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DEPARTMENT OF THE INTERIOR
Memorandum for the Press

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THE RED ARROW GOLD DISCOVERY IN THE LA PLATA MOUNTAINS, COLORADO

A recent discovery of gold at the Red Arrow No. 2 claim, in the La Plata Mountains of Colorado, has attracted much attention in newspaper accounts, and as the district in which this strike was made is little known in mining literature a brief account of the discovery and local geology will be of interest. This account is based upon a brief examination by two members of the United States Geological Survey, Department of the Interior, made in November 1933, and upon data furnished to them by the Red Arrow Gold Corporation, of Mancos, Colo., the present operator of the property.

The discovery was made June 3, 1933, on the west side of Gold Run Draw about 500 feet northwest of the junction with the East Mancos River, in sec. 11, T. 36 N., R. 12 W. This region lies in Montezuma County a little more than a mile northwest of the La Plata County boundary line and about 8 miles east-northeast of the town of Mancos. Raymond and Charles Starr while panning small bars in Gold Run Draw obtained spectacular showings of coarse gold at a point in the creek just below the crossing of a small fissure in the Triassic red beds. Further search and panning up the west slope of the draw led to an examination of the first bedrock outcrop of the rocks called "La Plata sandstone" in early reports on this region, which overlie the red beds, on the slope well above the bed of the creek. This outcrop, which was comparatively small, proved to contain coarse gold embedded in oxidized vein material in the sandstone. Since the discovery a small open cut has been made at the surface outcrop, and just below this cut a tunnel has been driven

west on the fissure about 110 feet into the hillside. The fissure strikes about due east and dips 60°-70° S. at the tunnel. According to the owners the vein has been traced for about 800 feet. The tunnel is about 9,100 feet above sea level and appears to have been driven into the upper sandstone member of the La Plata sandstone at a position 50 to 75 feet above the thin limestone that divides the La Plata into two parts.

The vein and fissured zone as exposed in the tunnel has a width of 2 to 5 feet, with an average of 3 or 3-1/2 feet. Sandstone county rock composes both hangingwall and footwall and is noticeably fractured and seamed on the hanging-wall side. The vein material is partly friable, porous, and oxidized, and the gangue is composed chiefly of barite with some fragments of the sandstone country rock. Some of the ore contains small amounts of partly oxidized sulphides, among which pyrite, chalcopyrite, and chalcocite can be recognized, and these are seamed by the oxidation products malachite, azurite, and limonite. There is also a small amount of a clayey substance, possibly a variety of kaolin. The barite and sandstone are locally seamed and stained by these oxidation products. At the breast of the tunnel, over which there is a back of about 50 feet, the center of the vein consists chiefly of massive interlocking barite crystals between which there are vugs and openings filled with limonitic material. This portion of the vein is essentially free of sulphides or of the stain of secondary copper minerals, indicating that the original sulphides had filled in between only portions of the original

barite vein material. As reported by the owners the gold occurs chiefly on the hangingwall or footwall. In specimens seen at the property the gold was associated with partly or nearly completely altered sulphides. One streak of ore along the hangingwall is reported to have run from 1 to 3 ounces of gold to the ton and where mined ranged from 20 to 30 inches in width. The footwall streak is in places 8 to 12 inches wide and contains the coarser nuggets of gold. This coarse gold occurs in platy or foliated form, and pieces were found from a few grains up to 8 ounces in weight. Screenings from this streak yielded 4.4 ounces of gold and 15.8 ounces of silver to the ton. Whether the silver occurs entirely alloyed with the gold or partly in some other form is not known, and none of the specimens examined yielded any information on this point. The owners report a production of 21 tons of ore, yielding $5,441.14, but state that they are holding some of the foliated gold which had not been marketed.

Sufficient development work has not been done to show the primary occurrence of the gold in this locality. The limonitic material was tested and found to contain only traces of manganese, the presence of which is supposed to favor the possibility of slight solution and migration of gold. The coarse form of part of the gold does not favor the possibility that it was derived entirely from oxidation of tellurides, which usually yield a finely divided "mustard" gold. However, tests carried out on the limonite and partly oxidized sulphides showed the presence of small amounts of tellurium and probably traces of selenium. This would seem to indicate that at least some of the original vein minerals were tellurides of gold, or of gold and silver that have been largely or completely destroyed. Tellurides are known

to decompose easily under these near-surface conditions to tellurium oxide or tellurates of iron. Tests of limonite apparently free of visible gold also showed the presence of traces of gold.

Much of the fine or invisible gold thus may have resulted from the destruction of tellurides and pyrite. The large nuggets of gold were more likely formed by slight migration of dissolved gold and its adherence to particles or plates of primary native gold. The concentration at the discovery shoot could thus be due to several factors. First, and probably the most important, the volume decreased through oxidation; second, because of the porosity of the vein material some fine gold may have been carried down mechanically with colloidal and dissolved oxides of iron; finally, a little gold may have been carried in solution or in the colloidal state slight distances and formed the larger nuggets by accretion.

The East Mancos River, near which this discovery was made, rises 4 miles to the northeast, near the center of the La Plata Mountains. These mountains are the result of a domal uplift that is considerably modified by its position on the southwestern flank of the much broader San Juan uplift, and numerous crosscutting intrusive bodies and sills locally affect the attitude of the strata. The inclined strata dip, in general, away from the central higher areas, and along the East Mancos River near the Red Arrow dip about 10°-12° SW., but not far above the mine local dips of 30°-40° are superimposed upon this regional dip. Existing maps and literature assign a comparatively minor part to faulting in this area. The principal mapped faults are the east-west Menefee and Parrott faults, in the southern part of the uplift, and a series of faults north of the uplift that strike about N. 60° E. The downthrown

sides of the faults are generally away from the center of the dome. A few north-south breaks and several northward-trending breccia zones as much as several hundred feet in width are known. These breccia zones may represent fault movements.

The sedimentary rocks exposed in the La Plata uplift, beginning with the oldest formation cropping out in the center of the mountains, comprise (1) the Cutler formation, of Permian age, which consists of arkosic sandstone, conglomerates, and shales of predominating dull red color and of which about 1,200 feet, representing only a part of its total thickness, is exposed; (2) the Dolores formation, of Triassic age, a series of reddish sandstones, grits, and conglomerates of somewhat brighter color than the Cutler and 300 to 500 feet thick, some of the conglomerates containing small limestone pebbles; (3) the Entrada sandstone, of Upper Jurassic age (the lower sandstone member of the La Plata sandstone of older reports), a massive cliff-forming friable white sandstone which is strikingly cross-bedded, 150 to 200 feet thick; (4) the Morrison formation, of Upper Jurassic age, about 550 to 700 feet thick, a complex of alternating yellow or gray sandstones and variegated shales, with some calcareous beds; the lower 150 to 200 feet is a white sandstone which contains several thin shale partings and a layer of dark limestone 8 to 30 feet thick at its base; this is the sandstone in which the tunnel on the Red Arrow is driven and corresponds to the upper sandstone member of the La Plata sandstone of older reports; (5) the Dakota (?) sandstone, of Upper Cretaceous age, a gray or rusty-brown quartzose sandstone 100 to 300 feet thick with a variable conglomerate, which contains small chert pebbles, at or near the base, and carbonaceous shale partings at several

horizons; (6) the Mancos shale, of Upper Cretaceous age, 1,200 feet thick, a dark-gray or almost black soft carbonaceous or clay shale that contains thin lenses or concretions of limestone. Above the Mancos shale are considerable thicknesses of the Mesaverde formation and Lewis shale, but these lie largely beyond the local effects of the La Plata uplift.

The igneous rocks of the La Plata uplift are all intrusive; surface flows of lava such as cover much of the San Juan uplift to the northeast are entirely lacking. Near the center of the uplift there are plugs of diorite or monzonite which cut across earlier porphyritic sheets and dikes.

The La Plata uplift probably corresponds in age and origin to the centers of mineralization and igneous activity in the Rico and Ouray districts, which are older than the great eruptive centers that formed the lava-covered mountains of the San Juan region.

The mineral-producing area of the La Plata Mountains, sometimes known as the California district, is mostly in La Plata County but extends westward and includes part of Montezuma County. The production of the La Plata district to the end of 1933 is $3,923,536 in gold, and $1,226,651 in silver. Small amounts of copper and lead have also been produced.

The ores of the mountains as a whole occur in well-defined veins or in irregular lens-shaped bodies in fissured zones. According to older reports three well-marked sets of fissures occur--east-west, northeast, and northwest The northeast set is distinguished by a large number of zones of crushed rock, cemented by quartz and sulphides. The strongest veins are in the east-west and northeast sets. The veins are commonly tight and narrow in the shale beds but increase in size and productivity in some of the porphyries and sandstone beds.

The principal ore minerals are the tellurides of gold and silver, but other minerals reported include native gold, amalgam, freibergite, tennantite, stephanite and other sulphantimonides and sulpharsenides of silver, pyrite, marcasite, chalcopyrite, galena, sphalerite, realgar, cinnabar, magnetite, and hematite. The gangue minerals include quartz, chalcedony, calcite, rhodochrosite, dolomite, barite, fluorite, chlorite, sericite, kaolin, and numerous minerals formed by metamorphism of the sedimentary rocks near intrusive bodies.

The ores are in general of two kinds--the telluride ores and the ores containing gold associated with pyrite or in native form. The ores of the district that are not telluride ores are largely of low grade. In several places veins follow and partly replace the dike rocks. The gold content in the high grade veins tends to be spotty, but very rich pockets have been discovered.

Prod June 1933

	Tons	oz Au	oz Ag	lbs Cu	lbs Pb	Value
1933	21	171.83	129			$3,597
1934	718	791.96	775	600		28,221
1935	81	270.	562			58,590
1936	296	1593.	3414	2000		9,961
1937	221	1948	2397	2000		70,276
1938	682 tons	1891 oz Au	3,595 Ag	3000 lbs Cu	100 Lead	68,829
1939	839	943	1,102	500		33,805
1940	3,066	1607	945			56,917
	5,904	9,215.79	12,919.	8,100		$330,196