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GOLD MINE CLOSING ORDER

Among the common failings of human beings--especially of a free people--is that propensity of unhesitating expression of opinion on almost any subject. Too often these extemporaneous opinions are given without thought either to their soundness or to their possible serious consequences.

For a good many months it has been the custom of people in various parts of this country to make such remarks as, "Why in h... don't they close the gold mines? Gold miners should be mining base metals to help the labor situation; moreover, gold mines are consuming critical materials."

This illustrates our propensity of forming and expressing opinions without realizing or weighing all the possibilities inherent in the action advocated.

Ever since people have come to realize the very critical role that base metals play in this war, gold mining has sunk lower and lower in the scale of human endeavor. Gold mines were denied satisfactory priorities; most of their workers^{either} migrated to better paying jobs under government contracts, or went into military service. Dredges were doing better than lode mines since a very few key men can keep things moving at capacity on a dredge. Not so with lode mines. Many of the latter had closed down while others were struggling along with about one-fifth of a normal crew when the W.P.B. delivered the coup de grace.

Ostensibly the proponents of gold mine closing had most of the logic on their side. However, the actual carrying out of the closing order shows up certain effects that may not have been intended. It is to be presumed that the government officials who made the decision on the closing order made a thorough and honest effort to predict the consequences, both good and bad. Plainly not all conditions could be anticipated. In any event, the matter of closing will stand some examination and we wonder if all factors were realized by those responsible for the sweeping order.

Let us list the benefits and the penalties of the gold mine closing order. On the benefit side are the following:

- (A) Making available experienced mine labor to base metal operations.
- (B) Stopping all consumption of critical materials by gold operations.

On the penalty side are the following:

- (A) Disaster to the economy of communities affected by closing of gold mining operations, including loss in taxes.
- (B) Disaster to classes of labor rooted to the community by property ownership, family relations or otherwise.
- (C) Discrimination by our Government against domestic producers by the continuation of gold purchases from foreign producers.

In commenting on these various issues, let us divide gold operations into three categories:

(1) the larger gold mines, such as Homestake and the Grass Valley mines in California; (2) the small "family operations" operated by one or two up to a half dozen men including both lode and placer and both seasonal and continuous operations; and (3) alluvial mining, particularly dredging.

In the case of the large lode gold mines (No. 1 above) their location is not uncommonly in mining districts that do not contain base metal mines and sometimes these districts are hundreds of miles from points where the labor released could find employment in base metals or strategic mineral operations. There are a number of reasons for this condition. Mine labor in the west has changed in complexion considerably in the last twelve months. The younger single men, especially, have practically vanished from the mines, choosing either fancy wages at war plants on the coast or the armed service. The mines then recruited farmers, sheepherders and miscellaneous types, largely of little mining experience, to supplement the meager force of older experienced men. When the gold mining closing order came, the elder employees with homes and families and the locally recruited miscellaneous labor went back to former occupations or into local industries having some bearing on the war effort. There was a conspicuous absence of migration of skilled mining labor from the larger gold mining operations to base metal operations.

The small family type of gold operations (No. 2 above) never did employ a significant number of miners that would be available for base metal operations. These little family operations, in the first place, consume almost no strategic materials. Their consumption of explosives even, of which there is no shortage apparently, is very low. A typical such operation continues in the winter months when there is water for hydraulicking or where underground work is not interfered with by weather, and the operators work on their farms or in the woods or for the Forestry Department regularly during the summer season. The gold mine closing order, if strictly administered, would be fatal to a lot of these small operations which are just as harmless as can be, but which nevertheless form an important part of the communities in which they are located.

Now as to the dredges (No. 3 above) their case is perhaps clearer than either of the other two. The supplies of critical materials they use are extremely small; the effect on the economics of the community where they operate is frequently very important. The number of employees they have released is relatively small and the percentage of those few employees that could be expected to go to a base metal or critical mineral operation is also negligible. Such employees consist of winchmen and other specialized jobs not common in underground mining, in fact most of the dredge employees are prejudiced against working underground. We know of one dredge recently closed that had been the main support for years of an entire valley. Not a single one of its twenty odd employees would consider migrating to a base metal district for underground work. Incidentally, closing down of this dredge and the selling of its equipment is a tremendous loss not only to the owners but to the community in which it operated and also to the State. In many former gold mining communities, it is very difficult to see how the tax income to the community can be replaced under war conditions.

There is the feeling that in closing down its own gold mines and at the same time continuing to buy gold from foreign countries our government is encouraging foreign producers at the expense of its own citizens.

It would appear that the penalties imposed on the country's economy by closing down gold mines outweigh the anticipated benefits to the war effort. We think that the matter of getting maximum base metal production was handled better during the last war. Then reduction in gold mining operations was automatic because of high operating costs.

ERRATUM

In the October issue of the Ore.-Bin the author of the radio script entitled "Fluorescent Light Mineralogy" was given as Mr. R. C. Treasher. This was in error. Mr. R. G. Bassett prepared the script and gave the talk.

GOLD MINES

Concerning the gold mine closing order, the American Mining Congress reported as follows under date of October 30:

"At a conference arranged this week by Representative Harry Engelbright of California, WPB Chairman Donald M. Nelson received first hand information concerning actual results realized under the gold mine shut down order, L-208. It now seems evident that even the small numbers of men which the mining industry had previously shown might become available for copper and other non-ferrous mines are not being realized, and that possible benefits to the war program are wholly incommensurate with the prospective damage to established communities and mining properties.

"Following the conference Congressman Engelbright reported that Chairman Nelson had stated that the whole matter would receive reconsideration. In connection with further studies, gold producers are being asked to submit to Rep. Engelbright full data as to the minimum number of men and minimum amounts of critical materials (such as carbon steel, alloy steel, stainless steel, copper, copper base alloys, zinc and aluminum) that would be needed to keep their properties operating on a sufficient basis to pay standby expenses, together with information as to age of employees and particularly whether such operations could be maintained with men above military age."

THE PLATINUM METALS*

Introduction

The platinum metals are a group of related elements usually occurring alloyed with one another; platinum is usually the dominant metal and is by far the most important commercially. Osmium, iridium, palladium, ruthenium and rhodium complete the group. They are characterized by their light metallic color, resistance to corrosion and high specific gravity.

Native platinum, generally found alloyed with small amounts of other metals of the group, rarely occurs in crystals (isometric) and is usually found in grains and scales. It has no cleavage; has a hackly fracture, a metallic luster, is malleable and ductile, and has a whitish steel gray and shining color and streak. It is fairly hard (4-4.5) and heavy - the native metal has a specific gravity between 14 and 19 and the pure, 21 and 22. It is sometimes magnetic and occasionally shows polarity. Most platinum yields from 8 to 15 or even 18% iron, 0.5 to 2% palladium, 1 to 3% each of rhodium and iridium, a trace of osmium, and finally 0.5 to 2% or more of copper. It is distinguished by its color, malleability, high specific gravity, infusibility and insolubility in ordinary acids.

Other platinum group minerals vary somewhat in their characteristics. For example, osmiridium (an alloy of iridium and osmium) is only slightly malleable and has a hardness between 6 and 7. It is distinguished from platinum by greater hardness and its tin-white to light steel-gray color.

Palladium, alloyed with platinum, has a whitish steel gray color and a specific gravity of 11.3 to 11.8.

Iridium, alloyed with platinum and allied metals usually occurs in angular grains of a silver white color. It is relatively rare.

Platinum also occurs as sperrylite ($PtAs_2$ - Sudbury, Ontario) and as cooperite ($Pt(AsS)_2$ - Transvaal, South Africa).

*Material for this article was taken mainly from Minerals Yearbook, Review of 1940, Lindgren's Ore Deposits, and Dana's Textbook of Mineralogy.

Occurrences

The members of the platinum group are siderophile (iron-like) elements and occur mainly as magmatic differentiates in basic rocks, especially in peridotites and dunites. They are not uncommonly associated with high temperature copper ores though in such association palladium is often more common than platinum.

In placer deposits platinum occurs as small rounded grains and as concretionary and knobby dark-gray particles. Osmiridium in the form of bright silvery scales often occurs with it. The largest pieces of platinum have come from the Ural placers; the largest piece weighed over 25 pounds. These deposits occur in the vicinity of the platinum-bearing rocks. Minerals associated in the rocks or found in these placers are olivine, serpentine, chromite, magnetite, zircon, corundum, and other platinum metals.

Platinum has long been known to occur in primary deposits but until the last decade or so, only a few of these have been of economic importance. As primary deposits its associations are as follows:

- (1) In dunites and peridotites (disseminated) associated with chromite. It is sometimes intergrown with olivine, pyroxene and serpentine.
- (2) As magmatic differentiates in basic rocks, in association with chalcopyrite and pyrrhotite.
- (3) In minor amounts in many kinds of copper deposits (with palladium).
- (4) Miscellaneous types.

Native platinum is a rare mineral and occurs in commercial quantities in but a few localities. It was first discovered in alluvial deposits of the river Pinto, Department of Cauca, Colombia, from where it was taken to Europe in 1735. Here in Colombia, it received its name from platina, meaning silver-like.

The placers of the Ural Mountains, U.S.S.R., discovered in 1822, have been important producers. The productive area is in the province of Perm, east of the crest of the Urals. Other important placer deposits are the platinum-bearing gravels in the Choco district, Colombia; in New South Wales, Australia; Goodnews Bay district, Alaska; the placer black-sands of California; and in Oregon at Cape Blanco, Curry County.

The most important commercial primary deposits are at Sudbury (Ontario) where platinum metals occur as sperrylite and palladium associated with nickel-copper ores. Other important deposits are those in Transvaal, South Africa (basic rocks) and those in Tasmania.

Production

World production in recent years has been slightly over 530,000 ounces annually. Canada became a significant producer in 1930. The long-time lead in production of platinum metals by U.S.S.R. was taken over by Canada about 1934 and since then Canada has increased its production till in 1938 she was producing over half the annual output, nearly 300,000 ounces. The U.S.S.R. was second in 1938 with some 100,000 ounces. South Africa was third with about 60,000 ounces, followed in turn by the United States and Colombia. Other countries contributed but a very minor amount.

According to U.S. Bureau of Mines Minerals Yearbook, in 1940, 35,000 ounces of crude platinum were recovered in Alaska, 1,400 ounces in California, 69 ounces in Oregon, and 31 ounces in Montana. Alaska production is largely from the Goodnews Bay district in southwestern Alaska. In California most of the output was a by-product of dredges working gold placers. The principal production in Oregon comes from the ocean beach sands near Cape Blanco in Curry County, but a small quantity was obtained as a by-product to gold recovery from hydraulicking and dredging.

In addition, reporting for 1940, the Minerals Yearbook states that many gold and copper ores in the United States contain small quantities of platinum metal. In 1940, 7,774 ounces

of platinum metals were recorded as a by-product of refining gold and copper ores. Since 1935, chiefly due to large-scale mining in Alaska, production of platinum metals in the United States advanced progressively from 11,552 ounces in 1935 to 48,269 ounces in 1938. This amount is made up of 40,932 ounces in placer platinum, 7,427 ounces recovered from gold-copper refining, and 90 ounces from platinum-bearing ore.

Despite the much larger output of domestic placer platinum, most of the new platinum metals recovered by refineries in the U. S. in 1939, as in previous years, were derived from crude platinum from foreign sources, notably Colombia, as most of Alaska platinum was refined abroad.

New platinum metals recovered by refineries in the U.S. 1936-40 in troy ounces (Mineral Yearbook):

Year	Platinum	Palladium	Iridium	Osmiridium	Others	Total
1936	39,728	4,682	1,678	541	317	46,946
1937	36,174	5,945	1,998	640	501	45,258
1938	30,444	3,653	1,247	384	485	36,213
1939	36,033	3,491	1,051	727	139	41,441
1940	38,951	4,564	1,517	644	1,663	47,339

Again the Minerals Yearbook states that the major part of the refined new platinum metal now consumed in the U.S. emanates from the United Kingdom. The metals are recovered there as by-products in refining nickel-copper matte from the Sudbury district of Ontario, and, to a smaller extent, ^{from matte} from the Rustenburg district, Transvaal, South Africa, and from placer platinum originating in the Goodnews Bay district, Alaska.

In 1940, 66,430 ounces of secondary platinum metals were recovered from the treatment of scrap metal, sweeps, and other waste products of manufacture that contain platinum.

Uses

Platinum and its allied metals (palladium, iridium, rhodium, ruthenium, and osmium) have high melting points, white colors and are resistant to oxidation at high temperatures and to attack by destructive chemical compounds.

The platinum metals either pure or alloyed are used in the jewelry trade and dentistry, in the chemical and electrical industries, and for numerous other purposes.

A marked increase in the world output of platinum metals, due chiefly to improvements in metallurgical processes for refining copper-nickel ores, has made available large quantities of platinum, palladium, iridium, rhodium, ruthenium and osmium. Despite this gain in output during the past decade, new uses are being found for these metals and they have taken the places of other materials in many markets.

In 1940 jewelers in the U.S. bought some 42% of the total domestic sales employing it, alloyed with iridium and ruthenium, for precious stone settings as well as in other forms of jewelry.

The chemical industry in 1940 took 25% of domestic consumption. It is used as a catalyst in making sulfuric and nitric acids, for lining processing and reaction vessels, for hydrogenation of organic compounds, for rayon, spinnerets, crucibles and the making of many other products.

The electrical industry advanced from fourth to third place as a consumer of platinum in 1940. Here it is used for thermocouples, temperature measuring and recording instruments, magneto contacts, automobile voltage regulators and many other electrical uses.

The dental industry, now fourth, took 8% and there it is used either pure or alloyed in tooth-pins, bridges, orthodontic appliances, etc.

Palladium is the next most extensively used metal of the platinum group and is about half as common as platinum though less costly. Pure or alloyed, palladium is suited for many of the uses of platinum and is being increasingly employed by the dental, electrical and jewelry industries.

The other platinum metals - iridium, rhodium, osmium, and ruthenium - comprised only 7.1% of the total consumption for the group in 1940. Iridium is used chiefly as a hardening addition to platinum and in magneto contacts for airplanes. Its compounds are employed as fixing agents, as a porcelain pigment, and as a catalyst. Rhodium, alloyed with platinum, is used for high-melting point thermocouple wire, furnace winding, and is used also as a catalyst. Rhodium plating is used as a finish to glassware and silverware and employed in surfacing reflectors for searchlights and projectors. Osmium, mixed with other metals, makes pen points that resist wear and corrosion by ink and these alloys are used as bearings in fine instruments to replace jewels. The oxide is used as a biological stain for fats and for finger-print work. Ruthenium also is used as a hardener for platinum metals and one of its salts serves as a biological stain. Ruthenium has been effectively employed as a hardener of platinum in jewelry to replace part of the iridium now being used by the aircraft industry.

Markets

The United States leads the world by a wide margin in consumption of platinum metals. This country is also an important refining center and occupies a prominent position in the international platinum trade.

Despite the increased consumption of these metals in 1940 there were no appreciable changes in the quoted prices of most platinum metals. Market prices were as follows per troy ounce: platinum, \$36; palladium, \$24; rhodium, \$125; and ruthenium, \$35-\$40. Iridium, however, opened the year at \$125 an ounce and advanced until in December it was \$275. The O.P.M. conducted an investigation and reported there was no real shortage (as attributed to increased use in aircraft industries and cutting off of supplies from U.S.S.R.) and in February, 1941, the quoted price was lowered to \$175 an ounce. Platinum is currently selling at \$36 per ounce troy (New York).

Buyers

Braun Corp., 2260 E. 15th Street, Los Angeles, California
S.B. Gracier & Sons, 212 Stockton Street, San Francisco, California
Wildberg Bros. Smelting & Refining Co., 742 Market Street, San Francisco, California
Western Gold & Platinum Works, 589 Bryant Street, San Francisco, California

CLEARING HOUSE

No.74-CH Wanted to purchase, small placer property with plenty of water, ranch house and land for market garden use. Write G.L. Caskell, 404 West Commonwealth Ave., Alhambra, California.

RAY OF LIGHT IN THE FOG

The American Mining Congress reports in its weekly information service that WLB chairman Nelson is endeavoring to eliminate unnecessary paper work on the part of war industry. Through his efforts, 120 WPB forms have been eliminated and 132 others have been improved and simplified. Also a centralized control has been established for the issuance of new forms, and no branch or division of WPB may issue a form requesting information from industry without approval by a special committee and the Bureau of the Budget.

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