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PRIMARY NAME: SEVENTY-NINE PROPERTY

ALTERNATE NAMES:

MCHUR PROSPECT

GILA COUNTY MILS NUMBER: 10B

LOCATION: TOWNSHIP 4 S RANGE 15 E SECTION 21 QUARTER SE
LATITUDE: N 33DEG 03MIN 50SEC LONGITUDE: W 110DEG 48MIN 52SEC
TOPO MAP NAME: HAYDEN - 15 MIN

CURRENT STATUS: EXP PROSPECT

COMMODITY:

LEAD
COPPER
SILVER
ZINC
MOLYBDENUM

BIBLIOGRAPHY:

- ① ADMMR 79 MINE FILE *attached*
- ① TENNEY J B 2ND RPT ON MIN IND AZ AZBM BULL
129 1930 P 75 *attached*
- ✕ LAPIDARY JOURNAL SEP 1980 P 1278
- ✓ AZBM BULL 158 AZ ZN & PB DEPTS 1951 P 72-81
- ① SAEC PRELIM RECON 172-480 GILA CO 1953 P 162
- ① HICKS C J MOLY OCCUR AZ 1979 P 16 ADMR PUB
- ① EAGLE PITCHER GEO. FILE FOWLER, 1938
- ① ROSS C P ORE DEPTS SADDEL MTN & BANNER MGN
DISTS USGS BULL 771 1925 P 66 & 68
- ✓ KIRSCH G A SEVENTY-NINE THESIS U OF AZ 1947

AVAILABLE
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185 pages

THE GEOLOGY AND ORE DEPOSITS OF THE SEVENTY NINE
MINE AREA, GILA COUNTY, ARIZONA.

by
George A. Kiersch

A Thesis
submitted to the faculty of the
Department of Geology
in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy
in the Graduate College
University of Arizona

1947

Approved:

W. S. Butler
Director of Thesis

May 13, 1947
Date

MINERALOGY AND PARAGENESIS OF THE **79 mine** LEAD-ZINC-COPPER DEPOSIT

by Stanley B. Keith 2748 E. 9th Street, Tucson, Arizona 85716

Skarn

PORPHYRY COPPER PROBABILITY STUDY
OCCURRENCE DESCRIPTION OUTLINE

I. SULFIDE SYSTEM

A. Name 79-Mine County Gila State Arizona

*B. Length: Exposed 1000 ft; Extrapolated 2500 ft.

*C. Width: Exposed 1000 ft; Extrapolated 2500(?) ft.

*D. Azimuth of Elongation 80 °; Sulfide Concentration _____ Vol. %

*E.) Capping (circle one for each)

Oxidized Capping	<u>yes</u>	no		no data
Leached Capping	yes	no		<u>no data</u>
Intensity in Outcrop	subtle	apparent	obvious	<u>no data</u>
Color	red-brown	<u>maroon</u>	bleached-yellow	no data

*F. Absolute Age (m. y.); Min. _____; Max. _____; Average _____
Relative Age (bracket): (62 m. y.)

*G. Drillholes

1. Maximum Depth 1602 ft.

2. Comments BCMC drilled hole CC#3 to 1602 feet which adequately
tests property proving 79-Mine area does not contain a large
tonnage PCD.

*H. Geologic Setting (age, host rocks, intrusive relationships, oldest to youngest formations, contacts, alteration halo to core zone).

Irregular pod-shaped contact replacement sulfide bodies of Pb & Zn with minor Cu are formed in skarn alteration in Paleozoic limestones adjacent to a quartz diorite porphyry stock and ENE granitic dikes. Pb-Zn oxide ores were shipped from 1879 to 1948.

I. Reference:

Caviness, C. R., 1968, Final report 79-Mine, Gila Co., Arizona:
BCMC rept., July 2, 1968.

*Note: See Rules and Conventions.

Sulfide System Name 79-Mine

II. Diagnostic Reconnaissance Characteristics

A. District Prospect Zoning Outside of Sulfide System

1. Prospects/Mines

Metal/Type	Min. Diam. (feet)	(M) Mines (P) Prospects	Rock Types	Deposit Types
Cu	6000	M	Precambrian diabase & lime-stone	contact replacement
Pb-Zn				
Ag-Au	1200	P	Cretaceous andesites	vein
Mn				
Other				
Other				

B. Dike Swarms

Rock Types	granite porphyry			
Length (ft.)	6000			
Width (ft.)	8000			
Azimuth (°)	60			
Age	mineral			
* Spatial Rel.	11 elong. sulfide system			
Contacts				
Other				

*C. Important Regional Structures (other than dike swarms)

Type	normal faults		
Length	5000		
Azimuth (°)	60-70		
Recognition Factors	invaded breccias along edge dikes		
Age	premineral		
Spatial Rel.	mineralizing dikes follow faults		
Contacts	broken		
Other			

*D. Other Reconnaissance: (See back of page)

Sulfide System Name 79 Mine, Gila Co., Arizona

IV. Aeromagnetic Expression of Sulfide System or Mega-District

A. Type Magnetic high

B. Magnitude 310 Gammas, Line Spacing 1/3 mile
Clearance 1000' AT

C. Source

1. Length 11,000 ft. Width 4,000+(?) ft. Azimuth N 85° E.°

2. Susceptibility 1500-2000 x 10⁻⁶ cgs.

D. Diagnostic Character WITHOUT Geology Weak to moderately magnetized
intrusive, 0-300 feet deep, considerable depth extent.

E. Diagnostic Character WITH Geology Complex intrusive system into
Paleozoic sediments. The 79 Mine deposit lies just within the
southern margin of the magnetic source.

F. Other Geophysical Expression

G. Reference:

Andrews, R. K., 1970, Saddle Mountain aeromagnetic survey, Gila, Pinal, and Graham Counties, Arizona, preliminary interpretation: KEI-GDO.

H. Comments on Quality of Data:

III. Center of Mineralization (zone of best copper)

A. Name no name

*B. Copper Mineralization

1. Type	*%	Av. Grade	Rock Type	*Other Data
a. Primary				
b. Enriched				
c. Skarn (replacement)	100	1.0	skarn	oxidized
d. Oxide				
e. Mixed				

2. Current Mineral Inventory

a. Tons 17x10⁶; Av. Grade 0.22 Cu %; Cutoff 0.05 Cu %b. Other Credits Pb & Zn

3. Past Production

a. Tons 1x10⁵; Av. Grade 1.0 %; Cutoff %b. Other Credits 7-20% Pb; 1-14% Zn; 2-5 oz. Ag/T; 0.01-0.04 oz. Au/T

C. Cover

1. 20 % Exposed at time of discovery

2. Projected Post Mineral Cover

a. Thickness (ft.) Zero - 100* b. Formations Tertiary alluvium* c. Estimated elevation of base of cover to top of cc blanket (ft.) 0 (no cc)

3. Premineral Cover

a. Thickness (ft.) noneb. Formations

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine ' 79 Mine

Date January 19, 1961

District Banner District, Gila County

Engineer Lewis A. Smith

Subject: Mine and mill visit with N.C. Grissom.

Location: S 21, T 4 S, R 15 E, (2 $\frac{1}{2}$ miles from Hayden Junction - to NW and thence 4 miles north by graded road).

Owners: 'Callahan Zinc-Lead Company, Inc. See - Callahan Mining Corp. (card)

Lessee: 'Charles E. Goetz, S-27th Ave., Phoenix (Box 2228) Home
Office (P.O. Box 126 - Tolleson, Arizona)
Telephones: (BR 6-2246 and WE 6-3721)

Superintendent: N.C. Grissom, Box 79, Hayden

Work: The mine is entered through a 600 foot inclined shaft which pitches eastward at about 70 degrees. Three deeper levels, the 5th, 6th and 7th levels are located at approximate vertical depths of about 300, 420 and 500 feet respectively. The 6th and 7th levels are largely in sulphides to the south and oxides to the north and nearly all stoping above this has been in oxidized areas with some residual sulphides. The four upper levels are at variable intervals. The 6th level has several hundred feet of drifts and some short crosscuts and the 5th level has more than 300 feet of drifts and similarly a number of crosscuts. The stopes are generally discontinuous because the ore lenses were originally so. The stopes stretch over a length of over 600 feet along the east side of the north dike and extend locally along shear fractures to the south dike. The surface area north of the shaft has now been developed into a small open pit 100 feet long, 75 feet wide, and about 45 feet deep on the north face. The entire area is honeycombed by numerous small burrowlike stopes which were apparently wormed along sinuous high-grade lenses. The pit ore now averages 10% lead, as mined. One of the principal orebodies outcrops in this area, which is about 100 to 175 feet north of the shaft and lies under a strong iron-silica gossan which apparently is superimposed on epidotized shaley limestone. The host rock consists of impure Naco limestone (Pennsylvanian) with alternate layers of shaley and siliceous strata which dip 25 to 35 degrees south and strike about N 75 degrees E. The mineralization now being worked appears to be about 50 feet thick and from the indicated gossan may extend for several hundred feet along the strike and could extend in variable sinuous veins and lenses to the south for 250-300 feet or to the south dike. The north dike material in the immediate area is rhyolite porphyry, but north of the north dike at a distance of 600 feet a monzonite porphyry dike parallels the north dike. In between the two dikes a fault with a vertical displacement of 185 feet displaces the formation upwards on the north side of the fault. The second largest orebody within the thin bedded-limestone-shale series in the "Massive Pyrite" orebody lies immediately east of the main (with the up-throw on the southside) fault which displaces the orebody on the west between the 5th and 6th levels and fades out within 175 feet eastward in the limestone. On the 6th level, thin shaley calcareous beds, dipping approximately 45 degrees south have been replaced by massive pyrite accompanied by spongy silicification, as vuggy quartz. The pyritic orebody extends south to the "79" dike (composed of quartz diorite porphyry) northward to the south dike (composed of monzonite porphyry) and vertically from about 50 ft. below the 6th level to 15 feet above that level. The "79" dike downthrown segment on the south side of the fault is probably below the present mine workings. An attempt to market the massive pyrite to Kennecott for their acid plant, so far has failed to materialize,

79 Mine (continued)

but because of the short haul, as compared to that to the Magma mine, the pyrite may eventually be sold to them.

The oxidized mineralization occurs mainly against the north dike, appearing to be far more concentrated along the south border. A series of transverse and roughly parallel shear faults at various distances apart (30 to 75 feet) trend generally north and dip variably (near to vertical). These apparently control solution movements, the solutions apparently moving in from the south or southeast. Vein type replacements along these have formed lenses, which are usually discontinuous. Most of the ore in recent years has come from these although some lenses were located in the dike and to the north of it. Mr. Grissom states that most of the ore is on the east side. George A. Kiersch describes these and structural controls on pp 76 and 77 of Arizona Bureau of Mines Bull. 158 (Part II) ("Arizona Zinc and Lead Deposits") July 1951.

The principal sulphide minerals are pyrite, galena, chalcopyrite and quartz. Covellite and chalcocite are minor, the latter being mainly observed with sphalerite. The oxidized minerals include anglesite, azurite, brochantite, cerussite, chalcantite, limonites, malachite, manganite, melanterite, psilmelane, wulfenite, vanadinite (uncommon) and some plumbojarosite. Wulfenite was found sparingly in blebs or pods except on the 4th level near the main fault. Manganese is common between the second and fifth levels. Anglesite appears to be prevalent throughout the oxidized zone, although cerussite is the principal oxidized lead mineral. Some mixed sulphide and oxide ores were mined profitably (shortly after World War II). These contained lead, zinc, copper and silver. The present ore contains some silver and pods of sulphide (mainly galena) but oxides are predominant.

The mine is being worked toward the east face of the Pit. Loading is done by front loader into a 5 yd. truck. The distance from the pit to the mill bin is about 450 feet. Drilling is done by means of Denver Jackhammers. The ore shatters well and to small size. The toe holes are nearly horizontal and 6-10 feet deep.

The mill consists of an ore bin which feeds a 24-inch jaw crusher (Blake Type) where it is reduced to 1/2 inch. The crushed material is passed over a 10-mesh screen to eliminate the fines which carry good values. The oversize is routed to a Tornado impact machine, which on the first pass moves at 1400 revolutions. The discharge is screened to again remove the minus 10-mesh. The oversize is returned to the Tornado machine and reground at 1800 revolutions. The discharge is again passed over a 10 mesh screen and the oversize (mostly relatively barren quartz) is discarded, since it runs less than 0.40 percent lead. The fines, all minus 10 mesh, from the three screenings are channeled to a Denver ruffer Wilfley Table which separates about 45 to 50 percent of the lead values. The waste discharge is sent to a 30 x 54 inch Denver ball mill and ground to 60-65 mesh. Classification is done by a rake classifier. The mill discharge is sent to a cleaner Wilfley table where an additional 10-15% of the lead is extracted. The discard is sent to a battery of 6 Denver flotation cells where another variable percentage of the lead is extracted (this largely recovers finely divided sulphides). The flotation and Wilfley concentrates are combined and dried in vats. A thickener recovers much of the water after filtering. Extraction is calculated at about 90 percent. Power is furnished by a Fairbanks-Morse 110 horizontal diesel engine directly connected to a Westinghouse

79 Mine (continued)

generator. A motor driven compressor furnished air to the mill and pit by means of pipe lines.

Recently a 30-ton car of concentrates was shipped to El Paso. This ran about 62% lead and 3 ounces of silver and a little gold.

The operation is worked on an alternate mill and mine operation. The mill is now idle but the pit is being worked. Three men are employed, full time, and 1 or 2 men do weekend work. The recent drop in lead price has caused the operation to be considerably curtailed.

It was suggested that certain gossans similar to the one over the pit area, be core drilled and sampled down dip. Once the orebodies are outlined, a systematic mining plan can be developed. The proposal to increase the mill size would be dependent upon adequate reserves. The drilling should determine whether such reserves are definitely available. A plan of systematic drilling was tentatively worked out with Mr. Grissom, on multiple hole plan from single setups.

The geological map of the area is shown on p 68 of Bulletin 158, Arizona Bureau of Mines (1951).

Copper Development Company, the Mason Copper Company and the Keystone Copper Mining Company were active during the year, developing. Some ore was shipped by the Mason Copper Company.

Camp Creek, Maricopa County.—In this district, lessees operated the Red Rover Mine and shipped a small tonnage of high grade copper-silver ore.

Camp Creek, Yavapai County.—In this district south of Camp Verde the Squaw Peak Copper Mining Company carried on development work during the year. No shipments were made.

Bouse District.—In this district in northern Yuma County, southwest of Bouse, the Little Butte Amalgamated Mines Company did some work on the Little Butte Mine.

COPPER MINING SUMMARY

During the year 1929, the total copper production of the State was approximately 833,525,000 pounds¹, the greatest yearly production ever made. The source of the production was as follows:

District	Tons mined	Pounds copper produced
Jerome	2,252,307	206,558,330
Globe-Miami	11,272,817	189,212,123
Bisbee	2,754,083	188,217,171
Ray-Christmas	}	127,204,613
Morenci		
Ajo	3,578,335	70,033,261
Superior	269,579	36,550,000
Miscellaneous ²		15,749,502
Total		833,525,000

¹U. S. Dept. of Commerce, Bureau of Mines advance figures, Feb., 1930.
²Includes: Santa Cruz County, northern Yuma County, eastern Pima County, Bradshaw Mountains, and Miscellaneous.

The total number of men employed in 1929 was about 20,000. Assuming a dependent population of three to each worker, including families and business men, the total population directly dependent on copper mining was approximately 80,000.

LEAD MINING

Under this heading is included those mines producing ores whose predominant value is lead. Those whose ores contain other recoverable metals, especially zinc, will be reviewed under another head.

MINING PROPERTIES

The principal producing companies in 1929 were: The 79 Lead-Copper Company; the Tomopah-Belmont Development Company; the Phelps Dodge Corporation, Copper Queen Branch; the Southwestern Exploration (Trench Mine); and the Bunker Hill Mines, Incorporated (Tomestone).

79 LEAD-COPPER COMPANY

Location and General Geology.—The 79 Mine is located on the southwest slope of the Dripping Spring Mountains, four miles north of Hayden Junction, the nearest railroad point on the Hayden branch of the Southern Pacific Railroad. The ore occurs as a replacement of Paleozoic limestone close to its contacts with acid porphyry dikes. The ore minerals are the oxidized lead minerals, cerussite and anglesite with occasional cores of galena. Accompanying the lead minerals is some copper in the form of malachite, azurite, and glance. Considerable silver accompanies both the lead and copper. The gangue minerals are limonite, calcite, and jaspery quartz. The dip of the limestone is about twenty degrees to the southeast and the replacement occurs in a northeast fracture zone cutting across the bedding. On one side of the ore zone, primary galena—zinc blende-pyrite occurs. Some garnet is found at the limestone porphyry contacts, and the limestone is intensely sericitized and serpentinized below the ore.

Mining Methods.—The mine is opened by a 1½-compartiment shaft equipped with a skip, sunk at one end of the ore zone, to a depth of 500 feet on the incline, with lateral work on the first, second, third, fourth, fifth, and sixth levels. The ore is mined by overhead square-setting and fill, eight by eight-inch timbers being used. Sections about six sets wide are taken, leaving pillars of six sets between sections. The thickness of the replaced beds averages about fifty feet or between six and seven sets. Waste is obtained by driving raises above the ore, and from prospecting and preparatory work.

Ore and Material Handling.—The ore is hoisted in the skip, dumped into a wooden bin at the collar of the shaft, and transported to the

railroad by trucks. It is shipped to the Copper Queen smelter at Douglas for treatment. Materials are hauled by truck, and mine timbers and supplies lowered in the skip. Men enter the mine through a tunnel and connecting raises.

Power.—Compressed air is generated at the mine by a Diesel engine direct connected with a compressor. The hoist is operated by gasoline.

Labor.—The mine employs ninety men underground and on the surface.

1929 Production.—Production commenced April 1, 1929, and the total for the nine months was as follows:

	Pounds	Pounds	Ounces	Ounces
Tons mined	lead	copper	gold	silver
13,088	5,685,843	296,273	602.75	71,569

The average grade mined was 21.72 percent lead, 1.13 percent copper, 0.046 ounces gold, 5.468 ounces silver.

PERSONNEL OF COMPANY

Manager	D. C. Pearce	Hayden Junction
Superintendent	L. T. McElvany	Hayden Junction
Mine Foreman	L. S. Hovstadt	Hayden Junction

PHELPS DODGE CORPORATION, COPPER QUEEN BRANCH

This company continues to mine a small tonnage of direct shipping lead ore from its mines in Bisbee. The lead concentrator was closed in 1928, after a short run. The greater bulk of the ore is mined on company and lease account from the Southwest Mine.

Smelter.—No changes of note have been made at the smelter at Douglas.

TONAPAH-BELMONT DEVELOPMENT COMPANY

Location and General Geology.—The mine operated by this company is situated in the Big Horn Mountains in Maricopa County, 28 miles southwest of Wickenburg and an equal distance north of Haysampa on the Southern Pacific main line. The Big Horn Mountains are made up of a core of pre-Cambrian schist covered by thick flows of andesite and rhyolite, and the whole intruded by rhyolite dikes. The ore occurs as shoots in a steeply inclined vein cutting rhyolite, in close association with a rhyolite intrusive plug. The mine is developed by a 500-foot shaft with levels at 100, 250, 400, and 500

feet. The ore is hoisted to the 100-foot tunnel level. Shrinkage stopping methods are employed. The mining is much complicated by post ore faulting. About fifty tons of ore are produced a day.

Concentrator.—No changes have been introduced in the concentrator since the publication of the first edition of *The Mineral Industries of Arizona*.

Power.—Power is generated by an Ingersoll-Rand 440-h. p. Diesel engine direct connected with a 375-kv.-a. G. E. generator furnishing electrical power for the operation of compressor, hoist, and concentrator.

Water Supply.—Water for camp and concentrator is obtained from a well six miles south of the mine, 600 feet deep, and 1,000 feet lower than the mine. The pump is run by a fifty-h. p. Diesel engine.

Transportation.—Concentrates and supplies are hauled on contract by trucks from Haysampa. Concentrates are shipped to El Paso.

Labor.—About fifty men are employed at the mine and concentrator.

PERSONNEL OF COMPANY

Superintendent	John L. Dyran	Palo Verde
Mine Foreman	J. F. Bingaman	Palo Verde
Master Mechanic and		
Mill Superintendent	J. C. Thomson	Palo Verde
Purchasing Agent	F. G. Henckell	Palo Verde

SOUTHWESTERN EXPLORATION COMPANY

Location and General Geology.—This company operates the Trench Mine situated in the Patagonia Mountains, about twelve miles south of the town of Patagonia. The ore occurs as shoots in well defined veins cutting quartz diorite. The ore minerals are galena, pyrite, and subordinate zinc blende. The ore carries appreciable amounts of silver and gold.

Mine Development.—The mine is opened by a 500-foot vertical shaft with lateral work on the 500-foot level.

Concentrator.—The company controls the World's Fair Mine, a neighboring property, and operates the World's Fair mill on Trench Mine feed.

Power.—Electric power is purchased from the Nogales Power Company.

BUNKER HILL MINES, INCORPORATED

Location and General Geology.—This company, a subsidiary of Phelps Dodge Corporation, owns the principal holdings in the old Bonanza camp of Tombstone. The ore occurs as shoots in veins cutting

MOLYBDENUM OCCURRENCES

Christmas Mine: Sec. 19, 20, 29, 30, T 4 S, R 16 E and Sec. 25, T 4 S, R 15 E, Banner District, Gila County. Contact-metamorphic deposits that occur adjacent to the quartz diorite mass in certain favorable limestone beds which have been largely replaced by lime-silicate minerals and copper and iron sulphides. A little sphalerite and galena are commonly present and molybdenite is present in a few places. Extensive underground workings and copper production.

Source: Dept. of Interior, Bureau of Mines
War Minerals Report 339

Kulhman - McCool Mine (formerly Regan Mine): NE 1/4 of SE 1/4, Sec. 28, T 4 S, R 15 E; Banner Mining District, Gila County. Replacement in limestone along faults and fissures near a contact with andesite porphyry. Fractures contain a calcite and hematite gangue with considerable amounts of jasper. Wulfenite and vanadinite crystals throughout all openings and in places are concentrated in rich streaks and pockets. Anglesite and cerussite are also present appearing as a higher grade streak near the center of the vein. Copper carbonates were observed at a few points. Three shafts: one 240' deep, one of unknown depth and one 40' deep. About 500' of drifting and crosscutting. No shipments noted.

Source: DMR

Roscoe Group: Lat. N 33° 23', Long. W 110° 56'; Gila County. Molybdenite with copper in veins in granite.

Source: King, R.U., ABM Bull. 180, p. 235

79 Mine: Sec. 21, T 4 S, R 15 E, Banner Mining District (4 1/2 miles northwest of Hayden), Gila County. Limestone replacement ore body mineralized by galena, cerussite and oxide and sulphide copper minerals. Molybdenite coats the walls of veinlets of chalcopyrite and pyrite. Wulfenite has been observed in oxidized areas. Extensive mine workings to the 700 level and considerable lead, copper, gold and silver production until 1953.

Source: DMR
Ross, Clyde P., USGS Bull. 771,
p. 66 - 67

Suckerite Deposit: Sec. 24, T 6 N, R 13 E, Workman Creek area, Gila County. Molybdenite associated with uraninite in hornfels near diabase. Prospect explored by a bulldozed opencut about 100 ft. long and several diamond drill holes.

Source: DMR
Granger, H.C., et al., USGS Bull.
1046-P, p. 469-470

SEVENTY NINE MINE

Location.—The Seventy Nine mine is in the Ray quadrangle, a little less than 2 miles northwest of Tornado Peak and $4\frac{1}{2}$ miles northwest of Hayden in air lines. The principal workings and mine buildings are on the northwest side of a wash at an altitude of somewhat more than 3,300 feet above sea level, and there are prospect holes along the streamway above this.

History.—The deposit was located in 1879 by Mike O'Brien and his brother Pat, but little work was done on it until December, 1919. From that date until April 27, 1922, the mine was held by the Continental Commission Co., which is reported to have shipped about 2,000 tons of ore averaging 24 per cent of lead, 1.75 per cent of copper, and 4 ounces of silver and 80 cents in gold to the ton. In April, 1922, the mine was taken over by the Seventy Nine Mining Co., and in June, 1922, the managers reported that shipments of about 50 tons a day were being made of ore averaging about the same as that previously shipped. Recently the mine has been ordered reconveyed to the Continental Commission Co. as a result of litigation.

Property.—The property comprises 23 claims. The mine has been developed by two tunnels, one above the other, with irregular slopes from them. Most of the stoping now in progress starts from the upper tunnel. The ore is sent down chutes to the lower tunnel and trammed to the surface. There is a winze down 70 feet on a 85° slope from the lower tunnel. A short distance up the gulch from the mine are the office, boarding house, and a few other buildings. Not far from the boarding house is a prospect shaft, and a few hundred yards farther upstream is a tunnel from which a little stoping has been done. Other prospect workings are scattered over the property.

Character of the deposit.—The country rock is the Tornado limestone. In the northeastern part of the mine is a dike of altered igneous rock flanked by fault breccia, and near the mouth of the upper tunnel some irregular masses of comparatively fresh quartz-diorite are exposed. The ore has been formed as replacement bodies of galena along certain beds in the limestone separated by silicified beds, perhaps originally somewhat shaly, which are also more or less mineralized in places. About five different beds of ore from 3 to 5 feet thick are reported to have been found. There appears to be more unaltered galena in the upper slopes than below, but throughout the mine a large part of the ore is cerussite. Anglesite and small amounts of azurite and malachite are also present.

See also and *Min. Jour.*, vol. 116, p. 650, 1922.
See also and *Min. Jour.*, vol. 116, p. 650, 1922.

At the shallow shaft near the boarding house the ore, which is an irregular body formed by the replacement of limestone, is thoroughly oxidized. The minerals recognized are wulfenite, cerussite, limonite, andradite garnet, quartz, calcite, and a little hydrous manganese oxide and malachite. There is also a small amount of a yellow powdery material, probably an oxidized lead mineral, but it was impossible to separate enough for a conclusive test. Garnet is also reported in outcrops of some of the ore beds at the main mine. The tunnel farther up the gulch contains oxidized ore, but here copper is the metal sought, and no lead is reported to be present. The ore is stated to carry several ounces of silver to the ton. This deposit is also in the Tornado limestone but appears to have been formed along a fissure instead of along the bedding. The minerals recognized are chrysocolla, malachite, cuprite, black copper oxide, hematite, magnetite, quartz, garnet, and calcite.

COLUMBIA MINE

Location.—The Columbia mine of the Dripping Springs Mines Corporation is in a tributary gulch on the south side of Dripping Spring Valley about three-quarters of a mile west of the point where the highway to Globe swings north out of the valley and 2 miles east of Troy. It is about 18½ miles from Winkelman and 12 miles from the terminus of the Arizona Eastern Railroad at Christmas station.

History.—Most of the claims were located by J. W. Read, part of them in 1901. The Dripping Springs Copper Co. acquired the property about 1916 and was reorganized into the present company about 1920. Most of the development work was done in this year, and some copper ore was shipped. When visited in June, 1922, development work was in progress under Mr. A. T. Copley, superintendent, who kindly furnished the historical and other data regarding the mine. In the fall of 1922 exploration by diamond drilling from the floor of the principal tunnel was started, and an ore body 10 feet wide is reported to have been encountered.

Property.—The Columbia group comprises about 30 claims. The Dripping Springs Mines Corporation also owns the Pearl group of claims, near Mammoth. At the Columbia mine there are a number of buildings, an air compressor, and other equipment. The principal underground workings consist of a tunnel about 550 feet long with a crosscut at the end of the tunnel extending 950 feet south and 350 feet north and a shallow winze at the north end.

See also and *Min. Jour.*, vol. 116, p. 650, 1922.
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