side and top of Centennial Ridge. (See fig. 4.) Centennial, a small mining town about 2 miles northeast of the prospects, is reached from Laramie by the Laramie, Hahns Peak & Pacific Railroad. There is also a good automobile road from Laramie, from which the prospects are about 35 miles west.

Centennial Ridge is a crescentic flat-topped mountain, concave to the west, where the Middle Fork of Laramie River flows southward through a narrow, steep-sided valley 1,800 feet below the summit of the ridge. The valley widens at three places and forms small flats or parks. Remnants of inconspicuous terraces 25 feet above the present stream occur along the sides of the valley at a few places. The ridge is a part of a high, comparatively flat table-land, 9,500 feet in altitude, that surrounds the Snowy Range to the northwest. The climate is rigorous, and snowdrifts still remained and freezing nights prevailed in June. The table-land is covered by a fairly heavy growth of conifers and is included in the Medicine Bow National Forest.

### GEOLOGY

*The rocks.*—Centennial Ridge is formed from schist and granitic rocks, the latter in places gneissoid. On Sheep and Jelm mountains, a few miles to the east and southeast, apparently similar rocks have been determined by Darton, Blackwelder, and Siebenthal<sup>1</sup> as of pre-

<sup>1</sup> Darton, N. H., Blackwelder, Eliot, and Siebenthal, C. E., U. S. Geol. Survey Geol. Atlas, Laramie-Sherman folio (No. 173), pp. 2-3, 1910.

Cambrian age and as doubtfully of sedimentary origin. Numerous thin lenticular limestone layers in Centennial Ridge indicate that the schist, in part at least, consists of metamorphosed sedimentary rock. Blackwelder<sup>2</sup> notes similar limestones but says that "the identifica-

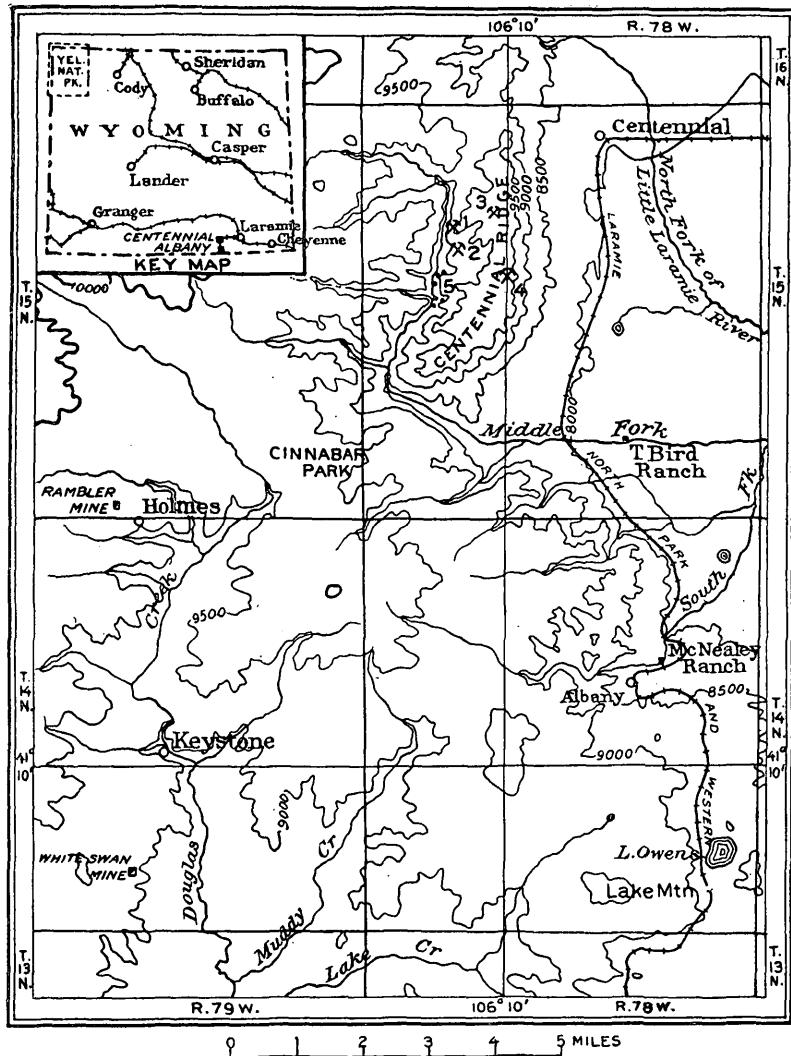


FIGURE 4.—Map of Centennial Ridge, the Rambler mine, and vicinity, Albany County, Wyo. 1, Cliff fraction; 2, Empire No. 1 claim; 3, Free Gold claim; 4, Queen shaft; 5, Wyoming Platinum Placer Co.'s giant (all locations approximate)

tion of them [as limestones of sedimentary origin] is open to question." The only alternative would seem to be that they are replacement deposits or veins, though deposits of both these types are usually much coarser grained than the limestone of this area.

<sup>2</sup> Op. cit., p. 3.

The schists are vertical and strike N.  $59^{\circ}$ - $80^{\circ}$  E. The most abundant variety is a dark-gray biotite-feldspar schist, in which the biotite (microscopically prominent) is partly chloritized. The groundmass consists of microcline and orthoclase inclosing a little hornblende and calcite. Hornblende schist, dark gray when dry and black when wet, is also common and alternates irregularly with beds of the biotite-feldspar schist. It contains green hornblende, quartz, sodic feldspars, orthoclase, and biotite in a diminishing series. Another schist, which crops out in a cliff near the Cliff prospect, is similar to the hornblende schist but contains indistinct white crystals an inch long and an eighth of an inch thick. The specimen of this schist was lost, and no microscopic examination of it could be made.

A number of intrusive rocks ranging in composition from granodiorite to amphibolite invade the schists. So far as the order of intrusion could be determined the following sequence was indicated: Fine-grained, highly gneissoid biotite granite, coarse hornblende gneiss (originally hornblende granodiorite), amphibolite (cutting the hornblende granodiorite), and fine-grained pink biotite granodiorite associated with alaskite. All these rocks are exposed about the middle of the west side of sec. 9, T. 15 N., R. 78 W. South of the road that crosses the hill in secs. 5 and 8 large masses of hornblende gneiss are exposed, and in the northern part of sec. 17, on the west side of the ridge, there are extensive outcrops of amphibolite.

*Gold veins.*—Veins that parallel the schistosity of the rocks occur in a number of places. They contain quartz, hornblende, soda feldspar, and calcite; the calcite is evidently the latest mineral, as it cuts all the others. The wall rocks are in places altered to chlorite. A number of these veins have been prospected for gold, which is reported to occur in the hornblende. On the east side of the ridge, on the Utopia claims, similar veins, generally less than a foot wide, have been more extensively prospected. In one, carrying considerable pyrite, gold was seen in decomposed hornblende.

On top of the ridge near the middle of the line between secs. 8 and 9, T. 15 N., R. 78 W., a vein of gray quartz about 2 feet wide follows the schistosity. It is vertical and strikes N.  $59^{\circ}$  E. (magnetic). This claim was formerly known as the Billy Waters but is now the Free Gold. There are surface workings along the vein for a distance of 800 feet, and prospect cuts extend nearly half a mile farther west. The quartz carries free gold and iron oxide (probably oxidized pyrite). It is reported that 100 tons of ore was run through a 2-stamp mill, and the pile of tailings supports this statement. No platinum metals have been reported from the vein. So far as could be ascertained, except the Centennial mine (near Centennial)

and the Utopia (which made a small output), this has been the sole producer on the ridge.

### PLATINUM

After 1890 there was considerable prospecting in this region. The Rambler copper mine at Holmes, about 9 miles southwest of Centennial, was operating, and mining in general was prosperous.

#### EMPIRE NO. 1 CLAIM

In 1896 Jacob Schnitzler located for copper a claim which he called the Empire No. 1, on the west side of Centennial Ridge, in the northern part of sec. 17, T. 15 N., R. 76 W. He drove two prospect tunnels along an iron-stained "slip plane," which followed the schistosity and showed here and there a thin coating of malachite or other green copper minerals. The lower of these tunnels is about 450 feet above Middle Fork; the upper is 50 feet higher. The length of the lower tunnel is approximately 170 feet. About 100 feet from the portal a small mass of sulphides or arsenides, probably less than a foot in diameter, was found where a small fracture crosses the tunnel at right angles. The mineral having been determined as simply pyrite, little more attention was paid to it, and the tunnel was continued 70 feet.

The upper tunnel apparently followed the same "slip plane" for 100 feet, and in it only a little iron stain was noted. In 1923 the sulphides from the lower tunnel were assayed and reported to carry platinum. A mild boom was started, the surrounding country was staked in winter, while the ground was covered with snow and a number of companies were promoted. Sulphides were so scarce, however, that visitors and prospectors soon carried them all away. A specimen reported to have come from this place was submitted to the United States Geological Survey through the Hon. John B. Kendrick, United States Senator from Wyoming. An assay by E. Theodore Erickson gave the following result:

Silver	-----	troy ounces per short ton	0.986
Gold	-----	do	.06
Platinum and palladium	-----	do	2.42
Iridium	-----	do	Trace.

When the writer visited the property no sulphides were seen in place, but two prospectors had small specimens from the small pocket, and Prof. E. Prosper McCarty also had a specimen. All closely resembled the specimen sent to the Geological Survey, and it seems certain that all came from the same small mass.

The few inches of iron-stained chlorite schist that surrounded the small sulphide mass was reported to carry a considerable quantity of the platinum metals. Accordingly, a sample of the rustiest part was collected and assayed. The assay showed

Platinum	troy ounce per short ton	0.12
Iridium	do	.07
Palladium		None.
Silver	troy ounce per short ton	Less than 0.5
Gold		Trace.

The iridium as determined may include also rhodium, ruthenium, and osmium, or it may be any one of the four metals or any mixture of them. Later Mr. Schnitzler drilled a short hole beneath the spot from which the sulphides were taken. A sample of the schist blown out gave the following assay:

Platinum	troy ounce per short ton	0.06
Palladium	do	.01
Iridium		Trace.
Gold		None.
Silver		Very little.

About 55 feet beyond the occurrence just described a second fracture about parallel with the first crosses the drift. It is reported that high assays for the platinum metals were obtained from specimens found here, but there is very little iron staining, the rock is but slightly decomposed, and a sample (8 by 8 by 2½ inches) taken by the writer showed on assay no trace of platinum metals, gold, or silver. A foot beyond this place there occurred 4 inches of crushed schist, 1 inch of gouge, and 8 inches of iron-stained chlorite schist. An assay of a sample cut across this material gave a button equivalent to 0.11 ounce to the ton. Small amounts of silver, platinum, and palladium were identified, but no test was made for iridium, as the entire button was so small.

A prospector, Mr. P. J. Winters, furnished a specimen weighing possibly an ounce of a rusty unidentifiable rock that was said to have come from the rich pocket. It contained small particles, perhaps one thirty-second of an inch (1 millimeter) across, of a metallic mineral that appeared to be a sulphide or arsenide. Qualitative tests showed both sulphur and arsenic. An assay of the specimen by Mr. Erickson gave the following result:

Iridium	troy ounces per short ton	2.84
Platinum	do	1.04
Palladium	do	63.72
Gold, not more than a trace.		
Silver, not determined.		

Another small specimen having like characteristics given by Mr. Charles F. Mercer, also said to have come from the small pocket, gave

Iridium-----	troy ounces per short ton	1.00
Platinum -----	do	.20
Palladium -----	do	9.08
Gold, not more than a trace.		
Silver, not determined.		

The end of the tunnel, 170 feet from the portal as paced, was in hornblende schist and showed two thin gouges less than an inch thick and 1½ feet apart. The rock was fresh and wholly unpromising. A sample taken between the gouges gave a trace of platinum and about an ounce of silver to the ton. No determination of iridium and palladium was made, on account of the minute size of the button.

The lowest prospect tunnel on this claim, less than 50 feet above Middle Fork, had been driven through the talus and into the schists but had not cut anything that could be regarded as a vein or the slip plane shown in the tunnels above. Two samples were taken from a narrow fault in the breast of the tunnel. Assays on one of the samples gave no platinum, less than an ounce of silver to the ton, and a very little gold, and on the other a trace of platinum, less than an ounce of silver, and no gold.

#### CLIFF CLAIM

In the SE. ¼ sec. 8, T. 15 N., R. 76 W., a short distance north of the Schnitzler or Empire claims, is what is known as the Cliff fraction. The property was said to have been worked by the Cliff Gold Mining Co. on a lease from the Colowyo Mining Co.

Old workings about 50 feet above Middle Fork had been driven along a thin quartz vein which, where seen, was at the most 2 or 3 inches thick and followed the schistosity. The vein was lost a short distance from the portal. According to the company's map the drift was carried forward a total of 775 feet. Neither gold nor platinum was reported in this drift. However, from a point about 700 feet from the portal, a crosscut was run a little west of north for about 325 feet, which at four places cut narrow fracture zones. The first, a few feet from the main drift, was said to carry \$12 to the ton in gold through a width of 15 feet, though only small amounts of quartz, sulphides, or iron oxides were visible. Such quartz as was seen was in small discontinuous veins, at most 2½ inches thick.

On what was known as No. 3 vein, mapped as 140 feet from the main drift, a short drift had been run eastward, and it was said that "strong traces" of platinum had been found somewhere within 15 feet of the face, but the exact place was not known, and no "chan-

nels" where samples had been cut could be found. A few short, narrow gash veins of quartz appeared in the broken schist. The schist was very fresh and free from sulphides or oxidation. From a sample cut across the breast a button, the total weight of which was only 0.01 ounce to the ton, was obtained. The button contained a doubtful trace of the platinum metals.

#### QUEEN SHAFT

The Queen shaft is on a prominent knob in the middle of the west side of sec. 16, T. 78 W., R. 15 N. It is sunk in amphibolite and hornblendic gneiss but is mostly in the amphibolite, which invades the gneiss. Some pink fine-grained granodiorite younger than both gneiss and amphibolite is present.

The shaft at the time of visit, June 10, 1924, was down 83 feet. Messrs. Bert and Jesse Northrop, who were in charge of the work, courteously had the shaft bailed out so that it might be examined. In the bottom several small faults crossed the shaft in various directions, and each carried a maximum of about an inch of gouge. One contained a small calcite vein one-eighth to one-half inch thick, with gouge on each side. Samples were taken from three of the faults, including that carrying the calcite seam, but they carried nothing. A sample taken from a gouge crossing the shaft from southwest to northeast and passing out at the northeast corner gave the following assay:

Platinum	troy ounce per short ton	0.03
Palladium	-----	None.
Iridium	troy ounce per short ton	0.05
Silver	do	Less than 1
Gold	-----	Trace (?).

#### PLACERS

The alluvial deposits in the three flats of Middle Fork west of Centennial Ridge have been located as placers. The middle flat is perhaps half a mile long and 500 to 600 feet wide. Here work was concentrated by the Wyoming Platinum Co. Old diggings show that efforts were made years ago to work the high gravel on the west side of the stream. Claims were made that hundreds of dollars in gold to the cubic yard could be proved by panning on the surface of the west bank and that rich gravel was found along the edge of the flat. It is odd that if such rich ground existed more work is not in evidence.

The writer, assisted by men connected with the companies, panned dirt from points supposed to have shown a high content of gold and platinum. In one pan two minute specks of gold were visible with a hand lens. No other gold and no platinum were found.

An appreciable quantity of glistening white zircon followed the black sand in the pans, and it was said that this mineral had been called platinum. Zircon may easily be mistaken for platinum, but with a good hand lens it is not difficult to see that the mineral is transparent and that the glistening faces lose their metallic luster on change of position.

A pipe line 2 miles long equipped with a hydraulic nozzle was on the ground, and a sluice box 150 feet long and  $3\frac{1}{2}$  feet wide, with block riffles, had been made, but no run was made during the writer's visit. Reports received later state that hydraulic mining during the summer obtained practically no gold and no platinum. Water had prevented holes being sunk to bedrock—a very necessary step to prospect this ground properly.

#### RAMBLER MINE

The Rambler copper mine is about 8 miles southwest of the prospects on Centennial Ridge. That platinum metals occurred with the copper in notable quantities is well known. In the 1890's the mine was worked for copper, but the rich ores were exhausted, and the mine has been idle for many years. It is reached most easily by way of Albany, about 15 miles by road from Centennial. From Albany the road, for 9 miles, crosses the rolling high plateau. The small mining town of Holmes, which was built near the mine, is now deserted, the mine buildings have been burned, and the workings have caved in.

The shaft is sunk in pyroxenite, the extent of which is not known to the writer. The pyroxenite is intensely altered hydrothermally, though in various degrees, to creamy-white open-textured or dull-reddish to yellow compact opal. Its surface is stained by green copper minerals. The dumps contain thousands of tons of this rock.

Sperrylite in exceedingly small crystals was discovered in covel-lite from this mine by Wells and Penfield.<sup>3</sup> The largest crystal was 0.12 millimeter (about 0.005 inch) in longest dimension. It is probable that palladium and iridium also occur as arsenides.

Mr. R. N. Black, in charge, for the Electrolytic Copper Co., which now owns the property, took a composite sample of the dumps, and a part of this sample was assayed by Mr. Erickson with the following results:

Platinum	—	troy ounce per short ton	0.11
Iridium	—	do	.02
Palladium	—	do	.08
Silver	—	do	Less than 1.0.
Gold	—	—	Trace.

<sup>3</sup> Wells, H. L., and Penfield, S. L., On a new occurrence of sperrylite: Am. Jour. Sci., 4th ser., vol. 13, pp. 95-96, 1902.

The writer took a hand-picked sample of some of the finer-grained material from various parts of the dump, which on analysis gave

Platinum-----	troy ounce per short ton	0.06
Iridium -----	do	.04
Palladium -----	do	.04
Silver -----	do	.10
Gold -----	Trace.	

The results obtained by Mr. Black from assays were higher than those just given for platinum and palladium, and his figure for iridium was the average of the two figures obtained by Mr. Erickson. As is well known, "grab samples" will vary greatly, and the method can not be regarded as in any way accurate. But the figures show the general occurrence of platinum metals in the dumps. Ores have been sold from this mine that carried several ounces per ton of platinum and palladium, for which pay was received.

### CONCLUSIONS

Platinum metals, in very small quantities, are undoubtedly present on Centennial Ridge. At some places there may be larger masses of rich ore than the small pockets found in the middle Schnitzler tunnel, but the writer believes the chances for such discoveries are too few to warrant the expenditure of money, time, or labor.

The mineral or minerals in which the platinum metals occur is unknown. Both sulphur and arsenic were present in one specimen tested, and there is much iron stain in the schist immediately surrounding the mineral mass extracted from the Schnitzler tunnel. The minerals may have been sperrylite scattered through iron sulphide. In sperrylite any of the platinum metals probably may take the place of platinum.

