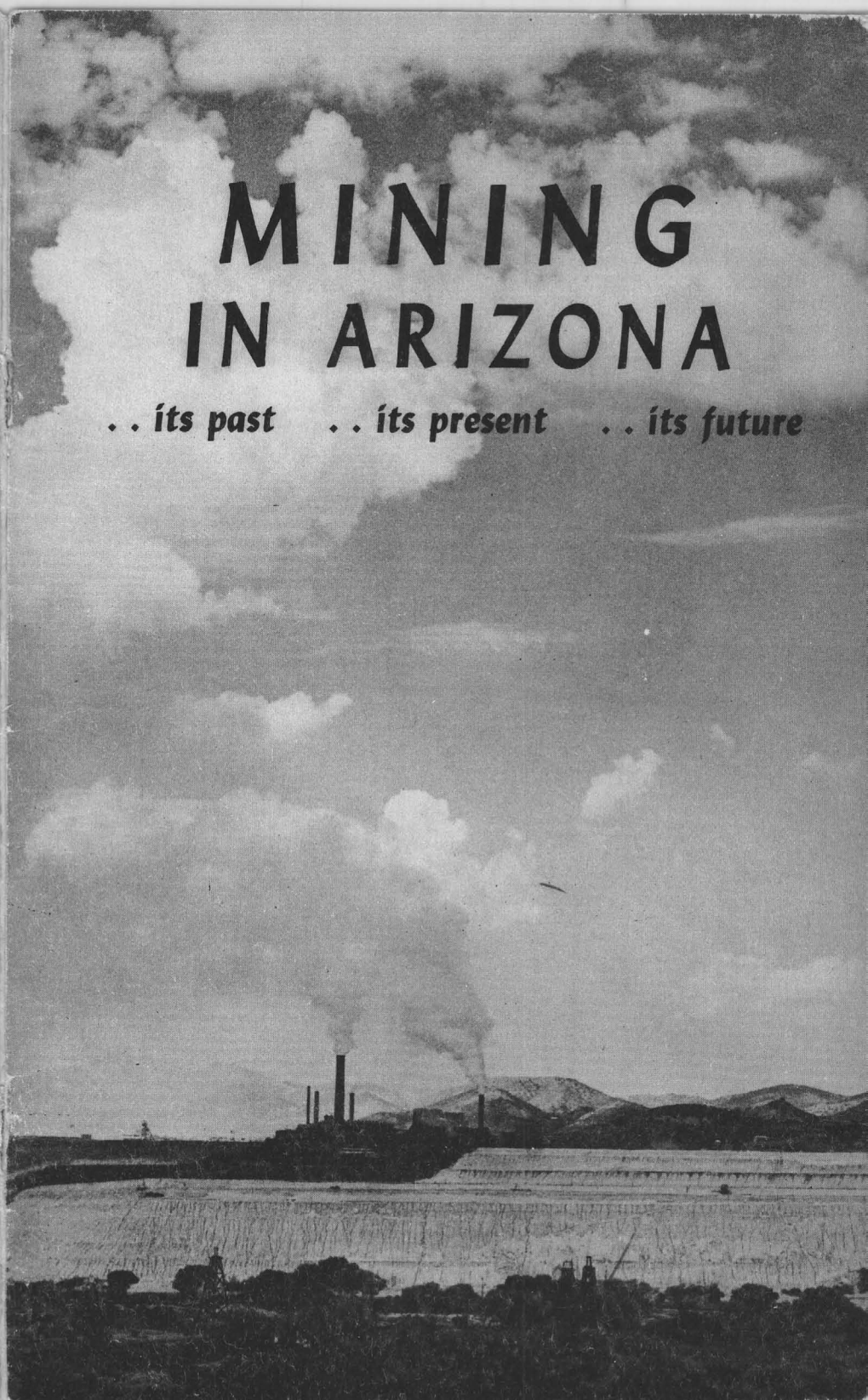


MINING IN ARIZONA

.. its past .. its present .. its future





Gold panning provides romance and adventure for the younger generation.

"LOST" MINES

Arizona is rich in legend 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.

Jacob Walz, an old German prospector who died without revealing the whereabouts of a fabulously rich gold mine in the Superstition mountains, near Phoenix, lies buried in this tomb. Now locked in legend, the "Lost Dutchman mine" has been the object of countless searchers, many of whom have died in the attempt.



MINING IN ARIZONA

INTRODUCTION

A primary objective of the Phoenix Chamber of Commerce is to assist in the continued development of Arizona's resources.

This booklet has been prepared with that objective in mind.

It does not purport to cover the mining industry in detail. It is, rather, a synopsis of the industry's historical past, its present importance, and its future possibilities in Arizona.

Mining Committee

Phoenix Chamber of Commerce

FOREWORD

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

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

It ranks third among western states in lead.

It ranks first in copper production.

It ranks second among western states in zinc.

It ranks third among all states in silver.

It ranks fifth among all states in gold.

This does not tell the whole story, however.

While other states may have been declining in their mineral production, Arizona's production has been increasing. Ten years ago, for example, Arizona ranked eighth in the production of lead. Today it ranks almost tops.

The following is a ten-year tabulation of the total production of these metals. Note Arizona's steadily increasing production of lead and zinc.

	Gold oz.	Silver oz.	Copper lbs.	Lead lbs.	Zinc lbs.
1936	322,408	8,386,043	422,550,000	21,376,000	7,178,000
1937	332,694	9,422,552	576,056,000	24,708,000	10,052,004
1938	305,043	7,479,153	421,594,000	21,142,000	11,628,000
1939	316,453	7,824,004	524,224,000	21,542,000	13,422,000
1940	294,807	7,075,215	562,338,000	26,532,000	30,912,000
1941	315,392	7,498,260	652,634,000	31,276,000	32,986,000
1942	253,651	7,064,467	786,774,000	29,544,000	37,044,000
1943	171,810	5,713,889	806,362,000	27,454,000	39,354,000
1944	112,162	4,394,039	716,606,000	33,414,000	58,154,000
1945	77,223	3,558,216	574,406,000	45,734,000	80,452,000
1946	78,300	3,400,000	582,000,000	47,500,000	85,000,000

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, Cardenas, stood on the brink of Arizona's Grand Canyon. Coronado, however, wanted his gold and silver already mined, smelted, minted. He was not interested in unmined ores, and consequently did no prospecting.

Thirty-seven years before the landing of the Pilgrim Fathers a white man, Antonio Espejo, found silver ore in what is now Arizona. It was the state's first recorded mineral discovery.

That was in 1583. The Elizabethan Age was dawning in England and Shakespeare was but 19 years of age.

In the 364 years, or three and two-thirds centuries, that have elapsed since, Arizona's mines have yielded \$3,897,030,072 in mineral wealth. Had that amount been possessed by one man 500 years before Christ, and had that same man lived until today, he could have spent \$4,000 **per day**—and still have over \$325,000,000 left. And that disregards any interest or income from the principal.

A typical prospector and his faithful burro.



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 examinations and reports for private parties. They can and will assist, advise and counsel small mine owners and investors. In addition, a mineral light and a good microscope help to identify rock specimens and ores. The technical trade journals are on file, together with late information on pending legislation, premium price data, etc.

The Department of Mineral Resources has its offices in the Mineral Building at the State Fairgrounds in Phoenix. In the same building is a valuable mineral collection—one that visitors will find interesting and informative regardless of their interest in mining as an industry.

Stately palms line the walk in front of the offices of the State Department of Mineral Resources at the State Fairgrounds in Phoenix.



ARIZONA'S FRONTIERS ARE DOWNWARD— INTO THE GROUND!

The state's mineral resources are not limited to its already proven ore reserves. Who is to say that new ore bodies will not 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. Further, some old districts now more or less abandoned have neither been worked out (as to modern methods and ore treatment), nor properly prospected.

To investors we say "investigate before investing."

The success of most conservative business undertakings depend upon a thousand contingencies, any of which may spell failure. No trade or business is without its speculative elements. Mining is no more a gamble than hundreds of other enterprises if the investor will but apply to his mining venture the same care, forethought, and business principles he applies to other endeavors.

Investors in mining 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, 528 Title and Trust Building, Phoenix, Arizona, furnishes many valuable services. Those interested in mining are advised to join that organization. Dues are only \$1 per year, including a subscription to its monthly publication, which disseminates mining news and information.

An investor, mining or otherwise, should realize that "investment facts won't stay put." Today or tomorrow some of the facts have changed or will change. New facts are discovered each day, especially in chemistry or metallurgy. Today's waste rock will be tomorrow's ore. And the demand for the metals continues to mount. Prices are probably due to remain at present levels because of wages. Long-range planning can probably be done much more safely now than at any time since 1939.

While all phases of the mining industry contributed to such achievement, it is to the pioneer prospector and miner we owe of this "machine age" 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 such adventure, hardship, danger, 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 appears 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.

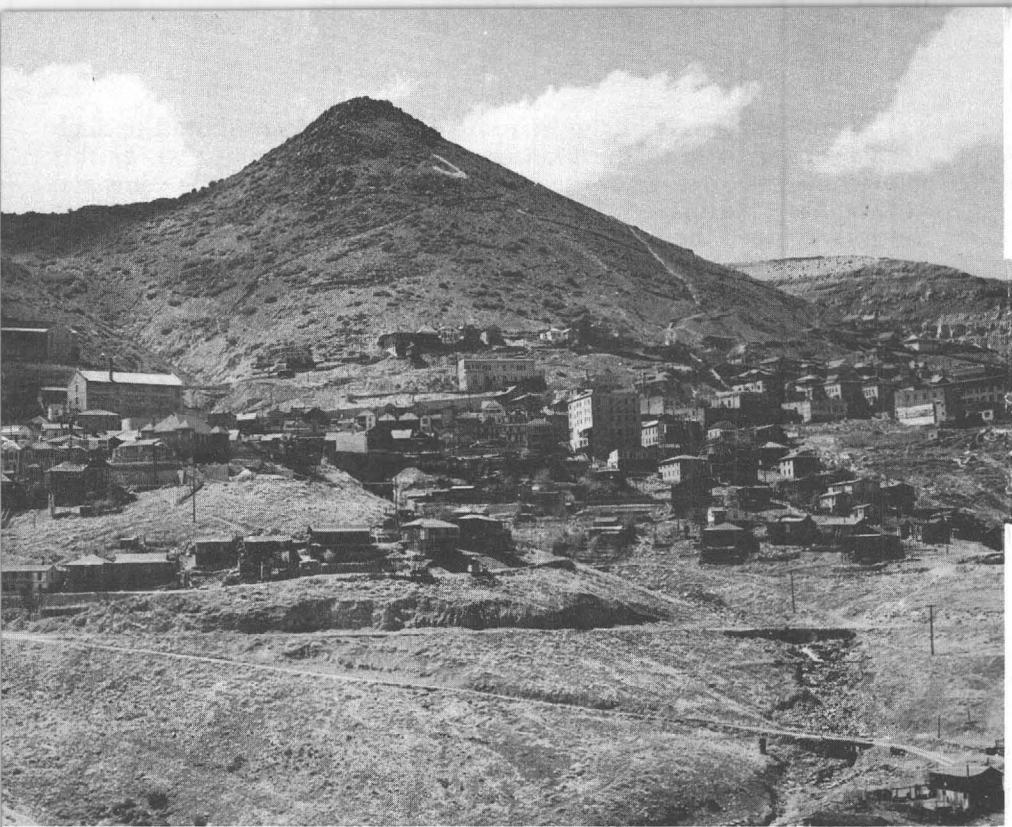
From about 1824 to 1842 much of Arizona was covered by American trappers and explorers, among them Bill Williams, Pauline Weaver and Kit Carson. Apache raids prevented settlement and prospecting, however, until well after 1848, when that portion of Arizona north of the Gila River became part of the United 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. The Globe-Miami district, Silver King, Superior, Bisbee, Jerome, Tombstone, and the Clifton-Morenci district 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.

"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



Jerome, a copper town in northwestern Arizona, is situated on the slope of Mingus mountain.

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 the hour is at hand when 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.

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, indium, columbium, beryllium, tantalum, and the two now much in the public mind because of their part in atomic energy developments—thorium and uranium.

In addition, there are the so-called "rare metals"—a term that is often a misnomer insofar as it may imply scarcity. Uranium, tungsten, and lithium are more widespread in the earth's crust than is zinc, thorium than lead; and beryllium and rubidium than tin. Indeed, spectrographic analysis of rocks and minerals is demonstrating that many so-called rare elements are rare only in the sense that they are less abundant than the common elements and not localized to the same extent in workable deposits. The old time prospector paid little attention to these metals, and Arizona because of its widespread mineralization, could easily become an important source of supply.

These are but a few examples. They are cited to indicate the great possibilities for further search and research.

THE FUTURE AND ARIZONA'S MINERALS

Arizona is not a "mined-out state." Not all of our ore deposits have been found. Some ore bodies of great promise, already known, have not been fully investigated or appraised under modern exploration, mining, or recovery methods.

Moreover, only 4% of the state's 73,015,669 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.

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 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.

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.

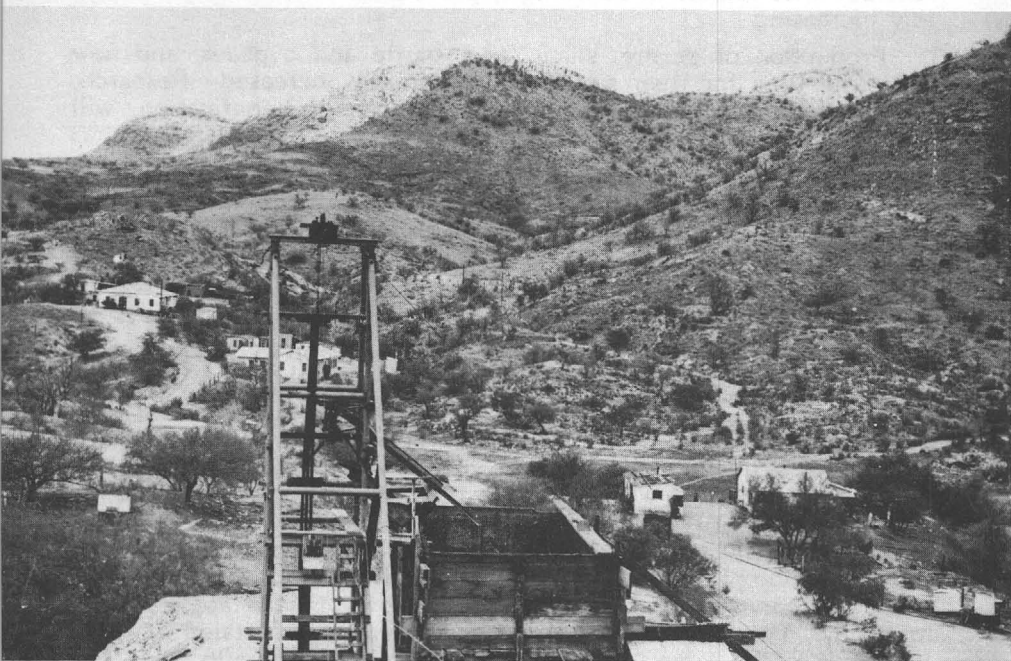
Until recently barite has only been produced spasmodically in Arizona, but about two years ago a promising prospect near Mesa, Arizona, was developed and a beneficiation mill installed. Production from that plant is about 100 tons a day. There are other promising prospects in the state.

Mercury: A volume could be written on this mineral. For many years our consumption exceeded production. Under the war stimulus new deposits were found and developed, resulting in ample supplies.

The many uses of mercury (quicksilver) are well known, but a new use, developed in 1944, is a new dry-cell battery of which mercuric oxide is an important component. Predictions as to the uses of this battery have greatly altered the future outlook for mercury.

Arizona's production in 1941 was valued at \$161,522. It declined to \$64,861 in 1944 because government purchases ceased in January of that year.

The Spanish-Italian cartel on mercury is rapidly driving the United States mines out of business. The foreign quicksilver is now being sold on the New York market below the domestic cost of production.



A typical small Arizona mining camp is pictured over the main shaft of a lead-silver mine in the southern part of the state. The shaft is 710 feet deep.

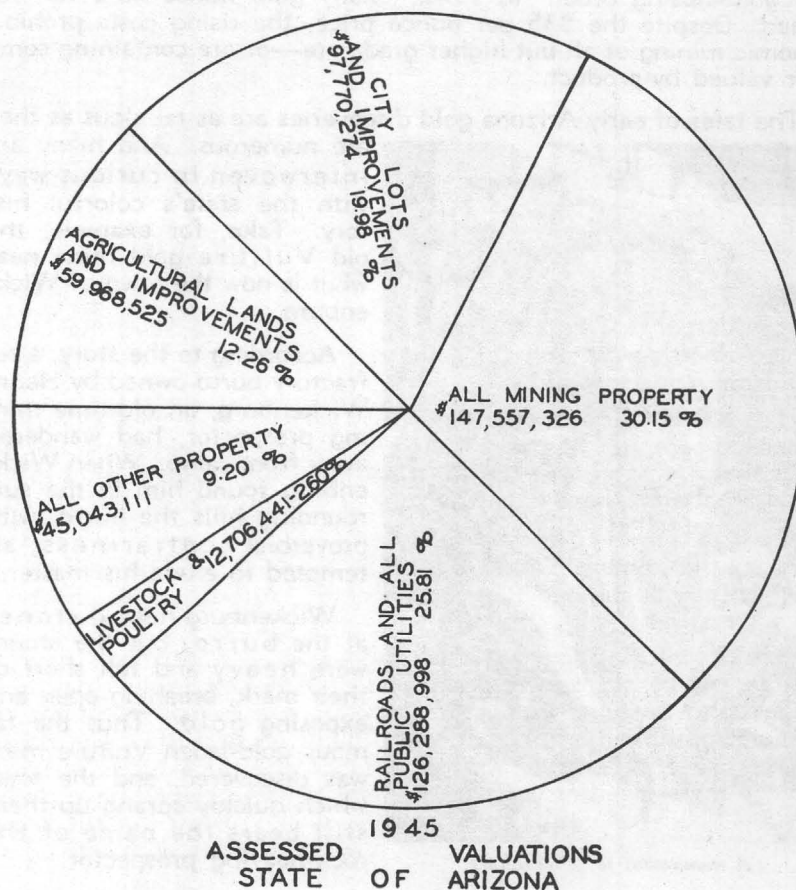
The following tables are a condensed, summarized tabulation of Arizona's production of five principal metals to the end of 1946:

Copper	Gold	Silver	Lead	Zinc
\$3,298,071,316	\$271,809,746	\$215,943,025	\$47,946,324	\$53,259,661
% of total 84.5	6.9	5.9	1.3	1.4

And that isn't all the story. Expenditures for Arizona products in 1945 by only ten percent of the major copper mines totalled \$4,112,393.21. To that figure should be added the expenditures by the 248 additional producing mines, large and small, now being operated in the state. The aggregate sum would probably be double the figure cited.

MINING AS AN INDUSTRY

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



THE MAJOR METALS

The five major metals being produced in Arizona are gold, silver, copper, lead and zinc. A few words about each metal are appropriate in a general information booklet.

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.

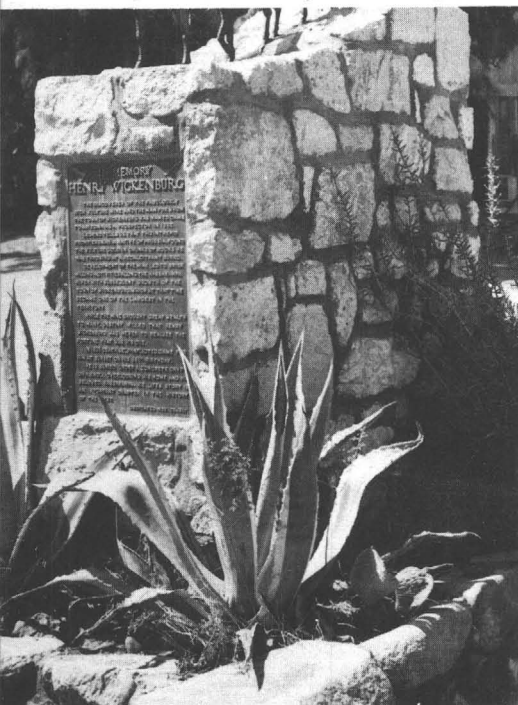
There has been no toil so arduous, no hardship so trying, no journey so perilous, no mountain bleakness, no desert desolation and danger that they have not willingly and eagerly endured to reach and gain the yellow prize that, the world over, stands for Heart's Desire.

Arizona's gold production is now largely as a recoverable metal from the copper ores. Gold mining received a severe setback with the "gold-closing order" in 1942. Many gold mines have not reopened. Despite the \$35 per ounce price, the rising costs prohibit economic mining of all but higher grade ore—or ore containing some other valued by-product.

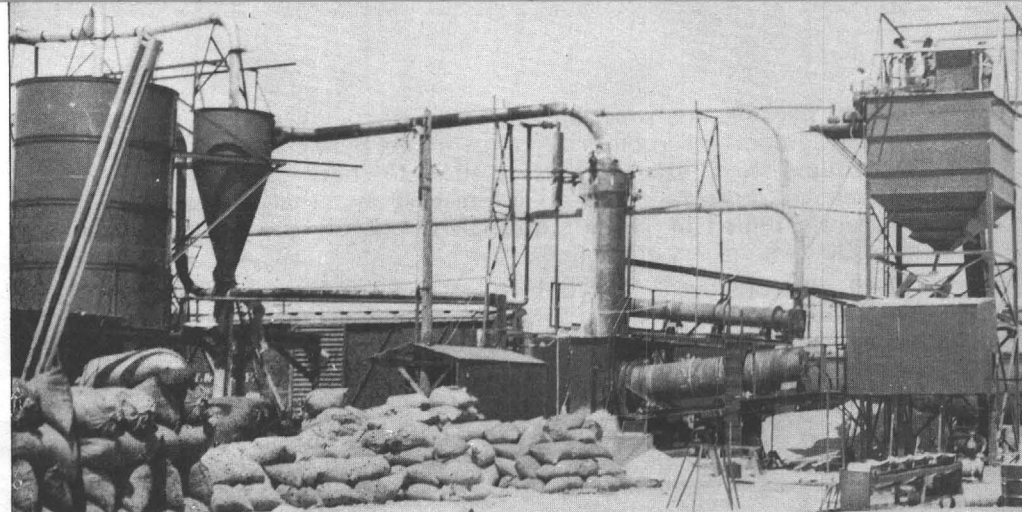
The tales of early Arizona gold discoveries are as fabulous as they are numerous. And many are interwoven in curious ways with the state's colorful history. Take, for example, the old Vulture gold mine near what is now the town of Wickenburg.

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.



A monument to Wickenburg.



An Arizona perlite crushing and popping plant.

NON-METALLIC SUBSTANCES

Under this heading is grouped the various products of clays, gypsum, feldspar, asbestos, barite, mica, 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, as they occur in Arizona, have superior qualities, and as this fact becomes known to consumers, production from Arizona is rapidly increasing.

Production of perlite, silica sand, barite and gypsum, and new industrial uses for their products, has greatly increased. Research, careful geological surveys, and new methods of beneficiation, will doubtless result in added production.

Perlite: Perlite in particular has come into a great deal of prominence in the last few years. It is a volcanic rock that when ground and heated pops like popcorn. The resulting expanded perlite has a weight of 5 to 15 pounds per cubic foot, and this light weight makes it an excellent heat insulating material, and useful for a variety of purposes.

Manganese and Barite: Technically, these minerals should not be under a "non-metallic" heading.

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. The Federal Bureau of Mines, during World War II, developed a process for the production of mattes and oxides of relatively high purity from low grade manganese ores. The process has not yet been applied commercially. The 1944 domestic output of manganese totaled 247,616 tons, and in the same year our imports totaled 1,315,508 tons.

LEAD

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

Because of its special chemical properties there is no substitute for the 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.

Arizona's production of lead increased to 47,500,000 pounds in 1946, or 42% increase over 1944.

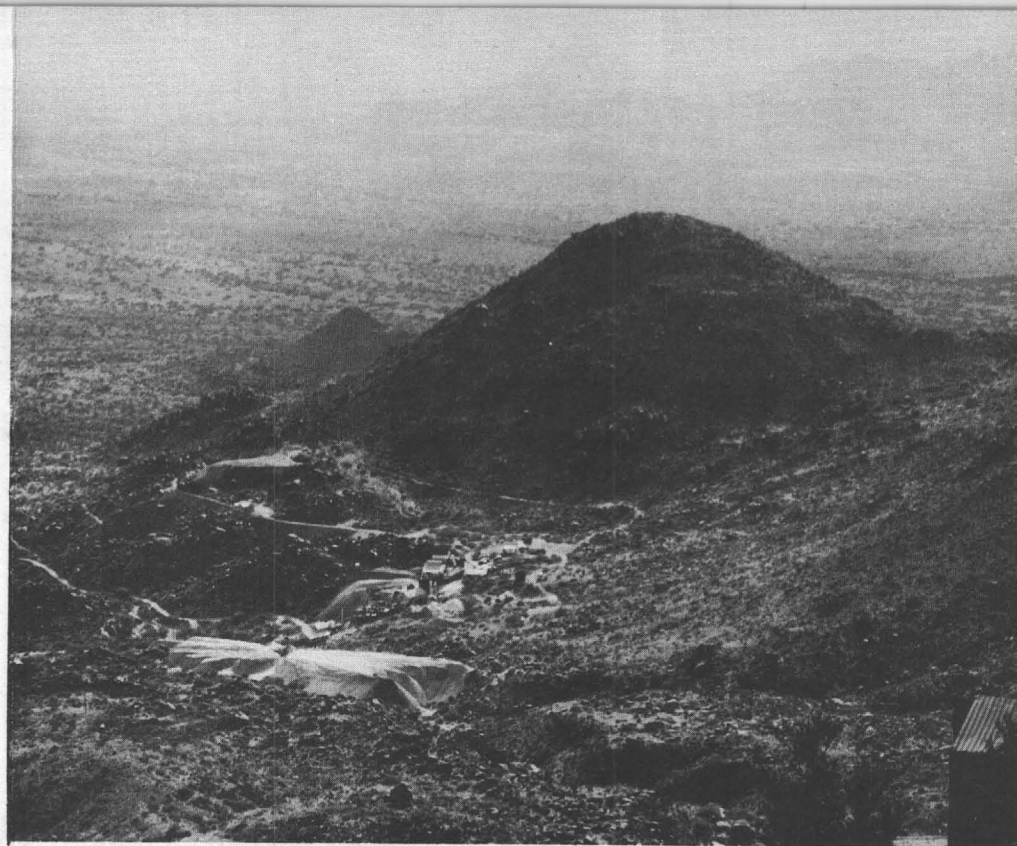
ZINC

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.

Arizona's production of zinc for 1946 was 85,000,000 pounds. This is an increase of 44% over 1944.

An important by-product of zinc smelting is sulfuric acid. Zinc oxides, both the lead-free and the leaded, are other valuable products much used in the rubber industry.

The Tennessee mine of the Tennessee Schuylkill Corporation at Chloride, Ariz., has been one of the leading lead-zinc producers for many years.



Looking down toward the desert from the top of Yarnell hill, southwest of Prescott, the traveler can see a cluster of tiny buildings near the Alvarado gold mine.

SILVER

The story of silver, if it be written, would of necessity contain much of early day history of the Western states, no less than of South America and Mexico.

Silver, like gold, is closely tied up with government. That factor overshadows all others. However, silver enjoys a much broader use in industry than gold. In fact, the consumption of silver for war purposes, and other essential uses in 1943, totaled about 85,000,000 ounces. That was about twice the domestic production for that year.

Arizona's silver production for 1946 was 3,400,000 ounces. That may have been somewhat less than in 1944, as silver production is largely obtained as a by-product in producing copper and copper mining was somewhat curtailed in 1946 by strikes and other factors. Arizona's silver production in 1947 will no doubt show a considerable increase. Silver is in increasing demand and Arizona has increasing potential resources.



A miner drills holes for blasting ore far beneath the ground. At the right is a typical small mine surface structure.



A puff of smoke bellows up (lower, center, in upper photo) where operations are in progress at the immense open pit copper mine at Ajo. The Sacramento Pit (lower) at Bisbee, the first open pit copper mine in the area, was once a huge mountain. Both are operated by the Phelps Dodge Corporation.

COPPER

Arizona leads the nation in copper production. The state produces about 32% of all United States production, and about 11% of the world production. 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. No other metal, except silver, can do its electrical job as well. 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.

Arizona's copper of late years has been won from ores of decreasing grade or copper content, and, in such fact alone, eloquent tribute is paid the genius and ingenuity of the mining industry. The state's 1946 output was slightly above that of 1945 despite labor disputes and uncertainties of government price controls in the postwar world.

The year 1946 was noteworthy in copper history as being the first peacetime year in which the United States became a copper importing nation. It is important to the state's welfare to note great increases in copper ore reserves of late because of the drilling results on the San Manuel ore body; approximately 500,000,000 tons of about .80% copper.

