MOLYBDENUM, SILVER AND GOLD

Statistics for 1968, and Other Years

ARIZONA, THE WORLD, AND THE UNITED STATES

Arizona Department of Mineral Resources

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MOLYBDENUM 1968

ARIZONA

Molybdenum, produced in Arizona as molybdenite concentrate (MoS_2), is the most important by-product of the State's copper industry. It is Arizona's second most valuable metallic mineral product in terms of dollar value of output. While reports of recovery of molybdenum in Arizona date back to 1931, it was not until 1938 that the Miami Copper Company at Miami, Arizona became the first Arizona copper mine to concentrate and so market the molybdenum contained in its ores. According to a tabulation of data from the U. S. Bureau of Mines, the value of Arizona's molybdenum concentrates from copper ores first surpassed the value of the State's silver output in 1959. The following year, the value of molybdenum production surpassed that of gold and in 1965 it exceeded the combined gold and silver values.

TABLE I - VALUES OF ARIZONA MOLYBDENUM, SILVER AND GOLD PRODUCTION 1/

Year	Molybdenum Thousand $	Silver Thousand $	Gold Thousand $
1955	1,511	4,194	4,467
56	2,670	4,687	5,114
57	3,071	4,778	5,336
58	2,827	4,240	5,004
59	4,019	3,528	4,362
1960	5,211	4,322	5,007
61	6,232	4,733	5,109
62	5,864	5,917	4,802
63	7,584	6,873	4,901
64	9,532	7,513	5,379
1965	15,880	7,881	5,265
66	17,812	8,196	4,988
67	15,385	7,112	2,830
68p	19,684	10,715	3,878

p Preliminary

1/ U. S. Bureau of Mines.

While United States molybdenum production increased 52 percent between 1955 and 1968, Arizona output increased 8-fold. Following the national pattern, the State's molybdenum production declined in 1967 because of the strike in the copper industry beginning in July 1967 but increased to new highs in 1968 as the mining companies resumed operations at the end of March 1968.

TABLE II - MOLYBDENUM PRODUCTION COMPARISON

Molybdenum (Content of concentrate in thousand pounds)

Year	U. S. 1/ Production	Arizona 1/ Production	Arizona's Share of Total (Percent)
1955	61,781	1,497	2.4
56	57,462	2,392	4.2
57	60,753	2,385	3.9
58	41,069	2,320	5.6
59	50,956	3,181	6.2
1960	68,237	4,359	6.4
61	66,563	4,878	7.3
62	51,244	4,412	8.6
63	65,011	5,553	8.5
64	65,605	6,296	9.6
1965	77,372	9,399	12.1
66	90,532	10,161	11.2
67	88,930	9,261	10.4
68p	93,900	12,000	12.8

p Preliminary

1/ U. S. Bureau of Mines.

Molybdenum, in molybdenite concentrate, is recovered in Arizona at the copper mines of American Smelting and Refining Co., Bagdad Copper Corp., Duval Corp., Inspiration Consolidated Copper Co., Kennecott Copper Corp., Magma Copper Co., San Manuel Division, Miami Copper Co., Phelps Dodge Corp., and Pima Mining Co., some of whom are investing heavily in expansion projects which will increase molybdenum production along with that of copper.

The 1967 and 1968 molybdenum production would have been considerably lower had it not been for the fact that the copper mines of Duval Corp., (Mineral Park and Esperanza); Bagdad Copper Corp., (Bagdad); and Pima Mining Co., (Pima), all important molybdenum producers, continued to operate during the copper strike period.

According to its 1967 Annual Report, ASARCO completed the expansion of its Mission Mine concentrator, west of Tucson, in the first quarter of the year. The expansion was rated at 50 percent, bringing milling capacity to 25,000 tons daily.

In November, 1967, the Duval Sierrita Corporation, a subsidiary of the Duval Corporation of Texas, obtained from the General Services Administration an agreement to provide certain financial assistance for development of a large, open-pit, copper-molybdenum mine, which will be brought into production in Pima County, Arizona - the scheduled date being late 1969.

In their 1967 Annual Report, Magma Copper Company, a major Arizona copper producer, reported the output of 4.00 million pounds of by-product molybdenum sulphide at their San Manuel operation. Early in 1968, Magma announced that an agreement had been reached to purchase the Kalamazoo property which lies adjacent to the San Manuel mine. The addition of the Kalamazoo reserves, estimated at 500 million tons averaging 0.7 percent copper, should make it possible for San Manuel to increase their mining rate. One plan reported under consideration calls for the daily output to be increased from the current 40,000 to 60,000 tons per day.

The Anaconda Company has reported that their Twin Buttes copper project west of Tucson was ahead of schedule and that the mine and mill would be ready for production by September, 1969. The company also has announced that molybdenum along with silver and gold would be recovered at the Twin Buttes property.

FREE WORLD PRODUCTION

Free World molybdenum production increased in 1967 and again in 1968. Contributing to these increases were the production of two new molybdenum mines, one each in Colorado and Canada; the expansion of molybdenum recovery systems by some copper producers; and the installation of new recovery systems by others. Further gains of both primary and by-product molybdenum are anticipated from presently-contemplated expansions of copper mines now in progress and new mines expected to be placed in production in this country, Canada and Chile.

TABLE III - FREE WORLD PRODUCTION OF MOLYBDENUM IN ORES AND CONCENTRATES 1/

(Table Insert, Arizona Production)

Thousand Pounds of Molybdenum

Country 2/	1963	1964	1965	1966	1967p	3/ 1968e
United States	65,011	r65,605	r77,372	90,532	88,930	93,900
(Arizona 4/)	(5,553)	(6,296)	(9,399)	(10,161)	(9,261)	(12,000)
Canada 5/	834	1,225	9,557	r20,419	21,526	22,200
Chile	6,400	8,393	r8,142	r10,430	10,752	10,500
Peru	r1,122	871	r1,499	r 1,484	2,037	2,200
Other 6/	1,688	1,735	1,890	2,102	2,118	2,200
Free World Total	r75,055	r77,829	r98,460	r124,967	e125,363	131,000

e Estimate p Preliminary r Revised

1/ U. S. Bureau of Mines

2/ Molybdenum is also produced in negligible amounts in Argentina, Bolivia, Nigeria, South-West Africa, and Spain.

3/ Based on 10-month and other accumulated data.

4/ Included in U. S. total.

5/ Shipments.

6/ Other includes small production in South Korea, Norway, Japan Mexico, Philippines and Australia.

UNITED STATES PRODUCTION

United States molybdenum production decreased slightly in 1967 due to the work stoppages in the copper mines but spurted to an all time high in 1968, according to preliminary U. S. Bureau of Mines data. Late in 1968, stocks at mines and plants stood at their highest levels since the 1940's.

TABLE IV - SALIENT MOLYBDENUM STATISTICS 1/

(Thousand pounds of contained molybdenum and thousands of dollars)

	1963	1964	1965	1966	1967		1968p
UNITED STATES:							
Concentrate:							
Production	65,011	65,605	77,372	90,532	88,930	2/	93,900
Shipments 3/	65,839	65,097	77,310	91,670	81,596	2/	91,000
Value	$91,096	$97,121	$120,801	$144,327	$133,604		NA
Consumption 4/	49,241	56,409	68,112	75,476	58,967	2/	78,000
Imports for Consumption	- -	- -	142	5	1,179		NA
Stocks, Dec. 31:							
Mine and Plant	2,436	4,303	4,208	3,433	9,919	5/	14,188
Primary Products:							
Production 6/	48,756	55,946	66,616	74,392	54,922	2/	71,000
Shipments	49,599	60,403	71,718	78,811	57,231	2/	64,300
Consumption	37,478	43,119	48,621	52,324	49,506	2/	45,000
Stocks,Dec.31: Producers	4,504	4,398	3,839	5,945	7,156	5/	17,784
FREE WORLD: Production	r75,055	r77,829	r98,460	r124,967	e125,363		e131,000

e Estimate p Preliminary r Revised NA Not Available.

1/ U. S. Bureau of Mines
2/ Calculated from 10-month's accumulated data.
3/ Including exports.
4/ Including quantity exported after conversion to molybdic oxide.
5/ As of Oct. 31, 1968.
6/ Comprises total production of all products less quantities of oxide, ammonium molybdate, etc. used to produce other products.

UNITED STATES CONSUMPTION

The principal value of molybdenum lies in its ability to impart to materials with which it is alloyed, such properties as toughness, resistance to corrosion, and strength at high temperatures. Because these alloys retain most of their strength even at temperatures above 2,500°F, they have many aerospace applications.

The United States iron and steel industries are the major molybdenum consumers in high speed, stainless and other alloy steels, gray and malleable castings and high temperature alloys. Consumption increased in the United States some 30 percent in the period 1960-1967 and both the United States and Free World consumption are estimated to continue at about the same rate for the following near term.

Table V shows that 68 percent of the molybdenum was used in the form of molybdic oxides and 21 percent in ferro molybdenum in 1967.

TABLE V - UNITED STATES CONSUMPTION OF MOLYBDENUM PRODUCTS BY END USES, 1967; AND FIRST THREE QUARTER'S PRODUCT CONSUMPTION, 1968 a/

(Thousand Pounds, Contained Molybdenum)

End Use	Molybdic oxides 1/	Ferromolybdenum 2/	Molybdenum metal powder	Ammonium molybdate	Sodium molybdate	Other 3/	Total
Steel:							
High speed	1,830	882	1	---	---	102	2,815
Hot work tool	188	120	---	---	---	4	312
Other tool	585	140	4/	---	---	2	727
Stainless	4,164	1,882	3	---	---	56	6,105
Other alloy	18,124	1,763	2	---	---	53	19,942
Steel mill rolls	1,203	95	---	---	---	---	1,298
Gray and malleable castings	540	2,601	17	4	---	17	3,179
Welding rods	---	281	4/	---	---	---	281
High-temperature alloys	1,654	765	42	---	---	1,580	4,041
Molybdenum powder:wire, rod, sheet, other	---	15	1,562	---	---	18	1,595
Chemicals:Inorganic pigments	402	---	4/	6	75	7	490
Organic pigments	213	---	---	13	273	1	500
Catalysts	1,551	---	---	284	3	---	1,838
Miscellaneous 5/	3,334	1,793	95	29	45	1,087	6,383
1967 Totals	33,788	10,337	1,722	336	396	2,927	49,506
1968:							
1st Quarter	8,973	2,520	511	77	74	447	12,602
2nd Quarter	8,593	2,164	566	150	54	404	11,931
3rd Quarter	6,612	1,753	429	84	47	367	9,292

1/ Includes technical and purified oxides.
2/ Includes molybdenum silicide, and calcium molybdate.
3/ Includes thermite molybdenum and molybdenum pellets, purified molybdenum disulfide, and molybdenite concentrate added direct to steel.
4/ Less than ½ unit.
5/ Includes cutting and wear resistance materials, alloy hard facing rods and materials, permanent-magnet alloys, soft magnetic alloys, copper, nickel and titanium-base alloys, metal to glass seal materials, electrical contact materials, electric resistance alloys, friction material, diamond bit matrices, hard facing rods and materials, cast carbide dies or parts, ceramic pigments, lubricants, fertilizer, ground coat frit, and unspecified.

a/ U. S. Bureau of Mines.

UNITED STATES, FOREIGN TRADE

Total United States exports of molybdenum ore and concentrates continued at about the same tonnage level for the years 1966-1968. Their pattern shifted, however, after the Netherlands started production of molybdic oxide in 1966. Exports to most other European countries decreased as the Netherlands supplied increasing amounts of Europe's oxide requirements.

TABLE VI - U. S. EXPORTS OF MOLYBDENUM ORE AND CONCENTRATES (including roasted concentrates), BY PRINCIPAL COUNTRIES 1/

(Thousand pounds of contained molybdenum)

Country	1966	1967	10-Months 1968
Netherlands	11,551	16,287	12,576
Canada	1,014	3,415	580
Japan	3,405	2,690	3,577
West Germany	4,779	1,971	1,568
Belgium-Luxembourg	2,726	1,878	1,833
France	1,978	1,526	660
Others	4,315	2,233	1,099
Total	29,768	30,000	21,893

Imports of molybdenum ore, concentrates, and molybdenum compounds by the United States have been in minor amounts.

1/ U. S. Bureau of Mines

SILVER - 1968

ARIZONA

The value of Arizona's silver production more than doubled in 1968 as compared with the mid-1950's. An important by-product of the copper ores, the value of recovered silver has been increasing since 1959, Since 1961 the increases have been due principally to increases in the price of the metal. In 1968, silver production represented 1.7 percent of the value of the States total mineral production compared with 1.1 percent in 1961, notwithstanding a drop in the number of ounces of silver produced in 1968 compared with 1961.

TABLE I - COMPARISON OF ARIZONA RECOVERABLE SILVER AND TOTAL MINERAL PRODUCTION 1/

Year	Recoverable Silver Troy Ounces (in 000's)	Recoverable Silver Value (in 000's)	Value of Total Mineral Production (in 000's)	Silver % of Total
1955	4,634	$4,194	$378,277	1.1
56	5,179	4,687	485,751	1.0
57	5,279	4,778	372,641	1.3
58	4,685	4,240	314,520	1.3
59	3,898	3,528	326,862	1.1
1960	4,775	4,322	415,512	1.0
61	5,120	4,733	432,614	1.1
62	5,464	5,917	474,131	1.2
63	5,373	6,873	481,392	1.4
64	5,811	7,513	534,353	1.4
1965	6,095	7,881	580,092	1.4
66	6,339	8,196	622,079	1.3
67	4,588	7,112	465,255	1.5
68p	5,000	10,715	626,051	1.7

p Preliminary

1/ U. S. Bureau of Mines.

The Phelps Dodge Corp., with three mines, Copper Queen-Lavender Pit, New Cornelia, and Morenci, was Arizona's leading silver producer in 1967 with total production of 1.2 million Troy ounces. The other leading silver producers in 1967 in order of rank were: American Smelting and Refining Co., Duval Corp., Pima Mining Co., and Shattuck Denn Mining Corp. Of the twenty-five leading domestic silver-producing mines, seven were in Arizona. The mines, with numbers to indicate their national rank are as follows:

Mine	Operator	Source of Silver	Rank
Mission	American Smelting & Refining Co.	Copper Ore	(12)
Pima, Northeast	Pima Mining Co	" "	(14)
Mineral Park	Duval Corp.	" "	(17)
Iron King	Shattuck-Denn Mining Corp.	Lead-Zinc Ore	(18)
Copper Queen - Lavender Pit	Phelps Dodge Corp.	Copper Ore	(19)
Morenci	" " "	" "	(20)
New Cornelia	" " "	" "	(21)

Source: U.S. Bureau of Mines.

As in other mining areas in the United States, interest in silver bearing properties in Arizona was generated by the rise in the price of silver. In the Tombstone area in Cochise County some 400 new locations were filed in less than a 4-month period in 1967. The Escapule Mining Association continued working at its Santa Ana mine in 1967 and generated considerable interest in early 1968 when they announced a silver strike.

The Piedras del Sol Mining Company reported cross-cutting to and drifting on a silver bearing vein at its Side Wheel mine near Tombstone.

In Pinal and Santa Cruz Counties, OME (Office of Minerals Exploration of the U. S. Geological Survey) completed loan agreements with the Big Treasure Mining and Development Co. and with D. C. Gilbert for silver exploration at the Little Treasure-Adjust and the Royal Deer-Horn claims respectively.

In Yavapai County, underground exploration continued at the Silver Crown mine, a silver-lead development of the Arizona-Michigan Mining Company.

WORLD PRODUCTION

World production of silver, (excluding communist dominated areas), increased some 9 percent in 1968 over 1967, according to Handy and Harman's 1968 Silver Market Review. Of the major producing countries, Canada is credited with the greatest 1968 increase (approximately 25 percent) placing it first in production, displacing Mexico which registered about a 10 percent yearly increase. Peru has maintained third position followed by the United States.

A table of world silver production for the years 1965-1967 follows:

TABLE II - WORLD PRODUCTION OF SILVER 1/ 2/

Thousand troy ounces

Country 3/	1965	1966	1967p
Mexico	40,332	r41,983	37,939
Canada	r31,917	r33,418	36,426
Peru 4/	r36,470	r32,841	35,870
United States 4/	39,806	43,669	32,119
Australia	r17,281	r18,876	19,765
Japan	8,989	r10,319	10,834
Rest of Free Countries	41,081	42,940	43,499
Total Free World	215,876	224,046	216,452
U.S.S.R. e	r31,000	r33,000	35,000
East Germany e	4,800	4,800	4,800
Czechoslovakia e	2,400	2,400	2,400
North Korea e	r 650	r 650	700
Rest of Soviet Sphere	1,636	1,668	1,468
Total Soviet Sphere	40,486	42,518	44,368
TOTAL WORLD	r256,362	r266,564	e260,820

e Estimate p Preliminary r Revised NA Not Available

1/ U. S. Bureau of Mines
2/ Content of ores and concentrates produced unless otherwise noted.
3/ A small amount of silver was produced in Bulgaria, Mozambique, Panama, Thailand, and Turkey.
4/ Recoverable.

UNITED STATES PRODUCTION

United States mine production of recoverable silver increased slightly in 1968 over 1967, based on available preliminary data. This reflects second and third quarter production gains as the copper industry returned to normalcy after the prolonged strike, and the major silver producers in the Coeur d' Alene mining district of Idaho resumed operations in June.

Although United States mine production of silver in 1968 was only slightly ahead of 1967, its value increased almost 39 percent to $69.2 million as the price of silver rose to a high of $2.565 per Troy ounce at mid-year. The average selling price of silver in 1968 was $2.143 per Troy ounce compared with $1.550 in 1967. This was largely brought on by persistent rumors that the United States Treasury would be unable to meet its redemption obligations and stockpile commitments. Both fears proved groundless, however, and the price at the end of the year was down to $1.900 per ounce. It was the first year in a decade that the domestic price of silver was lower at the end of the year than at the beginning.

A table of Salient Silver Statistics follows:

TABLE III - SALIENT SILVER STATISTICS 1/

		1963	1964	1965	1966	1967	1968p
UNITED STATES:							
Mine Production	thousand troy ozs.	35,243	36,334	39,806	43,669	32,119	e32,287
Value	thousands	$45,076	$46,980	$51,469	r$56,464	$49,784	$69,191
Ore (dry & siliceous) produced:							
Gold Ore	thousand short tons	2,460	2,631	3,113	2,580	2,315	NA
Gold-Silver ore	thousand short tons	223	224	205	248	157	NA
Silver ore	thousand short tons	587	644	902	1,069	904	NA
Percentage derived from							
Dry & Siliceous ores		33	32	35	33	39	NA
Base Metal ores		67	68	65	67	61	NA
Imports, General 2/	thousand troy ozs.	59,062	51,674	54,709	63,032	55,520	3/ 58,584
Refinery Production 4/	thousand troy ozs.	5/ 35,000	5/ 37,000	5/ 39,000	48,358	30,268	6/ 25,875
Exports 2/	thousand troy ozs.	31,485	109,395	39,665	85,538	70,769	3/ 109,082
Stocks Dec 31: Treasury 7/	million troy ozs.	1,583	1,218	r 804	594	351	8/ 246
Consumption							
Industry and Arts	thousand troy ozs.	110,000	123,000	137,000	183,696	171,031	145,000
Coinage	thousand troy ozs.	111,493	203,000	320,321	53,582	43,851	3/ 35,300
Price 9/	per troy oz.	$ 1.279	$ 1.293	$ 1.293	$ 1.293	$ 1.550	$ 2.143
WORLD:							
Production	thousand troy ozs.	249,982	r248,551	r256,362	r266,564	260,820	e284,000
Consumption 10/							
Industry & the arts	thousand troy ozs.	260,700	r304,200	r346,600	390,200	377,400	NA
Coinage 11/	thousand troy ozs.	167,000	264,500	r380,600	r106,400	78,200	NA

e Estimate p Preliminary r Revised NA Not Available.

1/ U.S. Bureau of Mines
2/ Excludes coinage.
3/ As of Oct. 31, 1968
4/ From domestic ores and concentrates.
5/ U.S. Bureau of the Mint.
6/ As of Sept. 30, 1968
7/ Includes silver in silver dollars.
8/ As of Nov. 30, 1968
9/ Average New York price.
10/ Free World only; Sources: Handy and Harman 1963-1965; H. and H. and U.S. Bureau of Mines 1966-1967
11/ Free World only.

The projected 1968 domestic silver production increases were due in large part to increases in Arizona and Utah. California silver production was also revised upwards in mid-1968. A State by State silver production tabulation for 1965-1968 follows:

TABLE IV - MINE PRODUCTION OF RECOVERABLE SILVER IN THE UNITED STATES, BY STATES 1/

(Troy Ounces)

State	1965	1966	1967	1968p	Refinery Production 1967
Alaska	7,673	7,193	5,787	2,600	3,000
Arizona	6,095,285	6,338,696	4,588,081	5,000,000	4,000,000
California	196,787	189,989	144,515	553,000	125,000
Colorado	2,051,105	2,085,534	1,817,699	1,646,300	1,600,000
Idaho	18,456,809	19,776,785	17,033,330	15,827,700	15,000,000
Kentucky	1,931	1,086	568	---	650
Michigan	457,851	483,000	301,992	W	275,000
Missouri	299,522	---	---	---	272,800
Montana	5,207,031	5,319,785	2,066,464	2,032,800	3,000,000
Nevada	507,113	867,567	565,755	571,000	529,000
New Mexico	287,472	242,620	157,495	195,000	171,400
New York	11,441	21,590	31,103	26,700	35,900
Oklahoma	W	W	W	W	W
Oregon	8,801	343	31	W	W
Pennsylvania	W	W	W	W	W
South Dakota	128,971	109,885	121,258	114,900	121,300
Tennessee	94,142	100,716	130,078	90,900	150,400
Utah	5,635,570	7,755,411	4,874,640	5,363,900	5,550,300
Washington	W	W	W	W	W
Wyoming	52	---	---	---	---
Other States 2/3/4/	358,477	368,788	279,898	862,300	165,200
TOTAL	39,806,033	43,668,988	32,118,694	32,287,100	31,000,000

p Preliminary W Production withheld to avoid disclosing individual company confidential data.

1/ U. S. Bureau of Mines.

2/ Other States, mine production, 1965, 1966 and 1967 includes Oklahoma, Pennsylvania and Washington.

3/ Other States, mine production, 1968 includes Michigan, Oklahoma, Oregon, Pennsylvania and Washington

4/ Other States, refinery production, 1967 includes Oklahoma, Oregon, Pennsylvania, Texas, Washington and Wisconsin

UNITED STATES CONSUMPTION

Handy and Harman have estimated United States silver consumption in 1968 as 145 million Troy ounces. Electroplated ware, sterling ware, jewelry, photography, and miscellaneous uses were all projected at lower rates than in 1967, while brazing, electrical and electronic consumptions were estimated to be higher than the previous year, as shown below.

1968 UNITED STATES
SILVER CONSUMPTION 1/

Use	Troy Ounces in millions
Photography	42
Elec. & Electronic Prod's.	33
Sterling ware	26
Brazing alloys	16
Electroplated ware	15
Jewelry	4
Miscellaneous	9
Total	145

1/ Source: Handy and Harman, 53rd Annual Review
The Silver Market in 1968

A complete tabulation of United States silver consumption for 1966-1967, is given in Table V.

TABLE V - U. S. CONSUMPTION OF SILVER, BY END USE 1/

Thousand Troy Ounces

	1966	1967
Electroplated ware	21,486	17,897
Sterling ware	30,894	30,269
Jewelry	6,349	5,751
Photographic Materials	48,435	50,306
Dental and Medical Supplies	2,457	2,690
Mirrors	2,946	2,174
Brazing, Alloys and Solders	18,419	15,390
Electrical and Electronic Products:		
Batteries	12,517	11,405
Contacts and Conductors	33,676	26,777
Rocket Nozzels	699	---
Catalysts	2,683	5,847
Bearings	569	600
Miscellaneous 2/	2,564	1,925
Total Net Industrial Consumption	183,696	171,032
Coinage	53,852	43,851
TOTAL CONSUMPTION	237,548	214,883

1/ U. S. Bureau of Mines.

2/ Includes silver-bearing copper, silver-bearing lead anodes, ceramic paints, etc.

UNITED STATES TREASURY SILVER

According to the Treasury Department, its total net inventory of silver on November 30, 1968 amounted to 246.1 million ounces, consisting of 169.5 million ounces in coins and 76.6 million ounces in bullion. A more complete tabulation of Treasury silver for 1967, and preceding years is given in Table VI.

TABLE VI - U. S. MONETARY SILVER 1/

Million Troy Ounces

	1963	1964	1965	1966	1967
Held in Treasury:					
Silver Bullion	1,557.7	1,208.0	793.8	591.1	348.3
Silver Dollars	22.1	2.3	2.3	2.3	2.3
Subsidiary Coin	2.7	3.4	(a)	(a)	(a)
Total Treasury Stocks	1,582.5	1,213.7	(b) 796.1	(b) 594.2	(b) 350.6
Outside the Treasury:					
Silver Dollars	352.9	372.6	372.6	372.6	372.6
Subsidiary Coin	1,365.2	1,563.4	1,883.0	(c) 1,911.0	(c) 1,960.0
Total Silver Outside Treasury	1,718.1	1,936,0	2,255.6	2,283.6	2,332.6
TOTAL SILVER	3,300.6	3,149.7	3,051.7	2,877.8	2,683.2

1/ U. S. Bureau of Mines

(a) No breakdown is available between silver and nonsilver coins.
(b) Excludes silver, in subsidiary coin.
(c) Estimated - Treasury data do not separate silver and nonsilver coins.

The break in United States silver prices came after June 24, 1968, the end of the year's time allowed for all holders to redeem their silver certificates with silver. This and Treasury's reduced silver requirements for coinage were the principal contributing factors in establishing U. S. silver sufficiency for the immediate future, and making New York silver prices at the end of 1968 lower than at the beginning of the year.

TABLE VII - AVERAGE PRICES OF SILVER - NEW YORK

In cents per Troy ounce 0.999 Fine

Yearly Basis 1/	
Year	Price
1955	89.099
56	90.826
57	90.820
58	89.044
59	91.202
1960	91.375
61	92.449
62	108.521
63	127.912
64	129.300
1965	129.300
66	129.300
67	154.968
68 2/	214.341

Monthly Basis		
Month	1967 1/	1968 2/
January	129.300	201.025
February	129.300	184.613
March	129.300	213.760
April	129.300	217.950
May	129.591	237.845
June	130.100	246.405
July	159.290	234.067
August	174.978	220.000
September	167.950	221.369
October	178.590	198.800
November	195.320	200.002
December	206.600	196.250
Years Average	154.968	214.341

1/ Source: Year Book of the American Bureau of Metal Statistics, for years 1955 - 1967. Prices are as reported by Engineering and Mining Journal.

2/ Source: Calculated from data in Metals Week, McGraw-Hill Publication, Jan. 27, 1969, Vol. 40, No.4.

UNITED STATES FOREIGN TRADE

The United States has traditionally been a net importer of silver. However, in 1964 exports exceeded imports and they have continued to do so every year except 1965. Data for the first 10 months of 1968 indicate no change in the pattern. World industrial consumption of silver has barely been holding steady or perhaps even decreasing slightly, but apparently more silver continues to enter into the holdings of private individuals and speculators. No near-term change in this trend is expected. A tabulation of United States silver imports and exports follows:

TABLE VIII - UNITED STATES IMPORTS AND EXPORTS 1/ OF SILVER

In Thousands of Troy Ounces

Year	U.S. Imports	U.S. Exports
1961	50,256	39,828
62	76,359	13,057
63	59,062	31,485
64	51,674	109,395
65	54,709	39,665
1966	63,032	85,538
67	55,520	70,769
1968 - 1st Qtr.	16,007	26,049
68 - 2nd Qtr.	15,836	41,307
68 - 3rd Qtr.	18,942	31,287
1968 - October	7,798	10,419
1968 10-Mo. Total	58,583	109,062

1/ U. S. Bureau of Mines.

GOLD - 1968

ARIZONA

Arizona's gold production, mainly a by-product of the State's copper industry, in the mid-1950's ranked third after copper and zinc in a value comparison of metallic commodities. At present, it ranks fourth, following copper, molybdenum, and silver.

The settlement of the nation's prolonged copper strike early in 1968 was a major contributing factor in Arizona's increased gold production for the year. Preliminary U. S. Bureau of Mines data credits Arizona with the production of 100,100 Troy ounces of recoverable gold in 1968, compared to 80,844 ounces in 1967.

TABLE 1 - ARIZONA PRODUCTION OF RECOVERABLE GOLD 1/

YEAR	TROY OUNCES
1955	127,616
56	146,110
57	152,449
58	142,979
59	124,627
1960	143,064
61	145,959
62	137,207
63	140,030
64	153,676
1965	150,431
66	142,528
67	80,844
68p	100,100

p Preliminary

1/ U. S. Bureau of Mines.

At the time of writing this report, 1968 gold production data for individual companies was generally not available. In 1967, 83 percent of Arizona's gold production was a by-product of the copper industry; 16 percent was derived from lead-zinc production; and the remaining 1 percent came from other ores.

Arizona's major lead-zinc producer, the Iron King mine of the Shattuck Denn Mining Corp. was closed at the end of 1967, due to economic conditions. The Corporation reported that 13,165 Troy ounces of gold had been recovered for the year from the mine's lead and zinc concentrates. The mine was reopened at a reduced production rate in 1968 and produced some 5,537 Troy ounces of gold for the year, on a content basis of the lead and zinc concentrates 1/.

In 1967, the Phelps Dodge Corp., Arizona's largest gold producer produced 59 percent, or 48,000 Troy ounces, of the State's gold output, all derived from copper ores or concentrates 2/.

The Magma Copper Co., the State's second largest gold producer, reported their San Manuel and Superior divisions as having produced 10,534 and 4,970 Troy ounces of gold respectively in 1967 3/.

According to a 1967 tabulation by the U. S. Bureau of Mines of the 25 leading gold producing mines in the United States, 6 were located in Arizona. In descending order of production they were: the New Cornelia, Phelps Dodge Corp., (8); Copper Queen - Lavender Pit, Phelps Dodge Corp., (9); Iron King, Shattuck Denn Mining Corp., (11); San Manuel, Magma Copper Co., (13); Morenci, Phelps Dodge Corp., (17); and Magma, Magma Copper Co., (20).

The following Table II, Arizona Production of Gold and Silver in 1967, the last year for which data was available, shows the varied sources of the State's gold and silver production and its dependence on copper ore output.

1/ Personal Correspondence
2/ U. S. Bureau of Mines
3/ Magma Copper Company, 1967 Annual Report, March, 1968.

TABLE II - ARIZONA PRODUCTION OF GOLD AND SILVER IN 1967 1/

By Class of Ore In Terms of Recoverable Metal

Source	Number of Mines 2/	Material Sold or Treated Short Tons	Gold Troy Ounces	Silver Troy Ounces
LODE ORE:				
Dry Gold	5	474	29	105
Dry Gold-Silver	4	49,529	73	3,426
Dry Silver	10	13,551	8	37,995
Total	19	63,554	110	41,526
Copper	35	74,289,203	66,993	3,996,587
Copper-Zinc	2	17,306	10	6,937
Lead	3	1,163	4	2,122
Lead-Zinc and Zinc 3/	4/ 7	344,307	12,997	526,233
Total	45	74,651,979	79,944	4,531,879
OTHER "LODE" MATERIAL:				
Gold-Silver Tailings	2	24,987	407	10,889
Copper Cleanup	5/	1,309	31	868
Copper Precipitates	22	66,892	-	---
Lead Cleanup	5/	288	350	2,919
Total	24	93,476	788	14,676
Total "Lode" Material	76	74,809,009	80,842	4,588,081
PLACER	1	---	2	---
Total All Sources	77	74,809,009	80,844	4,588,081

1/ U. S. Bureau of Mines.
2/ Detail will not necessarily add to totals because some mines produce more than one class of material.
3/ Combined to avoid disclosing individual company confidential data.
4/ 6 Lead-Zinc mines and 1 Zinc mine.
5/ From properties not classed as mines.

WORLD PRODUCTION

World gold production in 1968 was estimated to be slightly less than the 45.61 million Troy ounces produced in 1967. While the Republic of South Africa reported a slight gain in production for the first 9 months of 1968 over the like 1967 period, both Canada and the United States indicated slightly reduced productions. A World Table for the years 1965-1967, the last years for which complete production data was available, follows:

TABLE III - WORLD PRODUCTION OF GOLD 1/

Country 2/	Troy Ounces 1965	1966	1967p
Republic of South Africa	30,553,874	30,879,700	30,532,880
Canada	r 3,606,031	3,273,905	2,961,999
United States 3/	1,705,190	1,803,420	1,584,187
Ghana	755,191	684,395	762,609
Australia	r 877,643	r 914,732	627,171
Southern Rhodesia	544,100	e 550,000	NA
Philippines	r 437,474	r 453,546	500,417
Colombia	319,362	r 280,823	258,186
Japan	264,842	r 256,395	252,769
Mexico	r 215,795	r 213,609	181,491
Nicaragua	198,152	199,108	177,702
Brazil 4/	r 155,031	r 167,955	172,000
Republic of the Congo (Kinshasa)	90,408	158,632	153,520
Fiji	109,095	112,567	111,108
Rest of Free Countries	1,139,762	1,027,876	1,423,961
Total Free World	r40,971,950	r40,976,663	39,700,000
U.S.S.R. e	5,030,000	5,370,000	5,700,000
North Korea e	160,000	160,000	160,000
China, Mainland e	60,000	60,000	50,000
Total Soviet Sphere e	5,250,000	5,590,000	5,910,000
Total e	r46,221,950	r46,566,663	45,610,000

e Estimate p Preliminary r Revised NA Not Available

1/ U. S. Bureau of Mines
2/ Gold was also reported as being produced in Bulgaria, Czechoslovakia, Rumania, and probably in East Germany, Hungary and Thailand.
3/ Mine production.
4/ Officially reported production only.

UNITED STATES PRODUCTION

United States production of recoverable gold in 1968 was down from the previous year, based on preliminary data from the U. S. Bureau of Mines. United States monetary gold stocks continued to decline until the latter part of the year when some additions to the stocks began. Early in 1968, the central banks of the United States and six other nations formed an agreement designed to maintain their remaining gold reserves by restricting gold sales from their monetary stocks to those for intergovernmental settlements only, at the fixed price of $35 per ounce, and to refuse to buy or sell gold to anyone else. Gold outside these seven central banks was left to seek its own level, which meant that there was established a free market for gold, subject to the laws of the United States and other countries. At the same time, the U. S. Treasury terminated both its purchases of gold from domestic producers and sales to domestic consumers.

This meant that "domestic producers could sell and export freely to foreign buyers as well as to authorized domestic users." The latter could "continue to import gold or to purchase gold from domestic producers within the limits of their licenses or authorizations in the Gold Regulations." There was no change of the prohibition of unauthorized private holding of gold by U. S. citizens either in the United States or abroad.

After the new two-tier gold pricing system was established, the price of gold on the free markets fluctuated between $38 and $42 per ounce, averaging $39.

TABLE IV - SALIENT GOLD STATISTICS 1/

		1963	1964	1965	1966	1967	1968p
UNITED STATES:							
Mine Production	thousand troy ozs.	1,454	1,456	1,705	1,803	1,584	1,530
Value	thousands	$50,889	$50,971	$59,682	$63,119	$55,447	$59,400
Ore (dry and siliceous) produced:							
Gold ore	thousand short tons	2,459	2,631	3,113	3,447	3,076	NA
Gold-silver ore	thousand short tons	223	224	206	248	157	NA
Silver ore	thousand short tons	556	542	752	669	617	NA
Percentage derived from:							
Dry and siliceous ores		51	54	54	58	69	NA
Base-metal ores		36	37	40	37	27	NA
Placers		13	9	6	5	4	NA
Refinery production 2/	thousand troy ozs.	1,469	1,469	1,675	1,802	1,526	NA
Imports, general	thousand troy ozs.	1,281	1,169	2,905	1,200	930	4/ 5,139
Exports	thousand troy ozs.	5,820	12,078	36,717	13,067	28,720	4/ 23,941
Stocks Dec 31: Monetary 3/	millions	$15,596	$15,471	$13,806	$13,235	$12,065	4/ 10,788
Consumption in industry and the arts	thousand troy ozs.	2,920	4,801	5,276	6,062	6,294	e 7,200
Price: Average 5/	per troy oz.	$35.00	$35.00	$35.00	$35.00	$35.00	6/ $35.00
WORLD:							
Production	thousand troy ozs.	43,147	r44,840	r46,222	r45,567	45,610	e 45,100
Official reserves 7/	millions	$42,310	$43,060	$43,300	$43,205	$41,600	4/ $40,709

e Estimate p Preliminary r Revised NA Not Available.

1/ U.S. Bureau of Mines
2/ From Domestic ores.
3/ Includes gold in Exchange Stabilization Fund.
4/ Oct. 31, 1968.
5/ Price under authority of Gold Reserve Act of Jan 31, 1934.
6/ Inter-government transactions only, affective Mar 17, 1968 establishing two-tier price system.
7/ Held by Free World central banks and governments.

Alaska, Arizona, Montana, Utah, and Washington produced more recoverable gold in 1968 than in 1967. South Dakota and Nevada, however; registered decreases over the same period, based on preliminary data.

TABLE V - MINE PRODUCTION OF RECOVERABLE GOLD IN THE UNITED STATES 1/
BY STATES

	Troy Ounces				
	1965	1966	1967	1968p	1967 Refinery Production
Alaska	42,249	27,325	r22,948	25,000	23,650
Arizona	150,431	142,528	r80,844	100,100	82,300
California	62,885	64,764	r40,570	14,640	40,000
Colorado	37,228	31,915	r21,181	21,000	19,900
Idaho	5,078	5,056	r 4,838	2,760	3,540
Montana	22,772	25,009	r 9,786	12,080	15,000
Nevada	229,050	366,903	r434,993	329,850	420,000
New Mexico	r 9,506	9,295	r 5,188	5,850	4,000
South Dakota	628,259	606,467	r601,785	590,000	615,500
Tennessee	122	141	r 181	130	210
Utah	426,299	438,736	r288,350	352,100	260,000
Washington 2/	r91,173	r85,281	r73,523	76,490	41,400
Wyoming	3	---	---	---	---
TOTAL	1,705,190	1,803,420	r1,584,187	1,530,000	1,525,500
Percent by type of mine production:-					
Placers	6	5	4	NA	
Dry Ore	54	58	69	NA	
Copper Ore	33	30	20	NA	
Lead & Zinc Ores	0.5	0.3	0.2	NA	
Complex Base Metal Ores	6	6	7	NA	

r Revised NA Not Available
1/ U. S. Bureau of Mines
2/ Oregon and Pennsylvania included to avoid disclosing individual company confidential data.

UNITED STATES CONSUMPTION

Domestic, industrial gold consumption in the United States has more than doubled since 1960. At present, about 70 percent is used for jewelry, decorative purposes, and dental products, while the remainder is going into electrical and electronic products and is finding increased use in the communications and aerospace industries. These new uses are based on gold's high electrical conductivity, it's high light and heat reflectivity, and it's superior malleability and corrosion resistance.

Gold is now commonly used in the telephone industry for coating contact points in the electro-mechanical switchgear.

A new magnet alloy containing 6 percent gold has been developed at Bell Telephone Laboratories for use in computer memories.

Westinghouse Electric Corp. has developed a process using gold and titanium films which substantially increase the reliability of integrated electrical circuits.

A brazing technique using gold-nickel alloys to secure leakproof joints in lightweight tubular systems for aerospace vehicles was developed by Aeroquip Corp. The alloys contain some 82 percent gold and 15 percent nickel.

During the Gemini space program, Lockheed Missiles and Space Co. developed a gold spray-on process, increasing a spacecraft's reflectivity of the suns heat and thereby reducing its air conditioning requirements. Lockheed reported that a 0.000004-inch thick spray-on coating would reflect more than 60 percent of the sun's heat energy admitted through a glass window. A similar coating is used on windshields of airliners. An electric current is passed through it to heat it and thus melt snow and sleet.

UNITED STATES GOLD CONSUMPTION IN INDUSTRY AND IN THE ARTS 1/

Year	Net Consumption (Thousand troy ounces)
1960	3,000
1961	2,775
1962	3,576
1963	2,920
1964	4,801
1965	5,276
1966	6,062
1967	6,294
1968 2/	e 3,000

e Estimate 1/ U.S. Bureau of Mines 2/ Six months domestic consumption.

UNITED STATES AND WORLD GOLD STOCKS

United States gold outflow was heavy in 1967, about double that of the previous year. This mostly occurred in December and continued into 1968 until the action taken by members of the international gold pool began to take effect. U. S. Stocks, which included gold in the Exchange Stabilization Fund, increased $213 million in June, 1968, the first increase since September, 1967. In July, stocks decreased $5 million but in August and September they registered increases of $5 and $74 million respectively. In October, the last month for which information is now available, United States gold stocks increased $33 million bringing the total to $10,788 million, their highest level since February. This compares to $12,065 million at the end of 1967.

United States gold stocks as of October 31, 1968, represented 26.5 percent of total Free World stocks held by Central banks and governments. The decreases in Free World stocks since 1966 have mainly indicated gold withdrawals from monetary reserves to supplement new production, much of which has been withheld from the world market by South Africa.

TABLE VI - GOLD MONETARY STOCKS 1/

(IN BILLIONS OF DOLLARS)

Years	U.S. Monetary Stocks	U.S. % of World	World Official Reserves 2/
End of 1950	$ 22.7	63.4%	$ 35.8
" " 1951	22.7	63.15%	35.95
" " 1952	23.2	64.1 %	36.2
" " 1953	22.0	60.3 %	36.2
" " 1954	21.7	58.1 %	37.35
" " 1955	21.7	58.4 %	37.15
" " 1956	21.9	58.1 %	37.7
" " 1957	22.85	58.7 %	38.9
" " 1958	20.6	51.6 %	39.9
" " 1959	19.5	48.0 %	40.6
" " 1960	17.8	44.0 %	40.5
" " 1961	16.9	41.1 %	41.1
" " 1962	16.1	38.7 %	41.4
" " 1963	15.6	36.9 %	42.3
" " 1964	15.5	35.9 %	43.1
" " 1965	13.806	31.88%	43.300
" " 1966	13.235	30.63%	43.205
" " 1967	12.065	29.00%	41.600
" " 1968 3/. . . .	10.788	26.50%	40.709

1/ U.S. Bureau of Mines 2/ Held by Free World banks and governments.
3/ Oct. 31, 1968.

UNITED STATES FOREIGN TRADE

The United States continued to be a net gold exporter in 1968 as it had for every year since 1959. Gold imports and exports for the years 1966, 1967 and the first 10 months of 1968 follow:

Years	Imports 1/ Troy Ounces	Exports 1/ Troy Ounces
1966	1,200,000	13,067,000
1967	927,869	28,719,982
1968:		
1st Quarter	478,175	14,378,622
2nd Quarter	1,640,742	8,629,180
3rd Quarter	2,486,180	605,981
October	534,323	327,325
10-Month Total	5,139,420	23,941,108

1/ U. S. Bureau of Mines.