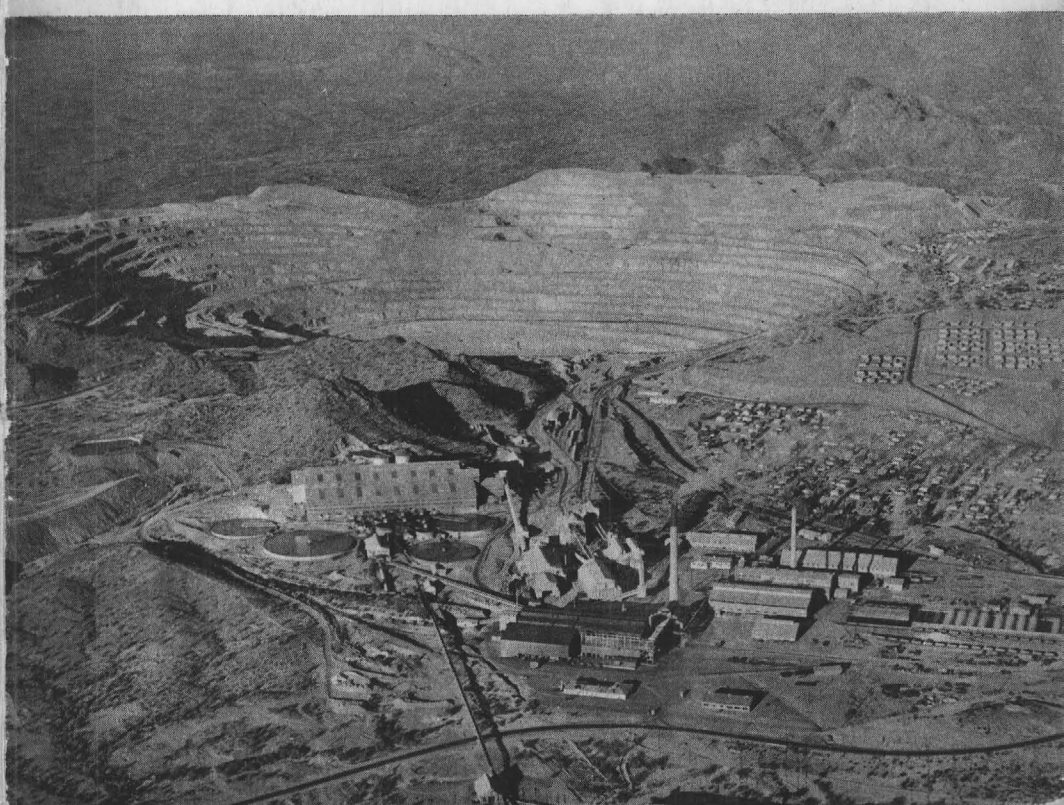
MINING
IN ARIZONA

Its Past ~ Its Present ~ Its Future



Superstition Mountain Monument

LEBEAU PRINTING

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
PHOENIX, ARIZONA

FRANK P. KNIGHT, DIRECTOR

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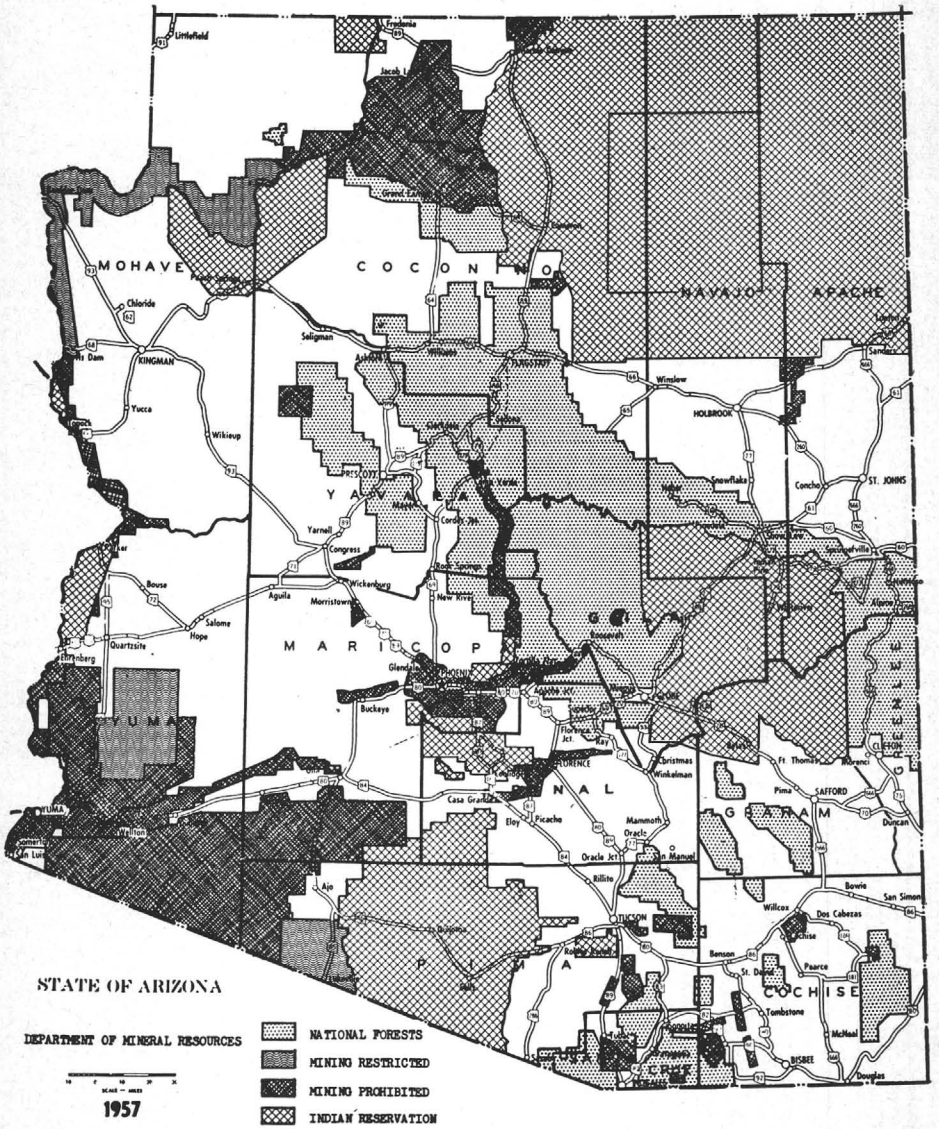
JANUARY, 1958



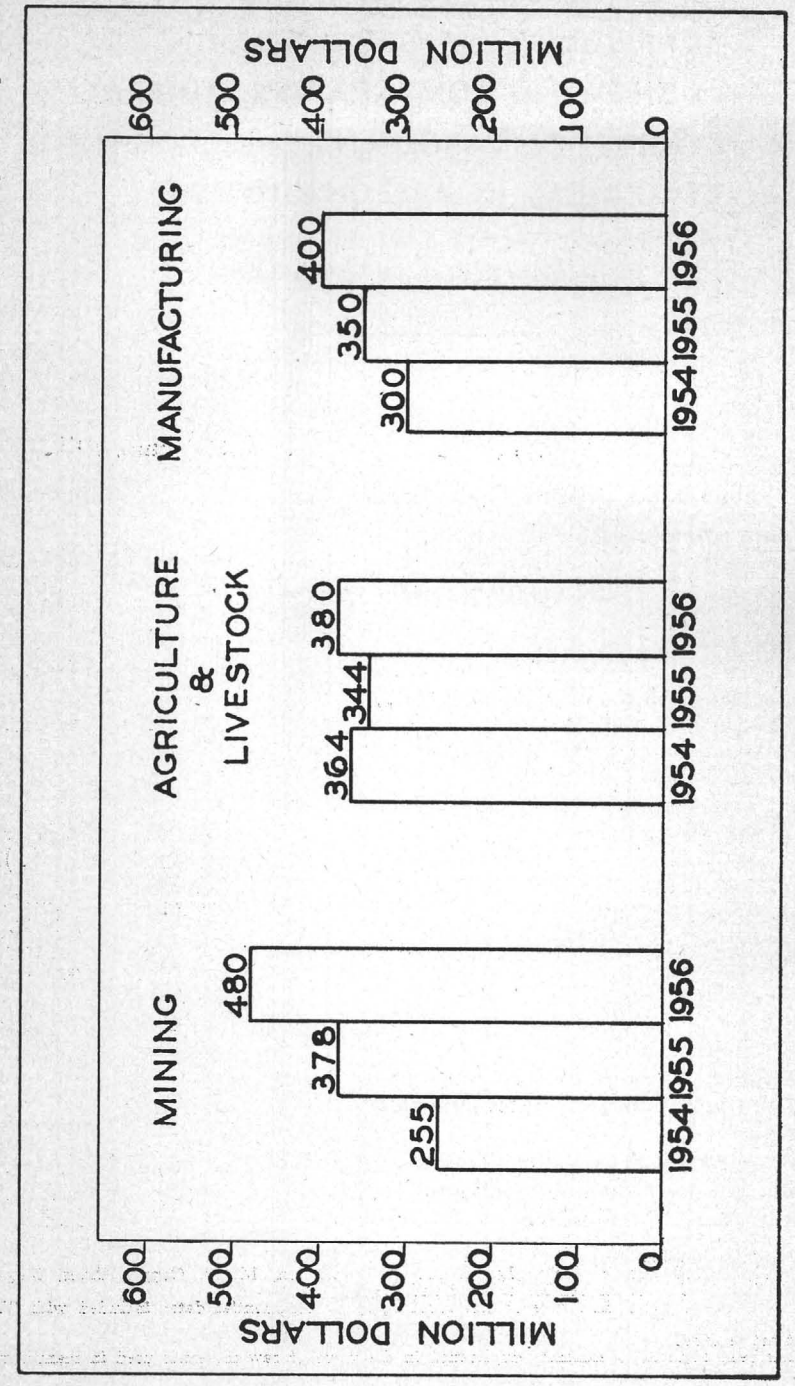
MINE PRODUCTION OF URANIUM ORE IN ARIZONA DURING FISCAL YEAR 1956(1)

County	July - December, 1955			January - June, 1956		
	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)	Number of properties	Ore (short tons)	U_3O_8 contained (pounds)
Apache	59	81,645	424,489	40	77,787	412,322
Cochise	—	—	—	1	(2)	(2)
Coconino	3	(2)	(2)	42	33,127	145,812
Gila	14	3,809	11,461	10	3,758	12,652
Graham	1	(2)	(2)	—	—	—
Maricopa	3	(2)	(2)	1	(2)	(2)
Mohave	1	(2)	(2)	—	—	—
Navajo	3	(2)	(2)	8	4,620	29,664
Pima	1	(2)	(2)	2	(2)	(2)
Santa Cruz	1	(2)	(2)	—	—	—
Yavapai	2	(2)	(2)	—	—	—
Undistributed	—	7,111	33,798	—	122	177
Total	88	92,565	469,748	104	119,414	600,627

(1) Based on data supplied to the Bureau of Mines by the Atomic Energy Commission.

(2) Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."

VALUE OF MINERAL, AGRICULTURAL & MANUFACTURING OUTPUT, 1954, 1955, 1956



Source: Mineral Production reported by United States Bureau of Mines.
: Agricultural Production reported by Geo. W. Barr — "Arizona Agriculture".
: Manufacturing Income reported in Valley Nat'l. Bank's "Statistical Review".

Mining In Arizona

Arizona is by far the greatest producer of non-ferrous, metallic minerals of any state in our Union. In 1957,

It ranked first in the combined dollar value of such metals.

It ranked first in copper production.

It ranked fifth among western states in lead.

It ranked fifth among western states in zinc.

It ranked fourth among all states in silver.

It ranked fourth among all states, including Alaska, in gold.

The following is a tabulation of the total Arizona production of these metals.

	Gold oz.	Silver oz.	Copper lbs.	Lead lbs.	Zinc lbs.
1947	95,860	4,569,084	732,436,000	57,132,000	109,288,000
1948	109,487	4,837,740	750,242,000	59,798,000	108,956,000
1949	108,993	4,970,736	718,020,000	67,136,000	141,316,000
1950	118,313	5,325,441	806,602,000	52,766,000	120,960,000
1951	116,093	5,120,985	831,740,000	34,788,000	105,998,000
1952	112,355	4,701,330	791,438,000	33,040,000	94,286,000
1953	112,824	4,351,429	787,050,000	18,856,000	55,060,000
1954	114,809	4,298,811	755,854,000	16,770,000	42,922,000
1955	127,616	4,634,179	908,210,000	19,634,000	45,368,000
1956	146,110	5,179,185	1,011,816,000	23,998,000	51,160,000
1957P	157,300	5,336,000	1,025,200,000	25,000,000	66,600,000

P — Preliminary

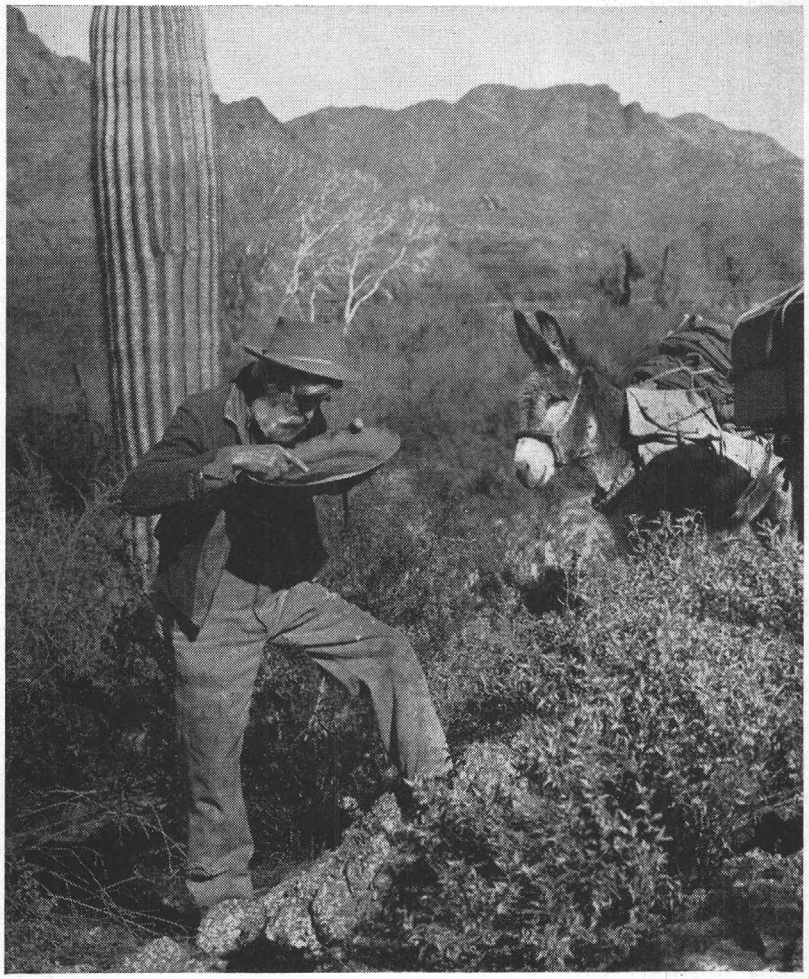


TABLE SHOWING COMPARATIVE MINERAL PRODUCTION(1) OF LARGE AND SMALL MINING COMPANIES IN ARIZONA IN 1957

Compiled from U. S. Bureau of Mines
Preliminary Report, January 3, 1958

1957 *Preliminary*

	Production	*Value*
Large Mining Companies: (2)		
Copper (Lbs.)	1,013,200,000	$303,960,000
Gold (Ozs.)	134,300	4,700,500
Silver (Ozs.)	4,000,000	3,620,000
Molybdenum (Lbs.)	2,370,000	2,728,500
Total Value of Large Mine Production		$315,009,000
Small Mining Companies:		
Copper (Lbs.)	12,000,000	$ 3,600,000
Gold (Ozs.)	23,000	805,000
Silver (Ozs.)	1,336,000	1,209,080
Lead (Lbs.)	25,000,000	3,600,000
Zinc (Lbs.)	66,600,000	7,659,000
Manganese concentrate (35% or more Mn) Long Tons	76,900	6,361,000
Tungsten concentrate (60% WO_3 basis) Short Tons	3	10,270
Beryllium concentrate	5	1,750
Lime — (Short Tons)	136,700	1,747,900
Clays (Short Tons)	(3)	(3)
Perlite (Short Tons)	1,300	7,620
Pumice (Short Tons)	113,400	551,700
Sand and Gravel (Short Tons)	8,000,000	6,240,000
Stone (Short Tons)	5,336,000	4,829,350
Coal (Short Tons)	10,000	(3)
Gem Stones	(4)	110,000
Gypsum (Short Tons)	80,400	320,900
Undistributed: Asbestos, cement, feldspar, mercury, vanadium, and values indicated by footnote(3)	—	12,378,000
Total Value of Small Mine Production	(5)	$ 45,617,000
Grand Total Value of Mineral Production	(5)	$360,626,000
Percentage due to Small Mines		12.6%

(1) Uranium ore is excluded.
(2) Large Copper Producers: Phelps Dodge, Kennecott, Inspiration, Miami, Copper Cities, Magma, San Manuel, A. S. & R. Co.'s Silver Bell Mine. Pima, and Bagdad.
(3) Figure withheld to avoid disclosure of individual company confidential data; included with "Undistributed."
(4) Weight not recorded.
(5) Total has been adjusted to eliminate duplication in the value of raw materials used in manufacture of cement and lime.

Arizona is the youngest state in the United States, the fifth largest, and has an area of 113,956 square miles. The State was organized as a territory in 1863, and was admitted to the Union on February 14, 1912.

The State flag represents the copper star of Arizona rising from a blue field in the face of a setting sun. The lower half is a blue field, the upper half is divided into 13 equal rays which start at the center and continue to the edges of the flag, consisting of six yellow and seven red rays. A five pointed copper star is superimposed on the center of the flag.

Arizona's state bird, the tiny cactus wren, likes to build his home in the protection of thorny desert plants. Because of this he often builds his nest in the arms of the giant sahuaro cactus. He builds several nests but lives in only one – the rest are decoys. He is a woody brown bird with a speckled breast.

The State flower is the pure white waxy flower of the sahuaro cactus, which blooms in the late spring. Blooms are found on the tips of the sahuaro arms. Many sahuaros are more than 100 years old and they often attain the height of 50 feet.

Arizona population in 1956 was estimated to be 1,080,000, 44 percent higher than the census figure for 1950. It is the nation's fastest growing state.

ARIZONA MINING HISTORY

Long before the white man set foot on much of this nation's area he had explored portions of Arizona. It was the lure of the metals – gold and silver – that prompted Coronado's famous expedition in search of the Seven Cities of Cibola. In 1540, eighty years before the Mayflower left England, Coronado's army captain, Gardenas, stood on the brink of Arizona's Grand Canyon. Coronado, however, wanted his gold and silver already mined, smelted and minted. He was not interested in unmined ores, and consequently did no prospecting.

Thirty-seven years before the landing of the Pilgrim Fathers, when the Elizabethan Age was dawning in England and Shakespeare was but 19 years of age, a white man, Antonio Espejo, found silver ore in what is now Arizona. It was the State's first recorded mineral discovery.

In the period from 1860 to 1956 inclusive, Arizona's mines have yielded more than $6,396,940,817, the value of its five principal metals, copper, lead, zinc, gold and silver produced in that period. Had that amount been possessed by one man 500 years before Christ, and had that same man lived until today, he could have spent $7,100 per day – and still have any interest or income from the principal.

While all phases of the mining industry contributed to such achievement, it is to the pioneer prospector and miner we of this "machine age" owe an everlasting debt. He first found the veins and ore-bodies. He blazed the trails, conquered the desert, braved its terrors, bridged the barrenness, scaled its difficulties and, in the end, wrested wealth from its age-long secrets and its hidden hoards.

The early-day history of Arizona's mines would be a fascinating story of adventure, hardship, danger and toil that we of this push-button generation cannot visualize. It is known that the Indians did little mining except for turquoise, salt, and possibly iron oxide for paint. After the silver discovery by Espejo in 1583 there ap-

pears to have been very little prospecting until about 1705 when Father Kino did some silver mining. About 1736, the rich silver deposits, Planches de Plata, near the site of Nogales, stimulated mining. In 1769 Tucson became a Spanish settlement, and it is known that the Spaniards mined gold and silver in the region. Gold placers at Quijotoa are said to have been worked in 1774.

From about 1824 to 1842, much of Arizona was covered by American trappers and explorers, among them Bill Williams, Pauline Weaver and Kit Carson. Apache raids prevented settlement and prospecting, however, until well after 1848, when that portion of Arizona north of the Gila River became part of the United States. That was also the year of the California gold rush, and while thousands of emigrants crossed Arizona enroute to the "gold diggings," few stopped to prospect. There are, nevertheless, well authenticated stories that Papago Indians had discovered gold near Gila City, Yuma County, in 1846, or two years prior to the California discovery.

Following the Gadsden Purchase in 1854, southern Arizona was actively prospected. In that year claims were located at Ajo. Mines were worked at Cerro Colorado, and in the Santa Rita Mountains south of Tucson. A few years later the Mowry mine was shipping rich lead ore. With the outbreak of the Civil War in 1861, and withdrawal of U. S. soldiers, the Apaches "took over" for some 10 years. Nevertheless, in 1862-63 the rich, gold placers of La Paz, Rich Hill and Lynx Creek were found and mined, and soldiers stationed at Fort Mohave discovered gold lodes near what is now Oatman. It was about that time, too, that many famous mines were discovered — Vulture, Planet, Castle Dome, and many of the rich mines of the Prescott region.

The '70's witnessed the discovery and development of many Arizona mining camps that are still yielding great mineral wealth. Globe-Miami, Silver King, Superior, Bisbee, Jerome, Tombstone, and Clifton-Morenci are among the mining districts founded in that period.

All these camps etched for themselves colorful pages in Arizona's early history, but perhaps the once-riotous Tombstone succeeded in leaving the most indelible impression.

the public only during the 10-day period of the Arizona State Fair in November of each year. Early in 1953, the following mining companies provided funds to keep the exhibit open on a year round basis with a curator and assistant: American Smelting and Refining Company, Inspiration Consolidated Copper Company, Kennecott Copper Corporation, Magma Copper Company, Miami Copper Company, and Phelps-Dodge Corporation. The Mineral Museum is under the direction of the Department. Besides the minerals in the display, there is a fine collection of almost every type of rock found in Arizona, all of which is valuable for study purposes as well as interesting and informative to visitors regardless of their interest in mining as an industry.

"LOST" MINES

Arizona is rich in legends of many "lost" mines.

Perhaps 98% of the "lost" mines are pure fiction. They exist only in imagination. True, the stories are interesting, especially to newcomers, but they are likewise dangerous. Many lives have been lost searching for these mythical mines, and in addition, the communities are put to extra expense for posses and searching parties.

"Don't believe it" is sound advice regarding lost mines. Forget the lost mines shown on the "old-map-my-grandfather-bought-from-an-old-Spaniard-he-befriended." It simply doesn't exist. The map is probably a fake, regardless of crude lettering, old and soiled paper, or other details which would seem to lend authenticity.

The rich ore that is supposed to have been obtained from a "lost" mine — and some were very rich — in all probability was "high-graded" (stolen) from some of the early day rich mines then working.

To a tourist in good health, and accompanied by an experienced prospector, the search for a "lost" mine is a healthful and interesting diversion during the winter months. Such trips always have the possibility of discovering some overlooked mineralized outcrop of promise; a neglected, rather than a "lost" mine.

ARIZONA FACTS

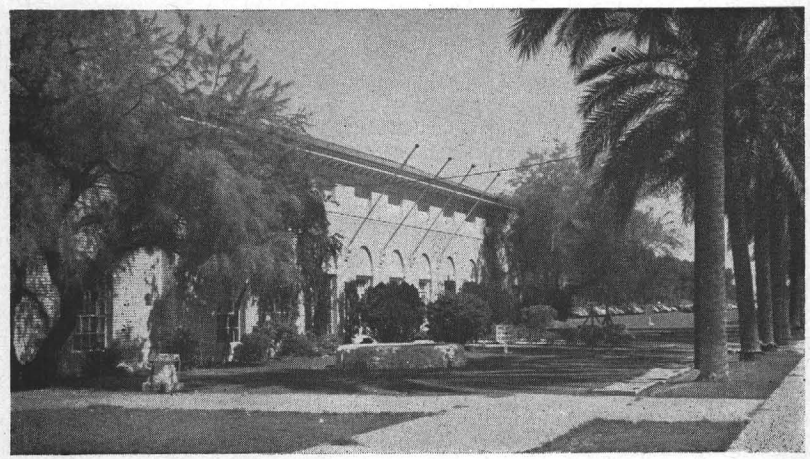
The word "Arizona" is derived from two Indian languages — Papago and Pima — and means "Little Spring." "Ari" means small and "Zonac" spring.

in the advancement of mining and metallurgical technology. Today's waste rocks will be tomorrow's ore, and the demand for the metals will continue to mount.

ARIZONA DEPARTMENT OF MINERAL RESOURCES

This department functions as a state agency through which prospective investors in either metallic or non-metallic substances may contact sellers or property owners. Its files contain information on many properties. In some instances, the data includes maps and a mining engineer's opinion on the property. The department engineers will render assistance within the limitations of their public position. They do not make examinatons and reports for private parties. They can and will assist, advise and counsel small mine owners and investors. The department has a library of many out of print U. S. Geological Survey and U. S. Bureau of Mines publications, very valuable for reference. In addition there is a set of American Institute of Mining and Metallurgical Engineers transactions from Volume 1 through Volume 153. Technical trade journals are on file, together with late information on pending legislation, price data, etc.

The Mineral Building finished in 1919, houses a fine collection of minerals. For many years this valuable display was open to



Mineral Building, Fairground

"Instead of a mine, you'll find a tombstone," said a fellow soldier to Ed Schieffelin in 1877 as he set out from Fort Huachuca, near the Mexican border, to "look for stones." Schieffelin recalled the warning, and when he came across some rich appearing ore, said to himself, "Here is my tombstone."

That was how the camp received its name. Since then stories of its development, its frontier sheriffs who brought law and order to one of the wildest mining camps of the then very wild West, and its rugged inhabitants have been the subject of a number of articles and books.

Today that romantic and picturesque town, "too tough to die," is almost equally as famous as a health center. And its mines still produce some silver.

Untold centuries ago there was locked away in Arizona's mighty mountain vaults a store of precious metals suited to this day and age; a supply sufficient and necessary for our increased commerce and more multiplied and complicated industries and life. The doors of these vaults were fitted with time locks and when the hour is at hand the bolts may be shot back. Those already opened have given the world rich treasures. Others as yet unlocked await but the same combination – work, capital, science, brains, courage and faith.

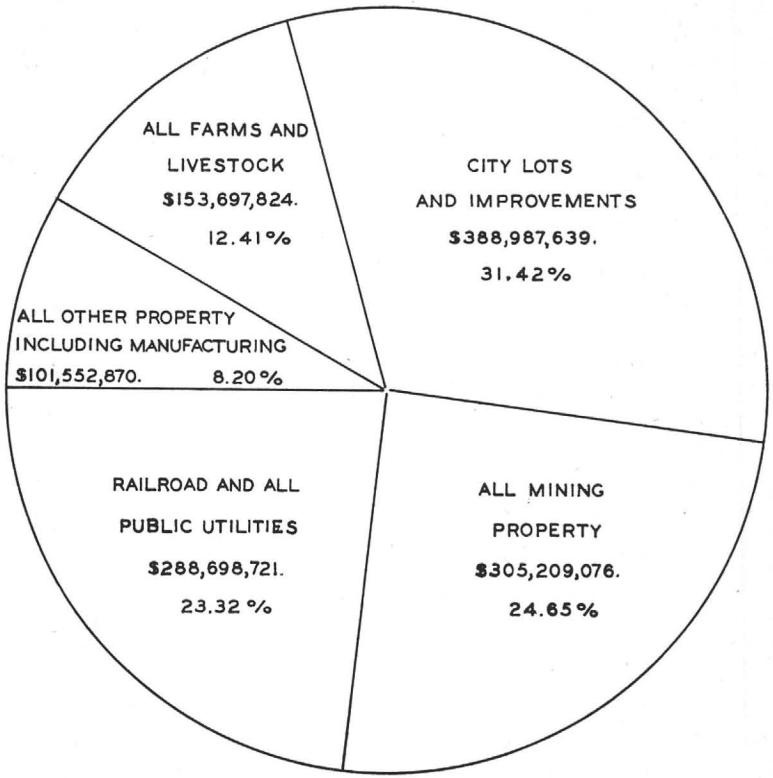
The following tables are a condensed, summarized tabulation of Arizona's production of five principal metals to the end of 1956:

15,224,796 tons of copper	worth	$5,545,567,518
566,016 tons of lead	worth	$ 107,821,422
715,127 tons of zinc	worth	$ 174,288,193
12,030,619 ounces of gold	worth	$ 308,566,820
340,676,334 ounces of silver	worth	$ 260,696,864
	Total Value	$6,396,940,817

And that isn't all the story. It is estimated that fifty percent of the value of all these metals has been expended in Arizona for wages, supplies, and state, county, city and school taxes. The balance has gone for out-of-state purchases, refining, marketing and dividends to investors, many of the latter being citizens of Arizona.

MINING AS AN INDUSTRY

The chart below shows the relative position of mining property in Arizona to other property, from the point of view of assessed valuation, which determines property taxes.



1956
ASSESSED VALUATIONS
STATE OF ARIZONA

and metallurgical practices they offer rich rewards for venture capital.

Arizona and our whole nation need new mines. We need them to take the place of those becoming depleted, to fill the requirements of industrial demands, and to make us secure and self-sufficient as a nation.

ARIZONA'S FRONTIERS ARE DOWNWARD ... INTO THE GROUND!

New ore bodies, perhaps larger than those of today, will surely be found in the future. It is an established fact that most of Arizona's mineralization occurred in a geologic time-period much earlier than the recent lava flows, and before deposition of the detritus covering much area in proven mining districts. Furthermore some old districts now more or less abandoned have neither been worked out (in the light of modern methods and ore treatment), nor properly prospected.

Arizona seeks and welcomes new mining venture capital. To investors we say, "investigate before venturing", because mining is a highly specialized industry; requires special know-how; and usually involves more risk than trade or manufacturing. Those entering the mining business need the best available advice about the risks involved and the chances of profit to justify the risk.

Investors in mining now have several advantages over early-day venture capital. Legally, they are much better protected in their investments. Technically, they can enlist the aid of the Arizona State Department of Mineral Resources, the Arizona Bureau of Mines, the United States Geological Survey, and the Federal Bureau of Mines. These agencies can and will furnish data as to the geology and mining history of most Arizona mining districts. Many valuable bulletins, maps and pamphlets may be obtained free of charge.

An organization known as the Arizona Small Mine Operators Association, 508 Title and Trust Building, Phoenix, Arizona, furnishes many valuable services. Those interested in mining are advised to join. Dues are only $1.00 per year, including a subscription to its monthly publication, which disseminates mining news and information.

Mining conditions change. New facts are discovered each day

outright government subsidies or protection through import control against such foreign minerals.

That a healthy mining industry is vital to the nation, is recognized by this Administration which is attempting to arrive at a long needed long range mineral policy.

Ore and minerals are of no practical value so long as they lie locked in the earth. They earn no interest, furnish no employment, produce no benefits to anyone. They are dead and wasted assets.

An active mining industry is the agency which converts potential wealth into actual and tangible assets. In the process of conversion, the benefits derived are distributed widely among other industries and businesses and thus indirectly benefit countless people.

THE FUTURE AND ARIZONA'S MINERALS

Arizona is not a "mined-out state." Not all of our ore deposits have been found. In recent years some ore bodies of great promise have been fully investigated and developed under modern exploration, mining and recovery methods. Among these are the San Manuel, Silver Bell, Lavender Pit, Copper Cities and Pima Mines. These have increased Arizona's copper production by at least forty percent.

The new development at the Duval property south of Tucson and recent research and exploration results elsewhere in the State promise further substantial additions to Arizona's copper production.

Only 4% of the State's 72,688,000 acres have been intensively prospected, and perhaps less than 1% have been investigated by geophysical methods. In addition, many marginal areas in the older and productive districts will yield mineral wealth in the future. Then there are the productive possibilities of many long-shut-down mines; and many oxide ores not now economical will become so when ways to treat them are found.

Arizona, despite the huge quantity of minerals already mined, still possesses great undeveloped ore bodies. These may not be as rich as those already mined, but the lower grade may be offset by greater tonnage. And, with the application of advanced mining

THE MAJOR METALS

The five major metals being produced in Arizona are gold, silver, copper, lead and zinc.

GOLD

From the days of Jason's Argonautic expedition in quest of the Golden Fleece, men have always and everywhere answered to the call of gold.

There has been no toil, no hardship, no perilous journey in mountain bleakness or desert desolation that they have not willingly and eagerly endured to reach and gain the yellow prize that has swayed nations.

Arizona's gold is now largely produced as a by-product from the copper mines. Gold mining received a severe setback with the "gold-closing order" in 1942, and many mines have not reopened. Despite the $35 per ounce price, present high costs prohibit economic mining of all but higher grade gold ores.

The tales of early Arizona gold discoveries are as fabulous as they are numerous, and many are interwoven in curious ways with the state's colorful history. Take, for example, the old Vulture gold mine near what is now the town of Wickenburg.

According to the story, a refractory burro owned by Henry Wickenburg, an old-time mining prospector, had wandered away from camp. When Wickenburg found him in the surrounding hills the burro, with proverbial contrariness, attempted to elude his master.

Wickenburg heaved stones at the burro, but the stones were heavy and fell short of their mark, breaking open and exposing gold. Thus the famous gold-laden Vulture mine was discovered, and the town which quickly sprang up there still bears the name of the rock-heaving prospector.

Another famous Arizona gold district was around Oatman where the first three decades of the 20th century recorded the production of 27 millions of dollars in gold from the Tom Reed and United Eastern mines.

SILVER

Silver, as well as copper and gold, was discovered in prehistoric time. The first great silver discovery in this country was the Comstock lode in Nevada in 1859. The Silver King Mine, the

"—— when there were no power lines, no gas mains, no Diesel engines, no roads"

largest of Arizona's silver mines, was discovered in 1875. A few years later Ed Schieffelin made his famous discovery and the colorful Tombstone silver boom started. Still later in 1895, John Pearce repeated Henry Wickenburg's stunt by picking up a rock to throw at a cow instead of a burro; noticing its unusual weight and having it assayed. It ran 2100 ounces in silver and the Commonwealth Mine, destined to become Arizona's largest silver-gold mine, was located.

Silver, like gold, is closely tied up with government. However, silver enjoys a much broader use in industry than gold.

Arizona's silver production is largely obtained as a by-product in producing copper, lead and zinc, and varies with the production of those metals. Between four and five million ounces are being produced annually.

COPPER

Copper may well be said to be mankind's oldest friend. It is easily worked and is beautiful as well as useful. The electrical industry is almost wholly dependent upon copper. The "light-metals industry" could hardly maintain itself without its aid as a hardening agent. Copper tubing finds greatly increased use in the building trades.

For more than 80 years the copper mines of Arizona have

earth's crust than is zinc; thorium than lead; and beryllium and rubidium than tin. Indeed, spectographic analysis of rocks and minerals is demonstrating that many so-called rare elements are rare only in the sense that they are neither well known nor easily recognized. The ores containing them have not been sought after or exploited because they had little or no commercial value. Today's tremendous advances in technology are calling more and more for new substances having special qualities. Singly or in combination, these unfamiliar elements are now important articles in every day use. Because of the varied and widespread mineralization in Arizona, this state could easily become an important source of supply for one or more of these elements.

IMPORTANCE OF ARIZONA'S MINING INDUSTRY

Arizona in 1956 produced minerals of a total value of $471,104,000, exclusive of uranium, as shown in the following tables. It was first in the nation in copper, exceeding second place Utah by 102 percent.

The mining industry is Arizona's largest taxpayer, its taxes averaging $16,000,000 per year for the six years prior to 1957. Mining alone carries about 22% of the total State tax load.

The huge mining payroll in Arizona of over $100,000,000 in 1956, provided work for thousands of the State's people in other lines of work.

Many millions were spent by mining companies for supplies and a goodly portion of the money stayed in Arizona.

Mining brought the railroads to Arizona and has furnished the bulk of the freight to keep them going and expanding.

Agriculture, lumber and livestock derive a large share of their income from mining and are hard hit when mining is curtailed.

Mining is a heavy purchaser of power generated at the irrigation storage dams, thus making cheaper power and increased water supply for agriculture and industry.

A healthy Arizona mining industry is vital to the whole state. 1957 finds the industry ailing in many of its branches. The major cause of ill health is the influx of low cost foreign minerals. Many believe that in order to survive they must have the support of

industrial uses for their products, has increased. Research, careful geological surveys, and new methods of beneficiation will doubtless result in added production.

ASBESTOS:

Asbestos production in Arizona has had some encouragement from the federal government. After a survey of the asbestos properties in the Globe district, a buying station was established at Globe for the convenience of Arizona shippers. This resulted in a substantial production of this low iron material, which is produced nowhere else in the United States, and in only a few other places in the world.

BARITE:

Barite is the principal barium mineral. Its unique properties make it important in oil drilling operations by increasing the density of drilling fluids, thereby helping them to check caving and control formation pressure. It is an interesting fact that one deep oil well recently drilled in Texas required the use of fifty-two carloads (over 2500 tons) of barite.

Barite has only been produced spasmodically in Arizona, and in 1956 there was little activity. Exploration was greater in 1957 and some promising prospects were found.

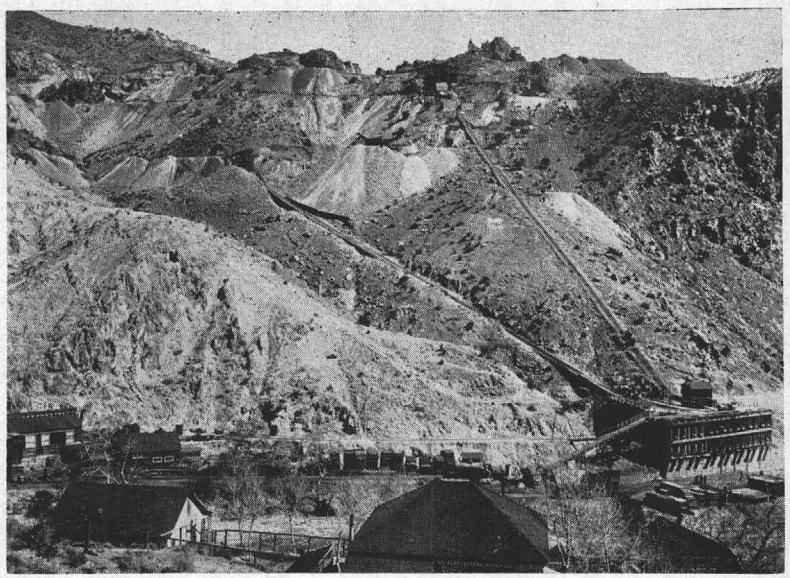
GENERAL INFORMATION ON METALS

Of the 92 chemical elements of which the earth is composed, 68 may be classed as metals. Perhaps half of these are commercially important although only about 20 are used now.

It has been said that development of metals got an impetus during the war that would have taken 50 years of peacetime effort to accomplish. Many new uses for metals and new alloys have passed the experimental stage, and many more will be discovered.

That statement applies particularly to the more obscure metals, the newcomers to important industrial use. Among these are lithium, germanium, indium, columbium, beryllium, tantalum, and the two now much in the public mind because of their part in atomic energy developments — thorium and uranium.

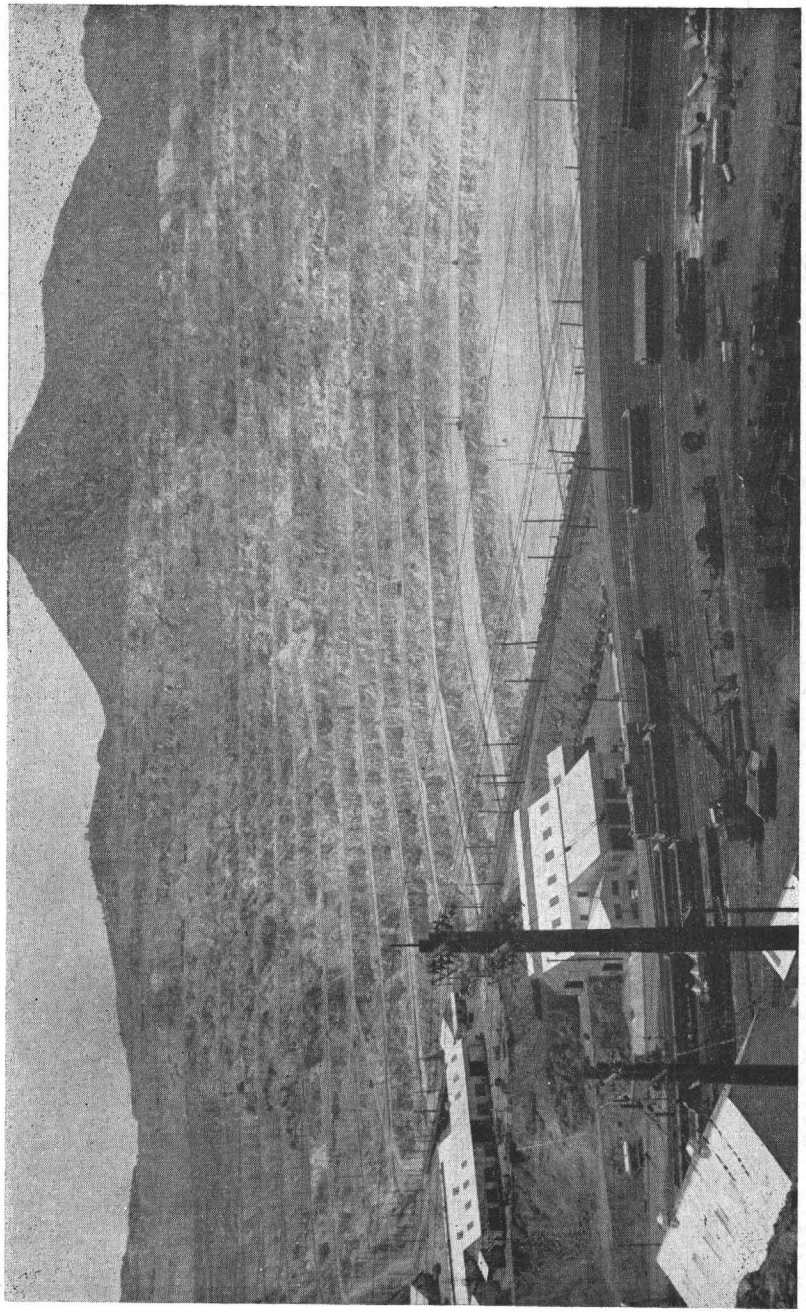
The term "rare metals" is often a misnomer insofar as it may imply scarcity. Uranium and lithium are more widespread in the



Copper Mining About 1900

poured a ceaseless stream of metal into the nation's industries. The state has for 47 years ranked as the leading copper producer in the United States, its output, up to the end of 1956, amounting to 15,277,088 tons of copper worth $5,539,384,518. Arizona is today maintaining her place in spite of the tremendous quantities already produced, and there is no reason to believe that she cannot continue as the leader for many years to come. Nature has made her one of the world's most important sources of copper and in 1956 she produced 45% of the United States production and one-eighth of the world tonnage.

The record of Arizona's steady growth and progress is closely linked with the development of her copper industry. This development has been achieved through decades of courageous and unremitting effort, and perseverance in the face of repeated discouragements. Thousands of Arizonans have spent a lifetime in helping to build up the communities of which they are so justly proud. Their accumulated savings have been invested in homes or businesses in the various mining towns throughout the state; and the life-blood of those towns is copper. Any disturbance in that life blood is immediately reflected in the community which



Large Open Pit Copper Mine

MERCURY

During 1956, the mercury price dropped to $255 per flask. This resulted in reduced activity and an Arizona output for that year of only 100 flasks.

Along with many other minerals mercury is plagued by an influx of low cost foreign metal from which it needs protection commensurate with the difference in living standards where the minerals are produced.

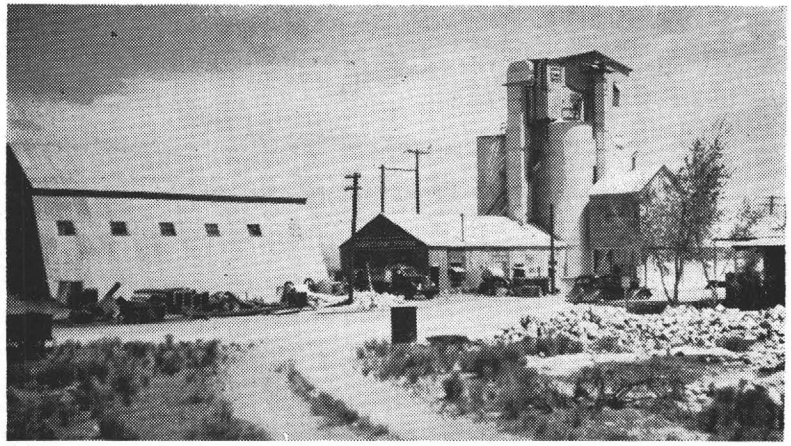
For many years United States consumption of mercury exceeded production, but under war stimulus new deposits were found and developed, resulting in ample supplies.

NON-METALLIC MINERALS

Under this heading is grouped the various products of clays, gypsum, feldspar, asbestos, barite, mica, pumice, perlite, etc.

Arizona has not been a large producer of these substances. They occur in great abundance in many parts of the nation and are relatively low in price. Arizona has been handicapped by adverse freight rates and distances from industrial centers, but some of these substances in Arizona, have superior qualities, and as this fact becomes known to consumers, production from Arizona should increase.

Production of pumice, perlite, bentonite and gypsum, and new



Feldspar Plant

one year, from a total 154 mines. A flood of lead and zinc imports in 1952-1954 caused metal prices to collapse and over 100 mines were compelled to shut down. The total production of lead-zinc in 1956 was only 37,000 tons, and most of this came from less than a half-dozen of the larger lead-zinc properties which had been kept going only because of their income from silver and copper by-products.

The lead-zinc industry is at the present time (1957) in a precarious condition throughout the country, but with adequate protection from foreign dumping, the industry, including Arizona, has potential resources capable of restoring it to its 1949 activity.

MANGANESE AND TUNGSTEN

Low grade manganese ore occurs in Arizona in a tonnage estimated by the United States Geological Survey at 200,000,000 tons of about 4% manganese. It is not visionary to predict utilization of this ore in the future when one remembers that the United States is largely dependent upon foreign sources for its manganese.

A buying station for the convenience of Arizona shippers of manganese ore was established by the G.S.A. at Wenden, Arizona in 1953, and resulted in a stockpile of manganese ore containing over 6,000,000 long-ton units of recoverable manganese. The station was shut down in May, 1955, after completing its quota. This ore will have to be concentrated to 35-40% manganese before it is usable in the steel industry. Meanwhile, a carload lot program permitting the purchase by G.S.A. of manganese ore or concentrates containing better than 35% manganese, has resulted in the production of 1190 tons worth $107,610 in 1955, and 38,900 tons worth $3,644,800 in 1956.

Tungsten mining in Arizona has received little encouragement from the Government. The production of tungsten concentrate containing 60% WO_3 or better, was at the rate of 132 tons in 1954, 181 tons in 1955, and 123 tons in 1956. The Government paid $63 per short ton unit until June 1, 1956, and $55 after July 20th of the same year.

Failure of Congressional appropriation to continue tungsten purchases authorized by Public Law 733 resulted in complete shutdown of Arizona tungsten mines in middle 1957.

it sustains. A cessation, or even curtailment of operations, would create serious economic problems for these communities, and for the State.

In 1956, the copper mining and smelting industry payroll in Arizona totaled over $90,000,000, with average weekly earnings higher than for any other industry in the state. Fringe benefits are adding over $15,000,000 to the annual wages of the Arizona copper workers. Most of these wages were spent in Arizona. In addition, the copper mines spent over $24,000,000 for Arizona supplies and equipment in 1956.

The copper mining industry has a vital and far-reaching effect on the economy of the whole state of Arizona and on every industry and community within its borders.

Copper is equally vital to the nation's security. This means that the mines must be kept producing, because in any possible emergency, time may be of the essence and it takes a long time to restore an idle mine to production.

LEAD AND ZINC

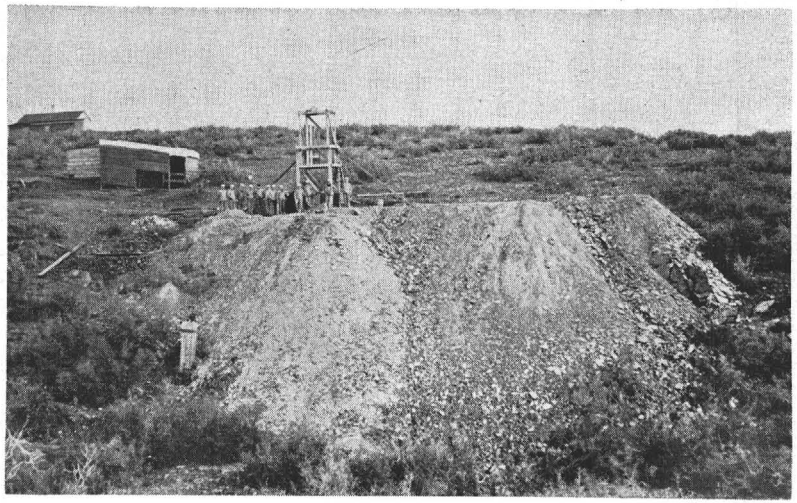
The uses of the valuable metal, lead, are well known. In addition to its use in paints, batteries, plumbing, sheets for acid chambers, etc., lead acetate, carbonate and other compounds are used in medicine.

Because of its special chemical properties there is no substitute for this metal in storage batteries and tetraethyl lead; because of its pliancy and low melting point there is no substitute for lead covered cables; because of its resistance to corrosion and rusting there is no substitute for red lead paint as a protective coating for iron and steel; because of its long life, affinity for linseed oil and ability to expand or contract under atmospheric changes there is no paint comparable in quality to that made of white lead.

Zinc symbolizes the "stone which the builder rejected" in the metals. Only a short time ago the miner was heavily penalized for even small percentages of zinc in his ore. Today the penalty is imposed only under certain conditions.

Zinc is one of the more common and widely used nonferrous metals and is consumed in large quantities in the manufacture of many kinds of metal products.

The largest use of zinc is normally in the galvanizing of iron or



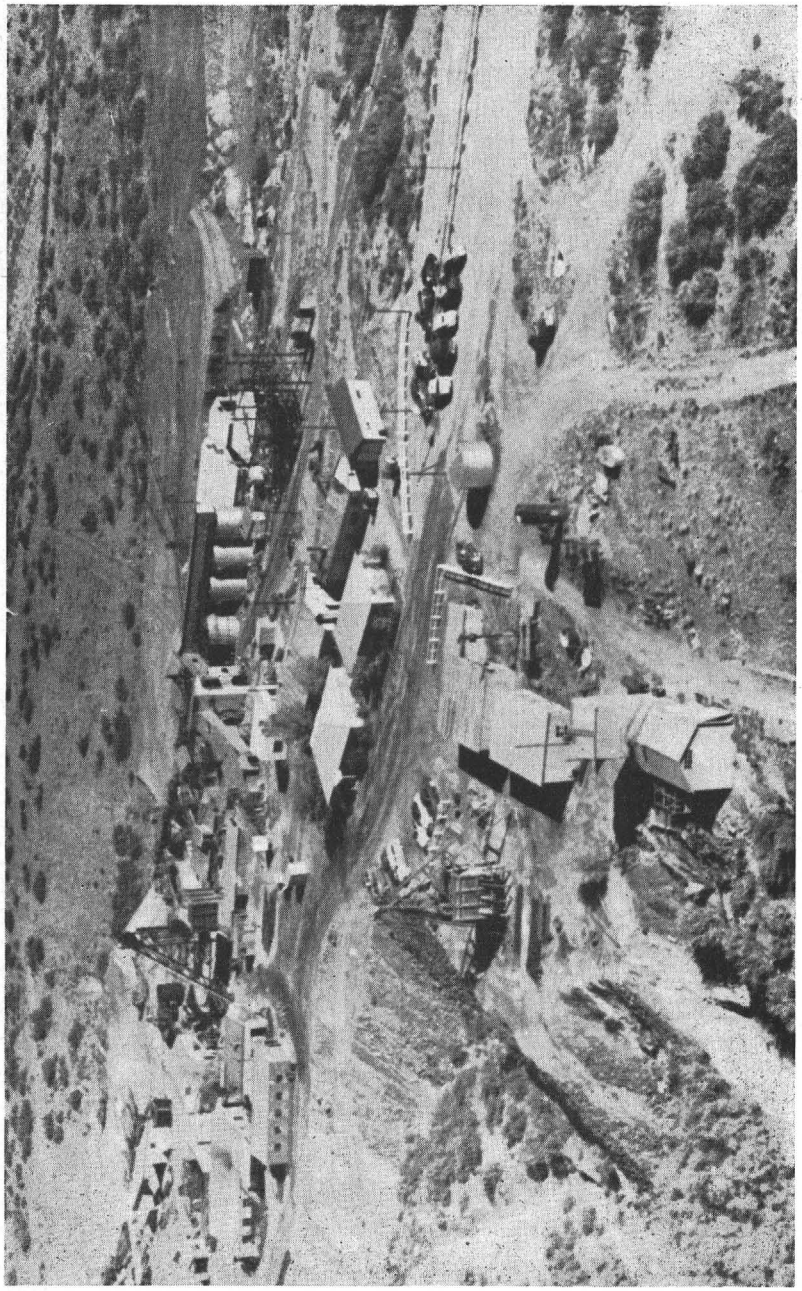
Early Lead-Zinc Mine

steel in order to increase resistance to corrosion. The most pronounced development in recent years in the consumption of slab zinc has been its increased use in zinc-base alloys for die castings. The automobile industry is the largest user of these alloys, principally for die-cast parts and assemblies for pumps, carburetors, radiator grills, etc. Brass products accounted for the third largest use of slab zinc in 1952 and rolled zinc used for dry batteries, photo-engraving plates etc., ranked fourth.

Arizona's annual production of lead and zinc is shown in the following table:

Period	Tons Lead Produced Annual Rate	Tons Zinc Produced Annual Rate
1911 – 1935	6,376	2,678
1937 – 1941	12,520	9,900
1942 – 1946	18,400	30 233
1947 – 1951	27,162	57,252
1952 – 1956	11,210	28,794

By the year 1949, because of the failure of foreign producers of lead and zinc to furnish our domestic needs, Arizona was encouraged to open up and develop its lead-zinc mines, and succeeded in attaining a production of 104,226 tons of lead-zinc, in



Same Lead-Zinc Mine About 50 Years Later