

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

STATISTICS FOR 1960 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 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

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COPPER INDUSTRY IN 1960

Reported by U.S.B.M. in Mineral Market Report M.M.S. No. 3264
Prepared August 4, 1961, by H.M. Callaway, Gertrude N. Greenspoon and
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of Nonferrous Metals, Division of Minerals.

Record production and exports, lower consumption, and rising stocks characterized United States copper industry in 1960, according to the Bureau of Mines, United States Department of the Interior. Labor strikes that had begun in Mid-1959 continued into early 1960. The need for primary source materials at smelters and refineries after settlement of the strikes stimulated domestic mine production and caused near-record imports of blister copper. Mine production in the United States was the largest since 1957. Copper recovered from domestic ores set an all-time record; smelter production from imported materials more than doubled; and recovery of copper from scrap increased by one-third.

Production of copper by United States mines rose 31 percent to 1,080,000 tons. Output in Arizona gained 25 percent and was 4 percent greater than the record production of 1957. Utah continued to rank second among copper-producing States and output rose 51 percent. Montana, with production of 92,000 tons, was the third-ranking State, and contributed 9 percent of the Nation's mine output. Other States having significant output in quantitative order were Nevada, New Mexico, Michigan, and Tennessee.

Consumption of refined copper during the early months of 1960 was at a rate lower than the monthly average for 1959. An upturn in March was not long sustained, and by mid-summer consumption had declined to only about three-fourths the rate established during the earlier months. August and September consumption rates were markedly above the mid-summer low and about the same as that of April, May, and June. However, the remaining quarter of the year saw a gradual decline that terminated with a December rate somewhat lower than that at the beginning of the year, and an 8-percent decrease from 1959.

The primary producers' price for electrolytic copper, delivered, established at 33 cents per pound on November 12, 1959, was unchanged until October 12, 1960. On that date, cumulative effects of increased output, slackened demand and resulting large consumer inventories caused a 3-cent-a-pound drop to 30 cents. Owing presumably to the extension of the labor strikes into the early months of 1960, custom smelters did not quote prices until about mid-March when a 33-cent-per-pound price was established; it was reduced to 31 cents on October 3 and to 30 on October 12.

Imports of unmanufactured copper declined 8 percent to the lowest level since 1958. The most significant drop was in refined copper; receipts of copper in concentrates remained virtually unchanged; and a decline in copper matte imports was offset by an increase in the ore class. Although the quantity of Chilean copper shipped to the United States diminished considerably, Chile remained the U. S. chief source of imported copper, supplying approximately 40 percent of the total. Canada was the second largest supplier with 22 percent of the total, and was the principal source of refined copper for the sixth consecutive year. Peru rose to third place, becoming a major supplier of blister copper from the newly-opened Toquepala unit of Southern Peru Copper Co., and contributing 17 percent of the U. S. supply.

Because the price of copper remained above 24 cents a pound, the 1.7-cents-a-pound excise tax, effective July 1, 1958, was unchanged.

Exports of refined copper more than doubled in 1960, and were the largest since 1928. West Germany, United Kingdom, Italy, and France were the major recipients, but significant shipments went to Japan, Brazil, and Argentina.

Exports of scrap copper expanded six-fold. Although substantial shipments were made to a score of countries, West Germany alone received about one-third of the total. Spain and Japan were also major recipients of the total. Brass and bronze scrap exports exceeded the previous record in 1954 by 31 percent and were the largest since these data were recorded separately in 1929. Three-fourths of the total went to Japan.

Because of the relatively high rate of consumption and the continuing strikes at smelters and refineries, stocks of refined copper at primary plants on January 1, 1960 were the lowest (18,000 tons) since the turn of the century. Settlement of the strikes and resulting return to near-capacity output at primary refineries caused inventories to rise from April through December, and stocks totaled 98,000 tons at the yearend.

The price of copper on the London Metal Exchange averaged £259 5s. 3d. per long ton (32.41 cents a pound) in January. The year's high of £263 17s. 5d. (33.02 cents) was recorded in February. During the spring and summer months the LME price was equivalent to 30-31 cents a pound. Corresponding to the decrease in the U. S. price, the London price fell to 27.89 cents equivalent in October and remained at that level throughout the rest of the year.

Despite labor disputes and political unrest, world production of copper rose to 4.6 million tons - an alltime record high. Planned production cutbacks by some producers to limit stock buildups and prevent price declines were more than offset by expanded output from other producing factions and entry of new facilities into the productive stage.

THE NEED FOR CONGRESS TO FOSTER A STRONG
HEALTHY DOMESTIC COPPER INDUSTRY

Over 90 percent of our domestic copper comes from low-grade mines handling huge tonnages. They have but little flexibility of operation, but a definite requirement of prices high enough to keep them in operation under their present cost conditions. They get their lowest costs only when running at full production. They have but limited possibilities as to selective mining. As production comes down because of curtailing to fit markets, their per pound costs go up.

The larger producers have their own smelters located near their mines, but a few custom smelters handle production from the other mines. To avoid speculation as to futures, the custom smelters ordinarily make it a practice to sell each day, at whatever price the consumer is willing to pay, a quantity of copper about equal to their daily intake from smaller producers. Thus their operations largely govern prices. Custom smelters, or refineries, also handle the secondary copper coming from scrap recovery, which increases in quantity as prices go up and thus increases the amount of metal at current bid prices. Thus the producing units of the large mines themselves have but little to say about markets and prices yet they are the ones most influenced by the ups and downs.

These large mines are in one-industry communities. For each man employed there are about six in population. They have nothing else to turn to when curtailment cuts their hours of labor. Yet there is no local available labor market when higher production is indicated by demand. When market conditions require a curtailment of production, it is done by shortening the work week, and thus giving every man a job and his family some income, even though it makes a lessened take-home pay for family support. If more drastic curtailment is called for, some miners are laid off. The only cure for such a depressed area is a reasonably stable production program. Whatever part of the domestic market that is taken away from domestic mines is largely paid for by those with fluctuating employment at the large mines because of lessened demand, and the labor at the small mines operating only when metal prices are high.

What the domestic copper mining industry needs to maintain full employment is a tariff sufficient to put the domestic industry on an equitable competitive cost basis with foreign mines when prices are below certain "peril points". The foreign mines with low wage scales, higher average grades of ore, cheap water transportation and other cost advantages are in position to take any or all of the domestic market that they wish, now or in the future.

National security demands a going domestic copper mining industry, rather than dependence upon foreign sources for this metal. This was revealed to us expensively by submarine sinkings during World War I. There is no metal more important to armed conflict than copper.

The weak and declining copper market of 1957-1958 resulted in substantial curtailment in output at most of the properties in the United States, and some mines were actually shut down. A significant point is that virtually all of the curtailment in 1957 was at mines in the United States. Production from foreign mines was actually about 100,000 tons greater in 1957 than in 1956.

The most deplorable evidence of the deterioration of 1957-1958 was the unemployment in the mining communities. In addition to actual layoffs of 6,000 men,

consequent to both curtailment and shutting down, there was widespread shortening of the work week.

The mining communities in Arizona are completely dependent on copper mining, milling and smelting. When a mine is shut-down, the damage extends not only to the mine employees but to hundreds of citizens indirectly affected by the shut-down. It has been estimated that a total of 13.5 persons (including the miners and their families as well as service employees and their families) are dependent on the output of one miner. With a normal employment of 16,000 by the copper companies in Arizona, this means that the livelihood of over 216,000 persons is affected. The industry is a major element in the economy of five Western States, and is important to at least five other states. Drastic curtailment of production and suspension of operations has unusually bad effects on the mines themselves, on the mining communities, and on the surrounding regions.

The impact of shutting down the typical metal-mining enterprise on the employees and the community is much more serious than with most other kinds of industry. Copper mining is carried on largely in isolated areas, where not only the working forces in the mines and reduction works but the families of the miners, the thousands of men and women engaged in essential business activities and the professions, community life itself, are dependent on the fortunes of the mining business. The mere statistics of mine employment are, therefore, utterly inadequate to measure the population dependent on the mines. Modern and stable towns and villages have been built up, enjoying every sort of civic advantage. Unfortunately, such communities depend on a single industry.

Indirectly dependent on the copper-mining industry, of course, are thousands of people engaged in producing and distributing foodstuffs and miscellaneous merchandise; machinery; supplies and equipment of many kinds. The industry is an important user of fuels, electricity, cement, explosives, steel, electrical machinery, automotive equipment, and power shovels.

Because of the location of most of the copper mines at long distances from manufacturing and consuming centers, the industry generates a great deal of long-haul as well as short-haul freight. The suspension of copper-producing operations consequently reacts seriously not only on the immediate community but on the surrounding region and the economy in general.

One not inconsiderable factor is the loss of tax revenue by local, state and Federal governments. In Arizona such taxes constitute a very important proportion of their total revenues.

The suspension of operations, even though temporary, of any industrial operation involves expense; but because of characteristics unique to mining operations the "shutdown" or "standby" expense is exceptionally high. This is particularly true of underground mines. The problem of supporting the ground is a continuing one; and constant repair and replacement of timber in haulageways, stations, and shafts is necessary whether the mine is producing or not. Pumps must be run continuously to prevent flooding of the workings. Hoisting machinery and other surface equipment and plant must be kept in repair. These are costly operations; but unless they are carried on, the likelihood is that the cost of future rehabilitation will be so great that valuable ore will be lost beyond retrieve.

Conservation of an Invaluable Natural Resource

It has been urged in some quarters that, if copper can readily be obtained from foreign sources, the United States should be content to import the metal and leave its copper reserves in the ground. This idea rests on a profound misconception of peculiar aspects of the business of mining and the true meaning of conservation. In its best sense, conservation means not hoarding in the ground; but efficient and beneficial discovery, production, and utilization. Only a healthy, vigorous copper-mining industry can and will explore for new ores, develop and equip new deposits, and devote itself to the manifold problems of converting ore bodies of successively lower grade into profitable enterprises. The incentive to do these things is the prospect of maintaining a reasonably prosperous, "going" industry.

The development of an ore deposit and the provision of necessary facilities for production typically are undertakings requiring from two to five years. Consequently, it is highly important that exploration be not only adequate but forehanded. Advocates of the "hoarding" conception of conservation assume that geologists and engineers know of every pound of copper in the ground; and that the supply can be drawn upon in emergency in the same way as could the gold buried in the vaults at Fort Knox, Kentucky. They are, of course, entirely mistaken.

At this point it may be useful to say a word on the matter of undeveloped resources as distinguished from known reserves. The notion -- once too widely current -- that the United States is a "have-not" nation in respect to metals, including copper, will not bear careful scrutiny. Competent geologic evidence is convincing that many important deposits must exist that are covered by lava flows, sedimentaries, or detrital material, laid down after the ore was deposited. The search for such deposits is expensive; but techniques are being improved; and, unless the most competent geologists and engineers are all wrong, many large ore bodies will be found.

THE DISCOVERY, EXPLOITATION AND PRUDENT USE OF THE NATION'S NATURAL RESOURCES OF COPPER DEPEND ON THE EXISTENCE OF A THRIVING COPPER-MINING INDUSTRY.

COMMENTS ON TABLES III, XII, AND XIII

A study of United States copper production and consumption figures (Table III), by years from 1945 to 1960 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 1952 inclusive (8 years) was 1,362,610 tons, and from 1953 to 1960 inclusive (8 years), it was 1,397,970 tons, an increase of 2.6 percent for the 8 years, or only 0.3 percent increase per year, where one might expect a normal growth-rate of at least 2 percent. The growth-rate in production of refined copper for the two 8-year periods amounted to 2.7 percent per year.

The other thing of note is that the United States has become self-supporting in copper production. This was the case in 1957, 1958 and 1960, and would also have been true in 1959 had the nation not suffered a loss of almost 300,000 tons in production due to the labor strike in the last five months of the year.

Mine productive capacity has reached 1,250,000 tons of copper per year (See Table XII), and with an estimated added production of 300,000 tons of secondary unalloyed copper, this country is now well prepared to produce all the copper it will need for some time to come.

Meanwhile, the copper tariff should be high enough to bar out low-cost foreign copper, 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 tariff of at least 4 cents per pound of copper is shown to be justified by a study of Table XIII. For example, in the period, 1958-1960, it took an annual average of 55,203,963 man-hours of labor at \$2.529 per hour to produce 120,362,020 tons of copper ore with a recovery of 1,916,546,000 pounds of equivalent copper; a labor cost of \$139,610,822 for copper mining, or \$0.07285 per pound of copper. This was a recovery of 34.72 pounds of copper per man-hour of labor. If we assume a recovery of 87.0 pounds of copper per man-hour of foreign labor, (which assumes a minimum grade of only 2.5 times the U.S. ores), and a labor cost of only \$1.04 per man-hour, (which is 40% of U. S. hourly earnings), we arrive at a cost of \$0.0115 per pound of copper by foreign labor. This is 6.2 cents less than U. S. labor costs, and would permit the foreign producer to reduce the price of his copper by the difference between the 6.2 cents and 2.2 cents (present tariff plus freight). As the object of a copper tariff was primarily to equate the difference in wage-rates, a proper tariff could be as much as 6 cents.

The problem facing Arizona and other U. S. copper-producing states is the maintenance of a price that will meet competition from substitutes. A new association (The Copper Products Development Association) has been organized and is already making progress.

Sir Ronald Prain of the Rhodesian Selection Trust has estimated the peril point of substitution at 30 cents per pound, while in this country the peril point is considered by many to range between 32 and 35 cents. In the opinion of Arizona producers, the copper excise tax should never be suspended while the price of copper is below 32 cents per pound.

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 of copper for the 8-year period (1945-1952) was 950,000 tons, and for the 8-year period (1953-1960) it was 1,500,000 tons. In 1960 alone it amounted to over 2,300,000 tons.

ARIZONA'S PART IN THE ECONOMY OF THE COPPER INDUSTRY

In the last ten years Arizona has increased its copper production from 415,870 tons in the year 1951 to an estimated 538,605 tons in the year 1960, or almost 30 percent. The annual tonnage of copper ore to produce this copper has increased from 42,874,000 to an estimated 66,000,000 tons, or about 54 percent. New producers have come into the picture during that time, such as Phelps Dodge Corporation's Lavender Pit, Magma Copper Company's San Manuel Mine, Asarco's Silver Bell Mine, Pima Copper Company's Pima Mine, and Duval Sulphur and Potash Company's Esperanza Mine. In addition Kennecott Copper Corporation has expanded its Ray Mine by almost 50 percent, and Bagdad Copper Corporation has expanded its operations by the construction of an acid plant and leaching plant to treat its oxidized ores.

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 proportions of United States production from 44.8 percent in 1951 to about 51.0 percent in the last two years. In other words, Arizona is producing more copper than all the other states combined. See Table II.

Other Tables, namely I, XII, XIII, XIV, and XVI to XXIII inclusive show Arizona's part in the economy of copper industry.

TABLE I

SALIENT U. S. COPPER STATISTICS

YEARS 1958, 1959 AND 1960

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

	1958	1959	1960
Arizona Mine Production - Tons Copper	485,839	430,297	538,605
U. S. Mine Production - Tons Copper	979,329	824,846	1,080,169
World Mine Production - Tons Copper	3,740,000	4,000,000	4,590,000
Refined Stocks - Beginning of Period	109,000	48,000	18,000
Refined Stocks - End of Period	48,000	18,000	98,000
Refinery Production (From Domestic Ores)	1,001,645	796,452	1,121,286
Refinery Production (From Foreign Ores)	350,875	301,795	397,641
Secondary Copper Recovered from Scrap as Unalloyed Copper	255,121	261,588	300,259
<u>IMPORTS:</u>			
Copper from Ore, Matte, Regulus	92,602	82,523	80,536
Blister Copper	268,178	287,665	296,160
Refined Copper	127,630	214,056	142,706
Total Imports - Crude & Refined	488,410	584,244	519,402
<u>EXPORTS:</u>			
Copper in Ores, etc.	11,475	2,981	11,111
Refined Copper	384,868	159,702	433,762
Total Exports - Crude & Refined	396,343	162,683	444,873
EXCESS IMPORTS OVER EXPORTS	92,067	421,561	74,529
<u>CONSUMPTION:</u>			
New Refined (Apparent Consumption)	1,157,000	1,183,000	1,148,000
Total Refined (Actual)	1,250,677	1,463,031	1,349,896
U.S.Mine Prod. % of Appar. Consumption	84.6	69.7	94.1
Average E. & M.J. Price of Copper	25.764¢	31.182¢	32.053¢

TABLE II

ARIZONA, UNITED STATES AND WORLD MINE PRODUCTION OF COPPER

E. & M. J. DOMESTIC AND EXPORT PRICE OF COPPER

Source: U.S.B.M.

Year	ARIZONA			UNITED STATES		WORLD	E. & M. J. E. & M. J.	
	Tons	% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	PRICE	EXPORT PRICE
							Per Pound	Per Pound
1945	287,203	37.2	12.0	772,894	32.2	2,400,000	11.775¢	11.700¢
1946	289,223	47.5	14.1	608,737	29.6	2,056,000	13.820¢	14.791¢
1947	366,218	43.2	14.6	847,563	33.9	2,500,000	20.958¢	21.624¢
1948	375,121	44.9	14.4	834,813	32.1	2,600,000	22.038¢	22.348¢
1949	359,010	47.7	14.4	752,750	30.1	2,500,000	19.202¢	19.421¢
1950	403,301	44.4	14.4	909,343	32.5	2,760,000	21.235¢	21.549¢
1951	415,870	44.8	14.3	928,330	32.0	2,900,000	24.200¢	26.258¢
1952	395,719	42.8	13.1	925,359	30.6	3,020,000	24.200¢	31.746¢
1953	393,525	42.5	12.9	926,448	30.4	3,050,000	28.798¢	30.845¢
1954	377,927	45.2	12.2	835,472	27.0	3,100,000	29.694¢	29.889¢
1955	454,105	45.5	13.3	998,570	29.2	3,420,000	37.491¢	39.115¢
1956	505,908	45.7	13.4	1,104,156 ^{2/}	29.1	3,790,000	41.818¢	40.434¢
1957	515,854	47.5	13.3	1,086,141	27.9	3,890,000	29.576¢	27.157¢
1958	485,839	49.6	12.9	979,329	25.9	3,780,000	25.764¢	24.123¢
1959	430,297	52.2	10.7	824,846	20.5	4,020,000	31.182¢	28.892¢
1960	538,605 ^{1/}	49.9	11.7	1,080,169	23.5	4,590,000 ^{3/}	32.053¢	29.894¢

^{1/} Highest annual production in history of Arizona.

^{2/} Highest annual production in history of United States.

^{3/} Highest annual production in history of The World.

Arizona Department of Mineral Resources

August, 1961

TABLE III

U. S. PRODUCTION AND CONSUMPTION OF COPPER

Source: U.S.B.M.

YEAR	MINE PRODUCTION	SECONDARY PRODUCTION *	TOTAL	ACTUAL CONSUMPTION TOTAL	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
Totals 1945-52	6,579,789	1,708,042	8,287,831	10,900,876	
8-Yr.Avg.	822,474	213,505	1,035,979	1,362,610	76.0
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
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
Totals 1953-60	7,835,131	2,040,067	9,875,198	11,183,756	
8-Yr.Avg.	979,391	255,008	1,234,399	1,397,970	88.3

* Unalloyed copper

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TABLE IV

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

	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>
1946	608,737	1,226,000	221,000	2,056,000	137,000	363,000	500,000
1950	909,343	1,551,000	300,000	2,760,000	261,000	460,000	721,000
1954	835,472	1,749,000	416,000	3,100,000	212,000	400,000	612,000
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

	CHANGE IN STOCKS	REPORTED CONSUMPTION	ESTIMATED CONSUMPTION
	Total World	United States <u>1/</u>	Total World <u>2/</u>
1946	8,000 I	1,187,000	2,548,000
1950	75,000 D	1,424,000	3,556,000
1954	141,000 D	1,254,000	3,853,000
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

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 1956, 1957, 1958, 1959 and 1960

Source: U.S.B.M.					
	1956	1957	1958	1959	1960
<u>NORTH AMERICA:</u>					
U.S.A.	1,104	1,087	979	825	1,080
Canada	355	359	345	399	438
Mexico	60	67	72	63	67
Other	19	18	14	10	13
	1,538	1,531	1,410	1,297	1,598
<u>SOUTH AMERICA:</u>					
Chile	540	535	515	602	587
Peru	51	63	59	53	202
Other	6	6	5	4	4
	597	604	579	659	793
<u>EUROPE:</u>					
U.S.S.R.	430	450	470	480	510
Yugoslavia	35	37	39	43	37
Others	108	122	129	141	147
	573	609	638	664	694
<u>ASIA:</u>					
China	13	17	33	33	77
Cyprus	39	44	37	40	39
Japan	87	90	90	93	98
Philippines	30	45	52	55	49
Turkey	31	29	28	31	30
Others	11	10	11	10	13
	211	235	251	272	306
<u>AFRICA:</u>					
No. Rhodesia	445	480	441	599	635
Belg. Congo	276	267	262	311	333
U. of So. Africa	51	51	55	56	51
Others	40	51	58	76	59
	812	849	816	1,032	1,078
<u>AUSTRALIA:</u>	59	64	82	104	121
<u>TOTAL WORLD</u>	3,790	3,890	3,770	4,040	4,590

Arizona Department of Mineral Resources

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TABLE VI

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

Years 1953-1960

Source: U.S.B.M.

Unit: Short Tons

	Year 1953	Year 1954	Year 1955	Year 1956
Ref. Prod. of New Cu from U.S. Ores ...	932,232	841,717	997,499	1,080,207
Ref. Prod. of New Cu from Foreign Ores.	360,885	370,202	344,960	362,426
Total Ref. Prod. of New Copper....	1,293,117	1,211,919	1,342,459	1,442,633
Imports of Refined Copper	274,111	215,086	202,312	191,745
Stocks at beginning of period	26,000	49,000	25,000	34,000
TOTAL AVAILABLE SUPPLY	1,593,228	1,476,005	1,569,771	1,668,378
Exports of Refined Copper	109,580	215,951	199,819	223,103
Stocks at end of period	49,000	25,000	34,000	78,000
TOTAL.....	158,580	240,951	233,819	301,103
Withdrawn on Domes.Acc.(Apparent Cons.)	1,434,648	1,235,054	1,335,952	1,367,275
Reported Actual Consumption	1,494,215	1,254,729	1,502,004	1,521,389

	Year 1957	Year 1958	Year 1959	Year 1960
Ref. Prod. of New Cu from U.S. Ores ...	1,050,496	1,001,645	796,452	1,121,286
Ref. Prod. of New Cu from Foreign Ores.	403,680	350,875	301,795	397,641
Total Ref. Prod. of New Copper ...	1,454,176	1,352,520	1,098,247	1,518,927
Imports of Refined Copper	162,309	127,630	214,056	142,709
Stocks at beginning of period	78,000	109,000	48,000	18,000
TOTAL AVAILABLE SUPPLY	1,694,485	1,589,150	1,360,303	1,679,636
Exports of Refined Copper.....	346,025	384,868	158,938	433,762
Stocks at end of period	109,000	48,000	18,000	98,000
TOTAL	455,025	432,868	176,938	531,762
Withdrawn on Domes.Acc.(Apparent Cons.)	1,239,000	1,157,000	1,183,000	1,148,000
Reported Actual Consumption	1,352,124	1,250,677	1,463,031	1,349,896

Arizona Department of Mineral Resources

August, 1961

TABLE VII

IMPORTS OF COPPER INTO UNITED STATESBY QUARTERS IN 1960

Source: American Metal Market

1960	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Year 1960
Ore Matte & Regulus (copper content)	25,401	25,162	19,471	10,502	80,536
Canada	7,056	2,416	2,751	2,727	14,950
Mexico	812	464	240	378	1,894
Cuba	2,159	3,975	420	-	6,554
Bolivia	467	155	619	105	1,346
Chile	3,862	4,119	5,005	1,206	14,192
Peru	1,419	3,129	3,243	1,632	9,423
Philippines	5,294	4,564	4,322	3,383	17,563
Union of So. Africa	3,969	6,259	2,662	922	13,812
Australia	352	81	198	140	771
Other Countries	11	-	11	9	31

Blister Copper (copper content)	61,940	75,665	82,164	76,391	296,160
Mexico	3,683	3,460	5,757	5,747	18,647
Chile	45,868	45,143	54,577	44,901	190,489
Peru	7,074	24,734	18,058	23,257	73,120
Rhodesia & Nyasaland	-	-	-	-	-
Union of So. Africa	4,433	2,328	3,772	2,489	13,022
Turkey	547	-	-	-	547
Australia	-	-	-	-	-
Other Countries	335	-	-	-	335

TABLE VII (Continued)

IMPORTS OF COPPER INTO UNITED STATES

1960	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Year 1960
Refined Cathodes and Shapes	74,681	24,703	23,468	19,854	142,706
Canada	35,176	23,474	22,136	19,854	100,640
Mexico	1,433	330	275	-	2,038
Chile	3,485	-	-	-	3,485
Peru	6,839	451	945	-	8,235
Belgium	2,392	225	56	-	2,673
Germany (West)	8,725	2	-	-	8,727
Sweden	2,568	221	-	-	2,788
United Kingdom	727	-	-	-	727
Belgian Congo	196	-	-	-	196
Rhodesia & Nyasaland	5,729	-	56	-	5,785
Union of So. Africa	-	-	-	-	-
Other Countries	7,412	-	-	-	7,412
TOTAL IMPORTS (Crude & Refined)	162,022	125,530	125,103	106,747	519,402
TOTAL EXPORTS	53,575	123,096	148,485	119,717	444,873
EXCESS IMPORTS	108,447	2,434	-	-	74,529
EXCESS EXPORTS	-	-	23,382	12,970	-

SUMMARY OF YEARS 1952-1960 INCLUSIVE

	1952	1953	1954	1955	1956	1957	1958	1959	1960
TOTAL IMPORTS	614,343	668,856	585,551	580,521	590,004	587,863	488,410	584,244	519,402
TOTAL EXPORTS	174,783	110,179	218,320	207,105	236,253	361,490	396,343	162,683	444,873
EXCESS IMPORTS	439,560	558,677	367,231	373,416	353,751	226,373	92,067	421,561	74,529

TABLE VIII

EXPORTS OF COPPER FROM THE UNITED STATESBY QUARTERS IN 1960

Source: American Bureau of Metal Statistics - U.S. Bureau of Mines

Compiled by Quarters by Arizona Department of Mineral Resources

1960	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1960
Ore, Concls. & Matte	1,970	2,257	1,826	5,058	11,111
Refined Ingots, Bars, etc.	51,605	120,839	146,659	114,659	433,762
Canada	515	201	251	365	1,332
Argentina	1,357	2,488	4,838	3,785	12,468
Brazil	1,265	3,830	4,433	5,363	14,891
Austria	-	222	6	11	239
Belgium	128	1,532	1,176	481	3,317
Denmark	224	392	587	212	1,415
France	8,473	13,935	21,845	12,612	56,865
W. Germany	14,357	29,690	33,839	28,112	105,998
Italy	5,087	20,106	19,899	16,368	61,460
Netherlands	1,370	3,758	6,319	2,212	13,659
Norway	1,092	297	840	1,232	3,461
Sweden	615	1,035	1,084	2,580	5,314
Switzerland	332	916	3,075	2,621	6,944
United Kingdom	8,867	27,456	30,128	24,212	90,663
Yugoslavia	-	728	2,358	2,561	5,647
India	-	1,385	1,851	1,830	5,066
Japan	7,598	11,129	9,636	7,207	35,570
Australia	280	784	1,701	1,008	3,773
Other Countries	45	955	2,793	1,887	5,680
TOTAL EXPORTS (Crude & Refined)	53,575	123,096	148,485	119,717	444,873

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 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
Year 1960	98,000	139,272	288,510

* 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 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
Year 1960	98,000	261,000	359,000

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

TABLE XI

REFINED COPPER CONSUMED IN U. S. 1957-1960
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
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
1960							
Wire mills	3,928	810,570	13,450	.....	.....	875	828,823
Brass mills	74,993	64,277	80,247	137,667	144,725	52	486,460
Chemical plants...	.....	.....	465	.....	.....	571	1,036
Secondary smelters	5,939	.....	1,913	177	.....	177	8,206
Foundries	4,644	92	10,224	26	275	900	16,161
Miscellaneous 1/..	1,220	5	2,328	6	558	5,093	9,210
Total	90,724	859,443	108,627	137,876	145,558	7,668	1,349,896

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

TABLE XII

ESTIMATED ANNUAL COPPER PRODUCTIVE CAPACITY
ARIZONA, UNITED STATES, OTHER FREE COUNTRIES, COMMUNIST COUNTRIES

- 1960 -

Based on Continuous Full Operation - 350 Days Per Year

<u>ARIZONA:</u>	<u>Tons Copper</u>
Morenci	130,000
New Cornelia	65,000
Copper Queen	30,000
Lavender Pit	35,000
	<u>260,000</u>
Ray	70,000
Miami - Copper Cities	40,000
Inspiration	40,000
San Manuel	72,000
Magma	21,000
Silver Bell	21,000
Pima	21,000
Bagdad	11,000
Duval	25,000
Miscellaneous	19,000
Sub-Total - Arizona	<u>600,000</u>
<u>OTHER STATES:</u>	
Utah (chief mine Utah Copper)	260,000
Montana (chief mine - Butte)	125,000
Nevada (chief mine - Ely & Yerington)	90,000
New Mexico (chief mine - Chino)	70,000
Michigan (chief mines - White Pine & Cal. & Hecla)	65,000
Tennessee (chief mine - Copper Hill)	15,000
Miscellaneous	25,000
Sub-Total - Other States	<u>650,000</u>
GRAND TOTAL UNITED STATES	<u>1,250,000</u>
<u>OTHER FREE COUNTRIES:</u>	
Canada	500,000
Chile	720,000
Peru	230,000
Western Europe	150,000
Asia	250,000
Africa	1,000,000
Australia	100,000
Other Countries	100,000
Sub-Total - Free Countries Other Than U.S.	<u>3,050,000</u>
GRAND TOTAL - All Free Countries	<u>4,300,000</u>
<u>COMMUNIST COUNTRIES</u>	<u>600,000</u>
GRAND TOTAL - WORLD	<u>4,900,000</u>

TABLE XIII

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

Source: "Employment and 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:								
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	43.7	43.3	2.674	2.65
1958-60 Avg.	12,444	26,800	\$106.50	\$105.27	42.08	41.63	\$ 2.531	\$ 2.529

	"E" Annual Man-Hours		"F" Annual Earnings		Annual Earnings Per Man	
	"A" x "C" x 52		"E" x "D"		"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 Years:						
1958	27,939,600	57,742,880	\$67,027,100	\$139,737,770	\$4,965	\$ 4,920
1959	24,704,160	49,853,440	62,402,708	124,633,600	5,622	5,564
1960	28,523,957	58,015,568	76,273,061	153,741,255	5,990	5,194
1958-60 Avg.	27,055,906	55,203,963	\$68,478,498	\$139,610,822	\$5,503	\$ 5,210

Continued -

TABLE XIII

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

Source: "Employment and 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:								
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	43.7	43.3	2.674	2.65
1958-60 Avg.	12,444	26,800	\$106.50	\$105.27	42.08	41.63	\$ 2.531	\$ 2.529

	"E" Annual Man-Hours		"F" Annual Earnings		Annual Earnings Per Man	
	"A" x "C" x 52		"E" x "D"		"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 Years:						
1958	27,939,600	57,742,880	\$67,027,100	\$139,737,770	\$4,965	\$ 4,920
1959	24,704,160	49,853,440	62,402,708	124,633,600	5,622	5,564
1960	28,523,957	58,015,568	76,273,061	153,741,255	5,990	5,194
1958-60 Avg.	27,055,906	55,203,963	\$68,478,498	\$139,610,822	\$5,503	\$ 5,210

Continued -

TABLE XIII (Cont'd)

	"G" Tons Copper Ores		"H" Lbs. Equiv. * Cu Produced From Copper Ores	
	ARIZONA	U. S.	ARIZONA	U. S.
Base Period: 1947-49	38,082,754	82,875,491	748,056,267	1,625,975,640
Last Three Years:				
1958	56,255,809	114,824,468	941,903,000	1,918,362,400
1959	53,121,545	103,715,843	821,777,000	1,594,926,200
1960 P	66,000,000	133,000,000	1,085,000,000	2,236,350,000
1958-60 Avg. P	58,492,451	120,362,020	949,560,000	1,916,546,000

P. = Preliminary.

* Includes value of gold and silver recovered from copper ores converted into lbs. of copper at average copper 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.
1947-49 Avg.	1.5268	1.3336	29.9901	26.1639	\$ 1.432	\$ 1.431
1958-60 Avg.	2.1619	2.1803	35.0962	34.7175	\$ 2.531	\$ 2.529
% Incr.in 11 yrs. Per Year	41.60% 3.78%	63.50% 5.77%	17.03% 1.55%	32.69% 2.97%	76.74% 6.98%	76.73% 6.98%

TABLE XIV

SUMMARY OF ESTIMATED* COPPER MINING EMPLOYMENT, WEEKLY EARNINGS,
WEEKLY HOURS, HOURLY EARNINGS, IN ARIZONA AND UNITED STATES,
BY YEARS, 1947 TO 1960 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

* 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 XV

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
1950	94,585,792	583,205 \$20,412,175	8,389,913 \$7,592,871	1,691,778,098 \$ 358,656,570	17.9 lbs. 21.2¢	\$386,616,616	1,823,876,000
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
1952	99,947,492	572,882 \$20,050,870	8,197,888 \$7,419,089	1,695,789,296 \$ 410,381,011	17.0 lbs. 24.2¢	\$437,850,970	1,809,300,000
1953	101,064,945	617,712 \$21,619,920	9,163,964 \$8,293,387	1,712,438,757 \$ 493,182,374	16.9 lbs. 28.8¢	\$523,095,681	1,816,305,000
1954	93,654,258	502,091 \$17,573,185	8,073,017 \$7,306,080	1,547,643,795 \$ 459,650,209	16.5 lbs. 29.7¢	\$484,529,474	1,631,412,000
1955	112,549,665	581,421 \$20,349,735	11,527,224 \$10,432,138	1,871,640,306 \$ 701,865,113	16.6 lbs. 37.5¢	\$732,646,986	1,953,725,000
1956	131,775,959	579,617 \$20,286,595	11,512,013 \$10,418,372	2,049,455,804 \$ 856,672,524	15.55 lbs. 41.8¢	\$887,377,491	2,122,912,000
1957	129,715,586	562,234 \$19,678,190	11,097,267 \$10,043,027	2,006,037,881 \$ 593,787,218	15.5 lbs. 29.6¢	\$623,508,435	2,106,447,000
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	103,715,843	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 P	133,000,000	471,219 \$16,492,665	8,778,000 \$ 7,944,000	2,160,000,000 \$ 691,200,000	16.2 lbs. 32.0¢	\$715,636,665	2,236,350,000

P. = Preliminary

Arizona Department of Mineral Resources

August, 1961

A R I Z O N A

The Mineral Industry of Arizona in 1960
U.S.B.M. Area Report III-123 - 10 Pages

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MINERAL INDUSTRY SURVEYS

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF MINES

STEWART L. UDALL, Secretary
Region III - R. W. Geehan, Regional Director

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Area Report III-123

THE MINERAL INDUSTRY OF ARIZONA, 1960

The Bureau of Mines, United States Department of the Interior, announced that the copper industry of Arizona in 1960, again dominating the mineral industries of the State, accounted for one-half of the Nation's copper output and supplied \$345.8 million or 83 percent of the State's \$415.8 million total value of all minerals produced. An \$81.6 million increase in the value of copper produced was primarily responsible for the \$88.9 million or 27-percent advance in the State's total. This significant growth was realized from the resumption of copper production in January 1960 from several of the principal producing mines, which had been closed by a labor strike during the last 5 months of 1959; a full-year's output from these and one new major mine; and increased output from a number of other important mines.

Output of all metals (mainly copper; but including byproduct gold, silver, and molybdenum from copper-ore treatment; lead; zinc; uranium (ore); and byproduct vanadium from uranium-ore treatment) furnished \$379.7 million or 91.3 percent of the total value of mineral production. Nonmetals (primarily sand and gravel, cement, stone, lime, and pumice) supplied \$35.8 million or 8.6 percent of the total, and fuels (coal and petroleum) accounted for the remaining \$0.3 million or 0.1 percent.

The 1960 employment and injuries statistics reflected the impact of the copper industry on the mineral industry of Arizona. Copper mining, milling, smelting, and refining accounted for three-fourths of the total man-hours worked (36 million) and of the total fatal (17) and nonfatal (790) injuries in the mineral industry of the State. However, the frequency rate (injuries per million man-hours) for copper mines (20.7) was lower than that of the total (22.4).

No Office of Mineral Exploration (OME) contracts were executed in Arizona in 1960. The General Services Administration (GSA) called for bids to supply nonferrous soft asbestos of domestic origin for the national stockpile. Acceptable bids were announced but no purchases had been made by the close of the year.

Prepared by William H. Kerns, F. J. Kelly, and D. H. Mullen, Commodity-Industry Analysts, under the supervision of Alfred L. Ransome, Projects Coordinator, Division of Mineral Resources, Region III, in cooperation with the Arizona Bureau of Mines, for release August 10, 1961.

TABLE 1.--Mineral production in Arizona 1/

Mineral	1959		1960	
	Short tons (unless otherwise stated)	Value (thousands)	Short tons (unless otherwise stated)	Value (thousands)
Clays <u>2/</u> -----thousand short tons--	120	\$179	173	\$260
Coal-----do-----	7	63	6	58
Copper (recoverable content of ores, etc.)-----	430,297	264,202	538,605	345,784
Gem stones-----	(3)	88	(3)	120
Gold (recoverable content of ores, etc.)-----troy ounces--	124,627	4,362	143,064	5,007
Lead (recoverable content of ores, etc.)-----	9,999	2,300	8,495	1,988
Lime-----thousand short tons--	123	1,666	148	2,430
Manganese ore and concentrate (35 percent or more Mn)-----gross weight--	68,183	5,727	1,626	40
Manganiferous ore and concentrate (5 to 35 percent Mn)-----do-----	10,693	234	8,677	190
Mica (scrap)-----	3,069	55	(4)	(4)
Molybdenum (content of concentrate)-----thousand pounds--	3,181	4,019	4,359	5,211
Petroleum (crude)-----thousand 42-gallon barrels--	25	(4)	<u>5/</u> 73	(4)
Pumice-----thousand short tons--	487	1,153	703	1,164
Sand and gravel-----do-----	13,458	11,966	14,490	14,235
Silver (recoverable content of ores, etc.)-----thousand troy ounces--	3,898	3,528	4,775	4,322
Stone-----thousand short tons--	2,468	3,998	4,233	5,107
Uranium ore-----	253,390	6,309	283,684	6,219
Zinc (recoverable content of ores, etc.)-----	37,325	8,585	35,811	9,239
Value of items that cannot be disclosed: Asbestos, beryllium concen- trate (1960), cement, clays (bentonite), feldspar, gypsum, mercury, perlite, pyrites, tungsten concentrate, vanadium, and values indicated by footnote 4-----	-----	<u>6/</u> 9,811	-----	16,115
Total Arizona <u>7/</u> -----	-----	<u>6/</u> 326,862	-----	415,776

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).2/ Excludes bentonite; included with "Value of items that cannot be disclosed."3/ Weight not recorded.4/ Figure withheld to avoid disclosing individual company confidential data.5/ Preliminary figure.6/ Revised figure.7/ Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

TABLE 2.--Ore mined, waste and leach material removed, and total copper production at principal copper open-pit and underground mines in Arizona 1/
(Short tons)

Mine	Ore mined		Waste and leach material removed		Total copper produced from all sources <u>2/</u>	
	1959	1960	1959	1960	1959	1960
Open pit:						
Morenci-----	10,513,000	14,500,000	18,930,000	21,200,000	74,997	105,640
New Cornelia-----	9,823,000	9,066,000	15,060,000	14,700,000	70,949	66,693
Inspiration-----	5,378,848	5,314,770	3,993,262	4,105,835	47,012	40,400
Ray-----	2,998,888	6,526,814	<u>3/</u> 7,419,324	<u>3/</u> 14,467,527	29,084	58,799
Lavender-----	3,170,000	4,245,000	4,773,000	11,588,900	25,551	33,248
Copper Cities-----	3,060,575	<u>3/</u> 3,058,372	<u>3/</u> 1,809,488	<u>3/</u> 1,666,149	18,470	16,551
Silver Bell <u>3/</u> -----	2,776,400	2,723,200	1,602,610	1,788,470	(4)	(4)
Esperanza <u>3/</u> -----	<u>5/</u> 3,216,383	4,366,856	6,545,400	9,648,961	(4)	(4)
Pima-----	1,200,606	1,327,473	<u>3</u> <u>6/</u> 2,618,804	<u>3</u> <u>6/</u> 4,027,316	(4)	(4)
Bagdad-----	<u>3/</u> 1,770,138	<u>3/</u> 1,821,402	<u>3/</u> 6,440,208	<u>3/</u> 5,988,379	<u>7/</u> 11,975	<u>7/</u> 11,931
Castle Dome dump-----					<u>8/</u> 2,451	<u>8/</u> 2,654
Mission <u>3/</u> -----			1,654,650	29,669,400		
Underground:						
San Manuel-----	7,595,867	12,261,220	-----	-----	46,170	81,724
Copper Queen-----	373,395	509,668	-----	-----	19,556	25,575
Magma-----	276,387	386,636	-----	-----	13,009	18,917
Miami-----	<u>9/</u> 998,568	(10)	-----	-----	10,615	9,390
Daisy <u>11/</u> -----	83,322	48,872	-----	-----	2,281	1,324

1/ Source: Company-published annual reports except where otherwise specified.

2/ Includes copper recovered from leaching of material in place and in dumps.

3/ Source: Mining World Catalogue and Directory Number, Apr. 25, 1961, p. 99.

4/ Figure withheld to avoid disclosing individual company confidential data.

5/ Wet weight.

6/ Cubic yards.

7/ Gross metal in concentrate shipped.

8/ Water leaching of mine dumps only.

9/ Cessation of underground mining July 1, 1959, and conversion to in-place leaching.

10/ All production from in-place leaching.

11/ Daisy-Mineral Hill in 1959--Daisy only 1960.

METALS

Following the 1959 labor strike, operations that resumed activity in the first quarter included the Copper Queen and Morenci Branches of the Phelps Dodge Corp., Ray Mines Division of Kennecott Copper Corp., and Magma and San Manuel properties of Magma Copper Co. The top 15 copper producers in the State furnished 530,500 short tons or 98.5 percent, and among these the leading 5 accounted for 368,500 tons or 68 percent. Three of the five leading producers were branch operations of the Phelps Dodge Corp.; one was San Manuel Copper Corp., a subsidiary of Magma Copper Co.; and one was a division of the Kennecott Copper Corp.

Numerous developments highlighted the copper industry of Arizona. The Esperanza open-pit copper mine and 12,000-ton-per-day mill had its first full year of operation in 1960. Maximum production was maintained throughout the year, and mine development was well advanced with six mining levels available for producing ore and three additional levels advancing in waste overburden to develop additional ore by the close of the year. A drilling program, begun in 1959, to evaluate a porphyry copper deposit in northwestern Arizona was still in progress at yearend.

By the close of the year, the American Smelting and Refining Co. (Asarco) \$43.5 million program Mission Project open-pit copper mine, scheduled for production by 1962, was well advanced. Construction begun in March on its \$17 million 15,000-ton-per-day concentration plant, for completion in September 1961, progressed on schedule. Stripping of the 200 feet of overburden was continued throughout the year: 31.3 million tons, well over half of the total pre-operation stripping required, was removed by the end of the year. Completed facilities included service buildings, machine shop, warehouse and changehouse, and a 7-mile railroad spur.

In April Inspiration Consolidated Copper Co. integrated its mining, milling, smelting, and refining activities through the purchase and operation of the International Smelting and Refining Co. Miami copper smelter located adjacent to International's concentrating plant. This purchase of the smelter and expansion of the refinery were effected to reduce smelting and refining costs and prepare for production from the Christmas mine to be in operation by late 1961 or early 1962. Through this integration of processes the copper output of its Inspiration and Christmas mines will be shipped in the form of refined copper cathodes.

Significant progress was made on the McDonald 18-foot circular shaft at the Christmas mine, 12 miles north of Winkelman. The shaft was sunk to a depth of 1,576 feet, 204 feet short of final depth, by the close of the year. In addition, 1,431 feet of development drifts, raises, and station excavation were driven in 1960 in the mine. A circular, 12-foot diameter air shaft, with a planned depth of 1,205 feet, was completed to a depth of 462 feet. The mill flowsheet and layout was determined, equipment ordered, and construction begun. Installation of miscellaneous service building and facilities was continued. The operation was designed for a production and milling capacity of 4,000 tons of ore per day; copper output is expected to be 36 million pounds per year.

In 1959, Kennecott Copper Corp.--acting on the results of a 3-year exploration program by its subsidiary, Bear Creek Mining Co.--purchased 120 claims on a copper mineralized area northeast of Safford; patent was applied for on 53 claims in 1960. In addition, at the close of the year a contract was awarded for sinking a 795-foot vertical two-compartment shaft on the property with inside dimensions of 9 feet 2 inches by 5 feet 6 inches. Another contract will be let for drifting, crosscutting, and raising from the 3,900-foot level to be cut at a distance of 754 feet from the collar.

Phelps Dodge Corp. started exercising options to buy approximately 300 mining claims 10 miles north of Safford, 2 miles west of the property Kennecott purchased in December. In a drilling program conducted by the company on the claims in 1959, copper mineralization reportedly was found in one hole at a depth of 1,000 feet. No immediate plans were announced for further exploration and development on these claims. American Metal Climax, Inc., terminated its option on claims on Turtle Mountain north of the Phelps Dodge property at the close of 1959.

By mid-year American Metal Climax, Inc., Bear Creek Mining Co., and Asarco had located extensive holdings of mining claims in the Twin Buttes mining area $6\frac{1}{2}$ miles south of Banner Mining Co., Pima Mining Co., and Asarco (Mission Project) operations south of Tucson. The first company reportedly located about 300 claims in the 10-square-mile area and drilled four test holes ranging in depth from 1,250 to 1,500 feet. The second staked claims and started drilling test holes. The third, Asarco, filed locations on 162 claims north of those located by American Metal Climax, Inc.

The first commercial application in the United States of the salt-coke segregation process to recover copper from copper-silicate ore was initiated when Transarizona Resources, Inc., completed a plant and development of an open-pit mine south of Casa Grande and began copper production in July. The plant has a rated capacity of 250 tons of ore per day with provisions for enlargement. Salt (30-50 tons per week) for the chloridizing furnace was trucked from Carlsbad, N. Mex.

The new five-compartment Palo Verde shaft was completed for Banner Mining Co. at a depth of 960 feet. Banner then began development of the mine by cutting stations and ore and waste pockets on the 700, 800, and 900 levels. By yearend development work was yielding 100 tons of ore per day which was being treated in the company mill. Intensive development work was continuing to bring the mine into full production of 1,000 tons per day in late 1961.

Banner Mining Co. and Pima Mining Co. reached an agreement that Pima would mine and mill 1,800,000 tons of Banner's Daisy mine ores from an extension of Pima's open pit. Mining of the ore over a 7-year period will begin in 1962. On this project, Pima started stripping and enlarging its open pit to uncover Banner's ore and made revisions to its mill resulting in increasing capacity from 3,000 to 3,800 tons per day.

The 500-foot Copper Queen shaft was completed for Cyprus Mines Corp. near its producing Old Dick mine. Stations were then cut at the 300- and 450-foot levels from the shaft to intersect the vein and a small tonnage of development copper-zinc ore was produced and treated in the company Old Dick mill.

In July the Bagdad Copper Corp. started construction of its \$2 million leaching and auxiliary sulfuric acid plants at its Bagdad open-pit copper operation. The leaching plant, to be completed in June 1961, was designed to recover 20 tons of copper per day from the low-grade oxide ore stockpiled and from additional low-grade material stripped during mining operations to produce ore for the company concentrator.

A new water reclamation plant was completed and placed in operation in June as a part of a \$40 million expansion program by Kennecott Copper Corp. at its Ray operation. The key to this all-important recovery of additional water from the mill tailings is a radiation detection device, believed to be one of the first such applications to the copper industry. This device--a radioactive isotope gamma ray source coupled with a detection unit--automatically controls the density of the solids in the thickener. The limitations of the company's water rights from the Gila River had controlled the quantity of ore that could be treated. Therefore, the availability of the additional water reclaimed was an important factor that enabled the company to increase the capacity of the Ray Mines Division from 15,000 tons of ore per day to 22,500 tons.

Tennessee Corp. acquired the Miami Copper Co. operating mines and plants in Arizona on June 10. The transaction included leaching operations at the Miami and Castle Dome properties and mining and milling at the Copper Cities property but excluded a royalty interest in the copper reserves. This interest was to be sold by Miami to institutional investors for a reported \$15 million.

The Phelps Dodge Corp. \$5 million expansion program started in 1959 on the Lavender open-pit mine of its Copper Queen Branch to double the life of the mine to 14 years continued throughout 1960. Buildings were relocated to permit enlargement of the open pit to the southeast, stripping in this area was started, a new diesel powerplant was completed, and four 35-ton capacity dump trucks were purchased.

In the iron industry, Kennecott Copper Corp. continued to produce sinter (sponge iron) from pyrite recovered as a byproduct of the treatment of copper ore at Hayden and from pyrite purchased from Magma Copper Co. The sinter and sulfuric acid, both produced from pyrite, were used in the leach-precipitation-flotation (L-P-F) process in the Ray concentrator.

Construction was started of a small plant to manufacture sponge iron from iron oxides produced from the Douglas copper smelter operations by Phelps Dodge Corp. The sponge iron will replace the detinned cans currently used in precipitating copper from solution in the company's leaching operation at Bisbee.

Southwest Iron and Steel Co. combined with the Arkota Steel Co. and started construction of a pig-iron plant near Coolidge. Raw material for the plant will come from Southwest's magnetite-bearing alluvial deposit 40 miles north of Tucson. The plant, with an anticipated daily capacity of 75 tons of pig iron, will employ a process reportedly developed by Julius D. Madaras. The material (magnetite) for the plant will be mined by open-pit methods and concentrated by the magnetic separation process.

The Colorado Fuel and Iron Corp. acquired an exclusive prospecting permit for iron and other minerals, including uranium, on 120,200 acres, 188 square miles, in the northwestern section of the Fort Apache Indian Reservation in Arizona. The permit is for 2 years with the right to extend it for an additional 2 years if desired. The company made geologic studies in the area during the past 2 years and announced that substantial reserves of iron ore had been indicated by this work.

Webb & Knapp, Inc., announced that the contract between the company and the Bonneville Power Administration for power for a steel plant at Anaconda, Mont., and plans to construct a plant at Anaconda did not mean abandonment of plans for a similar steel plant at Clarkdale. Relative to the Clarkdale plant, the company had announced plans for tripling the capacity of the projected steel mill to 350,000 tons and raising the cost of the mill from \$15 million to \$40 million. The steel would be produced from company-owned copper slag remaining from the Clarkdale copper smelter (last operated in 1950).

Shattuck Denn Mining Corp. (Iron King mine) and Nash & McFarland (Flux mine) accounted for the bulk of the output of lead. Test drilling was conducted on the main ore structure in the Iron King mine to depths below the presently developed levels and, according to the company, confirmed the continuation of the mineralized structure. Metallurgical research was aimed at the development of new products, such as soil conditioners and plant-food supplements, from the sulfur and iron contained in the mill tailings. Ore from the Flux mine and some custom ore were treated in the Nash & McFarland Trench mill.

Two operators produced and marketed manganese concentrate recovered from manganese mill tailings. In addition, Mohave Mining and Milling Co. of Wickenburg completed a contract in June for supplying manganiferous ore and concentrate to the Kaiser Steel Corp. Fontana, Calif., steel plant; Mohave liquidated all company assets by the close of the year.

Molybdenum output, all recovered as a byproduct of copper mining and milling, increased, despite the drop of one producer when Miami Copper Co. discontinued milling copper and the recovery of byproduct molybdenum at its Miami operation. Molybdenum production came from six of the State's leading copper-producing mines, Esperanza, Inspiration, Morenci, Silver Bell, San Manuel, and Bagdad.

Uranium-ore production, all from 64 operations in 5 counties, was greater than 1959. The mine value of the ore, however, decreased 1 percent because of a decline in grade from 0.30 percent (6.0 pounds) U_3O_8 per ton to 0.26 percent (5.2 pounds) in 1960. Major production continued to be from Apache, Coconino, and Navajo Counties. Practically all of the ore mined in Coconino and Gila Counties was processed at the Rare Metals Corp. of America mill at Tuba City which operated the entire year. Ores from Apache and Navajo Counties were processed at mills in Colorado, New Mexico, and Utah.

Vanadium was recovered as a byproduct of uranium ores processed at mills in southwestern Colorado (Climax Uranium Co. at Grand Junction and Vanadium Corp. of America (VCA) at Durango) and northwestern New Mexico (Kerr-McGee Oil Industries, Inc., at Shiprock).

The Iron King mine, operated by Shattuck Denn Mining Corp., was again by far the principal zinc producer followed by the Old Dick (Cyprus Mines Corp.), Atlas (B. S. & K. Mining Co.), Johnson Camp (McFarland & Hullinger), and the Flux (Nash & McFarland). Cumulatively, these mines accounted for 99 percent of the State's zinc output.

NONMETALS

Shippers of asbestos from mines in Gila County in order of output were: Jaquays Mining Corp. (Regal and Chrysotile mines), Metate Asbestos Corp. (Metate), Kyle Asbestos Mines of Arizona (Sloan Creek), and LeTourneau Asbestos Corp. (Asbestos Peak). A new LeTourneau mill constructed about 2 miles east of Globe processed ore from the Asbestos Peak and Bore Tree Saddle properties. The GSA, pursuant to an announcement late in 1959 by the Office of Civil and Defense Mobilization, called for bids to supply nonferrous, soft asbestos of domestic origin for the national stockpile; however, no purchases were made by GSA during 1960.

Cement for the first load of concrete poured at the Glen Canyon damsite on June 17 came from the new Clarkdale plant of Phoenix Cement Co. Division, American Cement Corp. Late in 1960, Phoenix Cement Co. announced plans to increase the capacity of its Clarkdale plant annual capacity by 800,000 barrels by constructing an additional kiln, thus raising the plant output capacity to 2.6 million barrels. Arizona Portland Cement Co. was issued a building permit for the construction of five new storage silos, a new finishing mill, loading facilities for both truck and rail, and lengthening the Southern Pacific spur track to reach the new loading docks at the Rillito plant.

International Minerals & Chemical Corp. (IMC) continued to be the only producer of crude and ground feldspar. Sena Mining Co. was the mine operator, and all crude output was shipped to the Kingman mill of IMC for grinding.

The gypsum industry of Arizona continued to consist of three mining operations in Pinal County. Arizona Gypsum Corp. mined gypsum near Winkelman and sold its uncalcined output for use as a portland-cement retarder and for agricultural purposes. Garcia & Peters Gypsum Co. sold crude gypsum from its Mammoth property for agricultural uses. Union Gypsum Co., with a wallboard and lathe plant at Phoenix, was acquired by National Gypsum Co. of Buffalo, N. Y., during 1960.

Most of the lime produced was used for metallurgical purposes in the concentration of metallic ores (principally copper). A lime plant employing five shaft-type vertical kilns was completed at the Ray Division operation at Hayden to supply lime necessary as a conditioning agent in the copper-flotation process.

An increase in the demand for ground mica by roofing paper and paint manufacturers resulted in a substantial gain in the mine production of scrap mica. The Buckeye Mica Co., with a mill at Buckeye and mines near Quartzite and Buckeye, accounted for nearly all of the production.

Increased production from the Superior operation of Harborlite Corp. was responsible for the 1960 gain in perlite output. Arizona Perlite Roofs, Inc. (formerly Perlite Industries of Arizona, Inc.) produced somewhat less perlite in 1960 than in 1959. Popping plants were operated at Phoenix by Perlite Industries of Arizona and at Tucson by Tucson Perlite, Inc.

Six operations accounted for the pumice (scoria) output in the State. The Atchison, Topeka & Santa Fe Railway Co., operating its Darling pit near Winona, was the largest producer, with all of its output being used for railroad ballast. The need for scoria in the manufacture of building blocks and for fill consumed all of the mine production of Superlite Builders Supply Co. and Paul Zanzucchi (supplying crude material to Harenberg Block Co., Inc., of Flagstaff). San Xavier Rock & Sand Co. continued to quarry scoria from its Douglas pit as did Gila Cinder Co. from its Graham County operation. Yavapai Block Co. activity centered at the Cruice cinder pit near Ashfork was added to the list of active operations in 1960.

Kennecott Copper Corp. at Hayden accounted for the bulk of the pyrite output. Magma Copper Co. shipped a small quantity to Kennecott; all the pyrite was consumed at the Kennecott sulfuric acid plant at Hayden. A contact acid plant was under construction by Bagdad Copper Co. at Bagdad. Crude sulfur will be used for the manufacture of the acid.

Commercial output accounted for 44 percent of the total sand and gravel production, and Government-and-contractor production 56 percent. Maricopa County, the center of production, had an output of nearly 6 million tons. Arizona completed to full or acceptable interstate standards 201.9 miles of road plus 312.4 miles of highway adequate for present traffic.

Two-thirds of the tonnage increase of stone production was due to the activities of the Federal Bureaus of Indian Affairs and Public Roads in the quarrying of basalt, limestone, and miscellaneous stone. A gain in the output of limestone used in the manufacture of cement and lime was largely responsible for increased output in the commercial category.

MINERAL FUELS

Coal was produced from the Cow Spring No. 3 mine in Coconino County and the Keams Canyon No. 4 mine in Navajo County.

Petroleum production, all from three fields in Apache County, was nearly three times that of 1959. Drilling during the year amounted to 39 completed wells--20 exploratory and 19 development. Of the 20 exploratory wells, 1 was listed as a discovery. The well was within the southern portion of the Paradox basin 2.5 miles northwest of the Bita Peak field. Initial production was 8 barrels of oil a day, on pump, from the McCracken (Devonian) formation at a depth of 6,758 to 6,794 feet. Two successful development wells were completed in the Dry Mesa field. Additional drilling in the Pinta Dome area was primarily for the development of shallow helium-gas reserves.

TABLE XVI

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
1947-1949	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
1950	41,757,037	79,562 \$2,784,670	2,853,375 \$2,582,304	765,334,514 \$162,250,916	18.3 lbs/ton 21.2¢	\$167,617,890	767,000,000
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
1952	44,472,522	83,692 \$2,929,220	2,900,851 \$2,625,270	730,809,903 \$176,855,996	16.4 lbs/ton 24.2¢	\$182,410,486	753,762,300
1953	45,187,838	89,724 \$3,140,340	3,164,255 \$2,863,809	738,404,453 \$211,922,077	16.3 lbs/ton 28.7¢	\$217,926,226	759,324,830
1954	43,072,894	94,648 \$3,312,680	3,380,060 \$3,058,954	714,154,795 \$212,103,976	16.6 lbs/ton 29.7¢	\$218,475,610	735,608,120
1955	52,189,728	105,330 \$3,686,550	3,629,191 \$3,284,418	856,270,850 \$321,101,569	16.4 lbs/ton 37.5¢	\$328,072,537	874,860,100
1956	60,468,580	119,435 \$4,180,225	3,963,579 \$3,587,039	935,039,400 \$390,846,469	15.5 lbs/ton 41.8¢	\$398,613,733	953,621,100
1957	59,571,834	123,375 \$4,318,125	4,088,618 \$3,700,200	947,840,100 \$280,560,670	15.9 lbs/ton 29.6¢	\$288,579,000	975,720,000
1958	56,255,809	114,262 \$3,999,170	3,543,044 \$3,206,455	913,973,800 \$235,805,240	16.2 lbs/ton 25.8¢	\$243,010,865	941,903,000
1959	53,121,545	96,153 \$3,365,355	2,724,701 \$2,465,854	803,087,000 \$250,563,144	15.1 lbs/ton 31.2¢	\$256,394,353	821,777,000
1960	66,000,000	119,460 \$4,181,100	3,400,000 \$3,077,000	1,062,000,000 \$339,840,000	16.1 lbs/ton 32.0¢	\$347,200,000	1,085,000,000

Arizona Department of Mineral Resources

August, 1961

TABLE XVII

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

1858-1960 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)
1874-1959	16,656,786	\$ 6,375,865	600,346	\$ 116,462	814,889	\$ 196,560
1960 Only	538,605	345,784	8,495	1,988	35,811	9,239
Total 1874-1960	17,195,391	\$ 6,721,649	608,841	\$ 118,450	850,700	\$ 205,799
Avg. Price		\$ 0.19545		\$ 0.09728		\$ 0.12096

	GOLD		SILVER		TOTAL VALUE
	Ounces	Value (thousands)	Ounces	Value (thousands)	
1858-1958	12,450,674	\$ 323,269	354,538,657	\$ 273,243	\$ 7,285,398,000
1960 Only	143,064	5,007	4,774,992	4,322	366,340,000
Total 1858-1960	12,593,738	328,276	359,313,649	\$ 277,565	\$ 7,651,738,000
Avg. Price		\$ 26.067		\$.77249	

Estimated value of other metals and non-metallics produced in Arizona through 1959					\$ 333,500,000
" " " " " " " " " " " " in 1960					49,416,000
Total Est. " " " " " " " " " " " " through 1960					382,916,000
GRAND TOTAL VALUE OF ARIZONA MINERAL PRODUCTION THROUGH 1960					\$ 8,034,654,000

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

TABLE XVIII

ESTIMATED VALUE OF METALS AND NON-METALLICS PRODUCED IN ARIZONA

YEARS 1858 - 1960 INCL.

Source: Arizona Bureau of Mines
United States Bureau of Mines

	VALUE (thousands)
<u>METALS:</u>	
Copper	\$ 6,721,649
Gold	328,276
Silver	277,565
Zinc	205,799
Lead	118,450
Sub-total - 5 principal metals	<u>\$ 7,651,738</u>
<u>MISC. METALS:</u>	
Manganese	\$ 34,520
Molybdenum	36,249
Uranium (July 1,1955-1960,prior years undisclosed)..	33,219
Tungsten (Value not disclosed after 1957).	6,337
Mercury (Value not disclosed after 1958)	1,500
Vanadium (to 1950 incl.,val.not disclosed thereafter)	460
Other Metals (val. undisclosed) beryllium concentrate, lithium, columbium-tantalum concentrate, iron ore and iron pyrite	-
Sub-total Misc.Metals(not including undisclosed?)	<u>\$ 112,285</u>
GRAND TOTAL ALL METALS(Not incl.undisclosed values).	<u>\$ 7,763,023</u>
ESTIMATED VALUE OF NON-METALLICS PRODUCED IN ARIZONA	<u>\$ 275,753</u>
GRAND TOTAL VALUE OF ARIZONA'S MINERAL PRODUCTION. .	<u>\$ 8,038,776</u>

TABLE XIX
MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN ARIZONA IN THE YEAR 1960,
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	21	4,476	883	9,520	32,100	.....	.....
Dry gold-silver	7	121,761	700	33,210	2,786,200	1,500	1,400
Dry silver	14	92,263	1	14,073	1,145,700	1,900	100
Total	42	218,500	1,584	56,803	3,964,000	3,400	1,500
Copper	44	66,032,439	115,602	3,689,622	993,370,700	800	300,500
Copper-zinc	4	147,541	92	50,555	8,454,400	31,600	17,270,500
Lead	9	4,202	128	33,738	7,200	495,400	24,200
Lead-zinc	4	337,070	24,493	919,054	837,500	16,423,600	46,930,200
Zinc	1	19,370	.....	1,027	62,600	.....	7,073,200
Total	65	66,540,622	140,315	4,693,996	1,002,732,400	16,951,400	71,598,600
Other "lode" material:							
Gold tailings	1	15,240	740	11,898	29,100	.....	.....
Gold-silver and silver tailings	2	15,542	10	779	77,400	.....	.....
Copper cleanup	(2)	10,215	56	7,237	3,284,600	.....	.....
Copper precipitates	11	44,929	.....	.....	66,691,000	.....	.....
Lead cleanup	(2)	8	.....	184	.....	9,100	400
Lead tailings	1	70	.....	123	.....	13,500	400
Lead-zinc mill cleanup .	(2)	32	5	392	400	5,600	3,300
Zinc cleanup	(2)	86	217	503	300	6,200	11,000
Uranium ore .....	.....	.....	10	3,068	430,800	800	6,800
Total .....	.....	86,122	1,038	24,184	70,513,600	35,200	21,900
Total "lode" material	106	66,845,244	142,937	4,774,983	1,077,210,000	16,990,000	71,622,000
Gravel(placer operations).	5	.....	127	9	.....	.....	.....
Total, all sources ..	111	66,845,244	143,064	4,774,992	1,077,210,000	16,990,000	71,622,000

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

^{2/} From properties not classed as mines.

TABLE XX

COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINES

YEARS 1959 AND 1960

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

MINE	1959		1960	
	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	14,499,800	211,281,072
New Cornelia	9,823,000	141,898,478	9,065,600	133,385,819
Lavender Pit	3,170,000	51,101,342	4,248,400	66,496,523
Copper Queen	373,395	39,111,962	509,700	51,149,219
Sub-Total	23,879,395	382,105,075	28,323,500	462,312,633
<u>KENNECOTT - Ray</u>	2,998,888	58,168,000	6,526,814	117,497,684
<u>MIAMI:</u>				
Miami	998,659	21,229,033		18,930,454
Copper Cities	3,060,575	36,939,297	3,058,372	33,100,562
Castle Dome	-	4,902,751		5,306,988
Sub-Total	4,059,234	63,071,081		57,338,004
<u>INSPIRATION</u>	5,378,848	94,023,162	5,314,770	80,800,960
<u>MAGMA:</u>				
San Manuel	7,595,867	92,340,444	12,261,220	163,448,339
Superior	276,387	26,017,688	386,636	37,834,116
Sub-Total	7,872,254	118,358,132	12,647,856	201,282,455
<u>A. S. & R. CO.</u>				
Silver Bell	2,783,200	37,606,481	2,718,700	45,138,255
<u>PIMA MINING CO.- Pima</u>	1,200,606	29,763,593	1,327,473	26,769,896
<u>BAGDAD COPPER CORP.</u>				
Bagdad	1,770,940	23,950,907	1,823,055	23,666,978
<u>DUVAL - Esperanza</u>	3,104,530	34,106,798	4,245,762	50,735,060
<u>BANNER MINING CO.</u>				
Mineral Hill & Daisy	83,322	4,612,409 ^{1/}	55,724	2,647,456 ^{1/}
TOTALS	53,131,217	845,765,638	66,042,026	1,068,189,381
OTHER ARIZONA MINES	633,618	14,828,362	803,218	9,020,619
GRAND TOTAL ALL ARIZONA MINES	53,764,835	860,594,000	66,845,244	1,077,210,000

^{1/} Copper in concentrates

TABLE XXI

MINERAL PRODUCTION OF LARGE AND SMALL PRODUCERS IN ARIZONA IN 1960

Source: U.S.B.M. Area Report III-123

<u>LARGE COPPER PRODUCERS</u> ^{1/}	<u>PRODUCTION</u>	<u>VALUE</u>
Copper (lbs.)	1,065,541,925	\$ 342,038,950
Gold (ozs.)	115,602	4,046,070
Silver (ozs.)	3,689,622	3,339,108
Molybdenum (lbs.) (content of concentrate). . . .	4,359,000	<u>5,211,000</u>
Total Value of Large Mine Production in 1960 *		<u>\$ 354,635,128</u>
<u>SMALL MINERAL PRODUCERS:</u>		
Clays ^{2/} (short tons).	173,000	\$ 260,000
Coal (short tons).	6,000	58,000
Copper (recoverable content of ores etc.) (lbs.).	11,668,075	3,745,050
Gem stones	^{3/}	120,000
Gold (recoverable content of ores, etc.) (troy ozs.)	27,462	960,930
Lead(" " " " ") (lbs.) . .	16,990,000	1,988,000
Lime (short tons)	148,000	2,430,000
Manganese ore and concentrate (35 percent + manganese) (short tons) .	1,626	40,000
Manganiferous ore and concentrate (5 to 35 percent manganese) (short tons) .	8,677	190,000
Mica (scrap).	^{4/}	^{4/}
Petroleum (crude) thousand 42-gal. barrels. . . .	^{5/} 73	^{4/}
Pumice (short tons).	703,000	1,164,000
Sand and gravel (short tons).	14,490,000	14,235,000
Silver (recoverable content of ores, etc.) (troy ounces)	1,086,370	992,892
Stone (short tons)	4,233,000	5,107,000
Uranium ore (short tons)	283,684	6,219,000
Zinc (recoverable content of ores, etc.) (lbs.). .	71,622,000	9,239,000
Value of items that cannot be disclosed: Asbestos, beryllium concentrate (1960), cement, clays (bentonite), feldspar, gypsum, mercury, perlite, pyrites, tungsten concentrate, vanadium, and values indicated by footnote 4.		<u>16,115,000</u>
Total Value of Small Mine Production ^{7/} . . .		<u>\$ 61,140,872</u>
GRAND TOTAL VALUE OF MINERAL PRODUCTION ^{7/}		<u>\$ 415,776,000</u>
PERCENTAGE DUE TO SMALL MINES.		14.7%

^{1/} Phelps Dodge, Kennecott, Inspiration, Miami, Magma, Asarco's Silver Bell, Pima, Bagdad and Duval's Esperanza.

^{2/} Excludes bentonite; included with "Value of items that cannot be disclosed."

^{3/} Weight not recorded.

^{4/} Figure withheld to avoid disclosing individual company confidential data.

^{5/} Preliminary figure.

^{7/} Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

TABLE XXII

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

Base period 1947-1949, 1958, 1959 & 1960

Arizona Covered Industry

Compiled by Department of Mineral Resources

Source: Arizona Employment Security Commission

	Average No.Of Employees*	Total Wages	Average Annual Wage	Average Weekly Wage	Average No.Of Employees*	Total Wages	Average Annual Wage	Average Weekly Wage
	Base Period 1947 - 1949				Year 1958			
Copper Mining Only	11,278	\$ 39,432,008	\$ 3,496	\$ 67.23	14,100	\$ 74,726,972	\$ 5,300	\$101.93
All Mining & Quarrying	12,870	44,345,018	3,446	66.27	16,403	86,199,194	5,255	101.06
Smelting **	1,500	5,175,000	3,450	66.35	1,831	8,892,801	4,857	93.40
All Mining, Quar., & Smelting	14,370	49,520,018	3,446	66.27	18,234	95,091,995	5,215	100.29
Manufacturing (Excl. Smelting)	12,639	36,910,624	2,920	56.15	38,485	203,624,961	5,291	101.75
Construction	10,844	35,424,826	3,267	62.83	26,680	150,239,757	5,631	108.29
Transp. & Utilities (Excl. RR's)	10,530	29,948,944	2,844	54.69	18,041	87,436,788	4,847	93.21
Wholesale-Retail Trade	36,213	91,916,860	2,538	48.81	63,640	234,196,004	3,680	70.77
Services & Misc. (Incl. Agri.)	18,643	43,103,526	2,312	44.46	37,734	135,450,709	3,590	69.04
Totals and Averages	103,239	\$286,824,898	\$ 2,778	\$ 53.42	202,814	\$906,040,214	\$ 4,467	\$ 85.90

	Year 1959				Year 1960			
Copper Mining Only	11,568	\$ 72,095,130	\$ 6,232	\$119.85	13,764	\$ 90,312,848	\$ 6,562	\$126.19
All Mining & Quarrying	13,680	83,038,890	6,070	116.74	15,837	102,175,093	6,452	124.08
Smelting **	1,525	8,439,106	5,534	106.42	1,033	5,995,780	5,804	111.62
All Mining & Quar., & Smelting	15,205	91,477,996	6,016	115.69	16,870	108,170,873	6,412	123.31
Manufacturing (Excl. Smelting)	43,400	241,713,804	5,569	107.10	46,470	265,799,784	5,720	110.00
Construction	29,260	169,187,767	5,782	111.19	32,174	200,203,313	6,223	119.67
Transp. & Utilities (Excl. RR's)	18,839	97,345,413	5,167	99.37	19,906	106,302,227	5,340	102.69
Wholesale-Retail Trade	68,990	263,771,499	3,823	73.52	74,423	291,911,971	3,922	75.42
Services & Misc. (Incl. Agri.)	42,727	162,489,695	3,803	73.13	47,190	187,753,626	3,979	76.52
Totals and Averages	218,421	\$1,025,986,174	\$ 4,697	\$ 90.33	237,033	\$1,160,141,794	\$ 4,894	\$ 94.12

* 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.

** Smelting employment has been segregated from Manufacturing as reported by the Employment Security Commission.

Note: Fringe benefits are not included in the total wages.

TABLE XXIII

SUMMARY OF TOTAL COVERED EMPLOYMENT & WAGES IN ARIZONA COPPER MINING
1947-1960 Inclusive

Source: 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	66,000,000 P	126.19

P. = Preliminary

August, 1961

Arizona Department of Mineral Resources