

ment caused considerable delay, inconvenience and discouragement to producers during the first year or two after they were established. Many of these problems were submitted to the Department and assistance and advice requested.

By close cooperation with the W.P.B. in Washington and the local W.P.B. office in Phoenix the procedure has been simplified and the early delays eliminated. There is no great problem existing now as to priorities but much work has been done to iron out early difficulties.

WAR PRODUCTION BOARD RELATIONS

In order to assist the mine operators in maintaining present production, or opening up new production, a close contact with and thorough understanding of the various procedures has been vitally essential.

Some of the problems have required full use of the contacts established by W. C. Broadgate in Washington and his personal presentation of argument on each individual case. Such problems usually called for an intensive study of the actual field conditions at the property, which required examination and report by the field engineers on assistance by them to the operators in presentation of their case. Some of the problems can be handled with the various branches of the War Production Board located within the State.

When a number of similar problems relating to any given subject or agency come to our attention, the department policy has been to give the various individual cases or problems full presentation and if they are recurrent, to then try for a change in policy or a clarification of the points involved by a special order or action.

In this manner much of the confusion and delay caused by decrees, blanket orders, regulations and restrictions, when first made effective, have been ironed out and made workable with a minimum of harm to the industry.

The major part of the department work has been trouble shooting for the mine operators to keep them in full production. This has been perfectly natural as the operators in the field, even with the attempt to keep them informed by bulletin and other services, have been unable to keep up with the many changes in policy made necessary by the changing demands and conditions.

Procedures in most cases have been complicated and the policy of trial and error has been employed many times when carefully thought through plans could have been far more effective.

Fortunately the Department has been equipped by its Washington connections and by its field engineers, to keep well informed on most of the subjects and to know where and how to get additional information so as to render the maximum and quick service to the mine operators.

OFFICE OF PRICE ADMINISTRATION

The shortage of tires and gasoline has continued and it has been necessary to limit the allocation of these items to essential and critical war needs.

By arrangement with the Office of Price Administration in Phoenix and also in Tucson all applications for mine use of additional or supplemental gasoline are referred to the Department for certification as to the validity and reasonableness of the requests. The local Office of Price Administration offices through the state have also been instructed to refer doubtful applications for mine use to the Department or direct to the field engineers of the Department.

This service on gasoline, and in a great many instances on tires, has been of great value to the operators as well as to the Office of Price Administration. From our extensive files and from the close contact of the Department with the various mines and operators in the state, we have been able to supply the information needed in making justified allotments of gas and tires.

OFFICE OF DEFENSE TRANSPORTATION

The services of the Department, either direct from its files or by investigation on the part of the field engineers, have been asked for, in many instances, by the Office of Defense Transportation in making a determination as to the war necessity of a great number of applications for the purchase of trucks.

Many of the operators come direct to the Department or the field engineers for this type of service and in other instances, when the operator applies direct to the Office of Defense Transportation, doubtful cases are referred to the Department for checking or for confirmation.

The procedure has been simplified and, for legitimate requirements when the proper procedure is complied with, little or no difficulties are encountered. The Department effort has been to direct and assist the mine operators in following the proper procedure.



DEPARTMENT OF MINERAL RESOURCES STATE OF ARIZONA

Board of Governors:

- Weldon C. Humphrey, Patagonia, Arizona, Chairman
(Term expires January 31, 1947)
H. F. Mills, Humboldt, Arizona, Vice Chairman
(Term expires January 31, 1949)
J. E. Layton, Chloride, Arizona
(Term expires January 31, 1948)
Dr. N. H. Morrison, Phoenix, Arizona
(Term expires January 31, 1946)
Lloyd C. Edmonson, Coolidge Dam, Arizona
(Term expired January 31, 1945)
George A. Ballam, Tucson, Arizona
(Appointed July 1, 1945, term expires January 31, 1950)

Personnel of Department:

- Chas. H. Dunning, Director
W. C. Broadgate, Assistant Director
Earl F. Hastings, Projects Engineer
Lorraine Porter, Office Secretary

Field Engineers:

- George A. Ballam, Southern District, Tucson, Arizona
(Resigned as of August 1, 1945. Position not yet filled)
A. C. Nebeker, Northern District, Prescott, Arizona
Elgin B. Holt, Western District, Kingman, Arizona
(Resigned May 1, 1945)
Andrew Macfarlane, Eastern District, Globe, Arizona
(Resigned June 30, 1945 on discontinuance of office)

Offices:

Headquarters Office

304 Homebuilders Building, 128 North First Avenue,
Phoenix, Arizona
Telephone—Phoenix 4-7034

Field Offices

Tucson, Arizona, c/o Chamber of Commerce
Prescott, Arizona, Basement Court House
Kingman, Arizona, c/o Chamber of Commerce
Globe, Arizona, Old Dominion Bank Building

On June 30, 1945 the offices at Kingman and at Globe were discontinued and their duties divided between the offices at Prescott and Tucson

SIXTH
ANNUAL REPORT

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DEPARTMENT OF
MINERAL RESOURCES

STATE OF ARIZONA

JULY 1, 1944 TO JUNE 30, 1945

•

CHAS. H. DUNNING
Director

ANNUAL REPORT

DEPARTMENT OF
MINERAL RESOURCES

STATE OF ARIZONA
1911

CHAS. E. SMITH
DIRECTOR

In compliance with Chapter 27, Laws of 1939, creating the Department of Mineral Resources, the following report of the activities of the Department from July 1, 1944 to June 30, 1945 is herewith respectfully submitted:

To Honorable Sidney P. Osborn, Governor

State of Arizona

Phoenix, Arizona

Dear Governor Osborn:

There are many people who may read this report who do not have a clear conception of the Department of Mineral Resources, its organization, history, functions and duties.

For the benefit of these people I am starting the report this year with an outline or a review of the Department.

THE DEPARTMENT

Law and History

The Arizona Department of Mineral Resources was created by the fourteenth legislature in House Bill No. 103, Chapter 27, which became a law on March 1, 1939, and functioning started immediately thereafter.

Except for a period in 1941 and 1942, when there was no appropriation provided for the Department, it has functioned steadily since organization, and has received the following appropriations from the legislature:

July 1, 1939 to June 30, 1940.....	\$30,000.00
July 1, 1940 to June 30, 1941.....	30,000.00
July 1, 1941 to April 17, 1942.....	None

During this period the Department was supported on a limited scale by private donations.

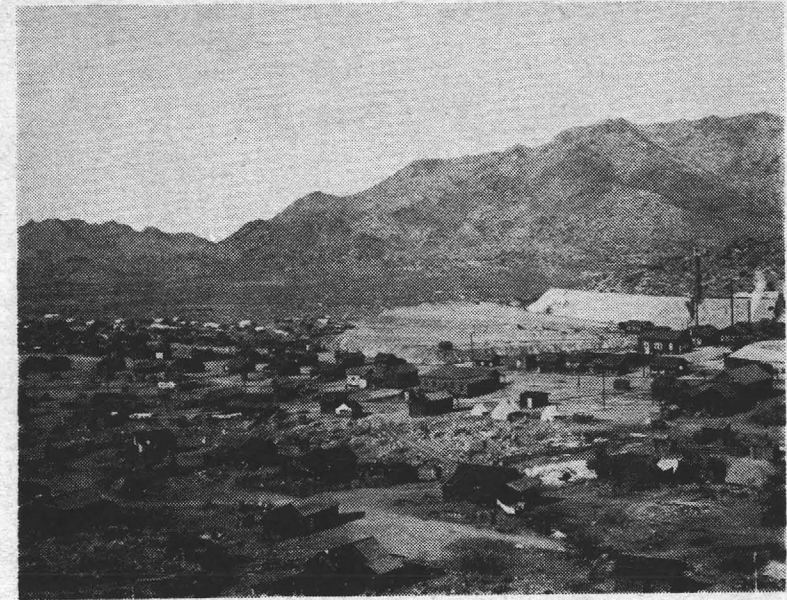
April 17, 1942 to June 30, 1942.....	\$10,170.00
July 1, 1942 to June 30, 1943.....	40,680.00
July 1, 1943 to June 30, 1944.....	33,000.00
July 1, 1944 to June 30, 1945.....	33,000.00

July 1, 1945 to June 30, 1947
the legislature has appropriated \$28,252.50
for each fiscal year.

Purpose and Objectives

The Department was created for the purpose of furnishing aid in the promotion and development of the mineral resources of the state, with particular view to assisting small mine owners and operators along semi-technical and general economic lines. The Department cooperates with, but does not encroach upon the field of the private engineers or the more technical bureaus.

Many persons confuse the Department and the Arizona Small Mine Operators Association. There is no direct connection between the two. The Department is state financed while the A.S.M.O.A. has nominal dues and chapters or councils in all mining communities. The two organizations work very closely together and it has been the policy of the Department to have its field engineers attend meetings of the Arizona Small Mine Operators Association throughout the state, where the latest news or information can be disseminated, and where any operator having problems within the scope of the Department's activities can interview the engineer, and if advisable, arrange a visit to his property. Every small mine operator thus knows just where and when he can personally contact a field engineer.



A boom mining town in 1900



Lost hopes in the early days

DEPARTMENT OF MINERAL RESOURCES

STATEMENT OF EXPENSES

July 1, 1944 to June 30, 1945

Allotment	\$33,000.00
Received from Reconstruction Finance Corp. on loan reviews	90.00
	<hr/>
e	\$33,090.00

ADMINISTRATIVE

Salaries	\$11,042.50	
Travel	821.79	
Printing & Stationary	608.88	
Postage	319.00	
Tel. & Tel.	175.25	
Office Rent	828.75	
Office Supplies	480.47	
Insurance	81.18	
Equipment Maintenance	71.82	
Blue Prints & Photostats	38.76	
Assays	56.25	
Miscellaneous	59.33	\$14,560.29
Special Projects		
Salary	\$ 1,100.00	
Travel	519.30	1,619.30
Capital Expense	\$ 22.55	22.55

FIELD WORK

Eastern District—Globe				
Salary	\$ 3,262.50			
Travel	1,792.73	\$ 5,055.23		
Southern District—Tucson				
Salary	\$ 3,262.50			
Travel	1,676.53	4,939.03		
Western District—Kingman				
Salary	\$ 1,967.50			
Travel	853.18	2,820.68		
Central District—Prescott				
Salary	\$2 ,762.50			
Travel	907.48	3,669.98	16,484.92	32,687.06
Returned to General Fund				\$ 402.94

During this war period this service has been of particular value as the frequently changing rules and regulations from Washington, affecting the mining industry, would have caused great confusion among mine operators without someone to interpret them and keep the operators fully informed and up to date.

Organization and Personnel

The Department is controlled by a Board of Governors consisting of five members from various parts of the state. These members are appointed by the Governor for various extending terms as shown on the inside front cover. The Board of Governors serve without compensation other than their actual expenses in attending meetings, which are required by law to be held each quarter.

The Board of Governors outlines the policies of the Department and employs the Director. The Director in turn employs such field and office force as is consistent with the appropriation and with the policies of the Board.

Heretofore the field force has consisted of four engineers each one of whom has covered a territory consisting of about one-fourth of the state.

Appropriations

In March 1945 the legislature reduced the appropriation for the Department with the requirement that the field force be reduced to two men. While the Department can continue to function fairly efficiently on this reduced basis, the small saving in taxes will be more than offset by the curtailment of constructive work. The Department of Mineral Resources is a tax producing department rather than a tax consuming department and for greatest efficiency should have an appropriation of at least \$50,000 per year.

In this regard it is noteworthy that a similar department in California receives an appropriation over

five times greater than Arizona and the California legislature has seen fit recently to increase it considerably. Yet the mining industry in California is not as great as in Arizona and not nearly so vital to the economy of the state.

Coordination

While the Department has functions and objectives that are peculiar to itself, much of its service must be in coordination and cooperation with other state and government agencies. In this regard it is noteworthy that there are over twenty-five government agencies with offices in Arizona with whom frequent contact and coordination is required.

The Department also works very closely with the Chambers of Commerce both within Arizona and in other states. In the fall of 1944 the mining department of the Los Angeles Chamber of Commerce, in conjunction with this department, made an extensive survey of the mining industry in Arizona and published a brochure listing 189 active Arizona mines with pertinent facts regarding each. While this publication was designed primarily as a guide for California manufacturers and salesmen, it is also of corresponding value to the mine owners and operators themselves.

METAL STATISTICS AND MARKETS

General

The metal situation during the past year has been, to say the least, chaotic. War requirements and consequent government policies frequently changed over night. Miners were often thrown into confusion and had no firm basis on which to make plans. Few people understand how necessary it is to plan ahead in carrying on any successful mining operation.

facilities as far as they go and coordinate fully with other mining agencies.

The value of the Department to the State could be increased many fold with a small increase in its appropriation.

Respectfully submitted,

CHAS. H. DUNNING,

Phoenix, Arizona

Director.

August 1, 1945

A financial statement for the fiscal year July 1, 1944 to June 30, 1945 is attached herewith.

able homesite; and wealthy summer-resorters locate great areas of our most desirable recreational land—all under the guise of mining.

These may all be necessary and advisable, and should be entitled to a reasonable place on the public domain, but the abuse of this mining right has become so great with our expanded population and new varied interests that some day the pendulum may swing the other way and miners will wake up deprived of their intrinsic locating right. Revisions should be made to permit legitimate mining locations without surface discoveries, and locators for other purposes should have a law of their own.

Small Mines Division

The U. S. Bureau of Mines should have a small mines division with a liaison official who can streamline the various possible services of that bureau so they can apply to the needs of the small mining industry.

Research

Of all the needs of the mining industry, research probably offers the most fertile field for advancement. Various possibilities have been hinted at throughout this report. The U. S. Bureau of Mines has been doing commendable work. The Arizona Bureau of Mines has also. Both should have increased means and, if so, would produce large returns for moderate additional expenditures.

Laboratory research, together with a program of field exploration using geophysics and some diamond drilling, would keep our resources far in advance of depletion.

General

The Department would like to further all of these needs of the mining industry. They will use their own

However, Arizona continued to produce critical metals and minerals in great volume and would have broken all previous production records if manpower had been available. Shortage of mining labor was especially acute in Arizona.

Gold and Silver

Gold and silver mining continued to be restricted under War Production Board Order L-208. Such production as there was came mostly as a by-product from base metal mines. Arizona production of gold and silver for the calendar year 1943 was \$10,076,560. In 1944 preliminary figures indicate that production was about 25% less. It is noteworthy that before the war there were over 700 gold and silver producers in Arizona that closed during the war because of the limitation order or other economic factors. In 1941 the value of gold and silver produced was over \$15,000,000.

Following the victory in Europe the government announced the rescinding of the limitation order. Some resumption of gold mining is being planned but there can be no great activity or production until conditions regarding manpower and supplies are more favorable.

Copper

Arizona continued to lead all other states in the production of copper in 1944. In 1943 the state produced 786,774,000 pounds of copper. Production was approximately 10% less in 1944, due entirely to shortage of manpower.

Many copper producers were assisted in maintaining production, in spite of war time costs and difficulties, by receiving a premium under the Premium Price Plan for Copper, Lead and Zinc. The ceiling price set by the government for copper has been 12 cents per pound. Records show that the average price received by Arizona producers for 1944 includ-

ing premiums was 13.4 cents per pound. This would indicate that approximately \$10,000,000 came into the state in the form of copper premiums alone.

At the same time the justification and success of the premium price plan is shown by comparing this price of 13.4 cents against the price of copper in World War I, when it ranged from 23 cents per pound to a peak of 35 cents.

Lead

Arizona has been rapidly coming forward as a producer of lead. In spite of the manpower shortage which curtailed the production of copper and many other metals, the production of lead in Arizona in 1944 actually increased about 20% over 1943 when it was 27,454,000 pounds. Lead remained throughout the year as the most critical of the common metals for war supplies. Here again the premium price plan has worked satisfactorily in both maintaining the mines in operation and in preventing a runaway market.

The average price paid for lead including premiums in 1944 was 7.9 cents per pound, of which 6.5 cents was the basic ceiling price and 1.4 cents the average premium. The future of lead mining in Arizona looks bright as many of the old midwest deposits are becoming exhausted, and lead is coming into increasing demand and use. It has become necessary to look farther west to fulfill the requirements of industry.

Zinc

The increase in Arizona zinc production was even more marked than lead or any of the other metals. In 1943 Arizona produced 39,354,000 pounds of zinc and this was increased by about 45% in 1944. The bulk of the increase came from the Copper Queen at Bisbee and from the new San Xavier (Eagle Picher) operation south of Tucson.

tacking the problem from a constructive angle. The recently appointed Arizona Power Authority should bring about a more equitable situation.

More Equitable Freight Rates

Many years ago it was naturally considered that the miner who had the highest grade ore made the most profit, and the railroads, wishing to "horn in" wherever possible, established freight rates on a sliding scale, increasing with the value of the ore.

The above premise is entirely untrue in present day mining, but the sliding freight rates are still maintained, acting as a penalty to those who would benefit their ores at the mine, and penalizing the small miner who, generally speaking, requires a higher grade ore than the large mine.

The railroads also advance the alibi that their risk is greater in transporting the higher grade ore, but it only becomes greater in the same ratio as zero becomes greater when multiplied. There is not one carload of ore in one million that becomes lost in transit.

The small mining industry needs to have this ancient and obsolete method of attempting to share one's profit, to say the least—modernized.

Mining Locations

The old method of locating and holding mining claims has long since become obsolete. Not only does it fail to function satisfactorily for the modern miner but it is subject to great abuses.

The old law intended to require a surface discovery. Most mines in the future may be without surface expression. As the enforcement of the law is relaxed to permit locations without outcrops, new abuses appear. Cattlemen locate springs, pastures and corrals; small businessmen locate service stations and hamburger stands; health seekers locate a desir-

west should also be provided with more approachable smelting facilities. Arizona alone is now producing nearly 500 tons of zinc concentrates and high grade zinc ores per day, which would support a large sized smelter. With improved facilities the amount would be greatly increased. The chief drawback is the uncertainty of the future, caused by lack of a stable policy regarding foreign competition.

More Reasonable Power Costs

Mines in other western states may be more fortunate as regards power than those in Arizona, although we have a superabundance of water power. In Arizona the small mine is being outrageously discriminated against. Commercial power for a small mine using from 50 to 100 H.P. and operating one shift per day may cost from four cents to over six cents per K.W.H. We will admit that there is an overhead cost to carrying any power account whether large or small. But why should the miner using 50 H.P. pay more per unit than the householder using 1 H.P., and why should the small miner pay 5 to 10 times as much as the large miner? If the theory is that the size of the account determines the rate, it should work both ways. In this case it does work both ways—with the small miner squeezed in the middle.

Few small mines can afford expensive power plants of their own. The result is that, faced with prohibitive commercial power costs, and being unable to purchase expensive diesel plants, they wind up by using old automobile engines and obsolete crude oil equipment with resultant breakdowns and delays. Many a feasible small mine has failed for no other reason.

Many may question the figures set forth above. The Department stands ready to prove them.

The Department notes with pleasure, however, that Governor Osborn has finally succeeded in at-

In years past zinc has often been a liability instead of an asset to Arizona miners, but improved metallurgy and facilities have now turned it into a profitable product. Arizona is in great need of further zinc reduction facilities which will probably come in due course after the war.

The zinc production industry also has been gradually moving west as deposits in the east and mid-west become exhausted. The search for zinc in Arizona has been neglected in the past but the state contains many possibilities for important new discoveries and, with a favorable economic situation and improved facilities the future of zinc mining in Arizona, is possibly the brightest of all.

The average price received for zinc in 1944 was 11.2 cents of which 2.7 cents was a premium.

Comparative Production—Copper, Lead and Zinc

Herewith is a table showing the production of copper, lead and zinc in Arizona since 1939 in tons of refined metal.

Year	Copper	Lead	Zinc
1939	262,706	10,771	6,711
1940	287,267	13,266	15,456
1941	328,550	15,638	16,493
1942	388,394	14,772	18,522
1943	397,434	13,727	19,677
1944	357,000 (?)	16,500 (?)	29,000 (?)

The steady increase in zinc production is especially noteworthy.

Manganese

There was considerable activity in manganese mining in Arizona during the calendar year of 1943 when 6,275 tons of high grade or direct shipping ore was produced, and 8,450 tons of low grade or milling ore was shipped to government stockpiles.

In 1944, 8,839 tons of direct shipping ore was produced. The amount of low grade ore shipped to government stockpiles is not yet of available record but probably closely paralleled 1943.

During 1944 the government purchase plan, while not abandoned, was made much more stringent. Many producers could not meet the new and more restrictive specifications and one by one dropped out of production. By July 1, 1945, practically all production has ceased.

Tungsten

In 1943 tungsten miners in Arizona produced about 65 tons of high grade tungsten ores or concentrates plus a small tonnage of low grade ores to government stockpiles. In 1944 the high grade shipments dropped to about half the 1943 tonnage but there were over 10,000 tons of low grade shipped to stockpiles.

Tungsten buying by government agencies stopped completely in July 1944 and the stockpiles were subsequently sold to private interests. Private markets around \$18 to \$20 per unit are still available, but there is very little production of tungsten in Arizona possible at that price.

A large potential tonnage of low grade tungsten has been discovered in Arizona during the stimulus of war prices, but either prices will have to be higher or costs lower before tungsten mining can be of much economic importance to the state.

Mercury

Production of mercury in 1943 amounted to 541 flasks of 76 pounds each. This was a decline from previous years due to higher operating costs and scarcity of labor.

The government purchase program for mercury received a cutback similar to and at about the same

NEEDS OF THE ARIZONA MINING INDUSTRY

Adequate Stockpile Legislation

The present stockpile legislation is too temporary and inadequate. The contemplated stockpile bill (S-752) has weaknesses as set forth under that heading. Miners need a buffer stockpile plan that will assure them of a steady market and, at the same time, streamline their market prices. The government needs stockpiling that will serve for national emergencies. The two could be nicely combined into a single simple plan. The bill should also provide for an exchange basis whereby surplus alloys can be turned over to consumers in exchange for equal weights of pure metal.

More Equitable Taxes

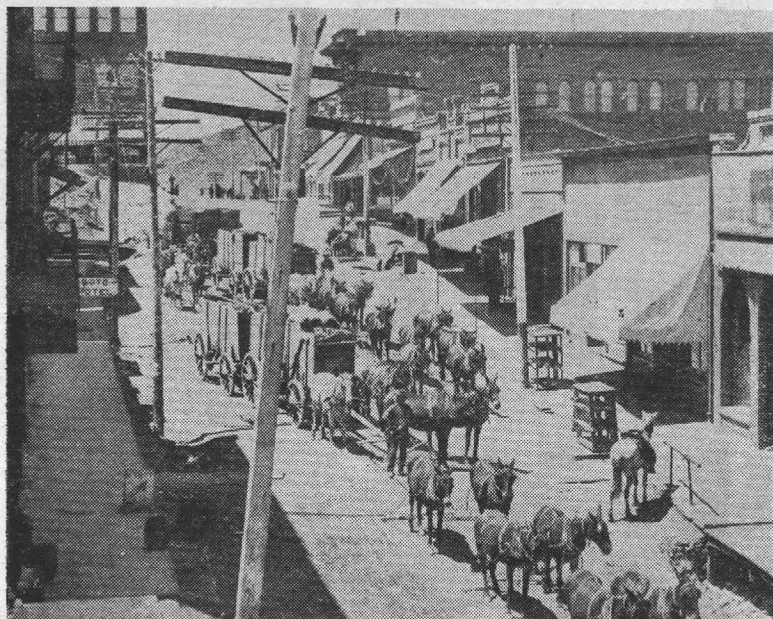
The early stages of a mining enterprise are highly speculative and ordinary tax laws are unfair to it. Such tax laws permit the tax collector to become an important partner when things are going well but leaves one on a limb when they are not. Venture capital, which new mines always need, would favor mining if it were not for the fact that the tax situation requires them to stand all their losses, but share most of their profits. The result of fair tax adjustment might be that we would have more good producing mines instead of, possibly, a breed of faster horses.

Zinc Smelting Facilities

Arizona has recently become an important producer of zinc, and could become still more so. It costs Arizona producers \$35 per ton to get their zinc ore or concentrates smelted. The nearest smelters are in Utah or Texas. Freight rates are high and zinc smelting, owing to peculiarities of its own, is very expensive.

Here again broad research should be carried on to lower the cost of zinc smelting, but the deep south-

ORE WAGONS



1900



1945

time as tungsten. Under government purchase, producers received \$196 per flask. After this purchase program stopped the open market price dropped to about \$100. New uses, such as the new powerful but miniature storage battery, increased the demand, and the open market price again rose in 1944 to a peak of about \$160.

Shipments from Spain were then increased and the Metals Reserve Company marketed some of their reserve stocks. By July 1, 1945 the market price was about \$140 but the price situation is too uncertain and unsettled to stimulate much Arizona production.

Arizona has one important mercury producing district and it has future possibilities worthy of exploitation.

Molybdenum

Molybdenum production has not been encouraged during the past year or two as a war effort. Its statistical position in Washington has been satisfactory, and stockpiles are ample.

In Arizona most all molybdenum production has been as a by-product from copper ore and there have been no straight molybdenum mines operating during the past year. As a by-product it has value in reducing the cost of producing copper, but there could be little incentive for the development of a straight molybdenum mine.

Asbestos

The demand and price for Arizona asbestos has declined measurably during the past two years, largely on account of substitute products.

The custom mill planned for the Globe area was completed but never put into operation and miners experienced difficulty in obtaining satisfactory markets. One of the largest privately owned plants has also closed recently.

Asbestos in Arizona occurs in rather small deposits that are not very consistent. For this reason there can never be much fiber actually blocked out or developed ahead. There can therefore be no certainty of definite production and users are hesitant to commit themselves to contracts. There may be differences in the character of the fiber from different mines, or in the grading as done by different producers, and here again the user is inconvenienced and may have to make frequent adjustments in his spinning machinery.

However, the iron free quality of Arizona asbestos is unique and a specialty market on a small scale will no doubt continue.

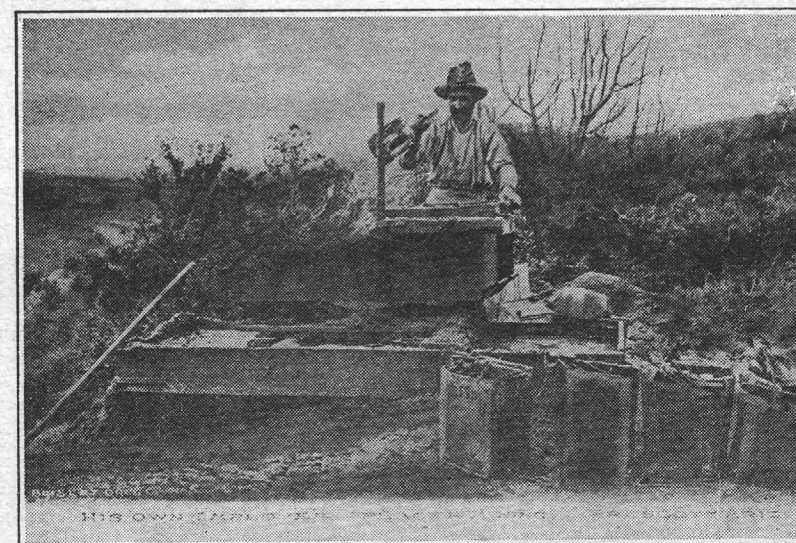
Fluorspar

Sporadic attempts to produce fluorspar in Arizona have not met with great success and production declined in 1944. The main reason was rising costs with no corresponding rise in prices. Most shipments were from the Duncan area to mills in New Mexico. Specifications are very stringent and only the highest grade ore will stand shipment.

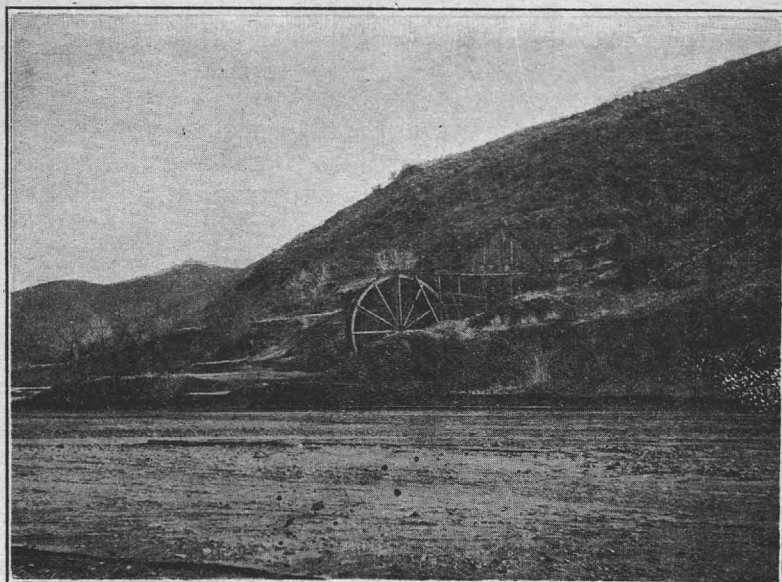
Many new uses are being developed for fluorspar, especially the acid grade (97.5% CaF_2). It is used in the powerful new insecticide DDT, in the new refrigerant "freon", and in producing high octane gasoline.

The mining of fluorspar, however, has been on an unsatisfactory and unbusinesslike basis. Much of it is produced on farms in the midwest, from surface workings, by spare time workers who do not know their real costs.

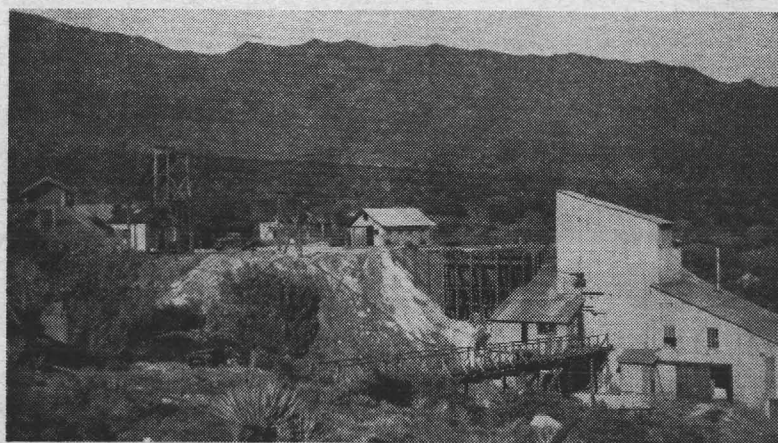
There are several excellent, though not large, fluorspar prospects in Arizona and as the economics of the situation adjust themselves, fluorspar mining in Arizona may become of importance.



Ore had to be high grade in these days



An Early Day Mill



A Modern Small Mine Plant

Barite

Barite is coming into greater demand as a weighting material in oil well drilling. One large deposit of high grade barite in the vicinity of Stewart Mountain Dam has been purchased by a Texas oil well supply company. They will install a 100-ton per day mill near Mesa to remove a small percentage of impurities, and ship the ground barite to the oil fields.

There are several other deposits of barite in Arizona and, with increasing demand and improved methods of treatment, barite mining may well become a new industry in the state.

Mica

Attempts to find and produce strategic or sheet mica in Arizona have not been successful. Most deposits in Arizona apparently contain impurities detrimental to its use in sheet form for electrical purposes, or have been subjected to stresses or strains that have ruined the required sheet structure.

Ground mica, however, has possibilities. The use of ground mica is increasing and Arizona contains many deposits containing a high content of flake mica. Such an operation is being started at the Mica Giant Mine near Kingman. The laudable pioneer work being done by these operators may well be the start of another new Arizona industry.

Gypsum

Demand for gypsum for local agricultural purposes is increasing. Gypsum offsets alkali soil conditions and is of especial value in growing cotton and vegetables.

A large deposit near Mammoth, Arizona, has been taken over by a local concern supplying fertilizers, and production has started. There are numerous other deposits in the state, and with an expanded local

demand, not affected by freight rates, increased interest in gypsum mining can be expected.

Perlite

Perlite is a volcanic glass or obsidian containing included water. On heating to the correct temperature the particles explode like popcorn resulting in a very light porous material that has unique insulating qualities. Arizona has some splendid large deposits of perlite but the industry needs research and definite technique.

The Arizona Bureau of Mines has undertaken some research work in this regard and with the knowledge and experience that will eventually be gained, perlite may become an important post-war building material.

Iron

The U. S. Bureau of Mines has been carrying on a rather extensive exploratory program for commercial iron deposits in Arizona. Some small deposits of high grade iron have been explored and one large deposit of low grade iron in Apache County has been extensively drilled.

As a source of ordinary iron ore this deposit seems quite far in the future but there are possibilities that it may be of immediate importance in the production of sponge iron. Sponge iron is needed and used as a precipitant for copper in certain copper ore dressing processes, and heretofore has been imported from other states.

General

At the close of the fiscal year few metals remained on the government's critical list. The only one of these produced to any extent in Arizona is lead. Truly the mining industry has done a remarkable job for the war effort—often in the face of seemingly impossible conditions.

of the hidden formation may not be as prolific of mineral as the 3% exposed.

Similar advances can be expected in metallurgy. While it is true that modern ore dressing extracts nearly all of a desired mineral from an amenable ore, there are large deposits of low grade or marginal ores that are not quite amenable enough. There are also complex ores, and ores containing secondary minerals which might be extracted at the same time, and for which important commercial uses may arise or be developed. The science of atomic structure and its co-relation with mineral structure and electrical propensities is still very young. The future is all ahead.

Anyone who thinks the ultimate has been reached should examine the past record of these things, and also the history of such believers in the past. The important point is to keep our mining industry alive. The rest will follow in the natural course of evolution.

3. Endorsing the principles of stockpiling.
4. That reciprocal trade agreements require approval of the Senate.
5. That the premium price plan be extended per S-502 (including the McFarland noncancellable proviso).

The West was never able to convince Congress that reciprocal trade agreements should require Senate approval. Proper amendments to the Contract Termination Act are still under consideration. The other three resolutions accomplished their desired purposes.

MINING EVOLUTION

Great advances have been made in mining and milling in the past generation. To many it may seem that the limit must have been reached. To the Department it seems that the possibilities ahead are far greater than the improvements already accomplished. Technological advances have continually increased our resources faster than production depleted them. This same ratio will continue in the future at an accelerated pace.

The science of geophysics is an example. It is used to detect unexposed ore bodies by electrical means. It is not new, but is being constantly improved with an unlimited field for improvement ahead. Geophysics is closely allied with electronics and radar. Some of our best young minds are making intensive studies of electronics and radar for the war effort, with resulting advances that are still military secrets. When peace comes and this knowledge and these bright young men can be coordinated with mining geophysics, most anything can happen.

A study of a geological map of Arizona shows approximately 97% of our surface covered by volcanic or sedimentary deposits that occurred later than the mineral formations. There is no reason why much

LOANS AND ROADS

Loans

The splurge of activity and incentive during the first period of the war caused a rush of applications for government loans to explore and develop marginal properties, old mines, and prospects.

The government in its effort to get out the metal was liberal in granting these loans. The mining industry complied with the war urge and brought forth many properties that were tentative producers. The motive in many cases was purely patriotic and many operators gambled more personally than they asked the government to gamble with them, and felt they were willing to take a big risk with only a fair chance of breaking even. At the same time there was of course an element who had only personal gain in mind and who never intended to do more than get the loan money into their pockets as easily and simply, and in as great amount as they could. These latter people do not belong to the real old time mining fraternity.

In any event it was natural that the cream of possible properties should be picked during the early stages of the war. It was also natural that the attitude, or interpretation of the rules, by the loaning agencies be made to fit the exigencies of the times. The pendulum now swings the other way, and although a few properties of merit may have been presented for loans during the past year, the result is that there have been no mining loans granted in Arizona during the past fiscal year. Seven applications were received and reviewed by the Department but none were granted loans by the Reconstruction Finance Corporation.

A summary of all loans, broken down into counties, appears in last year's annual report and need not be repeated here. It is interesting to note, how-

ever, that the R.F.C. reports the breakdown of class "C" loans into states as follows:

State	No. of Loans
Arizona	125
California	64
Colorado	112
Nevada	22
All others	132
Total	455

It will be noted that Arizona has received more loans than any other state. Possibly this may be accounted for by its superior climate.

There are still a few base metal loans pending or contemplated but we do not expect that the loaning agencies will see fit to grant loans for the production of base metals that would be produced merely in time to add to a post-war surplus, unless the property has unusual merit.

Gold Loans

Naturally there have been no straight gold mining loans applied for during the term of the gold closing order. New legislation is now pending that will permit loans for the rehabilitation of gold mines, and when and if same becomes a law the Department anticipates a great many applications. This new law is further discussed under the heading of Washington Activities.

Access Roads

Up to July 1, 1944, approximately a half million dollars had been spent in Arizona on mine-to-market roads. These are set forth in itemized form in the last annual report and will not be repeated here.

During the fiscal year ending June 30, 1945, the

formulated into laws or rulings of benefit to the mining industry.

El Paso Meeting

In November 1944 El Paso held its International Mining Day and representatives of the mining industry in the West and from Mexico attended. Governor Osborn requested that the Department's director attend and represent him and Arizona.

One government official from Washington made a long talk advocating the necessity of purchasing our metal requirements from foreign countries. The Department's director was on the program and made a talk quite to the contrary. He advocated steady production for true conservation. The mining element in the audience seemed more pleased. We are not so sure about the international element.

Reno Meeting

In April 1945 it was the privilege of the Department's director and Engineer Ballam to attend the conference of Western Governors in Reno, Nevada. Governor Osborn had been assigned the topic of copper, lead and zinc, and the Department furnished him with much of the data for his talk. Governor Osborn made a very fine talk and many persons from all states went out of their way to mention it.

The governors at this conference unanimously adopted the following resolutions which were proposed by the Department:

1. Provide adequate and equitable contract termination for metal producers.
2. That gold closing order L-208 be rescinded at the earliest period commensurate with the prosecution of the war, and, in the meantime, be relaxed as labor and materials become available.

EFFORTS BRING RESULTS. A 500-word editorial in the Prescott Courier July 5, 1945.

MINERAL CONSERVATION BY PRODUCTION. A 3,000-word article that will appear in the September, 1945, issue of "Nations Business" under the changed caption "Have Cake and Eat It."

THE OUTLOOK FOR POST WAR METAL PRODUCTION. A 2,500-word article in the August 1945 issue of the "Arizona Grocer".

In addition to a discussion of stockpiling, tariffs, premiums, etc., this article advocates the use of gold and silver as bases for our monetary system. Recent tendency is toward managed currency. Managed currency has been a historical failure and can never be better than the man who manages it. Who can say who that might be at some future date?

This article also shows the comparative importance of the mining industry in Arizona. Statistics show that it supersedes all other industries.

Meetings

Out of state meetings attended by the Department's director were held at San Francisco in August 1944., El Paso in November 1944, and Reno in April 1945.

San Francisco Meeting

This meeting was called by the Governors of California and Nevada for the purpose of adopting resolutions concerning the post war situation of western mining. The convention adopted nineteen resolutions which were presented to a meeting of western governors held at Phoenix some months later.

The resolutions adopted must have borne considerable weight with the governors, and in turn with Congress, for it is a fact that they were nearly all

following roads were authorized or constructed by the Grazing Service:

Summit and Alpha	Mohave	3.75	\$ 7,500.00
Yuma Copper	Yuma	6.50	8,500.00
Abril	Cochise	7.10	15,000.00
Indiana	Pima	4.50	4,000.00
Total		21.85	\$35,000.00

The following road was also constructed or under construction by the Forest Service:

Reynolds Falls Group Gila 7.0 \$19,000.00

The access road program is continuing but, as in the case of loans, the frenzy for metals has eased, and requirements have become more stringent.

A TYPICAL ACCESS ROAD



Before



After

It is a historical axiom that a nation's mineral production is a measure of its degree of civilization and place among other nations, and whenever a nation has become decadent and careless concerning its metal resources and production, it has soon been superseded by some other nation.

Lack of production does not conserve our resources—it ruins them. Production brings about technological improvements, exploration and research, and they in turn bring about new resources. It is an ever ascending spiral and each time that technological improvements make it possible to use a slightly lower grade raw material the resources of that material increase enormously.

The Department believes that the soundest way to win a better understanding of the problems and importance of the mining industry is through written matter brought before those people who are not ordinarily interested in mining.

Written Articles

In this regard several papers or editorials have been prepared by the Department and have appeared in various publications. Among these are the following:

THE WE-HAVE-NOT CLUB. A 600-word editorial appearing in Arizona Fax, April 20, 1945, in refutation of a speech by a government official in which he said "Thus the need for large scale stockpiling is of utmost importance . . . The stockpiling should be made up largely from foreign materials".

MINING AND THE RETURNED WAR VETERAN. A 300-word article appearing in the May issue of Arizona Visitors Guide.

MINERAL PRODUCTION, CONSERVATION. A 300-word Guest Editorial in the Phoenix Gazette June 30, 1945.

ing purpose. In the past this facility has largely been used to obtain information pertaining to some phase of the war effort for authorities in Washington.

Surveys have been made on the possible resources of various metals, manpower and draft deferment situations, and other conditions where an overall picture is desired.

Very little such work has been required during the past year but the readjustment period may call for much information of that type and the Department stands ready.

Active Mines

Before the war there were approximately 900 producing mines in Arizona. Many of these were small and most of them were gold, or gold-silver producers.

During the past year there have been between 250 and 300 active mines, the difference being accounted for by the closing of those mines not producing strategic metals.

The field engineers maintain a list, revised each month, of all active mines in their district. This list is mimeographed each month by the Department's head office and sent out by request only, to anyone having need for it.

PUBLICITY AND PROPAGANDA

General

One of the greatest obstacles to the continued prosperity of the mining industry has been the fact that the great preponderance of population in the East have little understanding of the facts regarding mining, and little realization of its importance to the nation as a whole. There is also an element who advocate closing our mines under the mistaken idea that our resources are thus conserved.

WASHINGTON ACTIVITIES

General

The Department has maintained representation in Washington and this activity is probably the most important service rendered to mine operators and to the taxpayers of the state. Our representation there "shoots trouble" and follows through in individual cases, and keeps the office advised in all matters of legislation pending, lends all possible effort toward legislation of constructive benefit to mining, and works against such legislation as would be unfair to the industry. The Department's representative there works very closely with our congressmen from Arizona and they have often expressed their appreciation and satisfaction to this office.

It has been the policy of the Department not to draw state lines in such broad matters, but to lend our efforts for the benefit of the whole mining industry. While there is much "case" work, an effort is made to correct basic policies which aid mining in all states.

Legislation Accomplished

The Stockpile Bill

In september 1944 Congress passed the Stockpile Bill—HR-5125. The Department had worked very hard to bring about an adequate stockpiling bill. The mining industry felt that metal markets needed protection from the great influx of scrap metal, battle field scrap, semi-fabricated war items, and metal in one form or another that might be thrown on the market as soon as military authorities decided it was no longer needed for the war effort. National Security was another angle. It always takes time to bring about any great increase in metal production and a reserve stockpile is essential for national security.

The stockpile bill as finally passed was only a

temporary stop-gap and but partially satisfactory. There is much still to be done to get permanent stock-pile legislation.

Contract Termination

That part of the Contract Termination Act relating to the production of metals and minerals was designed to repay losses to those producers who had been stimulated to produce, or prepare for production, by the war effort and some act of the government, but who had been prevented from recovering their investment by some subsequent act of the government—such as the cutback of a government purchase program. The law was expected to obviate any such situation as required the War Minerals Relief Act following World War I, many cases under which were still undecided 25 years thereafter.

The Department announced that it would render assistance to operators in preparing and filing claims under this act. Eleven such claims have been received, prepared, and filed with the proper authorities in Washington. All claims to this date have been denied.

The law provides for an appeal, and each of these claims has in turn been appealed. An appeal calls for an oral hearing and in May 1945 the government sent an appeal board of judges and attorneys to hear the appeals in the first two cases. The government attorneys have been inclined to put a different interpretation on the wording of the law than the Department feels was intended, but the attitude of the judges and attorneys was most sympathetic, and the hearings were conducted in a manner to give all claimants all possible benefits.

The appeals have not been decided yet but it is evident that relief for much of the hardship shown in these cases is not provided for in the present law, and the result of these hearings may be that the Department will have to instigate amendments or fur-

This is usually done at the time of the meeting, but if an operator cannot be present or gets short of gasoline unexpectedly, he can obtain the service by mail to the engineer's headquarters or the Department's main office.

Examinations

Field engineers will, when advisable, make a brief examination and report on any mining property without cost to the operator. If sampling and assaying are necessary, the owner pays the cost of the assays.

Mine owners or operators understand that the Department cannot enter into promotions. The engineers are instructed to make their reports strictly factual. They can describe a property as completely as possible, thus presenting a picture that the reader can visualize—but the reader must draw his own conclusions. The engineer may suggest or advise further work that he thinks may be of benefit to the property but he cannot project the picture into the future via his imagination, or express an opinion as to what he hopes will happen on further development.

It is hard to draw an exact line between an operator and a promoter. Operators often require financial help and when they seek to obtain it they become promoters. Then there are all degrees of promoters from the prospector who needs a grubstaking partner to the big public stock selling campaign.

To keep from becoming too much involved or being "promoted" itself, it is necessary that the Department require its engineers to adhere to the above policy.

Surveys

The Department stands ready at all times to undertake any special survey for any constructive min-

FIELD ACTIVITIES

General

Up to July 1, 1945, the Department has maintained four field engineers and the state has been divided into four districts. Field offices were maintained at Tucson, Globe, Prescott and Kingman. With the reduced appropriation effective July 1 the state will be divided into two districts. The southern and eastern districts will have headquarters in Tucson and the northern and western territory will have headquarters in Prescott.

The duties of the field engineers are to keep in touch with all operators; disseminate news and information either directly or at meetings; assist the small miner in any problems he may have; help him in all such matters as loan applications, priorities, premiums, equipment, contract terminations, access roads, obtaining labor, deferring employees, financing or selling his mine; and make a brief examination and report on his mine if advisable.

A.S.M.O.A. Meetings

There are about 40 active councils of the Arizona Small Mine Operators Association in the state. Some of these councils hold meetings each month and some every two months. The field engineers of the Department have a schedule that permits them to attend nearly all of these meetings. Mine operators anywhere in the state therefore know just when they can contact a Department field engineer and hence avoid distant or duplicate trips. The scheduling of engineers' field work so that they can attend meetings automatically requires the men to spread their efforts evenly over the whole district.

Gasoline

It is also incumbent on the field engineer to approve all gasoline for mining purposes in his territory.

ther legislation to provide equitable adjustment in these small mine hardship cases. We know that our Arizona Congressmen will cooperate fully in anything that thus becomes necessary.

Security and Exchange Commission Rules

The mining industry has long needed and desired some change in S.E.C. regulations regarding the financing of mines, that would permit a reasonable flow of venture capital toward the development of new mines, without the evils of the old style promotions.

All mines were once prospects and all prospects are speculative, but the S.E.C. regulations heretofore in effect have been so stringent that venture capital has shied almost entirely away from mining.

This department, as well as many other mining organizations, has been making efforts for some time to have these regulations made more reasonable.

In November 1944 a meeting was called at Butte, Montana, consisting of representatives of mining organizations and of the Security and Exchange Commission. Our engineer, George Ballam, attended this meeting, and this meeting together with all other efforts culminated in the Vandenberg bill (S-62) which amends the Securities Act of 1933 by raising the registration exemption for new issues to \$300,000. There are still rigid provisions to prevent untrue statements or misleading omissions—which is as it should be—but the door for legitimate mining enterprises will at least be a little wider open for mining venture capital.

Premium Price Plan

The premium price plan for copper, lead and zinc was instituted at the start of the war to permit the smaller and marginal mines to produce under increased wartime costs, without allowing metal prices to run wild as they did in the last war. The encour-

agement and incentive thus lent to the smaller mines also resulted in a necessary supply of fluxing ores needed by the smelters to mix with the concentrates from the large mines.

Another result of the encouragement thus given to the small mines is that out of the exploration and development thus stimulated there will result several new large mines that will become long life producers, and important tax assets to the state, and part of an important bulwark of mineral resources for the nation. As a result of this plan copper, for instance, has been produced at an average cost to the government of slightly over 13 cents per pound, whereas in the last war it averaged nearly 30 cents. Statisticians state that the government has been saved over two billion dollars in the purchase of these three metals during this war.

But the premium price plan was due to expire July 1, 1945, and if it had it would have thrown the mining industry into such great confusion and losses as to cause a severe economic shock to all mining states—in fact, it would have been felt throughout the nation.

Many of the smaller mines got into production so late, and were met with such continually increasing costs, that they needed a longer period of production to recover their war time investments. In fact, it is doubtful if more than a half dozen out of our present 289 active mines could continue production under present war time costs, without a metal premium or a parity metal price.

Normal efforts to extend the plan were strenuously opposed. The large majorities of congressmen from the East could see little reason in keeping our western mines operating when the war might be over any day.

A bill to extend the plan for another year did not receive such great opposition in itself but, as origin-

that a mine operator must do, and the various services that are available to him, have been brought up to date and reissued. Abrupt changes in policies and instructions from Washington, that occurred so frequently in the past and concerning which mine operators needed immediate advice, have been much less frequent, and the Department finds it better and simpler to disseminate such information through Pay Dirt.

Pay Dirt is the monthly publication of the Arizona Small Mine Operators Association. It is received by everyone who would be on any mailing list of our own and many others in addition. Membership can be obtained through this office.

Gold Mine Survey and Catalogue

Now that the gold mine closing order has been rescinded, and as labor and materials become more plentiful, the Department anticipates many inquiries for mines. We have over 1,000 mines listed in our files, most of which have "mine owners" reports only. Many of these are obsolete or otherwise of no value. The files are of little aid in answering inquiries for properties.

The Department plans to reorganize this system. All gold mine owners in the state will be sent a new report form. Information on this report will enable the office to give the mine a classification. The inquiries themselves usually indicate the type of mine desired. Copies of mine owner reports will be sent inquirors without charge and they will be advised of other reports or information available. A small charge per page will be made for copies of such further information. Gradually as time permits we hope to have our field force make examinations of all of these properties.

HEAD OFFICE

Gasoline

In September 1944 the Department was asked by the Arizona branch of the Office of Price Administration to recommend or approve all applications for gasoline for mining purposes throughout the state. This meant a great additional burden to the Department but we felt that it would be an important service to mine operators in that their applications would be judged by someone who understood their needs and problems, and delay and red tape would be thus avoided.

Special approval blanks were made up and all field offices as well as the head office were supplied with blanks and instructed in the procedure. An applicant for gasoline can either call at or write to any of the offices. If the Department is not familiar with an operation, it has been the policy to approve a fair amount of gas and then have the field engineer check up. New operations are handled in the same way.

This function of the Department also results in requiring our field force to keep in close touch with every operation in their district and brings about closer contact between the Department and all operators.

This service will be continued in the future although under a new arrangement with the O.P.A. they will no longer require the Department's approval of gas for personal cars, but we will report on gasoline requirements for commercial use.

Department Bulletins

During the past year the Department has not issued nearly as many bulletins as heretofore. Bulletins enumerating and outlining the various things

ally written, would do the mines little good for it permitted the cancellation of any or all premiums at any moment. Mines must necessarily plan their work months ahead and no mine can operate with such an axe hanging over its head.

So Senator McFarland injected the "McFarland proviso" into the bill. This stated that "all classes of premiums shall be noncancellable" for the forthcoming year (until July 1, 1946). A great fight started over this proviso. The Senate passed the bill with the proviso. The House Committee threw it out. Thus a joint conference committee was required and appointed. The Senate members of the committee stood firm. Enough of the House members were finally convinced so that the bill with the "noncancellation clause" was finally recommended, and subsequently became a law.

During this period of debate and conference the Department was especially busy. All other mining associations (over 70) were circularized and asked to bring pressure on their congressmen and friends. The Department's connection in Washington kept us fully informed, and when the final conference committee was appointed their names were immediately known and a flood of telegrams from all over the United States descended on each member.

Legislation Pending

Two important bills are now pending in Congress. One is a new stockpile bill (S-752) and the other a new mine loan bill (S-1200).

The stockpile bill, in the opinion of the Department, is a great improvement over the old bill. It provides for continued maintenance at a minimum level, and for the rotation of materials to prevent deterioration, if necessary. A serious objection to the bill is that, although it attempts to require that the stockpile be

built up from American mined material when possible, it does so merely by tying in the old "Buy American" act of 1933. The "tie-in" becomes involved in much matter not relevant, is subject to many "ifs and ands" and leaves too much to someone's judgment. The bill should have definite "Buy American" language of its own. Possibly the Department can bring that about.

The new loan bill (S-1200) authorizes mining, milling and smelting loans on a broader scale than heretofore. The bill provides that the "Reconstruction Finance Corporation may make such loans for the development of the mineral resources of the Nation as it shall deem to be advantageous to or in furtherance of the national economy or the national security. Development of the mineral resources means making accessible, examining, or developing mine, placer or quarry workings, mining, milling, smelting or otherwise treating ores . . . and as to gold mines or other mines the operation of which ceased or was curtailed by War Production Board Limitation Order L-208".

Past loan legislation left several types of mines or prospects in certain stages of development without the assistance offered to others no more deserving. The new law appears to be broader and, if fairly interpreted, should be of much assistance to the small mine industry. The Department hopes that it will become a law.

The mining industry will feel keenly the loss of Senator James C. Scrugham of Nevada in legislative matters. Senator Scrugham was always the friend of mining and has had a keen understanding of the

needs of the industry and of sound economics. We note with great pleasure, however, that former Governor E. P. Carville of Nevada will take the place of the late Senator Scrugham.

Senator Carville is well known to this department. We know that mining will have a new friend in him, and we can rest assured that Senator Carville has a thorough basic knowledge of mining problems and a sound knowledge of economic problems in general. Nevada could not have sent a better man.