

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

STATISTICS FOR 1964 COMPARED WITH OTHER YEARS

ARIZONA, UNITED STATES AND WORLD

COMPILED BY ARIZONA DEPARTMENT OF MINERAL RESOURCES

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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 per cent 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 per cent eventually returns to use as copper or copper alloys.

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

Arizona Department of Mineral Resources

August, 1965

COPPER INDUSTRY IN 1964

Source: U.S.B.M. Preliminary Annual, Prepared December 14, 1964,
By F. L. Wideman, Physical Scientist. Substitution of Final Figures
From Mineral Market Survey for May, 1965, Prepared July 14, 1965.

"In response to a strong demand which began to accelerate in late 1963, rates of domestic copper production increased through the first half of 1964, and after being impeded by strikes in the third quarter, resumed their upward impetus in the final quarter, according to the Bureau of Mines, U. S. Department of the Interior. New record highs were established in U. S. and world mine production, in domestic smelter and refinery outputs from primary materials, and production of refined copper from secondary sources. Reflecting similar actions abroad, producers' prices for electrolytic copper in the United States rose twice during the year and closed at 34 cents a pound. In July dealers' prices in the United States and spot prices on the London Metal Exchange began to rise above producers' prices and almost doubled by October. As a result of short supplies caused by production or transportation problems, some major producers in the United States and abroad invoked "force majeure" on orders and rationed copper to customers."

Production of copper at United States mines totaled 1,246,780 tons, an increase of 2.77 percent over 1963's production of 1,213,166 tons, but only 1.5 percent over the record production of 1,228,421 tons in 1962. Output averaged 120,000 tons monthly in January-June, but fell to 75,000 tons in July and August as a result of strikes and vacations. Production turned upward in September and reached a peak of 115,000 tons in October. Production in Arizona rose 4 percent to a new record (690,988 tons) and the State supplied 55 percent of the national total. Despite a strike of almost 3 months' duration, Utah remained in second place and contributed 16 percent of the total with 199,588 tons. Montana regained third place with a production of 103,806 tons, the highest in two decades. Fourth place went to New Mexico with 86,104 tons. As a result of strikes at some mines that adversely affected production, output from Michigan dropped 8 percent, yet Michigan made fifth place with 69,040 tons, replacing Nevada which had dropped 15 percent to 67,272 tons.

Smelter production in 1964 amounted to 1,338,433 tons, with domestic tonnage 1,301,115 and foreign tonnage 37,318. Total tonnage smelted was 3.2% above 1963's tonnage of 1,296,700. Refinery production for 1964 came to 1,656,395 tons, made up of 1,259,852 domestic tons, and 396,543 foreign tons, an increase of 3.76 percent over total refinery production for 1963. Refined copper produced from secondary materials increased 13 percent above the output for 1963 and established a new high.

Imports of unmanufactured copper totaled 579,296 tons in 1964 indicating an increase of 8 percent for the year. Of the total imports, Chile supplied 44 percent; Peru 14.5 percent; Canada 19 percent; U. of So. Africa 7 percent. Exports of refined copper in 1964 were practically unchanged at 321,645 tons. A large percentage of the exports went to European countries, principally France, Italy, United Kingdom and West Germany. Substantial shipments were made to India, but exports to Japan increased from 15,500 to 20,621 tons.

Consumption of refined copper totaled 1,825,281 tons, an increase of 4.6 percent over 1963.

Stocks of refined copper totaled 52,000 tons at the beginning of 1964 and dropped to 37,000 tons at the end. Inventories of unrefined copper at the end of 1964 totaled 246,000 tons, as compared with 252,000 tons at the end of 1963.

"The first change in the price of copper since May 14, 1961, occurred March 13 when the two large producers in Rhodesia, Anglo-American Corp. and Rhodesian Selection Trust, Ltd., announced a cent-a-pound increase in their fixed selling price. On the same day American Smelting and Refining Company posted a spot price of 32 cents a pound. Other large producers in the United States and abroad increased their prices effective March 16 or soon thereafter. Apparently in part reacting to pressure from the Government of Chile, The Anaconda Company and Kennecott Copper Corp. raised the price of copper produced in Chile and sold in Europe to 32½ cents a pound on August 13 and 17, respectively. On August 18, producers in Africa and Canada raised prices on copper sold in Europe comparably. On September 22 prices of domestic copper rose 2 cents to 34 cents a pound. A multiple-price market was created when the price of copper exported from Chile was increased 2½ cents to 35 cents a pound on October 6 and a producer in the United States increased its price for domestically produced copper sold in Europe a cent-a-pound above the producers' domestic price of 34 cents." The average E. & M.J. price of copper for 1964 was 31.960 cts. per pound.

"Strikes that began July 2 and varied from 37 to 81 days, halted operations of Kennecott Copper Corp. in Arizona, Nevada, New Mexico, and Utah. Strikes closed plants of the White Pine Copper Co. in Michigan from September 1 to October 19. Production in Chile and Northern Rhodesia was affected by short-term strikes and work slow-downs. The El Salvador mine and Potrerillos smelter of the Andes Copper Mining Co. were closed from February 1 to March 21 and production ceased at Kennecott's Braden mine from July 1 to 25."

"The Mineral Park concentrator near Kingman, Ariz., began operating at half capacity late in the year. The plant has a rated full capacity of 12,000 tons a day from which about 300 tons of concentrate will be recovered daily. It was reported that Duval Corp. invested \$32 million in the Mineral Park establishments."

"Texas Gulf Sulfur Co. announced the discovery of a large deposit of zinc-copper-silver ore north of Timmins, Ontario. The company continued to explore the deposit and began planning open-pit mining and processing operations. Calumet and Hecla, Inc. and United States Smelting, Refining and Mining Company, respectively, announced the discovery of copper deposits near Calumet, Mich., and Hurley, N. Mex. Both companies were developing the ore bodies which will be mined by underground methods."

"Production gains in many countries raised 1964 world mine production to a new record high. Australia, however, became an importing nation as a result of the closure of operations at Mount Isa by strike."

"Because the name Rhodesia would apply to Southern Rhodesia only after October 24, directors of the Rhodesian Selection Trust, Ltd., proposed to change the name of the parent company to Roan Selection Trust. It was also proposed to change the name of the Roan Antelope Division of Rhodesian Selection Trust, Ltd., to Luanshya Division of RST and that subsidiary companies whose names begin with Rhodesian Selection Trust use the letters RST in the future."

"A 6-month-trial period began October 2 at the newly built Las Ventanas smelter about 125 miles north of Santiago, Chile. The smelter will have an annual capacity of 150,000 tons of ore which will yield about 30,000 tons of copper."

"Bureau of Mines Report of Investigations 6423, Leaching Copper Sulfide with Selected Autotrophic Bacteria, by Joseph A. Sutton and J. D. Corrick, was published. Information on Laboratory research was published in Bureau of Mines Report of Investigations 6481, Smelting Copper Reverberatory Slags to Recover Iron of Low Copper and Sulfur Content, by V. E. Edland; and R.I. 6486, Preparation of Copper Powder from Leach Solutions after Precipitation with Iron, by R. D. Groves."

O U T L O O K

As reported by Arizona Department of Mineral Resources.

James Boyd, Copper Range Co. president, recently named as "Copper Man of the Year 1964," addressed an "Investment Outlook Conference" and has been quoted in the American Metal Market of January 20, 1965, as foreseeing the copper industry on the threshold of stability.

Mr. Boyd said the current copper shortage should end within the next few months. He stated that steadily increasing worldwide production will soon be in balance with the increasing demand for the metal.

Mr. Boyd also told the conference that it should not be misled by the current high prices for copper on the London Metal Exchange and the New York Commodity Exchange. "Actually less than 15% of the copper supply is bought through these markets; most of the copper goes directly from the producers to the copper user." U. S. producers' price of copper is 34 cents a pound.

"The current copper shortage," Mr. Boyd said, "is due to labor strikes and political unrest in some of the copper producing countries. Well over 90% of the world's mines are now back in full production, so supply should catch up to demand within the next few months."

In outlining a promising future for the copper industry, Mr. Boyd said that the industry is now more active than ever in developing new uses for copper. He said the industry has nothing to fear from possible use of other metals as a substitute for copper.

"Copper is the oldest of the metals which have been utilized by man; the Bronze Age Antedated the Iron Age by many thousands of years. In recent years, glamorous materials such as aluminum and plastics have been used as substitutes for copper, and yet the consumption of copper in the world has been doubled since World War II."

Mr. Boyd cited his own company, Copper Range, as an example of the progress and growth of the Copper industry. In its White Pine mine in the upper peninsula of Michigan, Mr. Boyd said that "recent geological surveys and core drilling show that the ore reserves at White Pine probably account for well over 10% of the

total known U. S. copper reserves of a high enough grade to be profitably mined."

The Copper Range president said his company has spent the past few years working on developing new uses for Lake copper and new approaches to marketing. "Copper Range is steadily increasing production at White Pine, and new mining techniques may make it possible for the company to begin a major expansion of production in the future."

KENNECOTT'S MILLIKEN VIEWS COPPER'S FUTURE

Frank R. Milliken, Kennecott president, in a letter to stockholders said, "Our customers both here and abroad expect their business to be strong in the first half of the current year." He added:

"An apparent easing of the tight copper supply situation is evidenced by recent lower prices on the metal exchanges. For example, the London Metal Exchange price, which was as high as 65¢ per pound in December, 1964, is now down to 42¢. This is still materially above our prices in the United States and in Europe."

"Kennecott expects its business for the first half of 1965 to be good."

Mr. Milliken also commented about the agreement between Kennecott and the Chilean Government to form a new corporation to take over the assets and operations of Kennecott's Braden Copper Co. Mr. Milliken said that a bill submitted to the Chilean Congress by the President of Chile would authorize the President to enter into this proposed agreement.

Anaconda Copper Co. also has been negotiating a similar agreement between Chuquicamata and the Chilean Government. As a result, a 700,000 tpy increase in Free World capacity has been forecast within the next four years by Asarco's Simon Strauss. Chile will be a strong force to be reckoned with in the future. President Frei has announced that output in Chile will be pushed from the present rate of 617,000 metric tpy to 1.1 million tpy by 1970.

PRESENT AND FUTURE COPPER PRODUCTIVE CAPACITY

The Engineering and Mining Journal has made a Project Survey reporting "conditions that come closest to matching today's galloping activity in the post World War II-Korean war era when pent-up consumer appetites demanded more copper, badly needed by the government for defense. One important feature, however, sets present project activity apart from the war-born demand of the early 1950's. Anticipated future growth in mineral production capacity is pretty well spread across the full spectrum of commodities and not confined to a few 'critical' items."

Table XIII gives this Department's estimate of the annual copper production capacity, as reported by the Arizona Department of Mineral Resources and the estimate made by a Project Survey conducted by the Engineering and Mining Journal, and reported in the Journal's issue of January 1965, showing their estimate of increase in capacity from 1962 to the end of 1969.

COMMENTS ON TABLES XII AND XIV

A study of United States copper production and consumption figures (Table XII), by years from 1945 to 1954 inclusive, and years 1955 to 1964 inclusive, brings out some pertinent statistics. The small increase in domestic consumption of refined copper is especially notable.

The average annual domestic consumption from 1945 to 1954 inclusive (10 years) was 1,364,982 tons, and from 1955 to 1964 inclusive (10 years) it was 1,506,687 tons, and increase of only 10.38 percent for the 10 years, or only 1.04 percent increase per year, when one might expect a normal growth-rate of at least 2 or 3 percent per year. The growth-rate in production of refined copper for the two ten-year periods was 3.1 percent per year.

Production of refined copper in the second period (1955 to 1964) averaged 91.4 percent of U. S. consumption, as compared with an average of only 77.0 percent in the first period (1945-1954). Such capacity should permit economical operation for most of the big producers at an 85 to 90 percent of capacity during a recession or lull in demand.

Meanwhile, a copper tariff high enough to bar out low-cost foreign copper should always be kept in mind, as from now on domestic copper will be mostly high-cost due chiefly to lowering grades of ore and rapidly increasing costs. The new producers, which have brought about this new productive capacity, must be kept active, not only for security reasons but for employment stability in a very important industry in our economy.

A study of Table XIV shows that during the last 3 years it took an annual average of 62,018,979 man-hours of U. S. labor at \$2.917 per hour to produce 150,622,238 tons of copper ore, with a recovery of 2,325,518,000 pounds of equivalent copper; a labor cost of \$180,783,696 for copper mining, or \$0.0777 per pound of copper.

With foreign ores assaying more than twice the grade of U.S. ores and foreign labor averaging less than half the U. S. wage-rate, it is easy to calculate a foreign copper mining labor cost of less than half the U.S. labor cost of producing a pound of copper. As the object of a copper tariff primarily is to equate the difference in wage cost per pound of copper, such a tariff should be at least double the present tariff of 1.7 cents per pound of copper.

In order to insure continuous production of the number one strategic metal, the domestic copper industry must be protected against a flood of low-cost foreign metal. Our foreign aid program has helped the foreign producer to develop his copper production techniques, and he can find a ready market for his product in a rapidly expanding economy throughout the world. The growth-rate of copper consumption throughout Europe has been truly amazing. According to the Copper Institute figures for deliveries of refined copper outside the U.S.A., the average annual consumption for the 10-year period (1945-1954) was slightly less than one million tons, and for the 10-year period (1955-1964) it was over two million tons.

TABLE I

SALIENT U. S. COPPER STATISTICS

YEARS 1962, 1963 AND 1964

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

	1962	1963	1964
Arizona Mine Production - Tons Copper . . .	644,242	660,977	690,988
U. S. Mine Production Tons Copper . . .	1,228,421	1,213,166	1,246,780
World Mine Production Tons Copper . . .	5,090,000	5,220,000	5,420,000
Refined Stocks - Beginning of Period . . .	49,000	71,000	52,000
Refined Stocks - End of Period . . .	71,000	52,000	37,000
Refinery Production (From Domestic Ores) . .	1,214,146	1,219,342	1,259,852
Refinery Production (From Foreign Ores). . .	397,584	377,009	396,543
Secondary Copper Recovered from Scrap as Unalloyed Copper . . .	301,374	314,643	366,197
<u>IMPORTS:</u>			
Copper from Ore, Matte, Regulus . . .	43,552	49,128	52,012
Blister Copper . . .	331,686	368,985	389,577
Refined Copper . . .	98,820	118,447	137,707
Total Imports - Crude & Refined . . .	474,058	536,560	579,296
<u>EXPORTS:</u>			
Copper in Ores, etc. . . .	1,916	1,210	5,415
Refined Copper . . .	336,525	311,477	316,230
Total Exports - Crude & Refined . . .	338,441	312,687	321,645
EXCESS IMPORTS OVER EXPORTS . . .	135,567	223,873	257,651
<u>CONSUMPTION:</u>			
New Refined (Apparent Consumption) . . .	1,352,000	1,423,000	1,493,000
Total Refined (Actual) . . .	1,599,676	1,744,273	1,825,281
U. S. Mine Prod. % of Appar. Consumption .	90.9	85.3	83.5
Average E. & M.J. Price of Copper . . .	30.600¢	30.600¢	31.960¢

T A B L E II

MINE PRODUCTION OF RECOVERABLE COPPER IN THE UNITED STATES

1962-1964, BY STATES, IN SHORT TONS

STATE	1962	1963	1964
Alaska	- -	- -	11
Arizona	644,242	660,977	690,988
California	1,162	916	1,035
Colorado	4,534	4,169	4,653
Idaho	3,861	4,172	4,666
Michigan	74,099	75,262	69,040
Missouri	2,752	1,816	2,059
Montana	94,021	79,762	103,806
Nevada	82,602	81,738	67,272
New Mexico	82,683	83,037	86,104
Oregon	<u>1/</u>	<u>2/</u>	15
Pennsylvania <u>3/</u>	6,108	4,434	3,614
South Dakota	- -	1	- -
Tennessee	14,298	13,717	13,889
Utah	218,018	203,095	199,588
Washington <u>4/</u>	41	70	35
Wyoming	- - -	- - -	5
Total	1,228,421	1,213,166	1,246,780

1/ Included with Pennsylvania for 1961-62 to avoid disclosing operations of individual companies.

2/ Included with Washington for 1963 to avoid disclosing operations of individual companies.

3/ Includes North Carolina for 1959-62 and Oregon for 1961-62 to avoid disclosing operations of individual companies.

4/ Includes North Carolina and Oregon for 1963 to avoid disclosing operations of individual companies.

TABLE III

ARIZONA, UNITED STATES, AND WORLD MINE PRODUCTION OF COPPER, In Short Tons

E. & M. J. DOMESTIC PRICE OF COPPER

By Years 1912 - 1964 Incl.

Source: U. S. Geological Survey: Mineral Resources; U.S.B.M. Minerals Yearbooks

Year	Tons	ARIZONA		UNITED STATES		WORLD	E.&M.J.
		% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
Beginning of Records							
1874 - 1,759,221 thru 1911							
1912	182,519	29.2	16.2	624,547	55.5	1,125,656	16.341¢
1913	203,962	33.0	18.6	617,755	56.2	1,099,366	15.269
1914 1/	196,509	34.2	19.0	574,216	55.5	1,034,487	13.602
1915 1/	229,986	30.9	19.6	744,036	63.4	1,173,150	17.275
1916 1/	360,917	36.0	23.2	1,002,938	64.6	1,553,498	27.202
1917 1/	356,083	37.6	22.2	947,717	59.1	1,602,914	27.180
1918 1/	382,428	40.0	24.2	955,011	60.5	1,579,246	24.628
1919	269,050	44.4	24.6	606,167	55.3	1,095,697	18.691
1920	279,128	45.6	26.4	612,275	58.0	1,056,014	17.456
1921 2/	92,517	39.7	15.1	233,095	38.0	613,987	12.502
1912-1921	2,553,099	36.9	21.4	6,917,757	58.0	11,934,015	20.497¢
1922	200,022	41.5	21.4	482,292	48.2	935,374	13.382¢
1923	309,464	41.9	22.8	738,870	54.5	1,355,327	14.421
1924	338,876	42.2	23.0	803,083	54.5	1,472,712	13.024
1925	356,678	42.5	22.6	839,059	53.2	1,576,998	14.042
1926	361,648	41.9	22.7	862,638	54.0	1,596,147	13.795
1927	341,095	41.3	20.5	824,980	49.5	1,666,694	12.920
1928	366,133	40.5	19.2	904,898	47.5	1,903,672	14.570
1929	415,314	41.6	19.3	997,555	46.4	2,150,587	18.107
1930 3/	288,095	40.9	16.2	705,074	39.7	1,775,805	12.982
1931 3/	200,672	37.9	13.0	528,875	34.2	1,545,425	8.116
1922 to 1931	3,178,002	41.3	19.8	7,687,324	48.1	15,978,741	13.867¢

(Continued)

TABLE III (Continued)

Year	ARIZONA			UNITED STATES		WORLD	E.&M.J.
	Tons	% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
1932 3/	91,246	33.3	8.0	233,111	20.9	1,138,676	5.555¢
1933 3/	57,021	29.9	4.9	190,643	16.4	1,159,000	7.025
1934 3/	89,041	37.5	6.3	237,401	16.8	1,415,353	8.428
1935 3/	139,015	36.0	8.4	386,491	23.5	1,647,939	8.649
1936 3/	211,275	34.4	11.1	614,516	32.4	1,899,263	9.474
1937	288,475	34.3	11.2	841,998	32.8	2,567,916	13.167
1938 4/	210,797	37.8	9.3	557,763	24.5	2,274,045	10.000
1939 5/	262,117	36.0	10.6	728,320	29.4	2,481,277	10.965
1940 5/	281,169	32.0	10.5	878,086	32.7	2,688,510	11.296
1941 5/	326,317	34.1	11.2	958,149	33.0	2,903,458	11.797
1932 to 1941	1,956,473	34.7	9.7	5,631,478	27.9	20,175,437	10.566¢
1942 5/	393,387	36.4	12.9	1,080,061	35.5	3,039,041	11.775¢
1943 5/	403,181	37.0	13.2	1,090,818	35.6	3,064,394	11.775
1944 5/	358,303	36.8	12.5	972,549	33.9	2,866,000	11.775
1945	287,203	37.2	12.0	772,894	32.2	2,400,000	11.775
1946	289,223	47.5	14.1	608,737	29.6	2,056,000	13.820
1947	366,218	43.2	14.6	847,563	33.9	2,500,000	20.958
1948 6/	375,121	44.9	14.4	834,813	32.1	2,600,000	22.038
1949 6/	359,010	47.7	14.4	752,750	30.1	2,500,000	19.202
1950	403,301	44.4	14.4	909,343	32.5	2,760,000	21.235
1951	415,870	44.8	14.3	928,330	32.0	2,900,000	24.200
1942 to 1951	3,650,817	41.5	13.7	8,797,858	33.0	26,685,435	16.699¢

(Continued)

TABLE III (Continued)

YEAR	Tons	ARIZONA		UNITED STATES		WORLD	E.&M.J.
		% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
1952	395,719	42.8	13.1	925,359	30.6	3,020,000	24.200¢
1953	393,525	42.5	12.9	926,448	30.4	3,050,000	28.798
1954 <u>7/</u>	377,927	45.2	12.2	835,472	27.0	3,100,000	29.694
1955	454,105	45.5	13.3	998,570	29.2	3,420,000	37.491
1956	505,908	45.7	13.4	1,104,156	29.1	3,790,000	41.818
1957	515,854	47.5	13.3	1,086,141	27.9	3,890,000	29.576
1958	485,839	49.6	12.9	979,329	25.9	3,780,000	25.764
1959	430,297	52.2	10.7	824,846	20.5	4,020,000	31.182
1960	538,605	49.9	11.7	1,080,169	23.5	4,590,000	32.053
1961	587,053	50.4	12.1	1,165,155	24.0	4,850,000	29.921
1952 to 1961	4,684,832	47.2	12.5	9,925,645	26.5	37,510,000	31.238¢
1962	644,242	52.4	12.7	1,228,421	24.1	5,090,000	30.600¢
1963	660,977	54.5	12.7	1,213,166	23.3	5,210,000	30.600
1964	690,988 <u>8/</u>	55.4	12.7	1,246,780 <u>9/</u>	23.0	5,420,000 <u>10/</u>	31.960
1962 to 1964	1,996,207	54.1	12.7	3,688,367	23.5	15,720,000	31.059¢
1874 to 1964	ARIZONA ONLY 19,778,651 Tons at 20.9842¢ per pound = \$ 8,300,781,000						

NOTES: 1/ World War I 1914 - 1918.

2/ Post World War I Recession. Lasted about one year.

3/ Depression began in 1930; was at its worst in 1933; gradually improved till 1937.

4/ Recession in 1938. Recovery in 1939 caused by War demand.

5/ World War II began in 1939; copper consumption reached its height in 1944.

6/ 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.

7/ 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.

8/ Highest annual production in history of Arizona.

9/ Highest annual production in history of United States.

10/ Highest annual production in history of the World.

TABLE IV

MINE PRODUCTION RECOVERABLE COPPER - PRODUCTION SECONDARY UNALLOYED COPPER
REPORTED REFINED COPPER CONSUMPTION IN U.S.A.
ESTIMATED WORLD REFINED COPPER CONSUMPTION

Year	MINE PRODUCTION RECOVERABLE <u>1/</u>				SECONDARY COPPER PRODUCTION		
	United States	Rest of Free World	Communist Controlled	TOTAL WORLD	United States <u>1/</u>	Rest of World <u>2/</u>	TOTAL WORLD <u>2/</u>
1954	835,472	1,749,000	416,000	3,100,000	212,000	400,000	612,000
1955	998,570	1,955,000	451,000	3,405,000	247,000	595,000	842,000
1956	1,104,156	2,171,000	515,000	3,790,000	273,000	537,000	810,000
1957	1,086,859	2,259,000	544,000	3,890,000	248,000	547,000	795,000
1958	979,329	2,217,000	584,000	3,780,000	255,000	525,000	780,000
1959	824,846	2,590,000	605,000	4,020,000	262,000	520,000	782,000
1960	1,080,169	2,829,000	681,000	4,590,000	300,000	550,000	850,000
1961	1,165,155	2,873,000	812,000	4,850,000	280,000	620,000	900,000
1962	1,228,421	2,888,579	933,000	5,050,000	301,000	900,000	1,200,000
1963	1,213,166	3,015,088	991,746	5,210,000	315,000	1,040,000	1,355,000
1964	1,246,780	3,152,593	1,020,627	5,420,000	366,000	1,225,000	1,591,000

	CHANGE IN STOCKS	REPORTED CONSUMPTION	ESTIMATED CONSUMPTION
	Total World	United States <u>1/</u>	Total World <u>2/</u>
1954	141,000 D	1,254,000	3,853,000
1955	20,000 I	1,502,000	4,227,000
1956	133,000 I	1,521,000	4,467,000
1957	104,000 I	1,348,000	4,581,000
1958	196,000 D	1,251,000	4,756,000
1959	30,000 I	1,463,000	4,772,000
1960	134,000 I	1,350,000	5,300,000
1961	20,000 D	1,463,000	5,730,000
1962	64,000 I	1,600,000	6,186,000
1963	5,000 D	1,744,000	6,575,000
1964	148,000 D	1,825,000	7,149,000

1/ Source: U.S.B.M. 2/ Estimated. No official records have been published of either secondary unalloyed copper or of world consumption. Estimates are calculated from: "World Mine Production (U.S.B.M.) plus estimated secondary unalloyed copper, plus or minus change in stocks (Decrease or Increase)"

TABLE V

WORLD MINE PRODUCTION OF RECOVERABLE COPPER

BY CONTINENTS AND PRINCIPAL COUNTRIES IN THOUSANDS SHORT TONS

Years 1961, 1962, 1963 and 1964

Source: U.S.B.M.

	1961	1962	1963	1964
NORTH AMERICA:				
U.S.A.	1,165	1,228	1,213	1,247
Canada	450	465	458	495
Mexico	54	52	62	58
Other	11	14	21	22
	1,680	1,759	1,754	1,822
SOUTH AMERICA:				
Chile	604	646	663	695
Peru	218	183	196	192
Other	4	4	5	8
	826	833	864	895
EUROPE:				
U.S.S.R.	600	700	770	770
Yugoslavia	55	57	68	70
Others	154	162	176	180
	809	919	1,014	1,020
ASIA:				
China	110	110	99	99
Cyprus	32	28	29	19
Japan	106	114	118	117
Philippines	57	60	70	67
Turkey	32	31	28	35
Others	13	19	31	33
	350	362	375	370
AFRICA:				
No. Rhodesia (Zambia)	633	620	648	742
Belg. Congo	325	325	298	306
U. of So. Africa	58	51	61	66
Others	67	63	75	80
	1,083	1,059	1,082	1,194
AUSTRALIA:	102	118	128	117
TOTAL WORLD	4,850	5,090*	5,220	5,420

* Corrected total for 1962.

TABLE VI

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

Years	1959-1964	Source: U.S.B.M.	Unit: Short Tons
	Year 1959	Year 1960	Year 1961
Ref. Prod. of New Cu from U.S. Ores	796,452	1,121,286	1,181,015
Ref. Prod. of New Cu From Foreign Ores	301,795	397,641	369,124
Total Ref. Prod. of New Copper	1,098,247	1,518,927	1,550,139
Imports of Refined Copper	214,056	142,709	66,855
Stocks at beginning of period	48,000	18,000	98,000
Total Available Supply	1,360,303	1,679,636	1,714,994
Exports of Refined Copper	158,938	433,762	432,253
Stocks at end of period	18,000	98,000	49,000
TOTAL	176,938	531,762	481,253
Withdrawn on Domes.Acc.(Apparent Cons.)	1,183,000	1,148,000	1,234,000
Reported Actual Consumption	1,463,031	1,349,896	1,462,830

	Year 1962	Year 1963	Year 1964
Ref. Prod. of New Cu from U.S. Ores	1,214,146	1,219,342	1,259,852
Ref. Prod. of New Cu from Foreign Ores	379,584	377,009	396,543
Total Ref. Prod. of New Copper	1,611,730	1,596,351	1,656,395
Imports of Refined Copper	98,820	119,165	137,707
Stocks at beginning of period	49,000	71,000	52,000
Total Available Supply	1,759,550	1,786,516	1,846,102
Exports of Refined Copper	336,525	311,479	316,230
Stocks at end of period	71,000	52,000	37,000
TOTAL	407,525	363,479	353,230
Withdrawn on Domes.Acc.(Apparent Cons.)	1,352,000	1,423,000	1,493,000
Reported Actual Consumption	1,599,676	1,744,273	1,825,281

TABLE VII

IMPORTS OF COPPER INTO UNITED STATES1962, 1963 and 19641959, 1960 and 1961

Source: U.S.B.M. & American Metal Market

	1962	1963	1964
Ore Matte-Regulus (Copper Content)	43,552	49,128	52,012
Canada	18,176	15,759	25,029
Chile	22	1,712	2,078
Mexico	244	401	1,027
Peru	6,899	9,189	8,244
Philippines	10,126	15,335	9,487
U. of So. Africa	5,751	4,047	3,605
Australia	751	1,151	1,015
Other Countries	1,583	1,534	1,527
Blister Copper (Copper Content)	331,686	368,985	389,577
Mexico	23,473	21,892	12,386
Chile	224,516	219,220	251,092
Peru	65,234	81,123	75,664
U. of So. Africa	18,409	31,309	39,161
Other Countries	54	15,441	11,274
Refined Cathodes and Shapes	98,820	118,447	137,707
Canada	76,600	73,277	84,877
Chile	856	6,728	917
United Kingdom	845	10	2,513
Rhodesia & Nyasaland	18,997	11,191	11,979
Other Countries	1,522	27,241	36,021
TOTAL IMPORTS	474,058	536,560	579,296
TOTAL EXPORTS	338,441	312,687	321,645
EXCESS IMPORTS	135,617	223,873	257,651
YEARS	1959	1960	1961
TOTAL IMPORTS	584,244	519,402	454,460
TOTAL EXPORTS	162,683	444,873	436,731
EXCESS IMPORTS	421,561	74,529	17,729

TABLE VIII

EXPORT OF COPPER FROM THE UNITED STATES
1962, 1963 and 1964

Source: U.S.B.M. and Bureau of Census

	1962	1963	1964
Ore, Concts. & Matte	1,916	1,210	5,415
Refined Ingots, Bars, etc.	336,525	311,477	316,230
Argentina	8,931	1,809	5,738
Australia (Oceania)	- - -	1,101	5,101
Belgium-Luxembourg	1,574	3,298	1,001
Brazil	4,765	5,116	3,912
Canada	1,013	4,130	7,908
Denmark	- - -	1,652	1,826
Finland	- - -	327	76
France	39,044	38,038	34,610
Germany, West	67,353	69,228	58,804
Greece	- - -	474	- - -
India	65,124	55,539	47,219
Italy	54,314	56,240	55,454
Japan	13,134	15,500	20,621
Netherlands	6,467	7,973	5,394
Norway	2,658	2,856	4,261
Sweden	3,861	4,285	3,868
Switzerland	4,126	4,451	3,397
Taiwan	540	986	128
United Arab Republic	- - -	- - -	- - -
United Kingdom	52,186	33,081	54,929
Yugoslavia	6,554	551	- - -
Other Countries	4,881	4,842	1,983
TOTAL EXPORTS (Crude-Refined)	338,441	312,687	321,645

TABLE IX
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 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
Year 1960	98,000	139,272	288,510
Year 1961	49,000	79,755	332,479
Year 1962	71,000	117,441	358,856
Year 1963	52,000	76,934	394,143
Year 1964	37,000	45,594	277,303

* 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 X
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	TOTAL
		IN PROCESS OF REFINING 1/	
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
Year 1960	98,000	261,000	359,000
Year 1961	49,000	236,000	285,000
Year 1962	71,000	246,000	317,000
Year 1963	52,000	252,000	304,000
Year 1964	37,000	246,000	283,000

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

TABLE XI

REFINED COPPER CONSUMED IN U. S. 1961-1964
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
1961:							
Wire Mills	604	812,065	10,356	- - - -	- - - -	774	823,799
Brass mills	119,172	42,391	95,943	152,876	189,333	50	599,765
Chemical plants	- - - -	- - - -	720	- - - -	- - - -	549	1,269
Secondary smelters	6,782	- - - -	2,390	172	- - - -	160	9,504
Foundries	6,157	92	9,186	- - - -	720	923	17,078
Miscellaneous <u>1/</u>	2,532	4	4,072	25	505	4,277	11,415
Total	135,247	854,552	122,667	153,073	190,558	6,733	1,462,830
1962:							
Wire mills	- - - -	913,131	8,964	- - - -	- - - -	813	922,908
Brass mills	113,402	42,799	97,090	184,085	198,676	97	636,149
Chemical plants	- - - -	- - - -	761	- - - -	- - - -	727	1,488
Secondary plants	7,368	- - - -	1,928	159	- - - -	5	9,460
Foundries	5,760	41	8,417	30	327	1,803	15,658
Miscellaneous <u>1/</u>	1,066	1	7,259	24	602	5,061	14,013
Total	127,596	955,972	124,419	184,298	199,605	7,786	1,599,676
1963:							
Wire mills	- - - -	1,024,093	11,271	- - - -	- - - -	798	1,036,162
Brass mills	145,271	44,250	87,832	186,876	209,576	102	673,907
Chemical plants	- - - -	- - - -	726	- - - -	- - - -	512	1,238
Secondary smelters	1,906	- - - -	1,731	11	- - - -	4	3,652
Foundries	3,575	118	7,584	12	413	1,450	13,152
Miscellaneous <u>1/</u>	1,163	- - - -	9,114	23	572	5,290	16,162
Total	151,915	1,068,461	118,258	186,922	210,561	8,156	1,744,273
1964:							
Wire mills	- - - -	1,086,215	10,424	- - - -	- - - -	879	1,097,518
Brass mills	129,944	44,756	111,506	184,434	219,651	115	690,406
Chemical plants	- - - -	- - - -	1,621	- - - -	- - - -	550	2,171
Secondary smelters	2,291	- - - -	2,308	9	- - - -	113	4,721
Foundries	3,792	61	9,654	- - - -	310	1,122	14,939
Miscellaneous	1,023	38	7,565	(2/)	700	6,200 <u>3/</u>	15,526
Total	137,050	1,131,070	143,078	184,943	220,661	8,979	1,825,281

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

2/ Included with other to avoid disclosing individual company data.

3/ Includes cakes and slabs to avoid disclosing individual company data.

TABLE XII

U. S. PRODUCTION AND CONSUMPTION OF COPPER

Source: U.S.B.M.

YEAR	MINE PRODUCTION	SECONDARY PRODUCTION*	TOTAL	TOTAL ACTUAL CONSUMPTION	PRODUCTION AS % OF CONSUMPTION
1945	772,894	112,856	885,750	1,379,272	64.2
1946	608,737	136,909	745,646	1,187,009	62.8
1947	847,563	303,092	1,150,655	1,463,294	78.6
1948	834,813	284,026	1,118,839	1,420,584	78.8
1949	752,750	250,089	1,002,839	1,129,686	88.8
1950	909,343	260,704	1,170,047	1,424,434	82.2
1951	928,330	186,462	1,114,792	1,416,865	78.7
1952	925,359	173,904	1,099,263	1,479,732	74.3
1953	926,448	242,855	1,169,303	1,494,215	78.3
1954	835,472	212,241	1,047,713	1,254,729	83.5
Totals					
1945-54	8,341,709	2,163,138	10,504,847	13,649,820	
10-Yr. Avg.	834,171	216,314	1,050,485	1,364,982	77.0
1955	998,570	246,928	1,245,498	1,502,004	82.9
1956	1,104,156	273,060	1,377,216	1,521,389	90.5
1957	1,086,141	248,015	1,334,156	1,347,815	99.0
1958	979,329	255,121	1,234,450	1,250,677	98.7
1959	824,846	261,588	1,086,434	1,463,031	74.3
1960	1,080,169	300,259	1,380,428	1,349,896	102.3
1961	1,165,155	279,511	1,444,666	1,462,830	98.8
1962	1,228,421	301,374	1,529,795	1,599,676	95.6
1963	1,213,166	314,643	1,527,809	1,744,273	87.6
1964	1,246,780	366,197	1,612,977	1,825,281	88.4
Totals					
1955-64	10,926,733	2,846,696	13,773,429	15,066,872	
10-Yr. Avg.	1,092,673	284,670	1,377,343	1,506,687	91.4

* Unalloyed Copper

TABLE XIII

ESTIMATED ANNUAL COPPER PRODUCTIVE CAPACITY

ARIZONA, UNITED STATES, OTHER FREE COUNTRIES, COMMUNIST COUNTRIES

	TONS COPPER EST. By Arizona Dept. Mineral Resources End of 1961	EST. BY ENG & MINING JOURNAL Increase 1962-1969	TONS COPPER Est. at End of 1969
<u>ARIZONA:</u>			
Morenci	140,000		
New Cornelia	72,000		
Copper Queen	35,000		
Lavender Pit	38,000		
Sub-Total	<u>285,000</u>	<u>15,000</u>	<u>300,000</u>
Ray	72,000		72,000
Miami-Copper Cities	35,000		35,000
Inspiration	47,000	10,000	57,000
San Manuel	82,000	10,000	92,000
Magma	24,000	5,000	29,000
Silver Bell	20,000		20,000
Pima	18,000		18,000
Bagdad	12,000		12,000
Duval (Esperanza & Ithaca Peak(after 1964)	30,000	25,000	55,000
Mission	45,000		45,000
Miscellaneous	30,000		30,000
Sub-Total (Arizona)	<u>700,000</u>	<u>65,000</u>	<u>765,000</u>
<u>OTHER STATES:</u>			
Utah (Utah Copper	225,000	100,000	325,000
Montana (Butte)	130,000	60,000	190,000
Nevada (Ely & Yerington)	95,000	5,000	100,000
New Mexico (Chino)	100,000	15,000	115,000
Michigan (White Pine & Cal. & Hecla)	80,000	20,000	100,000
Miscellaneous	70,000	70,000	140,000
Sub-Total (Other States)	<u>700,000</u>	<u>270,000</u>	<u>970,000</u>
GRAND TOTAL - UNITED STATES	<u>1,400,000</u>	<u>335,000</u>	<u>1,735,000</u>
<u>OTHER FREE COUNTRIES:</u>			
Canada	500,000	164,000	664,000
Chile	650,000	550,000	1,200,000
Peru	205,000		205,000
Western Europe	140,000		140,000
Asia	240,000	50,000	290,000
Africa	1,100,000	186,000	1,286,000
Australia	100,000	70,000	170,000
Other Countries U.S.	65,000	65,000	130,000
Sub-Total - Free Countries other than U.S.	<u>3,000,000</u>	<u>1,085,000</u>	<u>4,085,000</u>
GRAND TOTAL - ALL FREE COUNTRIES	<u>4,400,000</u>	<u>1,420,000</u>	<u>5,820,000</u>
Communist Countries	<u>800,000</u>	<u>200,000</u>	<u>1,000,000</u>
GRAND TOTAL - WORLD	<u>5,200,000</u>	<u>1,620,000</u>	<u>6,820,000</u>

Arizona Department of Mineral Resources

August, 1965

TABLE XIV

COPPER MINING EMPLOYMENT, WAGES AND HOURS IN U. S. AND ARIZONA

Base Period (1947-1949) Compared with Three-Year Period (1962-1964)

Source: "Employment Earnings," U. S. Dept. of Labor
 U.S.B.M. Mineral Yearbooks, "Arizona's Current
 Employment Development." Arizona Employment
 Security Commission.

	"A" Number Of all Employees		"B" Weekly Earnings		"C" Weekly Hours		"D" Hourly Earnings	
	ARIZONA	U.S.	ARIZONA	U.S.	ARIZONA	U. S.	ARIZONA	U. S.
Base Period 1947-49 Avg.	10,700	27,100	\$ 64.20	\$ 63.11	44.83	44.10	\$1.432	\$ 1.431
Last Three Years								
1962	13,350	28,500	\$ 129.29	\$120.98	44.28	42.90	\$ 2.920	\$ 2.820
1963	13,393	27,800	133.81	124.48	44.56	43.06	3.003	2.891
1964	13,275	27,000	140.97	130.42	45.00	42.90	3.133	3.040
1962-64 Avg.	13,339	27,767	\$ 134.69	\$125.29	44.61	43.05	\$ 3.019	\$ 2.917

	"E" Annual Man Hours "A" x "C" x 52		"F" Annual Earnings "E" x "D"		Per Man Annual Earnings "F" ÷ "A"	
	ARIZONA	U.S.	ARIZONA	U.S.	ARIZONA	U.S.
Base Period 1947-49 Avg.	24,943,412	62,145,720	\$ 35,718,966	\$88,930,525	\$3,338	\$ 3,282
Last Three Yrs.						
1962	30,753,060	63,577,800	89,798,935	179,289,396	6,726	6,291
1963	31,033,188	62,247,536	93,192,664	179,957,627	6,958	6,473
1964	31,063,500	60,231,600	97,321,946	183,104,064	7,331	6,782
1962-1964 Avg.	30,949,916	62,018,979	\$ 93,437,848	\$180,783,696	\$ 7,005	\$ 6,511

(Continued)

TABLE XIV

(Continued)

	"G"		"H"	
	Tons Copper Ores		Pounds Equiv.* From Copper Ores	Copper Produced
	ARIZONA	U.S.	ARIZONA	U. S.
Base Period: 1947-1949 Avg.	38,082,754	82,875,491	748,056,267	1,625,975,640
Last Three Years				
1962	78,868,147	150,216,710	1,230,386,000	2,332,794,000
1963	80,615,132	146,449,540	1,249,982,000	2,271,150,000
1964	86,132,039	155,200,464	1,279,898,700	2,372,611,000
1962-64 Avg.	81,871,773	150,622,238	1,253,422,233	2,325,518,000

* Includes value of gold and silver recovered from copper ore, converted into pounds copper at average price.

	Tons Copper Ore Produced Per Man-Hour "G" ÷ "E"		Lbs. Equiv. Copper Produced Per Man-Hour "H" ÷ "E"		Earnings Per Man-Hour "D"	
	ARIZONA	U.S.	ARIZONA	U.S.	ARIZONA	U.S.
Base Period: 1947-49 Avg.	1.5268	1.3336	29.9901	26.1639	\$1.432	\$1.431
1962-64 Avg.	2.6453	2.4287	40.4984	37.4969	\$3.019	\$2.917
% Incr. in 15 Yrs.	73.26	82.12	35.04	43.32	110.83	103.85
Per Year	4.88	5.47	2.34	2.89	7.39	6.92

TABLE XV

SUMMARY OF ESTIMATED* COPPER MINING EMPLOYMENT, WEEKLY EARNINGS,
WEEKLY HOURS, HOURLY EARNINGS, IN ARIZONA AND UNITED STATES,
BY YEARS 1947 TO 1964 INCLUSIVE

Source: "Employment and Earnings" - U.S. Dept. of Labor.
"Arizona's Current Employment Developments" -
Arizona Employment Security Commission.

	ALL EMPLOYEES		WEEKLY EARNINGS		WEEKLY HOURS		HOURLY EARNINGS	
	Arizona	U.S.	Arizona	U.S.	Arizona	U.S.	Arizona	U.S.
1947	10,700	25,700	\$ 59.40	\$ 59.27	45.0	44.8	\$ 1.32	\$ 1.32
1948	10,900	27,800	65.99	65.81	45.2	45.2	1.46	1.46
1949	10,500	27,300	66.98	63.96	44.3	42.3	1.512	1.512
Avg. 1947-1949	10,700	27,100	\$ 64.20	\$ 63.11	44.83	44.1	\$ 1.432	\$ 1.431
1950	9,500	25,800	\$ 75.80	\$ 72.05	46.5	45.0	\$ 1.63	\$ 1.601
1951	10,100	25,900	83.01	78.37	47.7	46.1	1.74	1.70
1952	10,700	26,500	90.31	85.73	47.06	45.6	1.92	1.88
1953	11,400	28,600	96.03	91.60	46.73	45.8	2.055	2.00
1954	11,900	27,400	96.60	87.33	45.31	42.6	2.132	2.05
1955	11,800	27,200	104.90	95.70	47.0	44.1	2.232	2.17
1956	13,300	34,400	112.07	100.95	47.1	43.7	2.377	2.31
1957	14,000	32,500	106.22	98.23	43.8	41.1	2.425	2.39
1958	13,500	28,400	95.40	94.62	39.8	39.1	2.399	2.42
1959	11,100	22,400	108.15	106.25	42.8	42.5	2.526	2.50
1960	12,733	29,600	116.83	114.75	43.69	43.3	2.674	2.65
1961	13,117	27,000	126.29	119.03	44.8	43.6	2.817	2.73
1962	13,350	28,500	129.29	120.98	44.3	42.9	2.920	2.82
1963	13,393	27,800	133.81	124.48	44.6	43.1	3.003	2.89
1964	13,275	27,000	140.97	130.42	45.0	42.9	3.113	3.04

* These estimates include all full and part-time wage and salary workers who worked or received pay during the pay period ending nearest the 15th of the month.

TABLE XVI

UNITED STATES COPPER MINING - OUTPUT IN TONS COPPER ORE,
VALUE OF COPPER, GOLD, SILVER PRODUCED

Source: U. S. Bureau of Mines

	Tons Copper Ore Annual Rate	Gold Ounces & Value	Silver Ounces & Value	Copper Pounds & Value	Lbs. Cu Recov. Per Ton & Copper Price	Value of Copper, Gold & Silver	Lbs. Copper Equiv. to Total Val. Cu, Gold & Silver
1947-1949	82,875,491	479,589 \$16,785,615	7,785,382 \$7,045,770	1,511,500,640 \$ 314,664,195	18.2 lbs. 20.81¢	\$338,495,580	1,625,975,640
1951	95,494,214	564,471 \$19,756,485	8,362,150 \$7,567,746	1,709,655,673 \$ 413,736,679	17.9 lbs. 24.2¢	\$441,060,910	1,822,566,000
1958	114,824,468	464,051 \$16,241,785	9,182,070 \$8,309,773	1,819,464,806 \$ 469,421,918	15.8 lbs. 25.8¢	\$493,973,476	1,914,626,000
1959	103,715,343	367,455 \$12,860,925	6,838,927 \$6,189,229	1,533,867,852 \$ 478,566,785	14.8 lbs. 31.2¢	\$497,616,939	1,594,926,200
1960	134,994,082	539,249 \$18,873,715	9,469,133 \$8,569,565	1,970,387,781 \$ 630,524,096	14.6 lbs. 32.0¢	\$657,967,376	2,056,147,800
1961	142,721,798	532,215 \$18,627,525	10,385,661 \$9,601,544	2,145,224,433 \$ 641,422,000	15.0 lbs. 29.9¢	\$669,651,000	2,239,636,000
1962	150,216,710	483,243 \$16,913,505	10,944,522 \$11,874,806	2,239,326,000 \$ 689,712,408	14.9 lbs. 30.8¢	\$718,500,719	2,332,794,000
1963	146,449,540	438,537 \$15,348,795	10,309,897 \$13,187,595	2,178,498,800 \$ 670,977,630	14.9 lbs. 30.8¢	699,514,020	2,271,150,000
1964 F	155,200,464	430,630 \$15,072,050	11,470,890 \$14,831,861	2,280,830,781 \$ 743,567,141	14.7 lbs. 32.6¢	\$773,471,052	2,372,611,000

F - Final

A R I Z O N A

ARIZONA'S PART IN THE ECONOMY OF THE COPPER INDUSTRY

In the last ten years, Arizona has increased its copper production from 454,105 tons of recoverable copper in the year 1955 to 690,988 tons in the year 1964, or about 52 percent. The annual tonnage of copper ore has increased from 52,189,728 tons in 1955 to an estimated 86,132,039 tons in 1964, or over 65 percent. New production came from Inspiration's Christmas Mine beginning in 1962, Duval's Esperanza Mine in 1959, and Asarco's Mission Unit in 1961. In addition, Kennecott's Ray Mine production expanded, beginning in 1957, and Bagdad expanded its operations in 1962, by the construction of an acid plant and leaching plant to treat its oxidized ores. Finally, Duval's Ithaca Peak operation in Mohave County began in 1964.

As a result of this new production, Arizona has not only maintained its rank as the Number One copper producing state, but has raised its proportion of United States production from 45.5 percent in 1955 to 55.4 percent in 1964 (See Table III).

CONTENTS OF ARIZONA SUPPLEMENT

The Mineral Industry of Arizona in 1964.	U.S.B.M. Area Report	See Note *
Arizona Copper Mining - Output in Tons Copper Ore, Value of Copper, Gold, Silver Produced from Copper Ore - By Years 1947-1964		Table XVII
Arizona Mine Production of Copper, Lead, Zinc, Gold and Silver 1858-1964 - Est. Value of Metals and Non-Metallics Produced in Arizona 1858-1964.		Table XVIII
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Average Number of Covered Employees, Total Wages, Average Annual Wage, and Average Weekly Wage in Arizona Covered Industry. Period 1947-1949, Years 1962, 1963 & 1964		Table XXIII

Note * This report has been revised and will be preprinted as an Area Report for the 1964 Minerals Yearbook. It will be mailed separately as soon as received from Washington. The total mineral production of Arizona will be found in Table XXI.

August, 1965

TABLE XVII

ARIZONA COPPER MINING - OUTPUT IN TONS COPPER ORE,
VALUE OF COPPER, GOLD, SILVER PRODUCED

Source: U. S. Bureau of Mines

	Tons Copper Ore Annual Rate	Gold Ounces & Value	Silver Ounces & Value	Copper Pounds & Value	Lbs. Cu Recov Per Ton & Copper Price	Value of Copper, Gold & Silver	Lbs. Copper Equiv. to Total Val. Cu, Gold & Silver
1947 to 1949	38,082,754	79,612 \$2,786,420	2,603,485 \$2,356,154	723,353,767 \$150,588,843	19.0 Lbs/ton 20.818¢	\$155,731,417	748,056,267
1951	42,784,388	83,521 \$2,923,235	3,087,865 \$2,794,518	775,609,514 \$187,697,501	18.1 Lbs/ton 24.2¢	\$193,415,254	799,236,600
1960	66,032,439	115,602 \$4,046,070	3,689,622 \$3,339,108	993,370,700 \$317,878,624	15.0 Lbs/ton 32.0¢	\$325,263,802	1,016,449,300
1961	71,918,991	129,184 \$4,521,440	4,380,458 \$4,049,690	1,092,360,900 \$326,845,395	14.6 Lbs/ton 29.9¢	\$335,416,435	1,121,007,000
1962	78,868,147	117,362 \$4,107,670	4,571,370 \$4,959,936	1,200,945,700 \$369,891,276	15.2 Lbs/ton 30.8¢	\$378,958,882	1,230,386,000
1963	80,615,132	121,177 \$4,241,195	4,494,239 \$5,748,132	1,217,337,700 \$372,505,336	15.1 Lbs/ton 30.6¢	\$382,494,463	1,249,982,000
1964	86,132,039	133,983 \$4,689,405	4,915,362 \$6,355,563	1,279,898,700 \$417,246,976	14.9 Lbs/ton 32.6¢	\$428,291,944	1,313,779,000

TABLE XVIII

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

1858 - 1964 Incl.- In Terms of Recoverable Metals

Source: U. S. B. M.

	COPPER		LEAD		ZINC	
	Short Tons	Value (thousands)	Short Tons	Value (thousands)	Short Tons	Value (thousands)
1874 - 1963	19,087,663	\$ 7,877,896	627,559	\$ 122,211	938,592	\$ 226,013
1964	690,988	450,524	6,147	1,611	24,690	6,716
Total 1874 - 1964	19,778,651	\$ 8,328,420	633,706	\$ 123,822	963,282	\$ 232,729
Avg. Price	21.054¢		9.770¢		12.080¢	

	GOLD		SILVER		TOTAL VALUE
	Ounces	Value (Thousands)	Ounces	Value (thousands)	
1858 - 1963	13,016,934	\$ 343,088	375,260,299	\$ 295,088	\$ 8,864,296,000
1964	153,676	5,379	5,810,510	7,513	471,743,000
Total 1858 - 1964	13,170,610	348,467	381,070,809	\$ 302,601	\$ 9,336,039,000
Avg. Price		\$26.4276		\$0.79408	

Estimated Value of Other Metals and Non-metallics Production in Arizona through 1963	\$ 558,480,000
Estimated Value of Other Metals and Non-metallics Production in Arizona in 1964	62,621,000
Estimated Value of Other Metals and Non-metallics Production in Arizona through 1964	621,101,000
GRAND TOTAL ESTIMATED VALUE OF ARIZONA'S MINERAL PRODUCTION THROUGH 1964	\$ 9,957,140,000

First Year of reported production: Gold & Silver - 1858, Copper - 1874, Zinc - 1905.

TABLE

TABLE XIX
MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN ARIZONA IN THE YEAR 1964
BY CLASS OF ORE IN TERMS OF RECOVERABLE METALS

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	6	199	138	272	900	1,000	100
Dry Gold-silver	5	105,687	279	5,673	1,742,700	- - -	- - -
Dry Silver	11	8,744	4	5,499	8,100	- - -	- - -
Total	22	114,630	421	11,444	1,751,700	1,000	100
Copper	39	86,132,039	133,983	4,915,362	1,279,898,700	42,000	1,343,800
Cu-Pb-Zn and Cu-Zn 2/ - - -	3	114,314	229	47,707	6,724,000	179,900	14,614,000
Lead	7	3,157	29	23,814	8,700	958,700	60,900
Lead-zinc	3	314,187	18,413	769,397	777,500	11,053,800	31,608,800
Zinc	4	15,714	2	3,426	33,500	46,500	1,747,700
Total	56	86,579,411	152,656	5,759,706	1,287,442,400	12,280,900	49,375,200
Other "lode" material:							
Gold mill cleanup - - - - -	(3/)	4/ 139	4/ 32	4/23,690	4/ 1,476,000	4/ 7,000	4/ 3,600
Gold Tailings - - - - -	1	4	6	2	- - - - -	- - - - -	- - - - -
Gold-silver & silver tailings 2/ 3	3	46,143	514	13,743	131,700	- - - - -	- - - - -
Silver cleanup - - - - -	(3/)	(4/)	(4/)	(4/)	(4/)	(4/)	(4/)
Copper cleanup - - - - -	(3/)	1,908	37	1,824	373,400	- - - - -	500
Copper precipitates - - - - -	16	65,414	- - - - -	- - - - -	90,800,800	- - - - -	- - - - -
Lead cleanup - - - - -	(3/)	27	- - - - -	100	- - - - -	5,100	600
Uranium ore - - - - -	- -	- - - - -	- - - - -	(4/)	(4/)	- - - - -	- - - - -
Total-	20	113,635	589	39,359	92,781,900	12,100	4,700
Total "lode" material - -	85	86,807,676	153,666	5,810,509	1,381,976,000	12,294,000	49,380,000
Placer - - - - -	1	- - - - -	10	1	- - - - -	- - - - -	- - - - -
Total, all sources - - -	86	86,807,676	153,676	5,810,510	1,381,976,000	12,294,000	49,380,000

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

2/ Combined to avoid disclosing individual company confidential data.

3/ From properties not classed as mines.

4/ Gold mill cleanup, silver cleanup, uranium ore combined to avoid disclosing individual company confidential data.

TABLE XX
COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINES
YEARS 1963 and 1964

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

	1963		1964	
	Tons Copper Ore Mined	Pounds Copper Recovered	Tons Copper Ore Mined	Pounds Copper Recovered
PHELPS DODGE:				
Morenci	17,141,000	242,440,000	18,632,000	258,788,000
New Cornelia	9,370,000	134,412,000	10,371,000	141,635,000
Lavender Pit	5,347,000	76,532,000	6,001,000	83,017,000
Copper Queen	715,000	66,142,000	749,000	65,050,000
Sub-Total	32,573,000	519,526,000	35,753,000	548,490,000
KENNECOTT - Ray	7,123,102	125,860,000	6,884,953	116,469,877
MIAMI:				
Miami		18,195,285		17,757,353
Copper Cities	3,149,260	35,402,918	3,163,565	35,969,908
Copper Cities Dump Leach		7,039,062		5,719,192
Castle Dome		5,513,538		4,882,984
Sub-Total	3,149,260	66,150,803		64,329,437
INSPIRATION:	5,487,483	93,874,294	5,836,968	97,815,150
Christmas Div.	638,755	20,232,893	953,231	24,952,471
Sub-Total	6,126,238	114,107,187	6,790,199	122,767,621
MAGMA:				
San Manuel	12,555,000	177,072,298	12,442,752	185,176,914
Superior	310,039	28,262,686	377,575	34,127,535
Sub-Total	12,865,039	205,334,984	12,820,327	219,304,449
A.S. & R. CO:				
Silver Bell	2,954,100	45,764,428	3,044,000	47,367,828
Mission Unit	7,289,100	98,018,489	7,579,800	104,834,797
Sub-Total	10,243,200	143,782,917	10,623,800	152,202,625
PIMA MINING CO:PIMA	1,992,725	48,248,471	2,850,410	60,580,041
BAGDAD COPPER CORP:	2,094,670	24,943,200	2,076,577	23,756,772
From Leach		10,326,300		15,507,042
Sub-Total	2,094,670	35,269,500	2,076,577	39,263,814
DUVAL - Esperanza	4,364,029	43,021,755	4,131,096	40,165,350
Precipitate Copper		3,765,358		4,969,494
Sub-Total	4,364,029	46,787,113	4,131,096	45,134,844
BANNER MINING CO:				
Palo Verde	64,298	2,539,896		
Mineral Hill & Daisy	257,195	7,353,021	256,670	7,336,193
Sub-Total	321,493	9,892,917	256,670	7,336,193
TOTALS	80,852,756	1,314,959,892	85,350,597	1,375,878,901
Other Copper Pro- ducers	429,602	6,994,108	1,457,079	6,097,099
GRAND TOTAL	81,282,358	1,321,954,000	86,807,676	1,381,976,000

TABLE XXI

MINERAL PRODUCTION OF LARGE AND SMALL PRODUCERS IN ARIZONA IN 1964 1/

Source: U.S.B.M. Area Report for Arizona, 1964

LARGE COPPER PRODUCERS: *		PRODUCTION	VALUE
Copper (lbs.)	.....	1,375,878,901	\$ 448,536,521
Gold (ozs)	.....	133,983	4,689,405
Silver (ozs.)	.....	4,915,362	6,355,563
Molybdenum (lbs.) (Content of Concentrates).	.....	6,296,000	9,532,000
			\$ 469,113,489
SMALL MINERAL PRODUCERS:			
Clays 2/	.....	168	\$ 213,000
Copper (recoverable content of ores) (lbs.)	.....	6,098,000	1,987,479
Diatomite (short tons)	.....	450	16,000
Gem Stones	.....	3/	120,000
Gold (recoverable content of ores)(troy Ozs.)	.....	19,693	689,595
Gypsum (thousand short tons)	.....	147	770,000
Iron Ore (usable)(thousand long tons, gross weight	.....	4	32,000
Lead (recoverable content of ores, etc.) short tons	.....	6,147	1,611,000
Lime (thousand short tons)	.....	177	2,920,000
Mercury (76-lb. flasks)	.....	77	24,000
Natural Gas (marketed) (million cubic feet)	.....	2,025	241,000
Petroleum (crude) (thousand 42-gallon barrels)	.....	64	W
Pumice (thousand short tons)	.....	880	1,635,000
Sand-Gravel (thousand short tons)	.....	18,116	20,868,000
Silver (recoverable content of ores, etc.) thou. troy oz.	.....	5,811 846	1,157,437
Stone (thousand short tons)	.....	3,759	6,283,000
Tungsten concentrate (60% WO ₃ basis) (short tons)	.....	16	17,000
Uranium Ore (short tons)	.....	102,258	3,253,000
Vanadium (short tons)	.....	W	575,000
Zinc (recoverable content of ore, etc.) (short tons)	.....	24,690	6,716,000

Value of items that cannot be disclosed: Asbestos, Cement, Clays, (bentonite & fire clay), Feldspar, helium, mica (scrap), perlite, pyrites, and values indicated by symbol W.

4/ 16,122,000

TOTAL \$ 534,364,000
Percentage due to small mines 12.2%

W. Withheld to avoid disclosing individual company confidential data.

1/ Production as measured by mine shipments, sales or marketable production including consumption by producers.

2/ Excludes bentonite and fire clay: included with "Value of items that cannot be disclosed."

3/ Weight not recorded.

4/ Value of mineral fuels, \$1,796,000; value of non-metals, \$14,326,000.

* Phelps Dodge, Kennecott, Inspiration, Miami, Magma (incl. San Manuel) Asarco's Silver Bell, Pima, Bagdad, Duval's Esperanza, Asarco's Mission Unit, Banner Mining Co.

TABLE XXII

SUMMARY OF TOTAL COVERED EMPLOYMENT & WAGES IN ARIZONA COPPER MINING
1947 - 1964 INCLUSIVESource: Arizona Employment Security Commission
United States Bureau of Mines

COPPER MINING	No. Covered Employees	Covered Wages	Average Annual Wage	Tons Copper Ores	Average Weekly Wage
1947	11,340	\$ 36,365,277	\$ 3,207	37,810,448	\$ 61.67
1948	11,493	41,318,524	3,595	39,072,204	69.13
1949	11,001	40,612,224	3,692	37,365,611	71.00
1950	10,181	41,994,321	4,125	41,757,273	79.33
1951	10,754	47,825,698	4,447	42,784,388	85.52
1952	11,365	54,950,235	4,835	44,472,522	93.14
1953	12,068	62,742,982	5,199	45,187,838	99.98
1954	12,502	65,518,853	5,241	43,072,894	100.79
1955	12,399	71,293,263	5,750	52,189,728	110.58
1956	14,008	83,568,996	5,966	60,468,580	114.73
1957	14,652	85,125,320	5,809	59,571,834	111.71
1958	14,100	74,726,972	5,300	56,255,809	101.93
1959	11,568	72,095,130	6,232	53,121,545	119.85
1960	13,764	90,312,848	6,562	66,032,439	126.19
1961	14,275	97,271,286	6,814	71,918,991	131.04
1962	14,408	101,920,108	7,074	78,868,147	136.04
1963	14,303	104,291,588	7,292	80,615,132	140.23
1964	14,720	113,792,031	7,730	86,132,039	148.65

TABLE XXIII

AVERAGE NUMBER OF COVERED EMPLOYEES, TOTAL WAGES, AVERAGE ANNUAL WAGE, AND
AVERAGE WEEKLY WAGE

Base Period 1947-1949 and Years, 1962, 1963 and 1964

ARIZONA INDUSTRIES COVERED BY SOCIAL SECURITY

Compiled by Arizona Department of Mineral Resources

Source: Arizona Employment Security Commission

	Average No. of 1/ Employees	Total Wages	Average Annual Wage	Average Weekly Wage
	Base Period 1947-1949			
Copper Mining Only 2/	11,278	\$ 39,432,008	\$ 3,496	\$ 67.23
Copper Smelting 3/	1,500	5,175,000	3,450	66.35
All Mining & Smelting	12,778	44,607,008	3,491	67.13
Other Mining & Quarrying	1,592	4,913,010	3,085	59.33
All Mining, Quarrying & Smelting . .	14,370	49,520,018	3,446	66.27
Manufacturing (Excl. Smelting) . . .	12,639	36,910,624	2,920	56.15
Construction	10,844	35,424,826	3,267	62.83
Trans. & Utilities (Excl. R.R.s) . . .	10,530	29,948,944	2,844	54.69
Wholesale - Retail Trade	36,213	91,916,860	2,538	48.81
Services - Misc. (Incl. Agri.) . . .	18,643	43,103,526	2,312	44.46
Totals and Averages	103,239	\$ 286,824,798	\$ 2,778	\$ 53.42
	YEAR 1962			
Copper Mining Only 2/	14,408	\$ 101,920,108	\$ 7,074	\$136.04
Copper Smelting 3/	1,868	12,216,000	6,540	125.76
All Copper Mining & Smelting	16,276	114,136,108	7,013	134.86
Other Mining & Quarrying	1,580	8,727,313	5,524	106.24
All Mining Quarrying & Smelting . . .	17,856	\$ 122,863,421	\$ 6,881	\$132.33
	YEAR 1963			
Copper Mining Only 2/	14,303	\$ 104,291,588	\$ 7,292	\$ 140.23
Copper Smelting 3/	1,817	12,144,000	6,684	128.53
All Copper Mining & Smelting	16,120	\$ 116,435,588	\$ 7,223	\$ 138.90
Other Mining & Quarrying	1,591	9,299,379	5,845	112.40
All Mining Quarrying & Smelting . . .	17,711	\$ 125,734,967	\$ 7,099	\$ 136.52
	YEAR 1964			
Copper Mining Only 2/	14,720	\$ 113,792,031	\$ 7,730	\$ 148.65
Copper Smelting 3/	1,790	12,428,972	6,944	133.53
All Copper Mining & Smelting	16,510	\$ 126,221,003	\$ 7,645	\$ 147.02
Other Mining & Quarrying	1,560	9,421,262	6,039	116.14
All Mining, Quarrying & Smelting . . .	18,070	\$ 135,642,265	\$ 7,506	\$ 144.35
Manufacturing (Excl. Smelting) . . .	56,643	365,459,136	6,452	124.08
Construction	27,599	198,501,774	7,192	138.31
Trans. & Utilities (Excl. R.R.s) . . .	21,235	133,633,024	6,293	121.02
Wholesale - Retail Trade	88,805	381,893,083	4,300	82.69
Services & Misc. (Incl. Agri.) . . .	63,581	283,400,614	4,457	85.71
TOTALS - AVERAGES	275,933	\$ 1,498,529,896	\$ 5,431	\$ 104.44

1/ This number includes all covered employees on payroll, and is not restricted to production workers only, on which the average hourly and weekly earnings are reported

2/ This number includes all copper mining and milling employees and some copper smelting employees not reported under Manufacturing by the Employment Security Commission. 3/ Smelting Employment has been segregated from Manufacturing as reported by the Employment Security Commission.

August, 1965