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Source: United States Bureau of Mines, American Metal Reporter,
Copper Institute, Engineering & Mining Journal.

August, 1960

C O P P E R I N D U S T R Y - P A R T I

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C O P P E R

PHYSICAL PROPERTIES *

Symbol - Cu. Atomic Weight - 63.54. Specific Gravity - 8.96

Melting Point - 1981.4°F. Boiling Point - 4700°F

Electrical Resistivity -Microhm-cm. - 1.673

Tensile Strength (H.D. - 60,000 #/sq.in.) (annealed - 30,000)

Crystal Structure - Face-centred cubic. Valence - 1 & 2

Copper ranks next to iron as a metal of commercial importance. It has the best conductivity of any base metal; for example, measured on the ordinary basis of conductivity per unit of cross sectional area, aluminum's conductivity is only 61 percent of that of copper, but 3.5 times that of iron. Copper is therefore the most important metal in the electrical field. Copper has enough strength for minor structural purposes (such as sheet-metal work, electrical manufactures, etc.), is easily rolled and drawn into wire, has great resistance to weathering, and is of moderate cost compared to competitive materials. In addition to these properties, copper is widely used alloyed with zinc to form brass, which is easily worked, offers good resistance to weathering and most solutions (principal exceptions are certain acids and alkalies), and is fairly strong and elastic; and alloyed with tin to form bronze, of note for its resilience. It has good thermal conductivity, so finds many uses in heat-transfer units, such as cooling fins and water heaters. In addition, a large percentage of copper may be recovered as scrap after it has outlived the usefulness for which it was originally intended. Of the total copper consumed in the United States it has been estimated that about 60 percent eventually returns to use as copper or copper alloys.

* U.S.B.M.'s "MATERIALS SURVEY" - September, 1952

COPPER INDUSTRY IN 1958 AND 1959

Source: U.S.B.M. Mineral Market Reports, Copper Institute,
American Bureau of Metal Statistics.

YEAR 1958

U.S.B.M. Mineral Market Report No. 2941, prepared July 23, 1959

Although reduced activity in the copper industry continued through the first six months of 1958, the situation changed in the latter half of the year largely due to voluntary restrictions in output and increased industrial demand, according to the Bureau of Mines, United States Department of the Interior.

Mine production of copper declined 10 percent in 1958 to the lowest since 1954, chiefly due to voluntary reductions in operations at leading producers. In January a 9-percent cutback in output was announced by Phelps Dodge Corp. (Arizona). In March the Miami Copper Co. curtailed underground mining operations at Miami (Arizona). Also in March the Kennecott Copper Corp. announced that the work week would be reduced from 6 to 5 days at its four western divisions and, effective May 4, a further reduction to 4 days. In May Phelps Dodge announced an additional 20-percent cutback and The Anaconda Co. closed the Leonard mine that previously had accounted for approximately 10 percent of Butte's (Montana) output. Following an announced 10-percent reduction at Inspiration Consolidated Copper Co. mine (Arizona), effective July 1, destruction of a railroad bridge by fire caused a change in the company's plan to a complete close down at Inspiration from June 21 to July 7 with vacations scheduled in that period, and a postponement of the voluntary curtailment to about October 1. On March 16 San Manuel Copper Corp. (Arizona) eliminated overtime for its employees by reducing the work week to 5 days. Operations, however, continued on a 3-shift, 7-day-week basis.

In the late months of the year, production schedules were stepped up to meet increasing demand. On August 4 Kennecott announced a return to a 5-day-week basis at its four western divisions. On August 21 the company stated that a 6-day work week would become effective the beginning of September, and by October 23, Kennecott's divisions were working 7 days weekly. On October 3 Phelps Dodge stated its operations would be expanded to a 5½-day week and on October 16 to a 6-day week.

Consumption of refined copper dropped 8 percent in 1958 and was the smallest since 1949. Consumption declined until May when it was 25 percent below the monthly average for 1957. As general economic factors began to improve in the second quarter of the year, consumption turned upward in June, gained markedly in the second half, and averaged 20 percent above the first six months. In the final quarter consumption averaged 32 percent more than in January to March.

The movement of copper quotations followed, in general, the decline and subsequent improvement in the industrial economy in 1958. At the beginning of the year principal primary producers quoted 27 cents a pound for electrolytic copper, delivered. On January 13 and 14 the price was reduced to 25 cents where it remained until June. One of the principal producers raised the price to 26.5

cents on June 16, and a range of 25-26.5 cents continued until all moved to the higher level on July 17. Two producers raised their quotations to 27.5 cents effective October 13 and the third moved up on October 14. Effective October 24 principal producers were quoting 29 cents, and this price was maintained beyond the end of 1958.

There were more changes in custom smelter prices with the movements responding more closely to economic conditions. The price was 25.5 cents at the beginning of the year, fell to 23 cents the lowest level of the year in February, rose to 26.5 to 27 cents in mid-June and fluctuated between 25.5 and 27 cents a pound until mid-October when it rose to 27.5 and later in the month to 30 cents. It declined to 29 cents in late November and was unchanged at the end of 1958.

Imports of unmanufactured copper declined 16 percent in 1958 and were the smallest since 1951. All classes of imports, except old and scrap for remanufacture, fell; ore and concentrates dropped 56 and 21 percent, respectively, and the unrefined and refined classes decreased 11 and 21 percent, respectively. In 1958 imports from Chile, Canada, Rhodesia, and Peru decreased, whereas receipts from Mexico, Union of South Africa, Belgian Congo, and the Philippines increased.

After a 7-year suspension, the excise tax on copper imports into the United States was reimposed July 1. The effective rate was 1.7 cents a pound as a result of the GATT meetings in Geneva in 1956. The 1.7-cent rate was to remain in effect when the price of copper in the United States was 24 cents a pound or more; if the price dropped below 24 cents, the tariff was to be 2 cents a pound. On June 11, 1958, a bill to continue suspension of duties on metal scrap to June 30, 1959 was signed by the President.

Effective November 10 copper items, including ores, concentrates, etc., refined copper, copper scrap, and copper-base scrap, were removed from the Department of Commerce's positive list (requiring export licenses) and placed on the general list for export to all destinations except Hong Kong, Macao, and the Sino-Soviet bloc.

Shipments of refined copper rose 11 percent in 1958 and were the largest since 1929. More than 80 percent of the total exported went to European countries with most important purchasers taking more copper than in 1957. The United Kingdom was the destination of 30 percent, France 24, and Germany 17.

Domestic producers' stocks of refined and unrefined copper declined 20 percent in 1958. At the beginning of the year inventories were at the highest level since the end of 1945. Conforming with the extension of the general industrial recession, producers' inventories accumulated until the end of April and rose another 70,000 tons. As the tempo of business gained in the second quarter of the year copper stocks began decreasing and at year end were 78,000 tons less than at the beginning of the year.

Refined copper stocks declined 56 percent in 1958 and at the year end were the smallest since 1955, whereas the larger-tonnage unrefined class decreased only 6 percent, also the smallest since 1955.

Quotations on the London Metal Exchange were at their lowest level of the year on February 13 when cash copper was quoted at £160 5s. (equivalent to about 20.03) cents per pound). The price rose with virtually no interruptions to £260

(about 32.5 cents) on November 6 and then continued unchanged to the year end. The average for the year, £197 13s. 3d. (24.7 cents) was at the lowest annual level since 1950 when Government controls were in effect.

World production declined 4 percent in 1958 owing to reduced output in all of the important copper-producing countries - United States, Canada, Chile, Belgian Congo, and Northern Rhodesia. Among smaller producers, output in Peru declined but in Mexico and Australia it rose against the general trend. Most of the world's larger producers inaugurated production curtailment programs early in the year, but abandoned the cuts following improvement in overall world consumption. Prolonged labor strikes in Canada, Chile, and Northern Rhodesia, played a large part in lowering world output in 1958.

YEAR 1959

U.S.B.M. Mineral Market Report No. 3094, prepared July 1960

Although copper production in the United States reached a record rate in the first six months of 1959, the year ended with the lowest annual total since 1949, according to the Bureau of Mines, United States Department of the Interior. Operations at most of the principal copper mines, smelters and refineries were halted by the longest strike in history. As a result, mine output fell 16 percent; and smelter and refinery production from domestic ores dropped 20 percent each.

During the first half of the year, short-term strikes closed the new Kennecott Copper Corp. smelter at Ray, Ariz., and a railroad strike prevented ore shipments from the Anaconda Company mines in Butte, Mont., to the smelter in Anaconda, Mont. An extended strike shut down operations at the Tacoma, Wash. plant of the American Smelting and Refining Co. from March 13 to June 17.

The 3-year labor contracts negotiated in June 1956 between principal producers and the unions expired in mid-1959 and by the middle of August strikes halted approximately 75 percent of the nation's output of copper. The Laurel Hill plant of Phelps Dodge Refining Corp. was closed on August 1; Kennecott Copper Corp.'s four Western Divisions on August 10; Magma Copper Co. and San Manuel Copper Corp. on August 11; The Anaconda Company's Montana properties on August 19; the Phelps Dodge Corp.'s Arizona properties (except Ajo) and El Paso refinery of the Refining Corp., and the American Smelting and Refining Co.'s plants on August 20; and the White Pine Copper Co. in Michigan on October 28. The first settlements were reached in early December when the AS&R plants resumed operations on December 11. The San Manuel strike was settled December 15, and all Kennecott divisions, except Utah Copper, returned to work on December 31. All other operations remained strike-bound beyond the end of the year.

An upward trend in consumption of refined copper, which had begun in the second half of 1958, continued through June 1959. Influenced by vacations at fabricators and lower output because of strikes, consumption in the last six months fell 19 percent below the first six months. For the entire year, however, consumption exceeded 1958 by 17 percent.

The principal primary producers' price for electrolytic copper was 29 cents a pound, delivered, at the beginning of the year. Increases in early February brought the price to 30 cents and after another increase in March producers were quoting 31.5 cents. About mid-July producers reduced the price to 30 cents, and

in mid-August strikes halted operations at most of the primary producers' plants. On September 9 some of the operating companies raised the price to 31.5 cents. Other producers had made no change in the price and the market was quotable at a range of 30-31.5 cents. On November 6 the price was raised to a range of 30-33 cents; by November 12 it was quoted at a flat 33-cent level, and this price held beyond the end of the year.

The custom smelters' price of 29 cents at the beginning of the year was increased gradually until it reached 34 cents on March 16. It dropped thereafter until it was again quoted at 29 cents by July 13. On August 31, a custom smelter posted a 33-cent price but on October 23 the price was withdrawn because of the strikes. On December 23, a custom smelter was quoting 35 cents for electrolytic copper for February 1960 shipment.

Imports of unmanufactured copper rose 19 percent over 1958; receipts of refined copper gained 67 percent and those of the unrefined class 7 percent. As usual, Chile was the chief source of copper from abroad, supplying 44 percent of the total - 29 percent more than in 1958. Canada was second with 19 percent of the total and 50 percent more than in 1958. More copper also was received from the Union of South Africa, whereas decreases were registered in receipts from Mexico, Peru, the Philippines, and the Federal of Rhodesia and Nyasaland.

The 1.7-cents-a-pound excise tax on copper imports, effective July 1, 1958, was unchanged. If the price was to drop below 24 cents a pound, the tariff would be 2 cents. The suspension of metal-scrap duties was continued to June 30, 1960, by a bill signed by the President on July 28, 1959.

Effective February 20, the U. S. Department of Commerce reimposed controls on all copper exports; shippers were required to declare destination of all shipments except to Canada.

Shipments of refined copper dropped 59 percent to the lowest since 1953. Although 87 percent of the total exported went to European countries, all of the purchasers took substantially smaller quantities than in 1958. France was the destination of 27 percent, Germany 24, and the United Kingdom 17.

Domestic producers' stocks of refined and unrefined copper declined 11 percent in 1959. High consumption throughout most of the year coupled with reduced domestic production caused refined stocks to drop 63 percent - the lowest since before 1900. Unrefined copper stocks decreased 2 percent to the lowest since 1955.

Quotations on the London Metal Exchange were trending upward at the beginning of the year. The monthly average price of cash copper for March of £248 10s. 3d. (equivalent to 31.20 cents a pound) was the highest since January 1957 (£265 17s. 11d. or 33.19 cents). Prices moved downward and were the lowest of the year in July. In the last three months of 1959 quotations advanced and the average for December was £255 8s. 10d. (31.91 cents). The annual average in dollars of 29.80 cents was 20 percent more than 1958.

World mine production was 6 percent higher than in 1958 and the highest ever achieved. All important copper-producing countries except the United States registered gains in production; increases of 16 percent in Canada, 17 in Chile, 19 in the Belgian Congo, 36 in Northern Rhodesia, and 26 in Australia enabled those countries to establish new records. Among the smaller producers only Mexico and Peru had lower production.

Major developments in the copper industry included the completion of the new electrolytic refinery of Kennecott Refining Corp. near Baltimore, Md. Test production in the tank house was begun in August, and it was expected that full capacity of 16,500 tons of copper a month would be reached by July 1960.

On January 19, the Import Bank of Washington authorized a supplemental credit of \$15 million to Southern Peru Copper Corp. for the development of the Toquepala project in Peru. An original credit authorization had been approved in 1955. The project was completed about 5 months ahead of schedule and production of blister copper at the smelter began January 1, 1960. The first copper ore was produced at The Anaconda Company new El Salvador mine in Chile during April. Operations at the Kennecott Copper Corp. El Teniente mine, also in Chile, were adversely affected by a 3-day strike in March and a month-long strike in October. In Rhodesia completion of the Kariba Dam on the Zambesi River assured that additional electric power would become available the beginning of January 1960.

The electrolytic refinery of Copper Refineries Pty., Ltd., at Townsville, Australia, was completed and began operations in late June. The present capacity of nearly 50,000 tons of copper annually was to be increased to 67,000 tons a year.

TABLE I
TONS RECOVERABLE COPPER MINED IN ARIZONA, UNITED STATES AND WORLD
U. S. COPPER PRICE, U. S. CONSUMPTION AND U. S. PRODUCTION AS PERCENT OF CONSUMPTION

Source: U. S. Bureau of Mines

Year	ARIZONA			UNITED STATES		WORLD	Apparent U.S. Con- sumption Tons	U. S. Prod. % of Apparent Con- sumption	E. & M.J. Price Per Lb.	Export or Foreign Refinery Price Per Pound
	Tons	% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Production				
1927	341,095	41.3	20.1	824,980	48.5	1,700,000	711,000	116.0	12.920¢	-
1928	366,138	40.5	19.3	904,898	47.6	1,900,000	804,000	112.4	14.570¢	-
1929	415,314	41.6	19.3	997,555	46.4	2,150,000	889,000	112.2	18.107¢	-
1930	288,095	40.9 1/	16.0	705,074	39.2	1,800,000	633,000	111.4	12.982¢	-
1931	200,672	37.9 1/	13.0	528,875	34.1	1,550,000	451,000	117.3	8.116¢	-
1932	91,246	38.3 1/	9.1	238,111	23.8	1,000,000	260,000	91.6	5.555¢	-
1933	57,021	29.9 1/	5.0	190,643	16.6	1,150,000	339,000	56.2	7.025¢	6.713¢
1934	89,041	37.5 1/	6.4	237,401	17.0	1,400,000	323,000	73.5	8.428¢	7.271¢
1935	139,015	36.5 1/	8.4	380,491	23.1	1,650,000	441,000	86.3	8.649¢	7.538¢
1936	211,275	34.4 1/	11.1	614,516	32.4	1,900,000	656,000	93.7	9.474¢	9.230¢
1937	288,478	34.3	11.1	841,998	32.4	2,600,000	695,000	121.2	13.167¢	13.018¢
1938	210,797	37.8 2/	9.2	557,763	24.2	2,300,000	407,000	137.0	10.000	9.695¢
1939	262,112	36.0 3/	10.5	728,320	29.1	2,500,000	715,000	101.9	10.965¢	10.727¢
1940	281,169	32.0	10.4	878,086	32.5	2,700,000	1,009,000	87.0	11.296¢	10.770¢
1941	326,317	34.1	11.7	958,149	34.2	2,800,000	1,642,000	58.4	11.797¢	10.901¢
1942	393,387	36.4	13.1	1,080,061	36.0	3,000,000	1,678,000	64.4	11.775¢	11.684¢
1943	403,181	37.0	13.4	1,090,818	36.4	3,000,000	1,502,000	72.6	11.775¢	11.700¢
1944	358,303	36.8 3/	12.8	972,549	34.7	2,800,000	1,504,000	64.7	11.775¢	11.700¢
1945	287,203	37.2	12.0	772,894	32.2	2,400,000	1,415,000	54.6	11.775¢	11.700¢
1946	289,223	47.5	14.5	608,737	30.4	2,000,000	1,391,000	43.8	13.820¢	14.791¢
1947	366,218	43.2	14.6	847,563	33.9	2,500,000	1,286,000	65.9	20.958¢	21.624¢
1948	375,121	44.9	14.4	834,813	32.1	2,600,000	1,214,000	68.8	22.038¢	22.348¢
1949	359,010	47.7 4/	14.4	752,750	30.1	2,500,000	1,072,000	70.2	19.202¢	19.421¢
1950	403,301	44.4	14.4	909,343	32.5	2,800,000	1,447,000	62.8	21.235¢	21.549¢
1951	415,870	44.8	14.3	928,330	32.0	2,900,000	1,304,000	71.2	24.200¢	26.258¢
1952	395,719	42.8	13.2	925,337	30.8	3,000,000	1,360,000	68.0	24.200¢	31.746¢
1953	393,525	42.5	12.7	926,448	29.9	3,100,000	1,435,000	64.6	28.798¢	30.845¢
1954	377,927	45.2	12.2	835,472 5/	27.0	3,100,000	1,235,000	67.6	29.694¢	29.889¢
1955	454,105	45.5	13.3	998,570	29.3	3,405,000	1,335,000	74.8	37.491¢	39.115¢
1956	505,908	45.7	13.5	1,106,215	29.5	3,750,000	1,367,000	80.9	41.818¢	40.434¢
1957	515,854	47.5	13.3	1,086,141	28.1	3,870,000	1,239,000	87.7	29.576¢	27.157¢
1958	485,839	49.6	13.0	979,329	26.2	3,740,000	1,157,000	84.6	25.764¢	24.123¢
1959	430,297	52.2	10.8	824,846	20.6	4,000,000	1,183,000	69.7	31.182¢	28.892¢

See Footnotes page 8.

- NOTES: 1/ Depression began in 1930; was at its worst in 1933; gradually improved till 1937.
- 2/ Recession in 1938. Recovery in 1939 caused by War demand.
- 3/ World War II began in 1939; copper consumption reached its height in 1944.
- 4/ In the year 1948 and the early months of 1949, copper was being produced in the United States at the rate of 68,000 short tons per month, imports were at the rate of 18,000 tons of blister copper and 22,000 tons of refined copper, and exports were at the rate of 12,000 tons per month. The price of copper averaged 22.5 cts. during this period, varying from 21 3/8 to 23 3/8 cts.

In March 1949 the copper import tax was suspended, and during the months following the suspension, domestic demand fell drastically, and for four months net domestic consumption of copper was at or below the level of domestic production, even though the latter was severely curtailed. During this period, imports continued at practically the same rate. The price of copper dropped from 23 3/8 cts. to 16 1/2 cts. per pound. Many mines were forced to close down, and the large low-cost producers curtailed production. The average monthly production dropped from a high of 78,000 to a low of 56,000 tons.

- 5/ Curtailment early in the year, and a series of strikes in August and September caused a loss in production of over 100,000 tons. Reduced consumption in the U. S. was offset by an appreciable rise in the use of copper outside of this country, chiefly Europe. Result: a short supply of copper at the end of the year.

SOURCE: Mineral Resources of the United States and Minerals Yearbook of the U. S. Bureau of Mines, and preliminary estimates.

TABLE II

SALIENT U. S. COPPER STATISTICS

YEARS 1957, 1958 AND 1959

Compiled By Arizona Department of Mineral Resources from U.S.B.M. Reports

	1957	1958	1959
Arizona Mine Production - Tons Copper	515,854	485,839	430,297
U. S. Mine Production - Tons Copper	1,086,859	979,329	824,846
World Mine Production - Tons Copper	3,900,000	3,740,000	4,000,000
Refined Stocks - Beginning of Period	78,000	109,000	48,000
Refined Stocks - End of Period	109,000	48,000	18,000
Refinery Production (From Domestic Ores) .	1,050,496	1,001,645	796,452
Refinery Production (From Foreign Ores) ..	403,680	350,875	301,795
Secondary Copper Recovered from Scrap as Unalloyed Copper	248,015	255,121	261,588
<u>IMPORTS:</u>			
Copper from Ore, Matte, Regulus	124,776	92,602	82,523
Blister Copper	301,180	268,178	287,665
Refined Copper	161,907	127,630	214,056
Total Imports - Crude & Refined	587,863	488,410	584,244
<u>EXPORTS:</u>			
Copper in Ores, etc.	15,656	11,475	2,981
Refined Copper	345,834	384,868	159,702
Total Exports - Crude & Refined	361,490	396,343	162,683
EXCESS IMPORTS OVER EXPORTS	226,373	92,067	421,561
<u>CONSUMPTION:</u>			
New Refined (Apparent Consumption)	1,239,000	1,157,000	1,183,000
Total Refined (Actual)	1,352,124	1,250,677	1,463,031
U.S.Mine Prod. % of Appar. Consumption .	87.7	84.6	69.7
Average E. & M.J. Price of Copper	29.576¢	25.764¢	31.182¢

TABLE III

NEW (PRIMARY) REFINED COPPER WITHDRAWN FROM SUPPLY ON DOMESTIC ACCOUNT

Years 1952-1959

Source: U.S.B.M.

Unit: Short Tons

	Year 1952	Year 1953	Year 1954	Year 1955
Ref. Prod. of New Cu From U.S. Ores	923,192	932,232	841,717	997,499
Ref. Prod. of New Cu From Foreign Ores .	254,504	360,885	370,202	344,960
Total Ref. Prod. of New Copper	1,177,696	1,293,117	1,211,919	1,342,459
Imports of Refined Copper	346,960	274,111	215,086	202,312
Stocks at Beginning of Period	35,000	26,000	49,000	25,000
TOTAL AVAILABLE SUPPLY	1,559,656	1,593,228	1,476,005	1,569,771
Exports of Refined Copper	174,135	109,580	215,951	199,819
Stocks at End of Period	26,000	49,000	25,000	34,000
Total	200,135	158,580	240,951	233,819
Withdrawn on Domes.Acc.(Apparent Cons.).	1,359,521	1,434,648	1,235,054	1,335,952
Reported Actual Consumption	1,479,732	1,494,215	1,254,729	1,502,004

	Year 1956	Year 1957	Year 1958	Year 1959
Ref. Prod. of New Cu From U.S. Ores	1,080,207	1,050,496	1,001,645	796,452
Ref. Prod. of New Cu From Foreign Ores .	362,426	403,680	350,875	301,795
Total Ref. Prod. of New Copper	1,442,633	1,454,176	1,352,520	1,098,247
Imports of Refined Copper	191,745	162,309	127,630	214,056
Stocks at Beginning of Period	34,000	78,000	109,000	48,000
TOTAL AVAILABLE SUPPLY	1,668,378	1,694,485	1,589,150	1,360,303
Exports of Refined Copper	223,103	346,025	384,868	158,938
Stocks at End of Period	78,000	109,000	48,000	18,000
Total	301,103	455,025	432,868	176,938
Withdrawn on Domes.Acc.(Apparent Cons.).	1,367,275	1,239,000	1,157,000	1,183,000
Reported Actual Consumption	1,521,389	1,352,124	1,250,677	1,463,031

TABLE IV
WORLD MINE PRODUCTION OF RECOVERABLE COPPER
Source: U.S.B.M.

YEAR	MINE PRODUCTION RECOVERABLE COPPER				SECONDARY COPPER PRODUCTION ^{1/}			
	UNITED STATES	REST OF FREE WORLD	COMMUNIST CONTROLLED	TOTAL WORLD	UNITED STATES	REST OF ^{2/} FREE WORLD	COMMUNIST ^{2/} CONTROLLED	TOTAL WORLD ^{2/}
1951	928,330	1,617,000	355,000	2,900,000	186,462	325,000	71,000	582,000
1952	925,359	1,691,000	404,000	3,020,000	173,904	318,000	76,000	568,000
1953	926,448	1,708,000	416,000	3,050,000	242,855	447,000	109,000	799,000
1954	835,472	1,826,000	439,000	3,100,000	212,241	464,000	111,000	787,000
1955	998,570	1,926,000	475,000	3,400,000	246,928	476,000	117,000	840,000
1956	1,106,215	2,136,000	508,000	3,750,000	273,060	527,000	125,000	925,000
1957	1,086,141	2,219,000	565,000	3,870,000	248,015	509,000	129,000	887,000
1958	979,329	2,200,000	580,000	3,760,000	255,121	570,000	150,000	975,000
1959	824,846	2,645,000	530,000	4,000,000	261,588	838,000	168,000	1,267,000

^{1/} Secondary copper refers to unalloyed copper recovered from secondary material.

^{2/} No records published. Estimated on basis that total industrial use provides the same percentage of recoverable copper as it does in the United States.

TABLE V
APPARENT CONSUMPTION OF NEW REFINED COPPER
Source: U.S.B.M.

	AVG. 1951-1956	1957	1958	1959
Apparent Consumption of New Refined Copper in U.S.A.	1,339,500	1,239,000	1,157,000	1,183,000
U. S. Mine Production of Recoverable Copper	953,500	1,086,141	979,329	824,846
New Copper Needed to be Imported	386,000	152,859	177,671	358,154
% of Apparent Consumption Needed to be Imported	28.82%	12.34%	15.20%	30.27%
Free World (outside U.S.A.) Mine Production	1,818,000	2,219,000	2,200,000	2,645,000
Less Exported to U.S. for Consumption	386,000	152,859	177,671	358,154
Est. Free World (outside U.S.A.) Consumption ^{1/}	1,432,000	2,066,141	2,022,329	2,286,846

^{1/} No reports published. Estimate based on Total Free World (outside U.S.A.) Production less Apparent U.S. Consumption. This estimated consumption would include shipments to Communist countries.

Reported Actual Consumption in U.S.A.	1,445,000	1,352,124	1,250,677	1,463,031
Estimated Actual Consumption in Free World(outside U.S.A.) ^{1/}	1,549,000	2,255,000	2,186,000	2,287,000

^{1/} No reports published. Estimate based upon same relation to Apparent Consumption as in United States.

TABLE VI

SUMMARY OF NEW COPPER PRODUCTION AND CONSUMPTION AS REPORTED BY U. S. B. M.

AND COPPER INSTITUTE - IN U.S.A. AND REST OF FREE WORLD ^{1/}

Year	PRODUCTION				CONSUMPTION			
	IN U.S.A.		OUTSIDE U. S. A.		IN U. S. A.		OUTSIDE U. S. A.	
	Reported By U.S.B.M.	Reported By Copper Institute ^{1/}	Reported By U.S.B.M. ^{2/}	Reported By Copper Institute ^{1/}	Apparent Consumption	Deliveries To Fabricators	Estimated Consumption ^{3/}	Deliveries To Fabricators
1951	928,330	964,589	1,617,000	1,378,833	1,304,000	1,367,787	1,241,000	1,013,450
1952	925,359	961,886	1,691,000	1,401,001	1,360,000	1,445,834	1,256,000	1,005,259
1953	926,448	957,318	1,708,000	1,441,874	1,435,000	1,443,719	1,200,000	831,441
1954	835,472	863,721	1,826,000	1,494,386	1,235,000	1,208,755	1,426,000	1,247,120
1955	998,570	1,036,702	1,926,000	1,576,960	1,336,000	1,446,354	1,588,570	1,298,037
1956	1,106,215	1,133,134	2,136,000	1,729,705	1,367,000	1,465,999	1,875,215	1,366,979
1957	1,086,141	1,116,380	2,219,000	1,781,339	1,239,000	1,277,946	2,066,141	1,575,361
1958	979,329	1,008,170	2,200,000	1,705,242	1,157,000	1,179,416	2,022,329	1,738,988
1959	824,846	805,875	2,645,000	2,054,579	1,183,000	1,312,328	2,286,846	1,660,698

^{1/} "In U. S. A." - Includes that of Cuba and the Philippines entering U. S. A. duty free through June, 1958.

"Outside U. S. A." - Includes production from Canada, Mexico, So. America, Europe, Asia and Africa, and, starting with July 1958, that of Cuba and the Philippines entering the U. S. Excludes production of Russia, Japan, Australia, Yugoslavia, Norway, Sweden, Finland and the production of several other small countries from which reports are not available. The Institute coverage represents approximately 85 to 90% of the Free World.

^{2/} "Outside U. S. A." - Includes Free World countries not under Communist control. Excludes Russia, E. Germany Poland, China, Yugoslavia, Finland. An estimated 400,000 tons of Free World copper (all outside the U. S.) is not reported to the C. I. An estimated 500,000 tons produced outside the Free World is also excluded.

^{3/} Estimated Consumption of new refined copper, based on U.S.B.M.'s reported production minus reported exports to U.S.A. for consumption. But does include possible exports to Communist countries for consumption. Does not take into account changes in stocks.

TABLE VII

STOCKS OF REFINED COPPER REPORTED BY
U. S. B. M. AND COPPER INSTITUTE *

STOCKS END OF PERIOD	IN U. S. A.		OUTSIDE U. S. A.
	U.S.B.M.	Copper Institute	Copper Institute
Year 1951	35,000	71,528	152,203
Year 1952	26,000	58,858	130,103
Year 1953	49,000	89,193	280,530
Year 1954	25,000	47,108	181,529
Year 1955	34,000	61,554	159,777
Year 1956	78,000	120,645	233,775
Year 1957	109,000	181,024	277,316
Year 1958	48,000	80,722	178,152
Year 1959	18,000	64,763	228,243

* Inventory data of the Bureau of Mines and Copper Institute always differ owing to somewhat different bases. After Jan. 1, 1947, differences were due chiefly to the method of handling metal in process of refining (included as "refined" by Copper Institute and as "unrefined" by the U.S.B.M.), and to other minor variations in interpretation until May, 1951. Then the Institute's inventory data began to include tonnages delivered to U.S. consumers at foreign ports. Bureau of Mines figures are on the basis of metal physically held at primary smelting and refining plants in the U.S. In the Bureau's classification cathodes to be used chiefly for casting into shapes are considered stocks in process and not refined stocks.

TABLE VIII

STOCKS OF REFINED COPPER, BLISTER, AND MATERIALS IN PROCESS
REPORTED BY UNITED STATES BUREAU OF MINES
IN SHORT TONS

END OF PERIOD	REFINED	BLISTER & MATERIALS IN PROCESS OF REFINING ^{1/}	TOTAL
Year 1951	35,000	182,000	217,000
Year 1952	26,000	185,000	211,000
Year 1953	49,000	223,000	272,000
Year 1954	25,000	189,000	214,000
Year 1955	34,000	201,000	235,000
Year 1956	78,000	261,000	339,000
Year 1957	109,000	274,000	383,000
Year 1958	48,000	257,000	305,000
Year 1959	18,000	253,000	271,000

^{1/} Includes copper in transit from smelter in the U. S. to refineries therein.

TABLE IX

REFINED COPPER CONSUMED IN U. S. 1956-1959
BY CLASSES OF CONSUMERS

Source: U.S.B.M.

Unit: Short Tons

Class of consumer	Cathodes	Wire bars	Ingots and ingot bars	Cakes and slabs	Billets	Other	Total
1956:							
Wire mills	9,694	838,476	16,415	.....	.....	.....	864,585
Brass mills	91,887	72,716	102,451	177,583	166,426	35	611,098
Chemical plants..	.....	.....	559	.....	.....	1,199	1,758
Secondary smelters	5,602	.....	1,411	207	.....	434	7,654
Foundries	5,180	76	13,341	3	237	143	18,980
Miscellaneous 1/	1,824	85	5,532	402	538	8,933	17,314
Total	114,187	911,353	139,709	178,195	167,201	10,744	1,521,389
1957:							
Wire mills	5,641	751,815	15,406	.....	.....	770	773,632
Brass mills	85,833	57,399	76,046	158,344	156,292	40	533,954
Chemical plants..	.....	.....	708	.....	.....	772	1,480
Secondary smelters	5,197	.....	1,839	212	.....	628	7,876
Foundries	4,118	758	15,161	.....	194	147	20,378
Miscellaneous 1/	1,905	205	3,208	205	495	8,786	14,804
Total	102,694	810,177	112,368	158,761	156,981	11,143	1,352,124
1958:							
Wire mills	4,394	723,450	11,464	.....	.....	962	740,270
Brass mills	91,192	47,354	74,098	116,659	150,160	47	479,510
Chemical plants..	.....	.....	407	.....	.....	490	897
Secondary smelters	4,080	.....	2,485	219	.....	398	7,182
Foundries	3,285	413	9,731	15	201	238	13,883
Miscellaneous 1/	779	40	1,012	111	501	6,492	8,935
Total	103,730	771,257	99,197	117,004	150,862	8,627	1,250,677
1959:							
Wire mills	6,432	817,030	11,790	.....	.....	925	836,177
Brass mills	86,648	64,277	116,190	146,852	170,074	59	584,100
Chemical plants..	.....	.....	310	.....	.....	484	794
Secondary smelters	5,320	.....	2,079	246	.....	466	8,111
Foundries	4,877	218	11,465	17	216	795	17,588
Miscellaneous 1/	1,298	4	4,064	6	295	10,594	16,261
Total	104,575	881,529	145,898	147,121	170,585	13,323	1,463,031

1/ Includes iron and steel plants, primary smelters producing alloys other than copper, consumers of copper powder and copper shot, and miscellaneous manufacturers.

TABLE X

IMPORTS OF COPPER INTO UNITED STATESBY QUARTERS IN 1959

Source: American Bureau of Metal Statistics. U. S. Bureau of Census.
Compiled by Quarters by Arizona Department of Mineral Resources.

1959	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Year 1959
Ore, Matte & Regulus (Copper Content)	24,240	20,710	22,292	15,281	82,523
Canada	1,825	1,411	2,369	944	6,549
Mexico	722	436	416	-	1,574
Cuba	2,125	1,175	2,287	4,355	9,942
Bolivia	631	329	306	522	1,788
Chile	5,969	3,090	4,028	3,806	16,893
Peru	3,080	766	2,375	2,274	8,495
Cyprus	-	3,525	-	-	3,525
Philippines	2,701	4,320	5,862	-	12,884
Union of So. Africa	7,011	5,529	1,990	3,080	17,610
Australia	134	99	2,642	173	3,048
Other Countries	42	30	17	126	215
Blister Copper (Copper Content)	75,899	67,314	71,716	72,736	287,665
Mexico	7,847	6,524	5,812	1,032	21,215
Chile	60,841	47,951	54,503	63,800	227,095
Peru	605	-	1,204	1,243	3,052
Rhodesia & Nyasaland	2,680	6,737	6,773	-	16,190
Union of So. Africa	1,665	3,889	2,223	6,657	14,434
Turkey	-	-	1,094	-	1,094
Australia	2,212	2,209	-	-	4,421
Other Countries	49	4	107	4	164

TABLE X (Continued)

IMPORTS OF COPPER INTO THE U. S. (Continued)

1959	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Year 1959
Refined Cathodes and Shapes	10,225	36,124	63,961	103,746	214,056
Canada	8,720	22,131	24,496	47,890	103,237
Mexico	-	1,784	1,456	3,333	6,573
Chile	200	2,100	6,461	5,410	14,171
Peru	1,207	2,835	7,194	5,968	17,204
W. Germany	-	2,072	5,751	16,482	24,305
United Kingdom	-	559	6,183	6,623	13,365
Belgian Congo	-	1,240	2,700	396	4,336
Rhodesia & Nyasaland	50	1,894	5,212	9,240	16,396
Union of So. Africa	-	761	-	952	1,713
Other Countries	48	796	4,508	7,452	12,756
TOTAL IMPORTS (Crude & Refined)	110,364	124,148	157,969	191,763	584,244
TOTAL EXPORTS	64,514	49,010	36,974	12,185	162,683
EXCESS IMPORTS	45,850	75,138	120,995	179,578	421,561
EXCESS EXPORTS	-	-	-	-	-

SUMMARY OF YEARS 1952 - 1958 INCLUSIVE

	1952	1953	1954	1955	1956	1957	1958
TOTAL IMPORTS	614,343	668,856	585,551	580,521	590,004	587,863	488,410
TOTAL EXPORTS	174,783	110,179	218,320	207,105	236,253	361,490	396,343
EXCESS IMPORTS	439,560	558,677	367,231	373,416	353,751	226,373	92,067

TABLE XI

EXPORTS OF COPPER FROM THE UNITED STATES

BY QUARTERS IN 1959

Source: American Bureau of Metal Statistics. U. S. Bureau of the Census.
Compiled by Quarters by Arizona Department of Mineral Resources

1959	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Year 1959
Ore, Concs. & Matte	2,098	531	26	326	2,981
Refined Ingots, * Bars, etc.	62,416	48,479	36,948	11,859	159,702
Canada	1,838	758	86	632	3,314
Argentina	2,039	1,259	772	198	4,268
Brazil	2,378	1,802	770	22	4,972
Austria	-	-	20	-	20
Belgium	62	17	-	191	270
Denmark	593	386	448	-	1,427
France	20,285	14,088	7,371	824	42,568
W. Germany	7,425	12,248	13,755	5,097	38,525
Italy	5,263	4,733	4,595	643	15,234
Netherlands	3,036	1,661	1,677	757	7,131
Norway	616	980	224	-	1,820
Sweden	307	420	369	224	1,320
Switzerland	1,286	280	184	121	1,871
United Kingdom	13,932	6,813	4,273	1,280	26,298
Yugoslavia	560	560	569	569	2,258
India	263	-	659	673	922
Japan	1,934	1,430	715	1,254	5,333
Australia	504	269	336	-	1,109
Other Countries	95	775	125	47	1,042
TOTAL EXPORTS (Crude & Refined)	64,514	49,010	36,974	12,185	162,683

* Includes exports of refined copper resulting from scrap that was reprocessed in toll for account of shipper.

PART II

COPPER INDUSTRY IN ARIZONA

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REVIEW OF ARIZONA COPPER IN 1958

Source: U.S.B.M. Area Report D-90, Prepared in July, 1959

Copper. -- Arizona supplied one-half of the United States copper output in 1958 and was again the leading copper-producing State, a position held since 1910. A decline of 6 percent in copper output and a drop in the annual average price for copper resulted in an 18-percent reduction in value of copper production in the State in 1958; value dropped from \$310.5 million in 1957 to \$255.6 million in 1958. As copper accounted for 81 percent of the total value of mineral production in Arizona, the \$58.1 million drop in Arizona's value of mineral production in 1958 was accounted for largely by the \$55.0 million decline in value of copper output.

Production of copper, which totaled 45,000 tons in January, dropped gradually each succeeding month to a low of 25,000 tons in July, then rose to 46,000 tons in October at which level it stayed for the remaining 2 months of the year. Production closely reflected the demand for copper. The 5 leading copper producers accounted for 69 percent of the State's total and the 15 leading ones supplied 99 percent.

Several new developments of significance occurred in Arizona's copper industry. The new smelter and L-P-F (leach-precipitate-flotation) facilities at Hayden were completed and placed in operation by the Ray Mines division, Kennecott Copper Corp. By being released from smelting the Ray concentrate, the American Smelting and Refining Co. smelter at Hayden accepted a greater tonnage of custom ore and concentrate. Duval Sulphur & Potash Co. continued the Development program for its new open-pit copper mine and the construction of its 12,000-ton-per-day mill at the Esperanza property scheduled for completion early in 1959. A decision was made by Phelps Dodge Corp. to enlarge the Lavender pit and thereby extend the life of the mine by 7 years. A decision was made by Miami Copper Co. to terminate underground operations at the Miami mine by the middle of 1959 and leach all remaining ore in place. This will lower the annual output but reduce copper recovery costs substantially. Preparation of the ground and installation of additional equipment and facilities for this change were begun. Exploration of a newly-discovered reported large low-grade copper deposit at the Mission project, near Tucson, and test work on samples of the ore by the American Smelting and Refining Co. progressed throughout the year.

REVIEW OF ARIZONA COPPER IN 1959

Source: U.S.B.M. Area Report D-106 Prepared in July, 1960

Arizona retained its position - held since 1910 - as the leading copper-producing State, and accounted for over one-half of the United States copper output in 1959. Copper accounted for 81 percent of the total value of Arizona's entire mineral production.

Several new developments of importance to the State's copper industry occurred during 1959. Duval Sulphur & Potash Co.'s Esperanza open-pit copper mine and 12,000-ton-per-day mill in Pima County began producing copper in March.

During the first half of the year, American Smelting and Refining Co. completed a 5-year exploration program on its Mission Project property - formerly called East Pima - 15 miles southwest of Tucson. At the July 28 meeting of the Board of Directors, an expenditure of \$43.5 million to bring the property into production in the next 3 years was authorized. Developing the copper ore body as an open-pit mine by stripping 200 feet of gravel-wash overburden was started. By the close of the year a contract for the construction of the milling facilities with a daily capacity of 15,000 tons of ore and an annual output of 45,000 tons of copper was let, and the general office building was completed and occupied.

Inspiration Consolidated Copper Co. reported that the McDonald shaft head-frame at its Christmas mine, 12 miles north of Winkelman, was nearing completion at the close of the year. The planned production rate for this mine - starting in 3 years - is 4,000 tons of ore daily or 36 million pounds of copper annually.

After three years of deep diamond drilling and geological surveying by its exploration subsidiary (Bear Creek Mining Co.), Kennecott Copper Corp. announced that it was buying a large group of 120 mining claims northeast of Safford. It was reported that a large copper mineralized area, consisting of mixed copper oxides and sulphides, was discovered. Phelps Dodge Corp. and American Metal Climax have also been exploring in this area.

Details of the third phase of its \$40-million expansion program were released in June by the Ray Mines Division, Kennecott Copper Corp. The property is now able to produce 20,000 additional tons of copper annually.

Underground mining at the Miami Mine came to an end on June 26 after 48 years of continuous activity. Extraction of the remaining recoverable copper in the mined-out area will be accomplished by in-place leaching and precipitation. It was announced that fewer pounds of copper would be produced annually from this operation, but the per pound cost for production of copper would be lower. The company still continues to produce copper at the old Castle Dome mine by water leaching of the old waste dumps. Mining and milling at the Copper Cities Division continued at about the same level as in 1958.

Phelps Dodge Corp. has started work on an estimated \$5 million expansion program on Lavender open-pit mine of its Copper Queen Branch. According to the company, the enlargement will increase the life of this open-pit mine by some 7 years to a total remaining operating life of about 15 years.

Bagdad Copper Corp. announced plans for the installation of a plant to produce sulfuric acid by burning sulfur for use in leaching copper from its oxide ore stockpile. This plant and facilities for handling the leach liquor and precipitating the copper from the solution will cost an estimated \$2 million, and the company expects to recover 40,000 pounds of copper per day by this addition.

In November Pima Mining Co. consummated a custom mining and milling agreement with the neighboring Banner Mining Co. under which Pima will enlarge its pit to include an adjoining portion of the Banner property and will mine and mill Banner's ore from this area.

Cypress Mines Corp. resumed operations in January at the Old Dick mine near Bagdad, after being inactive throughout 1958 and added a substantial quantity of copper output to the State in 1959.

Transarizona Resources, Inc. started stripping operations to develop its open-pit copper mine 28 miles south of Casa Grande. Transarizona mill, utilizing the segregation process for treating oxidized and mixed oxide-sulfide copper ores (which uses heat and then flotation for the recovery of copper), will be the first commercial plant of this type in the United States.

COPPER PRODUCTION RECORD OF ARIZONA COPPER MINES

1958 AND 1959

Source: U.S.B.M. & Company Reports

MINE	1959 *		1958	
	Tons Copper Ore Mined	Pounds Copper Recovered	Tons Copper Ore Mined	Pounds Copper Recovered
<u>PHELPS DODGE</u> - Morenci	10,513,000	149,993,293	13,039,187	193,175,391
New Cornelia	9,823,000	141,898,478	7,711,440	109,857,376
Lavender Pit	3,170,000	51,101,342	4,027,522	68,904,390
Copper Queen	373,395	39,111,962	499,257	58,530,950
Sub-Total - Phelps Dodge	23,879,395	382,105,075	25,277,406	430,468,107
<u>KENNECOTT</u> Ray	2,998,888	58,168,000	4,311,334	85,864,000
Inspiration	5,378,848	94,023,162	4,621,091	83,641,275
<u>MIAMI</u> - Miami	998,659	21,229,033	1,870,865	25,400,792
Copper Cities	3,060,575	36,939,297	2,768,390	36,072,087
Castle Dome	-	4,902,751	-	5,264,166
Sub-Total - Miami	4,059,234	63,071,081	4,639,255	66,737,045
<u>MAGMA</u> - San Manuel	7,595,867	92,340,444	11,486,300	149,401,672
Superior	276,387	26,017,688	391,084	41,315,344
Sub-Total - Magma	7,872,254	118,358,132	11,877,384	190,717,016
<u>A.S. & R.CO.</u> - Silver Bell	2,783,200	37,606,481	2,746,800	42,844,227
Pima	1,200,606	29,763,593	1,098,742	34,855,800
Bagdad	1,770,940	23,950,907	1,663,610	24,464,010
<u>DUVAL - ESPERANZA</u>	3,104,530	34,106,798	-	-
TOTAL	53,047,895	841,153,229	56,235,622	959,591,480
OTHER COPPER MINES	73,650	10,543,771	20,187	7,511,520
TOTAL COPPER MINES	53,121,545	851,697,000	56,255,809	967,103,000
MINES OTHER THAN COPPER	643,290	8,897,000	553,140	4,575,000
GRAND TOTAL ALL ARIZONA MINES	53,764,835	860,594,000	56,808,949	971,678,000

* 1959 Production affected by labor strikes at Morenci, Lavender Pit, Copper Queen, Ray, San Manuel and Superior.

ARIZONA MINE PRODUCTION OF COPPER, LEAD, ZINC, GOLD AND SILVER

1858-1959 Incl. - In Terms of Recoverable Metals

Source: U. S. B. M.

	COPPER		LEAD		ZINC	
	Short Tons	Value	Short Tons	Value	Short Tons	Value
1874-1958	16,226,489	\$ 6,111,662,626	590,347	\$ 114,161,548	777,564	\$ 187,975,153
1959.Only	430,297	264,202,000	9,999	2,300,000	37,325	8,585,000
Total 1874-1959	16,656,786	\$ 6,375,864,626	600,346	\$ 116,461,548	814,889	\$ 196,560,153
Avg. Price		\$ 0.19139		\$ 0.09700		\$ 0.12061

	GOLD		SILVER		
	Ounces	Value	Ounces	Value	TOTAL VALUE
1858-1958	12,326,047	\$ 318,906,535	350,640,657	\$ 269,714,918	\$ 7,002,420,780
1959 Only	124,627	4,362,000	3,898,000	3,528,000	282,977,000
Total 1858-1959	12,450,674	\$ 323,268,535	354,538,657	\$ 273,242,918	\$ 7,285,397,780
Avg. Price		\$ 25.964		\$ 0.77070	

Estimated value of other metals and non-metallics produced in Arizona through 1958	\$ 289,600,000
" " " " " " " " " " " " in 1959	43,900,000
Total est. value of other metals and non-metallics produced in Arizona through 1959	\$ 333,500,000
GRAND TOTAL VALUE OF ARIZONA MINERAL PRODUCTION THROUGH 1959	\$ 7,618,900,000

First year of reported production: Gold & Silver - 1858. Copper-1874. Lead-1894. Zinc-1905.

MINERAL PRODUCTION OF LARGE AND SMALL
PRODUCERS IN ARIZONA IN 1958

Compiled by Arizona Dept. of Mineral Resources
From U.S.B.M. Area Report, D-90 July 24, 1959

1958 Final Figures

LARGE COPPER PRODUCERS 1/

	Production	Value
Copper (lbs.)	952,000,000	\$250,376,000
Gold (ozs.)	114,000	3,990,000
Silver (ozs.)	3,400,000	3,077,000
Molybdenum (lbs.)	2,320,000	2,827,000
Total Value of Large Mine Production in 1958 . . .		\$260,270,000

SMALL MINERAL PRODUCERS

Beryllium Concentrate, short tons, gross weight . .	18	\$ 10,000
Clays 2/(short tons)	119,000	179,000
Coal (short tons)	8,000	54,000
Copper (recoverable content of ores, etc) (lbs.) . .	19,678,000	5,175,000
Gem stones	(4)	86,000
Gold (recoverable content of ores, etc) (troy ounces)	28,979	1,014,000
Iron ore (usable) long tons, gross weight	500	5,000
Lead (recoverable content of ores, etc) (lbs.) . . .	23,780,000	2,782,000
Lime (short tons)	126,000	1,817,000
Manganese ore & concentrate, (35-% or more Mn.) gross weight	62,279	5,220,000
Manganiferous ore & concentrate (5 to 35% Mn) . . .	1,455	32,000
Mercury - 76-pound flasks	53	12,000
Mica - (scrap) short tons	1,717	25,000
Perlite (crude) " "	(5)	(5)
Pumice " "	401,000	1,025,000
Sand and gravel " "	12,208,000	9,526,000
Silver (recoverable cont. of ores, etc) (troy ounces)	1,285,000	1,162,781
Stone (short tons)	1,528,000	2,731,000
Uranium ore (short tons)	257,756	7,049,000
Vanadium	(3)	(3)
Zinc (recoverable content of ores, etc) (lbs.) . . .	57,064,000	5,821,000
Value of items that cannot be disclosed: Asbestos, bentonite, cement, feldspar, fluorspar, gypsum, nitrogen compounds, petroleum, pyrites, and values indicated by footnote 3.		11,734,000
Total Value of Small Mine Production 5/		\$ 54,250,000
GRAND TOTAL VALUE OF MINERAL PRODUCTION 5/		\$314,520,000
PERCENTAGE DUE TO SMALL MINES		17.25%

FOOTNOTES:

- 1/ Phelps Dodge, Kennecott, Inspiration, Miami, Magma, A.S. & R. Co's Silver Bell, Pima and Bagdad.
- 2/ Excludes bentonite; value included with "Items that cannot be disclosed."
- 3/ Figure withheld to avoid disclosing individual company confidential data; value included with "Items that cannot be disclosed."
- 4/ Weight not recorded.
- 5/ Total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement and lime.

MINERAL PRODUCTION OF LARGE AND SMALL PRODUCERS IN ARIZONA IN 1959 *

LARGE COPPER PRODUCERS ^{1/}

	<u>PRODUCTION</u>	<u>VALUE</u>
Copper (lbs.)	841,153,000	\$ 258,234,000
Gold (ozs.)	100,000	3,500,000
Silver (ozs)	2,850,000	2,579,000
Molybdenum (lbs.)(content of concentrate) .	3,181,000	4,019,000
Total Value of Large Mine Production in 1959		<u>\$ 268,332,000</u>

SMALL MINERAL PRODUCERS:

Clays ^{2/} (short tons)	120,000	179,000
Coal (short tons)	7,000	63,000
Copper(recoverable content of ores,etc.)(lbs.)	19,441,000	5,968,000
Gem stones	(4)	88,000
Gold(recoverable content of ores,etc.)(troy ozs)	24,627	862,000
Lead(recoverable content of ores,etc.)(lbs.)	19,998,000	2,300,000
Lime (short tons)	123,000	1,666,000
Manganese ore and concentrate (35% or more Mn) (gross wt.)(short tons)	68,183	5,727,000
Manganiferous ore & concentrate(5-35%Mn)(gross s.t.)	10,693	234,000
Mercury (76-lb. flasks)	(3)	(3)
Mica (scrap)(short tons)	3,069	55,000
Pumice (short tons)	487,000	1,153,000
Sand and Gravel (short tons).	13,458,000	11,966,000
Silver(recoverable content of ores,etc.) (troy ozs.)	1,048,000	949,000
Stone (short tons).	2,468,000	3,998,000
Uranium Ore (short tons).	253,390	6,309,000
Zinc (recoverable content of ores,etc.)(lbs.)	74,650,000	8,585,000
Value of items that cannot be disclosed: Asbestos, cement, clays (bentonite), feldspar gypsum, perlite, pyrites, petroleum, vanadium, and values indicated by footnote 3		<u>9,837,000</u>
Total Value of Small Mine Production ^{5/}		<u>\$ 58,556,000</u>
GRAND TOTAL VALUE OF MINERAL PRODUCTION . . .		<u>\$ 326,888,000</u>
PERCENTAGE DUE TO SMALL MINES.		17.91%

FOOTNOTES:

- 1/ Phelps Dodge, Kennecott, Inspiration, Miami, Magma, A.S.&R.Co's Silver Bell, Pima, Bagdad and Duval's Esperanza.
- 2/ Excludes bentonite; value included with "Items that cannot be disclosed."
- 3/ Figure withheld to avoid disclosing individual company confidential data; value included with "Items that cannot be disclosed".
- 4/ Weight not recorded.
- 5/ Total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement and lime.

* Compiled from U. S. B. M. Area Report D-106, July 1960 - Final Figures 1959.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC
IN ARIZONA, IN THE YEAR 1958, BY CLASS OF ORE
IN TERMS OF RECOVERABLE METALS

Source: U.S.B.M. Final Figures

Source	Number of mines ^{1/}	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold -----	13	806	133	247	18,400	-----	-----
Dry gold-silver -----	7	67,369	706	14,116	1,179,900	3,300	-----
Dry silver -----	16	51,829	3	8,137	1,496,300	5,900	300
Total -----	36	120,004	842	22,500	2,694,600	9,200	300
Copper -----	43	56,255,809	114,262	3,543,044	913,973,800	21,500	683,700
Copper-zinc -----	2	5,961	11	3,204	301,100	6,300	1,524,600
Lead -----	19	6,571	189	56,153	14,300	3,179,100	169,900
Lead-zinc -----	3	361,488	27,420	1,052,987	1,059,500	20,555,700	49,411,300
Zinc -----	1	14,210	28	2,620	169,500	-----	5,271,600
Total -----	68	56,644,039	141,910	4,658,008	915,518,200	23,762,600	57,061,100
Other "lode" material:							
Gold and silver tailings-	2	8,075	70	748	52,300	-----	-----
Copper mill and smelter							
cleanings and cleanings-	-----	701	96	2,556	167,400	8,200	2,600
Copper precipitates -----	8	36,130	-----	-----	53,129,500	-----	-----
Uranium ore -----	-----	-----	2	758	116,000	-----	-----
Total -----	10	44,906	168	4,062	53,465,200	8,200	2,600
Total "lode" material-	100	56,808,949	142,920	4,684,570	971,678,000	23,780,000	57,064,000
Gravel (placer operations)-	4	-----	59	10	-----	-----	-----
Total, all sources ---	104	56,808,949	142,979	4,684,580	971,678,000	23,780,000	57,064,000

^{1/} Detail will not necessarily add to totals because some mines produce more than 1 class of material.

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC
IN ARIZONA IN THE YEAR 1959, BY CLASS OF ORE
IN TERMS OF RECOVERABLE METALS.

Source: U.S.B.M. Final Figures

Source	Number of mines ^{1/}	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	13	732	218	1,210	18,200	.....	.....
Dry gold-silver	8	68,959	985	19,520	991,300	.....	.....
Dry silver.....	17	57,247	3	12,153	1,050,100	12,800	9,200
Total	38	126,938	1,206	32,883	2,059,600	12,800	9,200
Copper	41	53,121,545	96,153	2,724,701	803,087,000	8,400	218,100
Copper-zinc	5	96,299	74	39,241	4,922,800	52,400	20,617,600
Lead	10	4,087	68	28,000	11,900	478,400	35,700
Lead-zinc	5	346,147	26,866	1,066,145	1,099,900	19,440,500	47,234,700
Zinc	1	16,139	27	1,757	163,200	.....	6,528,600
Total	62	53,584,217	123,188	3,859,844	809,284,800	19,979,700	74,634,700
Other "lode" material:							
Gold mill cleanings .....	.....	8	21	33	200	.....	.....
Gold and silver tailings ..	2	20,018	98	1,665	111,900	.....	.....
Copper smelter cleanings and cleanings .....	.....	969	36	1,307	167,300	5,500	2,100
Copper precipitates	13	32,685	.....	.....	48,610,000	.....	.....
Uranium ore .....	.....	.....	1	2,596	360,200	.....	4,000
Total	15	53,680	156	5,601	49,249,600	5,500	6,100
Total "lode" material ..	101	53,764,835	124,550	3,898,328	860,594,000	19,998,000	74,650,000
Gravel(placer operations) ...	3	.....	77	8	.....	.....	.....
TOTAL, ALL SOURCES	104	53,764,835	124,627	3,898,336	860,594,000	19,998,000	74,650,000

^{1/} Detail will not necessarily add to totals because some mines produce more than 1 class of material.

TABLE I

ESTIMATED VALUE OF METALS AND NON-METALLICS PRODUCED IN ARIZONA

YEARS 1858 - 1959 INCL.

Source: Arizona Bureau of Mines
United States Bureau of Mines

	<u>VALUE</u>
<u>METALS:</u>	
Copper	\$ 6,375,864,626
Gold	323,268,535
Silver	273,242,918
Zinc	196,560,153
Lead	116,461,548
Sub-total - 5 principal metals	<u>\$ 7,285,397,780</u>
<u>MISC. METALS:</u>	
Manganese	\$ 34,290,000
Molybdenum	31,038,000
Uranium (July 1,1955-1959-prior years undisclosed).	27,000,000
Tungsten	6,337,000
Mercury	1,500,000
Vanadium (to 1950 incl.,val.not disclosed thereafter)	460,000
Other Metals (val. undisclosed) beryllium concentrate, lithium, columbium-tantalum concentrate, iron ore and iron pyrite.....	-
Sub-total Misc.Metals (not including undisclosed?)	<u>\$ 100,625,000</u>
GRAND TOTAL ALL METALS(Not incl.undisclosed values)	<u>\$ 7,386,000,000</u>
ESTIMATED VALUE OF NON-METALLICS PRODUCED IN ARIZONA	<u>\$ 237,000,000</u>
GRAND TOTAL VALUE OF ARIZONA'S MINERAL PRODUCTION..	<u>\$ 7,623,000,000</u>

TABLE II

VALUE OF MINERAL PRODUCTION IN ARIZONA, BY COUNTIES

YEARS 1955.-56.-57.-58.-59

Source: U.S.B.M. YEARBOOK

County	1955 ^{1/}	1956	1957	1958	1959
Apache	\$ 731,066	\$ 3,691,829	\$ 3,164,474	\$ 4,324,954	\$ 4,233,943
Cochise	49,677,664	68,344,376	50,474,007	38,065,293	31,963,199
Coconino	64,045	1,884,705	2,864,384	4,394,124	4,884,107
Gila	66,684,347	76,785,677	50,935,723	43,124,640	50,239,827
Graham	674,745	531,609	290,079	20,402	153,582
Greenlee	95,328,130	111,374,672	67,052,744	53,073,897	48,084,455
Maricopa	3,315,210	3,959,377	6,206,000	5,370,894	6,698,542
Mohave	427,067	1,873,189	911,628	950,678	982,759
Navajo	104,443	793,823	1,495,443	2,253,126	3,170,572
Pima	82,748,688	91,431,712	75,739,870	66,089,879	91,324,508
Pinal	56,209,900	101,723,680	87,710,021	78,450,806	61,236,788
Santa Cruz	2,324,005	2,929,900	2,491,068	1,266,720	1,130,477
Yavapai	16,510,609	16,064,018	18,254,158	16,399,450	21,643,699
Yuma	99,088	331,363	1,117,509	1,652,166	1,794,254
Undistributed ^{2/}	4,332,066	4,344,641	5,230,422	288,528	682,697
Total ^{3/}	\$378,277,000	\$484,959,000	\$372,641,000	\$314,520,000	\$326,888,000

- ^{1/} Excludes value of manganese ore sold and blended at Gov't low-grade stock-piles for future beneficiation.
- ^{2/} Includes sand and gravel, vanadium, stone, gemstones, natural gas and uranium.
- ^{3/} Total has been adjusted to eliminate duplication in the value of raw materials used in the manufacture of cement and lime.