

New Mineral Is Found in Pike County

Democrat
Aug. 4, 1931

Cinnabar From Which Quicksilver Is Obtain- ed, Discovered.

Murfreesboro, Aug. 4.—(Special.)—To Arkansas' reputation as a wonder state has been added a new discovery in Pike county. Already distinguished as the county with the only American diamond mine where diamonds are found as in South Africa, Pike now presents another mine of rare metal in the form of cinnabar, from which quicksilver is obtained. Cinnabar is not widely distributed in nature and occurs in paying quantities only in a few countries of the world. The United States for many years has led in the world's production. Spain follows next. In 1904, the entire output of mercury or quicksilver was 3,492 tons, of the value of \$4,090,097. Of this the United States produced 1,188 tons. In 1930 this country yielded 21,553 flasks (76 lbs.) of the value of \$2,478,789.

This Pike county mine was discovered by a farmer, as was the diamond mine. (Not knowing the nature of the ore or as to its value, the first sample of ore was shown to some villagers as only a peculiarly red rock. It finally came to the notice of a man who was prospecting for minerals, and he quickly gave it name and appraised its worth. Having been identified as the rare and valuable ore it is, a quantitative test is now being made by noted assayists to determine its run per ton of ore. Other tests of a richer grade of the ore will soon follow, as locations and titles have now been practically settled.

The reduction of cinnabar to mercury or quicksilver involves comparatively small expense, as the ore is roasted in a furnace at the place of its excavation and when its vapor is condensed into mercury, it is heavy for market in small bulk with heavy weight and at good prices. The present quotations are \$90 per flask of 76 lbs. As gold and silver mining continue and as they require the use of more mercury now than formerly, there will be a ready market for this important mineral. As a by-product of this ore, vermilion coloring will also be produced.

CINNABAR DEPOSITS MAY BE DEVELOPED

'Discovery of Ore in Pike County to Add to State's Industries.

Democrat
Aug. 15, 1931

Special to the Gazette.

Hot Springs, Aug. 15.—When Owen Cox, 18, of Lowell Creek, Pike county, discovered a bright red rock jutting out of the ground, which he extracted from the earth and later decided to keep because it was unlike any other rock he had ever seen in those parts, he did not at that time realize that his name is likely to go down in Arkansas annals as the discoverer of a new and valuable ore, the presence of which brought to the scene Dr. George Branner, state geologist, and his assistant, Dr. Parks, and that to the state's resources it now appears that cinnabar, the one ore that produces pure mercury, will be added.

The Arkansas Gazette, about two weeks ago, carried a brief story from Pike county to the effect that cinnabar had been discovered. Since then prospectors have been busy west of Glenwood in an effort to ascertain what amount is deposited there. The investigation indicates that the deposit is of commercial quantity. The find is said to extend from township 5, south, range 23, west, and has been traced, it is said, 14 miles. The cinnabar is not a continuous deposit. It appears in veins running longitudinally, usually well up on the flanks of a succession of east-west sandstone ridges, which belong to the Jackford sandstone, members of the Mississippian series and of the lower carboniferous system of paleozoic rocks.

While the Pike county deposit is not of one continuous vein, it can be readily correlated, it was said, and is paralleled by other veins on adjacent ridges. The deposit varies in thickness from a feather edge to several feet. Samples running as high as 75 per cent have been brought to Hot Springs and tested.

When young Cox found the ore he did not know what it was, so he took it to F. S. Short, section foreman for the Missouri Pacific railroad. He too, was unable to identify it, and had the specimen sent to Hot Springs, where R. L. Caulfield, local geologist and mineralogist, declared the rock to be cinnabar.

In event the deposit is developed there are several landowners and at least one large lumber company that should profit handsomely. It is known that several persons are endeavoring to get mineral rights and leases on property said to hold the find.

Commercial mercury is now selling at \$75 a flask—90 pounds. Metallic mercury brings over \$1,000 a ton. Reduction of the ore is said to be a simple process.

Geologist Makes Test Of Cinnabar Deposits

Ark. Democrat
8-17-31

Hot Springs, Aug. 17.—(Special.)—Dr. George Branner of Little Rock, state geologist, has been in Pike county during the past week investigating reports that a deposit of cinnabar, the crimson ore producing mercury, had been located there. He pronounced samples of the ores submitted to him to be cinnabar. Dr. Branner said he is assembling data for a state bulletin on the cinnabar deposits.

The deposit extends west from and including township 5 south, range 23 west. Dierks and Roseboro lumber companies and farmers hold the land.

An 18-year-old youth, Owen Cox of Lowell creek, took a sample of the red rock to S. F. Short, Missouri Pacific section boss at Amity, who in turn brought it to Moritz Norden, Hot Springs, who tested it. Dr. Branner later tested other samples.

Who Said 'Mercury'?

Hot Springs Sentinel-Record
Aug. 11, 1931

By L. R. CAULFIELD

A new and startling natural asset of great potential promise has burst into being for Arkansas within the past half month—mercury!

Who of us supposed that, within an hour's auto distance from from Hot Springs, there lay sleeping among the hills of Pike county, cinnabar, the crimson ore of mercury, that yields the world's greatest supply of quicksilver?

Extending west from, and including, township 5 south, range 23 west, stretches a series of east-west sandstone ridges along whose pearl-gray flanks for 14 miles run ribbons of tell-tale crimson that spell the prophesy of the prospector's dreams—dreams most likely to come true!

The Sentinel-Record has deferred publishing the story of the find until the facts had been sifted and the discovery developed to a degree of certainty that would preclude the chance of a premature or sensational announcement. This precaution has been fulfilled and here are the facts:

As gold fields and oil fields are denominated, this cinnabar-bearing zone may properly be called a "mercury field," for its known ore-bearing area extends through township 5 south, ranges 23, 24, 25 west, along a belt 500 feet wide; and, were it situated on the public lands of the western mining states, would furnish a first-rate excuse for an honest-to-goodness "miners' rush" in all its weird primeval glory.

Now mining rushes don't necessarily spell bonanzas, so we're going to try to be conservative in this writing, even though the outlook for Arkansas' new "mercury field" is good—very good!

Skepticism and even ridicule are likely to greet the announcement here of Arkansas' new "mercury field," which would only be expected of Hot Springs if she hopes to live up to Walter Davenport's verdict of her as a "sophisticated city" even while the confidence men smile indulgently on her virginal innocence.

Now the prime essentials of an incipient "field"—be it gold, silver, cinnabar, lead, tin or zinc—are quality and quantity of ore and a

ready market; and, if we can convince you that Pike county cinnabar is endowed with these virtues, just buy a burro and the other fixin's and strike out for the new El Dorado in the sandstone ridges.

On the eve of your departure, it is well to remember that the new "mercury field" is not included in any part of the unappropriated public domain of the United States or in any forest reserve; and, therefore, if you are seeking leases or other privileges, you will have to treat with local owners in fee—mostly farmers, and they're getting hard-boiled—or with lumber companies, chiefly Dierks and the Roseboro Lumber companies, holding these lands as timber reserves.

The story of the field is short and, let us hope, sweet and penetrates antiquity about 30 days from the discovery of the ore. A callow youth of 18—Owen Cox, of Lowell Creek—did the trick, perhaps while prospecting for a new "swimmin' hole," and took the pretty red rock to the local mineralogist, Mr. S. F. Short—Missouri Pacific section boss at Amity—whose technical experience with rocks used as ballast and for tamping ties, failed him in identifying so unusual a mineral as cinnabar—which in no way impairs Mr. Short's prestige with the Missouri Pacific corporation. Mr. Short in turn, took the intriguing red rock to Mr. Moritz Norden, of Hot Springs, who tested it and, getting the restless silvery globules they put in thermometers, pronounced it cinnabar—and the "rush" was on!

As the news of the find percolated into the Capital City, Dr. George Branner, state geologist, pronounced samples of the ore submitted to him, to be cinnabar; and realizing the importance of the discovery and with characteristic enterprise, he hurried to Pike county with Dr. Parks, assistant geologist. Dr. Branner and his aide at once set about a thorough technical survey of the field to define its area and estimate the volume and character of the deposit and work out its geologic genesis and the identity of the formations embodying the ores.

Dr. Branner Right On the Job
Dr. Branner, at the time of this

writing (August 13), is still in the field and is impressed with the importance and economic value to his state of this discovery, if developed to commercial proportions. He stated that he is assembling data as the basis for a state bulletin to be published by his office dealing with the cinnabar deposits of Pike county. His presence in the field has inspired confidence among prospectors and his counsel as a technician is a valuable aid to intelligent exploration. It might be added here, parenthetically, that Dr. Branner's office would prove of incalculable value to Arkansas' mineral development were the legislature willing to properly finance his enlightened initiative!

What Is Cinnabar

Cinnabar is the sulphide of the metal element mercury. Symbol—Hg.S.; hardness, 2 to 2.5; specific gravity, 8 to 8.2; color, scarlet to reddish brown; lustre, metallic to earthy; crystals, transparent to opaque, often six- and four-sided prisms; composition, mercury 86.2 per cent, sulphur 13.8 per cent.

It occurs mostly in altered sedimentary rocks, as light colored shales and altered sandstone (quartzite); seldom in igneous rocks as granite, porphyry, etc. It is the principal ore from which the mercury of commerce is derived.

The Pike county cinnabar. In strict accordance with geologic precedent, occurs in light-colored altered sandstone and is therefore "orthodox," as all good Arkansasers are expected to be.

Geology of Deposits

The Pike county cinnabar appears in veins running longitudinally with the strike, usually well up on the flanks, of a succession of east-west sandstone ridges that belong to the Jackford sandstone member of the Mississippian series, lower carboniferous system of Paleozoic rocks—a murderous line of talk, dear reader, but you never feel like the doctor is earning his fee unless he tells you what ails you in Latin. The surface rock is the Stanley shale of the same series and system. The ridges are the product of earth movements exerting lateral pressure that folded and arched the sedimentary beds; and faulting and erosion did the rest, making the picture as we see it today. The granite eruptions in the region, exhibited near Murfreesboro a few miles south, and to the north in

Montgomery county, may be assigned to account for the presence of the cinnabar in the rocks; the heat producing exhalations of mercury and sulphur, which, issuing through faults and fissures, from subterranean depths condensed and crystallized in the upper and cooler strata and deposited the cinnabar.

Extent of Deposits.

The ore veins have been traced from a point west of Glenwood, township 5 south, range 23 west, through ranges 24 and 25, a distance of 14 miles. They are not continuous, but may be readily correlated. They vary in thickness from a feather edge to several feet and are paralleled by other veins on adjacent ridges over a north-south width of from 300 to 500 feet. At the time of writing, exploration had not been carried beyond the above distances. The ore so far encountered is invariably cinnabar, though some prospectors claim to have found native mercury. Samples running as high as 75 per cent cinnabar are not at all uncommon and bodies carrying substantial tonnage are reported by responsible parties.

Where the Money Comes In

Let us suppose that mercury right now is selling for \$75 a flask (90 pounds). At that rate a ton of 75 per cent cinnabar (1,500 pounds mercury sulphide), yielding 1,293 pounds of metallic mercury, would bring \$1,074.96. Now, when we remember that a ton of pure cinnabar bulks around four cubic feet—or what you'd dig out of an ordinary post hole—you'll begin to see big money in cinnabar and want to join the rush. The cost of extracting the ore is now in the conjectural stage, as just how much surface and how much underground

mining the position of pay ore bodies may require, it is now too early to determine; but it is quite probable that a great deal of profitable extraction can be done without "candle light."

Likewise, it is yet too early to figure on the extent of profitable ore bodies in the field, if at all; though the prospects from present exploration look awfully good. Anybody want to bet!

Metallurgy of Cinnabar

As mercury is a volatile metal with little affinity for oxygen, the reduction of its ores is very simple. The crushed cinnabar is placed in a retort or a section of iron pipe

closed at the lower end (a prospector's device), and heat applied. To make a cleaner job, a little carbon (coke or charcoal) is added to reduce any oxide or sulphate that may be formed. Air must not be excluded from the retort. The sulphur is converted to sulphur dioxide and the mercury so released vaporizes at 357 degrees F. and passing from the retort through a small pipe conducted from the top of the retort through a water jacket and bent at its end downward, drops in metallic globules into a convenient vessel. After providing the retort, the cost of reduction is negligible. Shipment and marketing of the metal is done in special steel-alloy flasks made for the purpose containing 90 pounds, net; and such flasks are the unit for market quotations. Prices do not seem to be influenced by the present depression and range from \$70 to \$90 a flask.

And so ends the story, for the present, of Arkansas' new "Mercury Field."

Let us hope, dear reader, that the next chapter will tell of Pike county hillsides teeming with blissful mercury miners, the roar of ore crushers, the smoke of retorting furnaces, the pop of dynamite—if not of corks—busy hands and loving hearts!

And let us hope, too, that the rustic mercury miner may not attempt to make a "run" of cinnabar through that time-honored home retort of his ancestors—the one with the worm attachment—just "to see how it'll work," but will reserve it for its ancient and nobler purpose, against loyal Hot Springers visiting "ARKANSAS' NEW MERCURY FIELD!"

THAT MERCURY FIND.

Hot Springs Sentinel-Record
8-16-31

In an area not far distant from Hot Springs, and in the corners of Montgomery and Pike counties, they have found mercury deposits. Our state geologist says there might be exceptional wealth to the state and to the people of the state from this find.

R. L. Caulfield writes interestingly of that deposit in today's Sentinel-Record. You may not understand the technique of it all, but the story is plain

in general, and that is we may have discovered a new source of wealth.

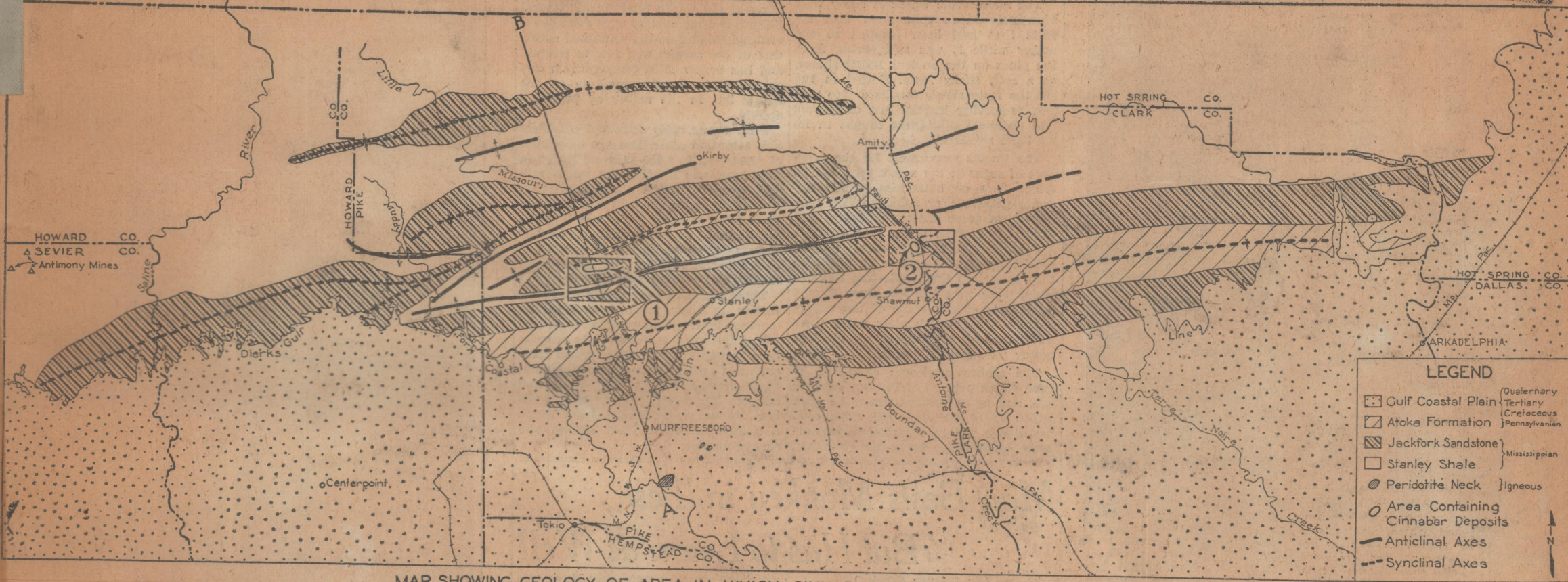
Not so long ago they discovered some barite near Magnet Cove. There seems to be no doubt but that in course of time this discovery will prove worth while. Just now nothing is being developed along any line.

Mercury in quantity is needed in affairs of mankind, and if we have new deposits that are valuable, it is all in the line of developing Arkansas and her resources.

We have a very excellent state geologist, and he is always on the hunt. He thinks well of the chance of mercury being added to the resources of the state. And we hope he is right. We can stand a lot of development around and about us.

State Geologist Writes About Pike County; Says Deposits May

TOBACCO WATER
(By Science Service)
Paris, France.—Goldfish can be trained to develop a tolerance for the poison of tobacco, but smokers should not therefore feel that any amount they take in is harmless after they have once acquired the habit. This is the advice of Drs. Leon Binet and C. Zamfir, French physicians.
Increasing amounts of tobacco-water, made by soaking two grams of good



MAP SHOWING GEOLOGY OF AREA IN WHICH CINNABAR DEPOSITS HAVE BEEN FOUND

LEGEND

- Gulf Coastal Plain (Quaternary)
- Atoka Formation (Tertiary)
- ▨ Jackfork Sandstone (Cretaceous)
- Stanley Shale (Mississippian)
- Peridotite Neck (Igneous)
- Area Containing Cinnabar Deposits
- Anticlinal Axes
- - - Synclinal Axes

By **GEORGE C. BRANNER**,
(State Geologist.)
The recent discovery of cinnabar (sulphide of mercury) which is the most important ore of mercury, at two points about 15 miles apart in Pike county, is of considerable interest. Prior to the late discoveries, the presence of cinnabar had never been reported in Arkansas. It is a remarkable coincidence that cinnabar from the two entirely separate localities was identified independently within a period of about two weeks.

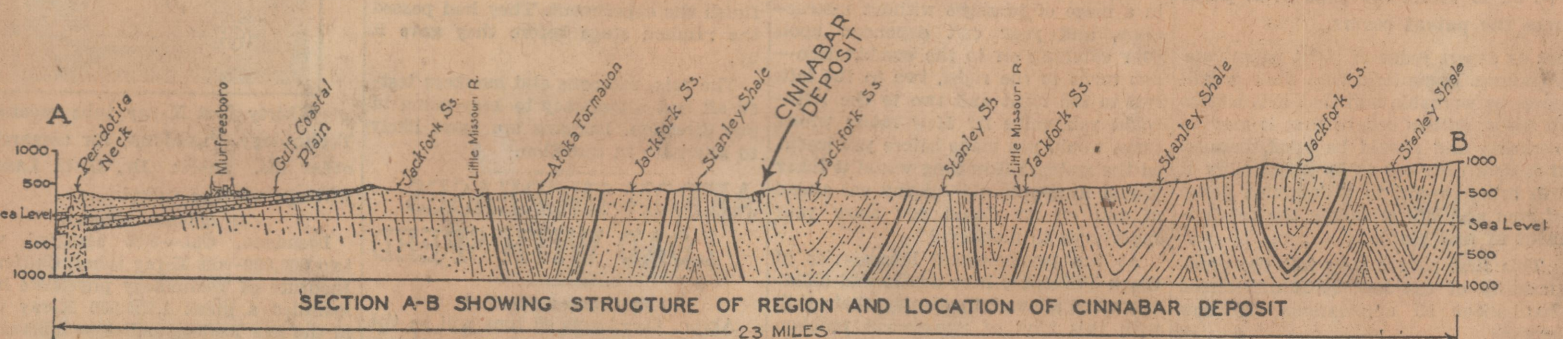
The eastern Pike county cinnabar was first noticed in May, 1930, by D. F. Short, of Amity, while blasting out sandstone riprap on the Missouri Pacific railroad one-fourth mile south of Nutt's Crossing, which is about five and one-half miles by rail south of Amity. The mineral was identified as cinnabar on July 20, 1931, by Moritz Norden of Hot Springs.

The western Pike county cinnabar, according to the landowners, was first found about four months ago in section 1, Twp. 7 S., R. 26 W., by Crown Cox, a farmer living in that locality, and was identified by Walter F. Hintze of Murfreesboro, during the second week in July, 1931.

Recent investigations by the Arkansas Geological Survey were made in both eastern and western Pike county. Mr. Hintze directed the investigating party to the deposits in western Pike county and D. F. Short supplied information concerning the location of the eastern Pike county deposits.

Western Pike County.
Two deposits of cinnabar in place were found and float rock containing cinnabar was found at several points. An aggregate area of about one square mile was examined in Sec. 6, Twp. 7 S., R. 25 W., and Secs. 1 and 12, Twp. 7 S., R. 26 W. The location of these deposits and the float rock are shown on the accompanying map. The deposit in the SW quarter of Sec. 1, Twp. 7 S., R. 26 W., is considered as a single deposit although the cinnabar is actually exposed at three points within a small area. They are located on a small hill immediately south of Hog creek and about one-fourth mile west of the Little Missouri river.

Three openings in this hill have been made, one at about 12 feet above the base of the hill, another at about 30 feet, and another at about 50 feet. The first vein is the richest found and was exposed laterally in the digging for about 18 inches. An average sample taken from this vein showed 51.6 per cent mercury. The second exposure on this hill contained small, fine veins



with a width of about 10 inches exposed. An average sample from this zone contained 8.24 per cent mercury. About 20 feet above this is another opening of about the same degree of richness. At both of the last two openings the cinnabar was exposed laterally for about 18 inches.

The cinnabar occurs in veins in the Jackfork sandstone (Mississippian age). The sandstone beds in this locality are comparatively hard and stand at or near the vertical and are responsible for the long, steep ridges which are found there. The veins in all of the three points described extend through the bedding planes of the sandstone and have a dip to the north of about 35 degrees. The surface of the hill in which the cinnabar occurs is almost entirely covered with soil and broken rock, and a considerable amount of digging and blasting will have to be done before the quantity of ore present can be estimated. A considerable amount of float rock containing cinnabar was found on the south flank of this hill.

The second occurrence in place was discovered by the writer in a Jackfork sandstone bed about 200 feet above the Little Missouri river in the SW quarter of Sec. 6, Twp. 7 S., R. 25 W. The mineralized zone there is about 10 inches wide and has about five feet of lateral extension.

Float rock containing cinnabar was found on the eastern end of this hill and in the bed of the branch there. It also occurs in the N half of Sec. 12, Twp. 7 S., R. 26 W. on the south flank of the Jackfork sandstone ridge immediately south of the hill last referred to.

Eastern Pike County.
The deposit five and one-half miles south of Amity on Antoine creek, oc-

curs immediately above the Missouri Pacific railroad near the top of a ridge of Jackfork sandstone which crosses the track at that point. The location is in the W. half of Sec. 28, Twp. 6 S., R. 23 W. The sandstone beds stand near or at the vertical and at five points were found to contain veins of cinnabar. The mineralized zones are from two to six inches wide and were found to extend along the bedding planes as far as they had been excavated, which was a distance of from four to five feet.

Two deposits were found near the first outcrop of the sandstone on the hillside about 250 feet above the railroad tracks and three were found about 60 feet above these. The five deposits were distributed across the bedding

planes at intervals for about 600 feet. At no place in this locality was the mineralization great. An average specimen from one of the best deposits was analyzed and found to contain 5.18 per cent mercury. The rocks here are so covered with soil and slide rock that a considerable amount of digging and blasting will have to be done before the amount of ore present can be determined.

The proximity of the eastern Pike county deposits to a fault of major magnitude (see map) which cuts the Jackfork ridge near the point where the cinnabar is located, may account for its presence at this place, as such a fault might provide a series of channels for the vertical migration of mineralizing solutions.

The geology of both the western and eastern Pike county deposits can be compared as follows:
The known occurrence in western Pike county is richer than in the eastern part of the county. In both localities the cinnabar occurs in steeply

folded Jackfork sandstone ridges. In the western area, the veined areas cut across the bedding planes at an angle of about 35 degrees with the horizontal, while in the eastern area the vein system is parallel to the bedding planes. Both of the occurrences are vein deposits which have doubtless been deposited from a water solution moving along the fine cracks and bedding planes of the sandstone.

At the present time the exposures have been so little uncovered and so little is understood concerning the origin and character of the vein systems making up the deposits, that it is not possible to form a definite opinion concerning their commercial value. It is very desirable that these deposits be fully opened up so that the causes for their presence in their respective areas may be better understood. When more is known concerning these controlling factors, prospecting can proceed more intelligently and with greater chance of success, at least in the vicinity of the deposits opened up.

Irrespective, however, of the conclusions which are reached relative to the origin, distribution and value of the cinnabar on the Little Missouri river and on Antoine creek, it is believed that, on account of the fact that the geology of the areas where the cinnabar is found is very similar to that which is found over an area of some 700 square miles in south Arkansas, the entire area in which the Jackfork, Atoka and probably Stanley shale occur in Hot Spring, Clark, Pike, Howard and Sevier counties should be carefully and systematically prospected for cinnabar. The location of these formations is shown on the map of this area.

It should be remembered that the principal quicksilver deposits of the world are erratic and low grade for the most part and usually known to be formed by the circulation of ground waters which have been in contact with igneous rocks. The presence of stibnite (antimony sulphide) deposits in the Stanley shale formation of Sevier county, near Gillam, which are very probably deposits formed in this manner, suggests the proximity of buried igneous rocks in that locality.

Any rock structural features, especially in the Jackfork sandstone formation, which would tend to bring about the concentration of mineralizing solutions should be carefully prospected. Those include faulted zones, especially fault breccias, crushed and broken strata overlain by shale, anticlinal and synclinal axes, contacts between shales

and sandstones, contacts between the formations in the area, especially contacts with the Jackfork sandstone formation, and proximity to spring deposits or any hot springs which may be found in the area.

On account of the fact that cinnabar usually is not far removed from igneous rocks, it is important also that their presence on the surface or their existence as buried masses be sought. As Arkansas igneous rocks are, as a usual thing, high in magnetite, which causes an increase in the strength of the earth's magnetic field in the locality where such rocks are found, the mapping of the earth's magnetic field

through the above area with a magnetometer or similar device might prove well worth while.

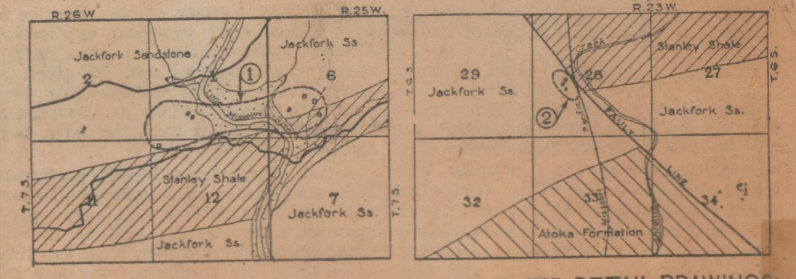
Mercury Is Valuable.
It should be borne in mind that mercury is one of the more valuable metals and the commercial development of deposits in Arkansas may prove to be of importance. The latest market quotation on the value of metallic mercury, taken from the Engineering and Mining Journal, dated August 24, 1931, is as follows: Quicksilver, \$78 to \$80 per 76-lb. flask, or \$1.02 to \$1.05 per pound.

By way of comparison, the present market value per pound of a few other metals is as follows: Aluminum, 23.3 cents per lb.; copper, 7.5 cents per lb.; lead, 4.2 cents per lb.; silver, \$3.26 per lb.; tin, 26.2 cents per lb.; zinc, 3.9 cents per lb.

According to the U. S. Bureau of Mines, in 1929 the United States produced 23,682 flasks of mercury, weighing 75 pounds each, or 1,799,832 pounds, (899.91 short tons of metal). During the same year 14,292 flasks were imported, or 1,086,192 pounds (543.09 short tons).

Approximately 1,000 uses are claimed for mercury. In 1928 these were classified as follows:

Drugs and chemicals	13,526	39.21
Fulminate	6,500	18.85
Industrial and control instruments	2,957	8.58
Electrical apparatus	2,522	7.31
Vermillion	2,418	7.01
Felt manufacture	1,697	4.92
Manufacture of caustic soda & glacial acetic	987	2.87
General laboratory use	620	1.80
Amalgamation	447	1.30
Various uses	2,808	8.15
Totals	34,462	100.00



LEGEND FOR DETAIL DRAWINGS

- Alluvial (Quaternary)
- ▨ Atoka Formation (Pennsylvanian)
- ▨ Jackfork Sandstone (Mississippian)
- Stanley Shale (Mississippian)
- Cinnabar Deposits
- Float Rock Containing Cinnabar

Above is a detailed drawing showing the cinnabar deposit near the Little Missouri river. At the right is a similar drawing showing the cinnabar deposit near Antoine creek. The maps were drawn by Carl M. Blacklock of the state geologist's office.

On account of the high value of mercury, low grade deposits can be worked profitably. According to the U. S. Bureau of Mines, the average content of ore treated in the more modern and efficiently operated American plants in 1928 was 5.3 pounds of mercury per (short) ton (.265 per cent mercury), and the average operating cost, exclusive of royalties and sundry general expense items, was \$71.73 per flask (76 lbs. of mercury). Costs, of course, vary greatly, according to the grade of the ore. For example, based on the assumption that the average mining and reduction cost is \$6 per ton, the cost per flask will be only about \$30 with ore yielding 16 pounds (per short ton on .8 per cent mercury) but will rise above \$75 with six-pound ore (.3 per cent mercury). When the price is \$120 per flask four-pound ore (.2 per cent mercury) is about the lowest limit of profitable ore.

Operations Cost Low.

The metallurgy of cinnabar is relatively simple, small operations merely requiring a retort and condensing apparatus. According to H. W. Gould & Co. of San Francisco, the cost of a complete plant for treating mercury ranges from \$400 to \$1,000 per ton daily capacity. Operating costs are likewise low. In a large plant one man per shift can handle 100 tons a day, and in California the average cost per ton of ore treated ranges from less than \$1 for a large plant to around \$2.50 for a small plant.

Production in the United States in 1929 was as follows:

State	Flasks of Mercury	Value	Per Cent	
California	29	\$1,238,428	42.8%	
Nevada	13	4,764	581,899	20.2%
Oregon	5	3,657	446,684	15.5%
Washington	2	1,397	170,637	5.8%
Texas, Arizona & Alaska	8	3,725	454,990	15.7%
Totals	63	23,682	\$2,892,638	100.0%

Publications on quicksilver, which may be obtained from the Arkansas Geological Survey, Little Rock, at cost prepaid, are as follows:

U. S. Bureau of Mines Chapter on "Mercury in 1929," by Paul M. Tyler, price five cents.

U. S. Bureau of Mines Bulletin 222, "The Metallurgy of Quicksilver," by L. H. Duschak and C. N. Schuette, (1925), price 50 cents.

U. S. Bureau of Mines Bulletin 335, "Quicksilver," by C. N. Schuette (1931), price 45 cents.

U. S. Geological Survey Bulletin 808, "Geology of the DeQueen and Caddo Gap Quadrangles, Arkansas," by Hugh D. Miser and A. H. Purdue. This contains a valuable geologic map of parts of Polk, Howard and Sevier counties. Price 75 cents.

The Arkansas State Geologic map, recently published by the Arkansas Geological Survey, is also valuable in understanding the geology of the region. Price \$1.50, postage and container 30 cents, total, \$1.80.

Geologist Makes Test Of Cinnabar Deposits

Hot Springs, Aug. 17.—(Special.)—Dr. George Branner of Little Rock, state geologist, has been in Pike county during the past week investigating reports that a deposit of cinnabar, the crimson ore producing mercury, had been located there. He pronounced samples of the ores submitted to him to be cinnabar. Dr. Branner said he is assembling data for a state bulletin on the cinnabar deposits.

The deposit extends west from and including township 5 south, range 23 west. Dierks and Roseboro lumber companies and farmers hold the land.

An 18-year-old youth, Owen Cox of Lowell creek, took a sample of the red rock to S. F. Short, Missouri Pacific section boss at Amity, who in turn brought it to Moritz Norden, Hot Springs, who tested it. Dr. Branner later tested other samples.

Test Crew at Work on Cinnabar Deposits in Pike County.

Special to the Gazette, 9-6-31
Gurdon, Sept. 5.—Leo Young Company Inc., of El Dorado has leased cinnabar land in Pike county near the Little Missouri river and has started prospecting. Mr. Young employs 10 men, including a chemical engineer. He expects to open a deposit immediately and to build a test report on the site.

NEW QUICKSILVER AREA

Discoveries in Arkansas Lead Geologist to Urge Testing of Large Territory

9-2-31 Wall St. Journal
Dow Jones News Service Pac. Coast

LITTLE ROCK, Ark.—Quicksilver has been discovered in Pike County, Arkansas, in sandstone, in two places recently, and Dr. George C. Branner, state geologist, believes that an area of 700 square miles in Hot Springs, Clark, Pike, Howard and Sevier counties is well worthy of investigation. One of the strikes was made near Nutt's Crossing and the other 15 miles away, near Kirby. Float rock carrying cinnabar sulphide of mercury has been found at various points in this general area. The discovery of cinnabar was made this summer. The ore, where in place, is of good grade with samples going 5.18% and 8.24% mercury being mentioned.

The area which Dr. Branner thinks has quicksilver possibilities is a few miles south of the hot springs of Arkansas and only nine miles north of the volcanic neck in which the only diamond mine of North America is located.

Dr. Branner says that the value of the Arkansas quicksilver deposits can be determined only after considerable work.

ARKANSAS IS ELATED OVER MERCURY FIND

Pike County Quicksilver Deposits Seem to Be Substantial and of High Test.

METAL HAS MANY USES

State Looks Upon This and Recent Bauxite Discoveries as Compensation for Drought.

By CHARLES MORROW WILSON.

Editorial Correspondence, THE NEW YORK TIMES
FAYETTEVILLE, Ark., Sept. 10.—Arkansas has discovered a new mineral resource. Metallic mercury, or quicksilver, apparently in substantial quantities, is being unearthed at two points in the southwest portion of the State. Strangely enough, both deposits occur in Pike County within easy range of the nation's only commercial diamond mines, where stones are being taken from the original periodotite matrix.

The two quicksilver deposits, about fifteen miles apart, were reported independently and, by a strange coincidence, virtually at the same time. Mercury deposits in the eastern portion of Pike County were first reported by railroad workers who were blasting out a sandstone riprap about five miles south of the village of Amith. Those in the west portion of the county were first reported by resident farmers.

Examinations of specimens and a survey of probable mining areas have recently been completed by the State Geological Survey and confirmed by the United States Geological Survey. In the west portion of the county about one square mile was included in the survey, and three trial openings were made. An average sample from the first vein encountered showed 51.6 per cent mercury, one of the highest assays ever known in cinnabar geology. Samples from adjacent zones showed an average mercury content of 8.24 per cent. Ore samples taken from the eastern area showed an average of 5.18 per cent, which approximates the national average.

Further Surveys Urged.

Dr. George C. Branner, Arkansas State Geologist, believes that a total of at least 700 square miles of Arkansas territory would warrant a careful survey for mercury resources.

Quicksilver is one of the few metals of primary importance which the United States continues to import in large quantities. This country's present production is concentrated in the Far West and along the Pacific Coast. The value of the metal has remained uniformly high, even in the thick of the depression.

According to the Bureau of Mines, the United States normally produces about 23,000 flasks, or 1,800,000 pounds, of quicksilver annually and imports about 1,000,000 pounds in addition. Of the total domestic production, California now leads with 42.8 per cent. Nevada follows with 20.2 per cent. Oregon produces 15.5 per cent; Washington 5.8 per cent, and Texas, Alaska and Arizona combined produce 15.7 per cent.

Aside from local interest altogether natural, the Arkansas deposits suggest an eastward shift in available supplies of mercury and a probable increase in production, which may, within the course of relatively few months, wield an important influence upon international trade. The current duty of \$19 a flask on imported quicksilver, plus the fact of a fairly centralized location, may serve to encourage profitable exploitation of the newly identified resource.

State's Hopes Are High.

Arkansas's hopes are further heightened by more general trends. There is increasing demand for quicksilver in industry and science. The metal is said to have more than 1,000 well established uses; among the more common of which are medicines, chemical amalgamation, electrical apparatus, drugs, control instruments and thermostats, general laboratory uses, and its function in the manufacture of felt, vermilion, caustic soda and various other stable necessities.

Moreover, the metal can be mined cheaply and because of its high value, even a low-grade deposit can usually be worked with profit.

The discovery of quicksilver, so soon after the identification of a fourteen-fold increase in the State's available bauxite resources, impresses Arkansas as a rather splendid gesture in poetic justice, a sort of kind fairy's compensation for this State's late siege of hurtful drought and still more hurtful drought publicity.

Mercury Made From Cinnabar At Hot Springs Fair.

Special to the Gazette, 10-2-31
Hot Springs, Oct. 7.—Visitors to the Garland County Fair at Whittington park are seeing pure mercury made from cinnabar rocks from Pike county. G. W. Schrantz, head of the Science Department of the local high school, secured many of the cinnabar rocks, which were broken up by pupils studying chemistry. The smaller particles of rock are ground to a powder, heated and the mercury results. This feature has attracted large crowds.

INCORPORATION MATTERS.

The Exploration Company of Hot Springs, formed to engage in exploration for mineral and to mine zinc, lead, cinnabar and other minerals, filed articles of incorporation in the secretary of state's office yesterday. The company's capital consists of 3,000 shares with a par value of \$20 a share. George F. Martin and C. H. Frost of Tulsa, Okla., and R. B. Martin of Hot Springs are the incorporators. 10-30-31

Incorporators.

Arkansas Quicksilver Company, Prescott, mineral development and mining concern, charter granted, W. N. Bemis and others, incorporators. 11-15-31

Pike County's Cinnabar Find Draws Capital

Strangers From Distance Flock In—Is Boon to County.

Mining Under Way Found Mainly on Antoine Creek and the Little Missouri.

Amity, Nov. 21.—(Special.)—Many strangers and out-of-state automobiles are seen in Amity every day since the opening up of the cinnabar mines a few miles south of this place. Many states are represented, New York, California, Oklahoma, New Mexico, Louisiana and others. No wild excitement is displayed over the discovery of the mercury ore, but there is a steady influx of capital that is seeking investment. No leases can be secured, now that the fact has been established that there is valuable mineral in the mountains near here.

One company is at work getting out the ore and sinking shafts in an effort to locate the main vein, which it believes is located somewhere in this vicinity. Practically all of the ore taken so far has been obtained on or near the surface. This ore is being put in sacks and hauled to Graysonia, the headquarters of the company, and there it is being put through a retort. The mercury, in the process used, is separated from the ore and is placed in bottles ready for shipment.

Several persons from Ft. Smith have been here this week, and it is understood that they have acquired several acres of his land and will begin operations as soon as machinery can be put on the ground.

Another company, composed of capitalists from Tulsa, Okla., is preparing to start work on its holdings not later than January 1. The mines that are being worked at this time are on the cut-over lands of the Ozan-Graysonia Lumber Company, and this company is in charge of the work, and is giving its men preference.

The Graysonia mills have about cut out all their timber and have been figuring on shutting down soon, but it is said that all of the men working for the company have been advised not to move to other jobs, as they will be used in mining cinnabar.

It is estimated by those who are in a position to know, that when all of the companies get to work on their holdings, employment will be given to about 500 men.

Several houses have been erected at the foot of a mountain south of here, and more will be erected later. This

little village has been given the name of Cinnabar City.

A good highway has been built from Amity to the foot of the mountain, also a bridge across Antoine creek has been erected and the mines can be reached via Amity at any time of the year.

This highway was constructed by Clark county, although the mining is nearly all in Pike county. Information reached Amity this week that another showing of cinnabar ore had been discovered on Jack mountain, south of Alpine, in Clark county, by some prospectors who have been

searching the mountains in that section.

In the cinnabar area "nearly" every man one meets has his pockets filled with "rocks," and each one believes he has made a valuable find. There is no question but what cinnabar, mercuric sulphide, has been found in paying quantities, and someone probably will make a fortune from it.

George C. Branner, state geologist, said that cinnabar had been discovered mainly in two localities in Pike county, near Antoine creek, a short distance south of Amity, which is in Clark county, and 15 or 18 miles south of there near the Little Missouri river. Cinnabar had been found also in the ridges between the two localities named, Mr. Branner said, and it might be that there is a continuous vein of the metal between the two locations.

Mr. Branner stated that the mining had been mostly on the surface thus far, and that if there is an underlying vein, no one had gotten into it as yet.

CINNABAR LANDS TO BE PROSPECTED

Leo Yount, Inc., El Dorado, Leases Site in Central Pike County.

Leo Yount, Inc., El Dorado, has leased cinnabar lands in central Pike county, about seven miles southwest of Kirby near the Little Missouri river, and has started work with an exploring crew, it has been announced.

Mr. Yount said he will work a crew of 10 laborers and four technical men, including a chemical engineer. He plans to open up a deposit immediately and to construct a test retort on the site. He said he will continue prospecting and mining operations for several months to determine the extent of the deposits. He began prospecting for cinnabar with four field assistants about three weeks ago.

Red Riches in the Hills

Cinnabar, or Mercury Ore, Has Been Found in Three Counties — Extent of Deposit Uncertain, But May Lead to Profitable Mining Industry—Pioneers at Work Testing Production in Pike, Howard and Clark.

By JERRY GREENE

Showings of cinnabar, a reddish brown ore from which mercury is obtained, have been found scattered over a long narrow strip running across Pike and parts of Howard and Clark counties in the southwestern part of the state, and the efforts of several prospectors to learn just what

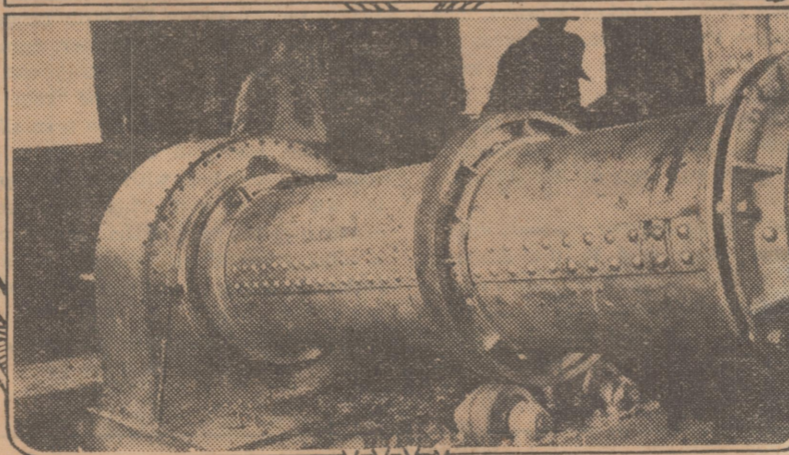
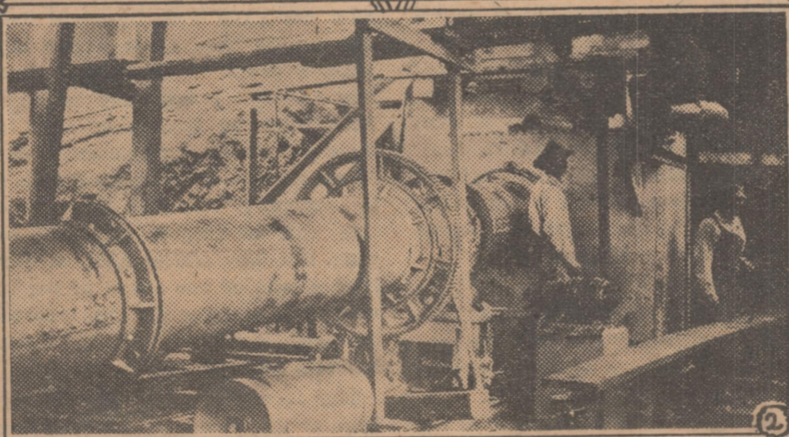
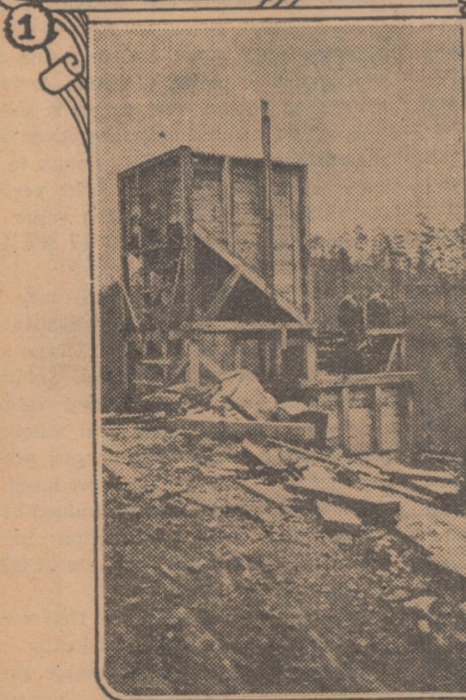
had happened. Many of these now have gone. A few were able to command sufficient capital to begin a long and costly process of prospecting, to learn the extent of the deposits, and to find whether commercial production of mercury in Arkansas might be made a reality.

zone and the numerous points of mineralization all tend to bear out the belief that at least a few deposits, probably a few acres in size, will be found which will prove of sufficient size and richness to justify long term operation.

"Generally speaking, it is presumed that

tively low grade, probably those with a content of something like 0.05 per cent quicksilver, or an even lower percentage, whereas quicksilver at \$50 per flask will require a much higher grade.

"The Arkansas deposits are of somewhat unusual interest for three reasons:



the deposits will amount to have given birth to a myriad of wild rumors, not only through Arkansas, but in states as far removed as New York and California.

For mercury, or quicksilver, is second in value only to gold, and the discovery of a real "strike" might mean the origin of a new and profitable industry for this state. There are comparatively few mercury-producing areas in the world. The bulk of the world's supply is found in Spain, and while the metal is produced in commercial quantities in several Southwestern states, California and other Pacific coast states, the production yield in the United States is low.

Consequently, when the word was passed about that a new deposit of cinnabar had been found in Arkansas, geologists, mineralogists, miners, and prospectors flocked to the area to see what actually

Gazette staff photographs of the plant of the Southwestern Quicksilver Company. The large picture, No. 1, shows the entire plant built on the side of a steep hill. No. 2, an interior view, showing workmen installing the rotary furnace. No. 5, shows the firing end of the furnace, where the oil burners are located. No. 3, is the hopper where cinnabar ore is dumped in, to travel by gravity to the furnace. No. 4 shows the condenser, from a back view.

Dr. George C. Branner, state geologist, made an extensive survey of the cinnabar area, drew several maps and prepared a lengthy report. Summed briefly, Dr. Branner's theories present the status of the entire situation:

"At the present time it may be said that the situation appears to be distinctly encouraging for careful and systematic prospecting. The length of the mineralized

cinnabar mining in Arkansas will be carried on on much the same basis as it is in the western portion of the United States; that is, low grade ore bodies will have to be blocked out and the average quicksilver content estimated, followed by such exploitation as is justified by the price of quicksilver. Quicksilver at \$100 or more per flask (of 76 pounds) will permit the opening up of deposits of rela-

they are the most eastern occurrences of cinnabar in quantity in the United States, the entire physiographic province (the Ouachita province) in which the deposits occur, is one in which cinnabar has never been known heretofore, and the distribution of the mineral presents unique features."

More than 30 years ago, leases on "quicksilver lodes" were recorded in the southwestern part of the state, and consequently, the exact date of discovery of the existence of cinnabar is a controversial matter. Production of mercury itself is an ancient art, beginning as far back as 1530. Mercury furnaces built in Spain in 1646 still are operating. Commercial production in the United States began about 1850.

Discovery of the deposits in Clark, Pike and Howard counties seems to date less

See page 10

than a year ago. A mountain boy picked up a piece of the ore-bearing rock, unusually heavy, and took it to a postoffice at Kirby, a little settlement about nine miles south of Glenwood. Here he gave it to W. F. Hintze, mineralogist from Dallas, Tex., who was knocking about in the hills. Hintze had the ore identified positively by geologists in St. Louis, and notified Dr. Branner of the find. About the same time, deposits of the ore were found on property south of Amity, near the border of Pike Clark counties. This property was controlled by a lumber company, of which W. N. Bemis, Prescott, was head.

Dr. Branner notified Leo Yount, a friend, who is what Mr. Yount himself terms a "practical miner," of the discovery. Mr. Yount formed a company and went into the hills. Other groups followed suit, but the operations of Mr. Yount are far in advance of others, Dr. Branner said, and aside from the Yount operations, those of the Bemis organization are the only other prospecting efforts begun on a fairly large scale.

Mercury is sold in steel flasks, which are comparatively small cylinders holding 76 pounds of the liquid metal. Mr. Yount has produced 10 such flasks, and the Bemis organization 15. This means that 1,900 pounds of mercury actually have been produced in the prospecting process. The present market value is about 85 cents a pound.

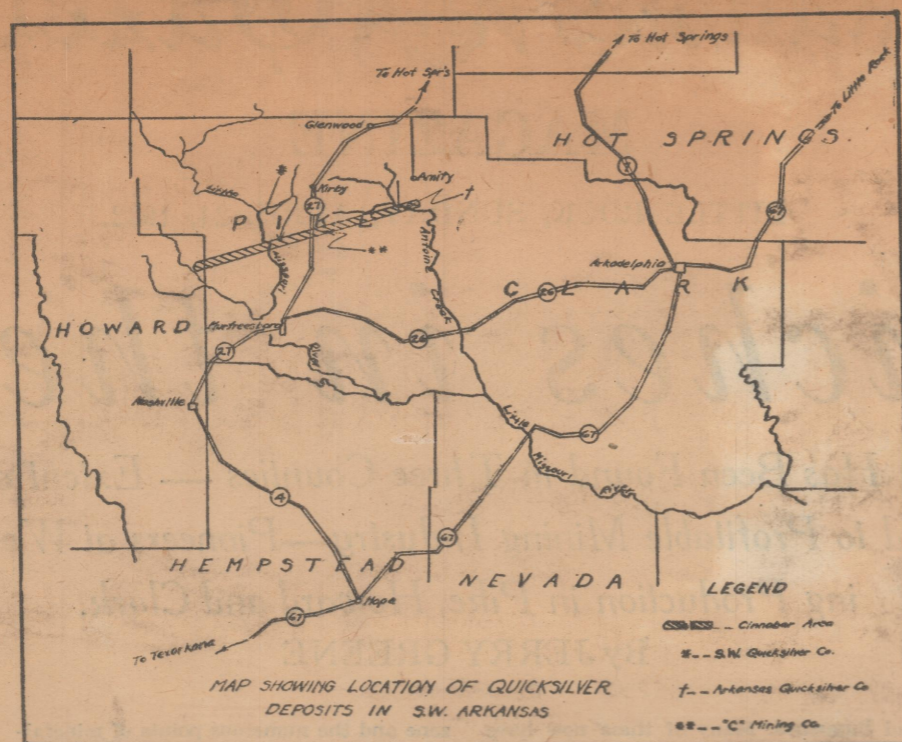
I made a trip recently to the cinnabar area, to learn as far as possible what had been done, and what might be expected from the mining efforts. Because I learned that Mr. Yount's organization had gone further in the prospecting work than any other, I decided to visit his "diggings."

Mrs. George H. Bell, Nashville, holds the title to 670 acres, some of which adjoin the Yount buildings. Because the country is so wild and rugged, I was afraid I would not be able to locate the mine without a great loss of time, if I were to attempt to locate it alone, and I persuaded Mr. Bell and his son, William Bell, to accompany me. I met them at their home about 3 p. m. Rain had been falling steadily during the day, and as I wanted to obtain photographs, I was advised to wait until another day. But soon after three, we started for the mine, some 30-odd miles from Nashville. Soggy gravel on the new highway made progress slow, and the little Ford skidded along almost at a crawl up through Murfreesboro and northward along the principal highway to a point several miles south of Kirby, where we turned west into the hills. I was told we had six miles to go.

This country lies in the Ouachita range of the Ozark mountains and it is rugged and beautiful. From Hot Springs, southwestward through Glenwood and Kirby, a new "black-top" highway provides easy access to a sparsely settled country. This is one of the few fine, fast automobile thoroughfares I have seen in the state where excellent scenery is marred by no billboards and almost no filling stations. At Kirby the "black-top" ends and a splendid, wide and well built gravel highway leads into Murfreesboro.

I glanced at my watch when we turned off the highway. It was 4 p. m., exactly. The six miles, I thought, would mean perhaps a 15-minute trip, and although it was raining, I believed there might be light enough for at least one or two photographs.

It took just 40 minutes to travel those six miles, and the car did not stop forward motion for an instant. Only the rankest optimist would call that elaborated cow trail we followed a road. Fully 90 per cent of the way was taken in second gear, and five per cent in low. The car would lurch from one steep bank to another, and for the life of me, I can't understand how a larger car could possibly have made the trip. We had to ford a creek three times—rain had swollen the streams slightly and the water lapped over the running boards. The exhaust was under water and its strained put-put sounded as though the car was protesting against its use as a motorboat.



We passed only one or two farmhouses. The hills once had been covered with virgin pine and a few of the trees remained after the lumberman had gone. Steep hills, covered with a dense growth of scrub oaks and underbrush, rose abruptly on either side of the narrow valley toward which we were headed. We burst out of the woods into a small cornfield. On the steep side of a hill, perhaps 150 or 200 feet above the floor of the valley, the plant

illustrated in the accompanying photographs might be seen. The Little Missouri river twisted its way across the far side of the valley.

Mr. Yount met us as we stopped in front of his combination office, sleeping quarters and dining room, built on a smaller hill several hundred yards away from the mine. After he had taken me over to the plant, where I had attempted to make the photographs in the half-light, with rain blurring the camera lens, we went back to his office to discuss the prospects.

Mr. Yount, I found, lives in Little Rock. He has been in the oil field in south Arkansas since its discovery, but was quick to see the possibilities of the mercury-producing ore. He formed the Southwestern Quicksilver Company, of which he is

president, Dr. N. H. Stearn, St. Louis, vice president, and L. M. Vaughan, Little Rock, secretary. Mr. Yount's company has obtained leases on 756 acres, of which he said probably 38 acres have cinnabar deposits. He entered the area in August, 1931, and since has had many geologists and mineralogists surveying and mapping. His story was quickly told.

"We are simply prospectors," Mr. Yount said. "We are here on a gamble, and while we believe we know more about this area than any one else, neither we nor anyone can say whether there is sufficient ore here to produce mercury in paying commercial quantities. To obtain this knowledge will take from two to five years, and until that time we cannot be classed as other than prospectors."

"To learn whether mercury can be pro-

duced here commercially we must find the length, breadth and depth of the deposits, and the ore must be of sufficient quality to make its handling profitable."

More than half-way up the hill upon which he has built his furnace, Mr. Yount has begun to open three cuts straight back into the hill. Later, he will turn the cuts downward to ascertain depth of the deposits. The mining of mercury is comparatively simple, as it was explained to me. The top of the ore crusher is on a level with the bottom of the shaft. Small trucks containing one ton of ore will be brought out of the mouth of the shaft on rails, and dumped at the top of the hopper. The ore will fall by gravity into the crusher and into another bin where it is raked over and cleaned. It then passes into a rotary furnace, where it is roasted. Mr. Yount has installed an oil-burn-

ing 24-inch Gould furnace, capable of handling from 12 to 20 tons of ore a day. This furnace is a long metal tube, lined with fire brick, which turns on rollers. When the ore is heated to a sufficient temperature, the mercury vaporizes. A blower fan carries this vapor out of the furnace through a condenser, where it is chilled and becomes liquid mercury. It is drained from the condenser into the metal flasks and is ready for shipment.

Mercury vapor is poisonous and precautions must be taken to prevent it from seeping out where it can be breathed.

The problem, then, is not in the mercury mining process, but in finding ore sufficiently rich to warrant its handling. Mr. Yount, whose plant now is working, said that in his experimental production, he hoped to obtain about 10 pounds of mercury for each ton of ore sent through the furnace.

Transportation also will furnish another problem for these prospectors. A heavily laden truck will have a long and arduous passage over the rough trail to the main highway. Heaven only knows how Mr. Yount hauled his machinery into the hills.

About 50 per cent of the mercury mined in the world is used for chemical work and pharmaceutical productions. Twenty-five per cent is used for fulminate, as a detonator for explosives, and the remainder of the production is scattered throughout many industries. Considerable mercury is used in electrical manufacturing and laboratory work.

A mercury vapor engine has been invented, and if its use becomes popular, it may furnish a vast market. In this engine, mercury, which has about four times the expansive power of water, is heated instead of water. The vapor is used to turn a turbine, and after the vapor leaves the turbine, it still is hot enough to heat water and produce steam. After performing this double function, the vapor then is condensed and returned to the boiler to be re-heated.

But as indispensable as mercury is to scores of industries, the quicksilver industry is of vanishing significance compared to the major mineral industries with respect to quantity and value of product, capital invested and number of men employed. Spain, the largest producing country in the world, produced 63,675 76-pound flasks in 1928, valued at \$3,996,635. The total consumption in the United States in 1928 was only 34,482 76-pound flasks.

It may be seen, therefore, that even if the Arkansas mercury-producing area should develop into a profitable project within 10 years, while it might assure the independence of this country from need of a foreign product, it cannot have the great financial and economic effects brought by discovery of a rich oil field, or gold "strike."

Down in Pike, Howard and Clark counties, several companies have been formed to ascertain exactly what Arkansas has in the way of cinnabar. The C Mining Corporation has built a custom plant near Kirby. Dr. E. H. DeVore, Fort Worth, Tex., and Mr. Bell, have sunk experimental shafts on their holdings. The Arkansas Quicksilver Company, Mr. Bemis' organization, has built a small plant with a simple retort on the Antoine river. Several thousand dollars have been and will be spent during the next three years in search of cinnabar.

Meanwhile, the geologists, mineralogists and mine workers may intersperse with their mapping and digging, if they wish, hunting of fox, wild turkey, deer, bobcats and other game abounding in a region not yet under the sanction of a Chamber of Commerce. And the howling of wolves will lull these miners to sleep.

The C. Mining Corporation of Kansas City filed notice that its capital stock has been increased from \$25,000 to \$45,000 to develop its mining projects in this state. James K. Catalina of Kansas City is vice president and manager of the company. The company is mining cinnabar ore near Kirby in Pike county.

Exhaustive Report on Cinnabar Deposits Prepared.

An exhaustive report, including 61 pages of typewritten material and 38

pages of maps and photographs of the recently discovered cinnabar deposits area in southwest Arkansas, has been completed by Dr. George C. Branner, state geologist, and sent to the American Institute of Mining and Metallurgical Engineers for publication, Dr. Branner said yesterday. Dr. Branner worked several months on the survey, in which each deposit of the quicksilver ore which has been discovered is covered. In the report, Dr. Branner said that while indications are that the area may be developed into a paying project, it will require much additional prospecting before a definite prediction can be made.

Gold Found in Cinnabar Ore in Pike County.

Special to the Gazette. Nashville, June 26.—J. K. Randin of Murfreesboro, who has an option on more than 1,000 acres north of Murfreesboro, in the cinnabar region, said today that gold had been discovered in the cinnabar bearing ore in section 17-7-24. An assay of surface rock, made by Smith & Richardson of Fort Smith, showed a yield of 96 3-10 per ton, Mr. Randin said.

INCORPORATION MATTERS.

The following incorporation papers were filed in the secretary of state's office yesterday:

Home Ice Company, Dardanelle, articles of incorporation; capital stock, \$10,000; M. B. Morgan and others, incorporators.

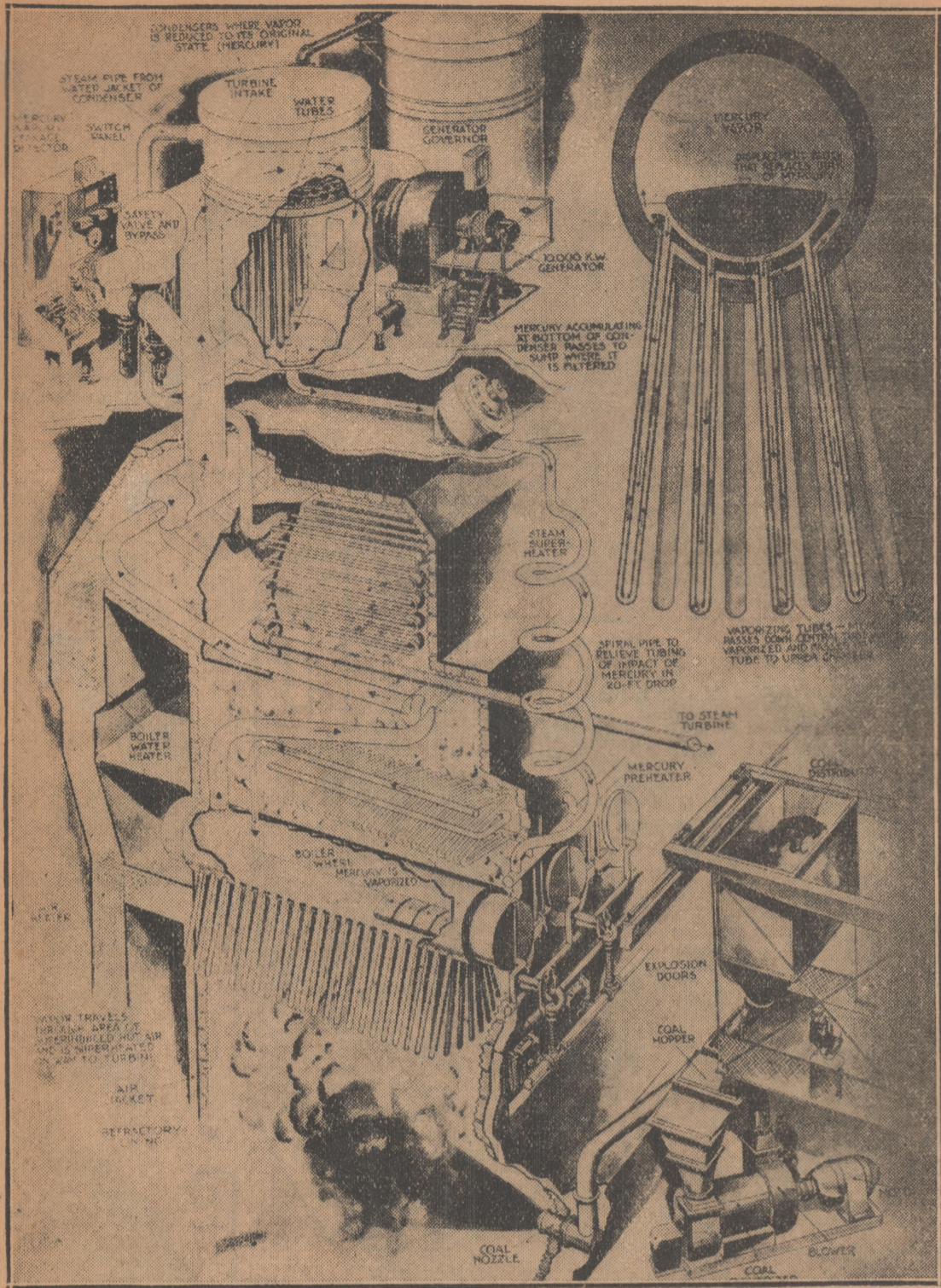
Economy Produce and Grocer Company, Fort Smith, articles of incorporation; capital stock, \$15,000; Lewis Friedman, Charles W. Ayers and Miles S. Friedman, incorporators.

The City Steam Laundry, Inc., and the Wardrobe, Inc., Batesville, articles of incorporation; John Q. Wolf Jr., Malcolm Evans, Frank McKeown and others, incorporators.

Arkansas Quicksilver Company, Prescott, notice that the company's capital stock has been increased from 1,000 to 5,000 shares of no par value stock.

The Malco Theaters, Inc., North Lit-

Mercury-Vapor Replaces Steam For Generation of Electric Power



Cut-away drawing of electric plant where mercury-vapor drives own turbine and heats water for accessory power.

By ROBERT D. POTTER.

Mercury, that fluid, glistening metal, has had a unique place in the history of civilization. The ancient alchemists endowed it with all manner of mysterious and even supernatural properties. It was used in medicine as well as the starting point in the frantic search for some magic "universal solvent" that would transform it into gold. Today scientists no longer try to transmute it, but take advantage of its heavy atoms and employ them to create high vacuum. And by bombarding mercury vapor with electrons they can learn some of the inner secrets of atomic structure. Most of us, however, are familiar with the metal because of its common application in thermometers.

While its use has been comparatively rare as fixed by the standards of iron, copper and aluminum, the annual consumption of mercury is expected to be increased 25 per cent within a short interval.

The anticipated sharp increase in the consumption of mercury arises because two new mercury-vapor electric power plants are under way, one partially finished and the other ordered. Two hundred and fifty tons of mercury will be required in these plants. With authorities estimating a yearly consumption in this country of about 1,000 tons, a sizeable demand seems probable. At current prices those 250 tons would cost over a million dollars.

Mercury Vapor Process.

Mercury vapor, replacing steam of the customary power plant, is now nearly 10 years old commercially. That pioneer plant of the Hartford Electric Light and Power Company, opened in 1923, has proved so complete a success that the two new plants mentioned are well beyond the tentative stage.

The plant at Schenectady is taking on a finished appearance, and less than three months ago the Public Service Corporation of New Jersey ordered a duplicate plant. Both will be twice as large as the original Hartford project.

The cost of the Schenectady plant alone is placed at about \$4,000,000, but when the operators can save \$1,000 each day by the use of mercury vapor instead of steam the cost is not too large. That is the estimated saving obtained from the operation records of the Hartford station, and these new plants should yield even greater economy.

The technical processes back of such plants have been described on several occasions, but certain of the basic principles are interesting enough to bear retelling. Actual generation of the electric power is obtained by suitable turbines, which in themselves are a mark of added efficiency, whether the propelling agent is steam or mercury as a result of the work of Sir Charles Parsons, who died last year, they have replaced ordinary reciprocating engines where high efficiency is desired. Reciprocating devices with

the forward and back motion of the piston are essentially slow and lose much of their power at every change of direction of motion. Momentum gained going forward is lost at the end of the stroke and must be regained each time.

High Temperature Attained.

In any turbine device the continuous action of the propelling agent keeps the motor turning constantly in one direction with a saving of energy. In the mercury vapor system the chief advantage comes from the high temperature of the mercury vapor, coupled with the comparatively low pressure at that point in the temperature scale.

Theoretically the efficiency of any heat engine depends on the temperature difference at the start and the finish of the process. With the mercury the starting temperature is about 677 degrees Fahrenheit and on emerging is still at 455 degrees. While steam could be heated to this temperature the pressure would rise so greatly that the strains on the feed pipes would be prohibitive. In the mercury system this pressure is only 35 pounds a square inch.

In the illustrated diagram above the circuit of mercury vapor from the time it is vaporized until it strikes the turbines and condensed is visualized. On the return path can be seen steam pipes leading to a steam turbine.

This is another advantage of this process, first developed during the war by W. R. L. Emmett, of the General Electric Company. This hot, liquid mercury is utilized to create steam in a common type water boiler. This steam is taken to a steam turbine and develop still more power.

Low pressure of the vaporized mercury allows welding to be used on the pipe lines that convey the mercury throughout the system. This practice insures a maximum safety against leaks which not only saves the expensive mercury but prevents possible illness if the mercury vapor gets into the stacks and the atmosphere.

At the recent meeting of the American Institute of Chemical Engineers at Schenectady A. J. Nerad of the General Electric Company, reported on the operation of the Hartford and described a new means of detecting mercury vapor in the stacks. Samples of flue gas pass over strips of paper coated with selenium sulphide. This yellow sulphide is blackened when mercury vapor comes in contact with it and the degree of discoloration, said Mr. Nerad,

tells the amount of leakage. So sensitive is this method that a few cubic centimeters of mercury dropped into the furnace may be detected even though more than 200,000 pounds—not cubic feet—of flue gas pass each hour.

This precaution, coupled with good ventilation, said Mr. Nerad, has prevented many cases of mercurialism in recent years and demonstrates that the simple measures taken are wholly effective.

Mercury, as it is seen in thermometers and used in these mercury vapor plants is familiar to every one. But in nature it never occurs in this comparatively pure state. Like iron, it is never seen alone unless properly treated.

The quickness with which it combines with the element sulphur causes this. What the engineers have done in their detecting scheme is to give the mercury an opportunity to go back into its common form on earth—cinnabar or HgS.

SUBMITS REPORT ON CINNABAR ORE

State Geologist Has Completed Exhaustive Survey of Deposits.

Aug 25-32

State Geologist G. C. Branner yesterday submitted to Governor Parnell a report on cinnabar, or quicksilver ore, deposits in southwestern Arkansas.

The report, written by Mr. Branner after a year's field and research work, represents the first comprehensive and scientific study of this recently discovered mineral deposit.

The report contains 51 pages of text, 38 plates and maps, and describes 34 separate occurrences of cinnabar. The quicksilver ore (sulphide of quicksilver) deposits discovered to date are located principally in northern Pike county, but occurrences have been reported over an area of 22 miles in length, lying in a nearly straight line.

Cinnabar was first noticed in Pike

county in April, 1930, but was not identified until June, 1931. The formations in which cinnabar has been found are hard sandstones and shales of Carboniferous age. These have been intensely folded so that the rocks stand near the vertical. Most of the cinnabar occurrences are on the axis of a great fold which extends from Antoine creek in eastern Pike county, to near Muddy Fork in northern Howard county.

The cinnabar is found, for the most part, in vein fractures in the sandstone, but has been found in quartz veins. It is probable that the cinnabar was deposited by hot water solutions rising from a great depth through the rocks.

The metallic minerals in the Ouachita mountains of western Arkansas include ores of antimony, bismuth, copper, iron, lead, manganese, silver, zinc, but no quicksilver minerals have ever been found in the area other than those in the cinnabar belt in Pike, Clark and Howard counties.

There have been two major developments in the area. The Arkansas Quicksilver Company, with holdings south of Amity on Antoine creek in eastern Pike county, installed a retort at Graysonia, and up to January 15, had recovered 1,293 pounds of quicksilver. The Southwestern Quicksilver Company, with a plant located on the Little Missouri river about 7 miles north

of Murfreesboro, have been operating more or less continuously since April 21, 1932. A 20-ton rotary, oil-burning furnace has been installed. Several other organizations have engineers in the field making detailed examinations.

Cinnabar in Southwestern Arkansas—Something About Geology.

BY GEORGE M. MORELAND

The recent discovery of cinnabar in southwestern Arkansas aroused deep interest throughout the United States because that sulfid, the chief ore of mercury, is a valuable and one too plentiful material in the United States. Its discovery in Arkansas, which fact was noted in this column at the time of the discovery in Pine County, proves once again that the gods were kind to the Wonder State and heaped within its borders a majority of the minerals of the world.

Today in my mail came a book neatly printed and well illustrated which is numbered Circular No. 2 of the Arkansas Geological Survey. The title of this circular is "Cinnabar in Southwestern Arkansas" and when it is noted that it is written by Dr. George C. Branner, the distinguished state geologist of Arkansas, we are assured that it is classically and authoritatively written.

The circular discusses the geology, origin, character, and distribution of the cinnabar deposits in Pike, Clark and Howard counties. It describes accurately and comprehensively individual occurrences and recommends procedure for prospecting. It contains in addition to the highly interesting reading matter geologic maps and sections and a topographic map showing the locations of prospects. The edition is lithographed and is neat and attractive. It is printed on heavy paper with durable paper covers and makes a fine addition to a geological library, particularly one devoted to the geology of Arkansas. There are 51 pages in the book and 38 plates.

This book is well worth the price and those interested in cinnabar, or those who are interested in Arkansas geology, one of the most fascinating subjects in the state, would be wise to order a copy of this valuable book written by a specialist who is devoting his rare talents to the great work of assembling data on Arkansas geology.

And speaking of Arkansas geology, it might be noted here and now that there is no more fascinating subject than to study the geology of Arkansas.

This writer is no geologist. In fact, I never studied geology in school or college in all my life. Several years ago Dr. George C. Branner, Arkansas State geologist, sent me a copy of one of his publications. I read it. I got little from it. I suppose my brain was not elastic enough to "masticate" a subject so deep and intricate at one reading. But I am a persevering rascal. When I get hold of anything I don't turn it loose until I "masticate" it. It was so with that erudite little booklet Dr. Branner sent me. I read it a second time. I understood it a little better. I read it a third time and I began to "masticate" that geological discussion. I became interested in Arkansas geology.

Since that time Dr. Branner has never failed to send me copies of all the publications issued from his office. I have assembled a very good "geological library" of Arkansas. I can actually talk intelligently about Arkansas geology. I do not say this boastfully. My readers know well enough that I am not egotistical. I say it to prove to my readers that any subject can be mastered if one

will just "stick to it" long enough. If they will only work hard enough.

I have in my library nearly all the reports of the Arkansas geological survey, including those issued by the world famous Dr. John C. Branner, lately deceased, and all the late publications of the department.

It is fascinating when I go perambulating over the wide and breadth of my beautiful wonderland to study the rocks and other geological features of my adopted state. Here at Hot Springs where I am now domiciled I find much of interest geologically. I can walk out into the woods and see rocks a million years old. I can see the handiwork of Him who fashioned the universe when it was young. The Ozarks are older than the Rocky Mountains. It is interesting to study the rocks and to delve into the mysteries of geology, a science not old but ever interesting.

Not far from my retreat near Hot Springs is Magnet Cove. You have heard of Magnet Cove, not less than 150 kinds of minerals have been found in that narrow mountain locked valley of not more than half a mile in width. It is one of the most interesting geological enigmas in Arkansas with the possible exception of Crowley's Ridge about which Dr. John C. Branner wrote so authoritatively and so entertainingly.

Too many people think because geology is one of the sciences that it is deep, uninteresting and dull. It is not so. You do not need a classical education to study and enjoy geology. Get a copy of one of the geological books on Arkansas, for instance, the book mentioned above which I have tried to review. Read it. It may be dull at first. But read it a second time. It will then be more interesting. Not only read books on geology but go out into the woods and fields and study geology first hand. You will find it fascinating. Remember, as the poet said,

"Blessings on science, and her hand-maid Steam!
They make Utopia only half a dream;
And show the fervent, of capacious souls,
Who watch the ball of Progress as it rolls.
That all as yet completed, or begun,
Is but the dawning that precedes the sun."

We cannot know—we cannot even imagine—what science will yet accomplish for the world. Today in science "is but the dawning that precedes the sun."

Geology is one of the most important of the sciences. It is the science that teaches us of the constitution and structure of the earth—teaches us how the world was made. Surely we are all interested in that subject. Then let me suggest to you, dear reader, that if you have not already done so you take up the study of geology. If you live in Arkansas Dr. George C. Branner will be glad to assist you. If you live in Mississippi write to Dr. Lowe, University, Miss., who is a delightful and scholarly man and will help Mississippians to create a love for geology.

Take it from me, it is an interesting subject if you'll stick to it.

NEW VEIN EXTENDS CINNABAR FIELD

Rich Discovery Made East of Proven Area in Clark County.

Special to the Gazette, Sept. 9.—Another rich vein of cinnabar ore, which yields quicksilver has been discovered south of Amity and east of the proven area traced in the recent report of State Geologist George Branner.

The vein is reported to be the biggest "find" discovered in the entire field. The rocks appear to be almost solid cinnabar and high in the percentage of quicksilver or mercury. The new field is in Clark county about 20 miles northwest of here.

Activity in Cinnabar Area to Be Resumed

Amity, Sept. 14.—(Special.)—The Graysonia Cinnabar Company has started work on its holdings south of Amity, employing 18 men. It is understood here that this number will be increased in the near future. Other companies with holdings in the cinnabar area south of Amity, are expected to begin development in the near future. Some very rich deposits of cinnabar ore have been discovered east of the present area and in Clark county, and are said to be the richest yet discovered.

There has been little work going on in this area for the past two months as all the mines were shut down, and only some prospecting has been going on. There is no question as to the quantity and quality of the cinnabar deposits, and it only awaits development.

Cinnabar Company Near Amity Resumes Work.

Special to the Gazette, 9-15-32
Amity, Sept. 14.—The Graysonia Cinnabar Company has resumed work at its mines south of Amity, employing 18 men. The number will be increased soon. Other companies are expected to begin operation soon. One of the richest deposits that has ever been discovered here will be worked.

ACTIVITIES INDICATE EARLY MERCURY MINE DEVELOPMENT

Mena Evening Star 10-2-35 10-2-35

Much Interest Being Shown in Eagleton Territory, but More Thorough Test Must Be Made Before Real Work Will Be Considered.

Two important developments of the past week in connection with the reported discovery of metallic mercury in the Ouachita National forest near Eagleton, confirms belief that the valuable metal is here in undetermined quantities and that big moneyed interests have already directed attention towards this newest find in the Mena mining field.

Recent activities indicate some real action towards the proper development of the mercury area may be expected in the near future. Just what the extent of this development may depend upon events now in the making.

This much is certain. Men interested in mining and the recovery of nature's stored-up mineral wealth, have shown enough interest in the local situation to make return visits to the new mercury field in the Ouachitas. At least two groups of men are still keenly interested.

Representatives of the Commerce Royalty Corporation, an organization of importance in Oklahoma mining, have also been here to get initial information about the metallic mercury field. A scout for the Guggenheim interests also paid the area a visit. Among the men of science who have visited the field was Dr. George Branner, state geologist of Arkansas. Dr. Branner has not issued any public statement as yet, but he has requested more samples for further examination and analysis.

Locally there has been increased activity among the home fraternity of prospectors and investors. Many new claims have been located and Mrs. Bessie Blanton, Polk Circuit Clerk, in whose office mining claims must be legally recorded, has found an increased business.

Among the latest visitors to the new mineral discovery was a party of Oklahoma men, which included Dr. C. V. Stuart, Dr. W. O. Francisco, H. C. Palmer, Wm. Robinson, Charles Purcell and Ed C. Seamans, all from Oklahoma City; Dick Walls and Elmer Isern of Miami. With part of this group came Dr. Harold White of Wilmington, Del., technical expert with the Atlas Powder company.

The Oklahomans represent a variety of interests, part financial and part technical, but all interested in developments of new sources of wealth. Some of them are frankly skeptical, which is not unexpected when investments are to be made, and want to have more proof regarding the worthiness of the mercury discovery.

These men are the ones who are preparing plans for making further tests, before committing themselves, yet are interested to the extent of being willing to spend good money to find out. These prospective tests are among the possibilities of the immediate future.

The fact that there are but few places in the entire world where metallic mercury has been found, challenges the interest of these men. The further fact that if tests to be made show that the valuable metal is found here in the expected quantities, investors will be interested because of its possibilities in economical recovery. The cost of building and operating a recovery plant will be cheap, mining men say, as compared with cinnabar mining, the usual source of commercial quicksilver or mercury.

Probably the most positive and authoritative statement from any of the recent visitors to the new mercury area, came from Dr. Stuart of Oklahoma City, who has spent many years in research work. Dr. Stuart is a former resident of Arkansas, and still has investments in the Wonder State. He is not denying he's looking for more and expecting some right here in the mineral wealth of the Ouachitas.

Dr. Stuart has made his second visit to the new field and frankly admitted that the development to date has not yet proceeded to the definiteness required by skeptical investors of big capital. Yet the Oklahoma man said Saturday: "I don't think there's any question concerning the value of the mercury discovery. It's here in great quantities, and as the cost of operation is

cheap, it affords a promising field for investment to those interested. Samples that I have assayed showed metallic mercury in quantities that ranged from three and one-eighth per cent to 28.1 per cent. There are other valuable metals that can be recovered in connection with the mercury if the right processes are used. One gold assay, one almost impossible to believe shows a value per ton of almost \$3,000."

Dr. Stuart readily admitted that more exhaustive tests would be required to prove the possible quantities of mercury in the area, before the attention and interest of really big capital could be gained.

Cinnabar to Be Mined on Large Scale

Democrat 7-21-35

Delaware Firm to Have Three Plants—History of Magic Metal.

By BOB THOMASSON.
Murfreesboro—The Mercury Producers, Incorporated, a Delaware corporation, which has been admitted to this state, has started work on a large scale on the holdings formerly operated by the Southwestern Quicksilver Company, about 10 miles northwest of Murfreesboro.

The personnel of the new company is as follows:

Frank A. Vanderlip, New York, chairman of the board; J. A. Miller, Murfreesboro, president and general manager; Dr. G. P. McNaughton, Miami, Okla., vice president; Charles A. Frankenhoff, New York, vice president; Ralph E. Root, New York, secretary-treasurer, and Frank A. Vanderlip Jr., vice president and assistant secretary-treasurer; M. J. Eunson, superintendent.

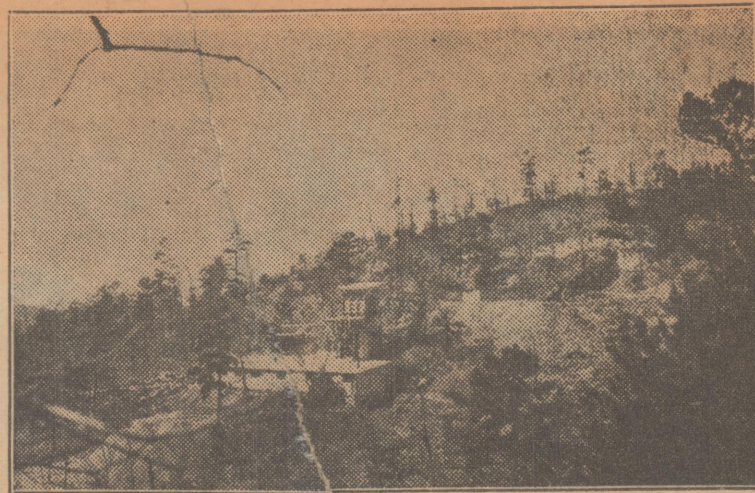
If present plans mature, three plants will be in operation on this 586-acre tract of land within a reasonably short time. The mills will be located on what is known as the "Parker," "Parnell" and "Gap Ridge" hills, and will have a daily capacity of two or three hundred tons, employing 150 or 200 men.

A tunnel is now being driven from the south through the Parnell hill and will be about 1,000 feet in length and 185 feet from the top of the shaft to the tunnel level. This method of mining has not been used heretofore in this district, but the handling of the heavy ore will be both expedient and economical.

This company has offered no stock for sale and will not have any for sale, it is reported, as the men connected with this enterprise are well known in financial circles and Wall street, and the first large scale development program in the cinnabar region is now under way. Yet the holdings of Mercury Producers, Inc., are but a small part of the cinnabar vein, which is known to be 30 miles long and one mile wide, making a total of nearly 20,000 acres in the area.

Cinnabar.
Since the term cinnabar is not as commonly known to the general public is lead, zinc, gold, etc., it seems logical to define the meaning of the word. A most every one is familiar with and knows by sight, the appearance of quicksilver or mercury, in its pure form. This precious metal is found in its deposits, usually in the form of deep, ruby red crystals, shot in porous rock, forming an ore called "cinnabar." Webster describes it as "red sulphide of mercury." From cinnabar ore, by methods of extraction, especially de-

One of New Reducing Plants



OWNED BY MERCURY PRODUCERS, INC.

signed and adapted to this class of ore, comes the pure quicksilver, or mercury.

Early Uses of Mercury.

Historically quicksilver was known at least four centuries before the Christian era. The first mention of it seems to have been made by Aristotle, who spoke of it as "Liquid Silver." In China there are records of use of vermilion ink and paint, also the fluid metal, about 400 years B. C. Mercury's use for amalgamation seems to have been known about two thousand years ago.

Moorish physicians used mercurial ointment and bichloride in treating ite hand other skin diseases over one thousand years ago. Mercury was used in determining the pressure of the atmosphere as early as 1643. This feat marks the introduction of quicksilver into scientific research by the invention of the barometer. In 1720 Fahrenheit invented the mercury thermometer.

American production appears to have begun in Santa Clara, Calif., as early as 1824, and this first American mine has been worked continuously since 1846. Since 1799 quicksilver has played another part of prime importance in the history of nations, due to the invention of fulminate of mercury by Howard in that year. No modern war can be fought without its aid and the blasting cap is a necessity in mining.

Present Uses of Mercury.

The uses of mercury are certainly well enough established, and over a sufficient period of time, to place mercury mining and reduction in the class of basic industries. Some of the important uses of the metal today are the recovery of gold and silver from ores by amalgamation, the manufacture of fulminate for explosive caps, of electrical appliances and scientific apparatus, vermilion, felt, anti-fouling paint for ship bottoms, and wood preservative, and much is used in the manufacture of drugs in over 400 preparations.

It appears that with the new uses being discovered there is no great danger of the supply so far exceeding the demand that mercury production will ever become unprofitable.

Production and Consumption.

Since 1850, America and Spain have been the most consistent producers, Italy comes next with heavy production during the past 25 years and now far exceeds America. California is America's leading mercury state, with some production in Oregon, Washington, Arizona, Nevada and west Texas. With the recent discovery in Arkansas, this state is added to this list and may in time become the most important.

All American mines to date have operated on comparatively low-grade ore, running only seven or eight pounds of mercury per ton, while it is believed that the average will be far above 20 pounds to the ton in the Pike and Clark counties district.

Between 1850 and 1917 California alone produced \$101,992,560 worth of quicksilver of which there is a record, and one can only speculate on how much more there has been of which there is no record available. America, by a wide margin, is the largest consumer of mercury, with Germany and the British Empire coming next. Neither of the last two is a producer. This fact would seem to place America in a preferred position from the producer's standpoint.

Topographical Formation.

The area under discussion is located in Pike and Clark counties in south Arkansas, about 10 miles north of Murfreesboro. The land around the mineralized zone is comparatively smooth, but the cinnabar belt is rough, with the hills lying mostly parallel and rising rather abruptly from a narrow valley to a height of from 100 to 300 feet.

The rock in the area is principally a hard sandstone. Assays taken from the surface have shown values from one-half of one per cent to three per cent mercury. Other assays from varying depths have shown values up to 36.60 per cent mercury. In some instances free mercury has been obtained in small quantities.

Method of Extraction.

During the hundreds of years of use of mercury, the process of extraction from the ore has passed through many stages. Today 90 per cent of the quicksilver ore mined in America is reduced in the Gould rotary furnace. With this type of equipment the reduction of cinnabar is simple. The ore is crushed to sizes that will pass through a half-inch to a 2 1-2-inch ring, then goes into a roaster, or kiln, heated to 400 to 600 degrees. During this roasting process the mercury fumes are liberated and passed into a condensing system, from which the pure mercury is drawn into 76-pound flasks, ready for shipment. The average price for this quicksilver is from \$75 to \$100 per flask.

It is the opinion of well-informed men that this cinnabar deposit in Pike and Clark counties in Arkansas is of vast importance to the owners, to the operators, to the state, the United States and to the world.

INCORPORATION MATTERS.
 Mercury Producers, Inc., a Delaware corporation with headquarters and principal offices at Murfreesboro, Pike county, filed papers in the secretary of state's office yesterday, qualifying as a domesticated foreign corporation. The company will use \$16,200 worth of property in exploration and development of quicksilver properties in this state. J. A. Miller of Murfreesboro was designated as statutory agent.
 The Pennsylvania Drilling Company of Pittsburgh filed notice of entry into the state and designated O. N. Warren Jr., a deputy in the secretary of state's office, as agent for service.

Survey of Cinnabar - Bearing Area Completed.
 Special to the Gazette.
 Arkadelphia, June 14.—The report of a survey of the cinnabar bearing area near here, made by the United States Department of the Interior, says "the district may prove important enough to alter considerably the United States quicksilver situation. This country produces but a small fraction of the quicksilver it consumes, and therefore any new source is of relatively great importance."
 The area where cinnabar has been discovered extends in a narrow belt about 30 miles in an east-northeast direction from Howard county on the west, across central Pike county, and into Clark county on the east. John C. Reed directed the survey.

Cinnabar to Be Mined on Large Scale
 July 24, 1935
Delaware Firm to Have Three Plants—History of Magic Metal.

By BOB THOMASSON.
 Murfreesboro—The Mercury Producers, Incorporated, a Delaware corporation, which has been admitted to this state, has started work on a large scale on the holdings formerly operated by the Southwestern Quicksilver Company, about 10 miles northwest of Murfreesboro.
 The personnel of the new company is as follows:
 Frank A. Vanderlip, New York, chairman of the board; J. A. Miller, Murfreesboro, president and general manager; Dr. G. P. McNaughton Miami, Okla., vice president; Charles A. Frankenhoff, New York, vice president; Ralph E. Root, New York, secretary-treasurer, and Frank A. Vanderlip Jr., vice president and assistant secretary-treasurer; M. J. Eunson, superintendent.
 If present plans mature, three plants will be in operation on this 586-acre tract of land within a reasonably short time. The mills will be located on what is known as the "Parker," "Parnell" and "Gap Ridge" hills, and will have a daily capacity of two or three hundred tons, employing 150 or 200 men.
 A tunnel is now being driven from the south through the Parnell hill and will be about 1,000 feet in length and 185 feet from the top of the shaft to the tunnel level. This method of mining has not been used heretofore in this district, but the handling of the heavy ore will be both expedient and economical.
 This company has offered no stock for sale and will not have any for sale, it is reported, as the men connected with this enterprise are well known in financial circles and Wall street, and the first large scale development program in the cinnabar region is now under way. Yet the holdings of Mercury Producers, Inc., are but a small part of the cinnabar vein, which is known to be 30 miles long and one mile wide, making a total of nearly 20,000 acres in the area.

Cinnabar.
 Since the term cinnabar is not as commonly known to the general public as lead, zinc, gold, etc., it seems logical to define the meaning of the word. Almost every one is familiar with and knows by sight, the appearance of quicksilver or mercury, in its pure form. This precious metal is found in its deposits, usually in the form of deep, ruby red crystals, shot into porous rock, forming an ore called "cinnabar." Webster describes it as "red sulphide of mercury." From cinnabar ore, by methods of extraction, especially designed and adapted to this class of ore, comes the pure quicksilver, or mercury.

Early Uses of Mercury.
 Historically quicksilver was known at least four centuries before the Christian era. The first mention of it seems to have been made by Aristotle, who spoke of it as "Liquid Silver." In China there are records of use of vermilion ink and paint, also the fluid metal, about 400 years B. C. Mercury's use for amalgamation seems to have been known about two thousand years ago.

Modern physicians used mercurial ointment and bichloride in treating its hand other skin diseases over one thousand years ago. Mercury was used in determining the pressure of the atmosphere as early as 1643. This feat marks the introduction of quicksilver into scientific research by the invention of the barometer. In 1720 Fahrenheit invented the mercury thermometer.
 American production appears to have begun in Santa Clara, Calif., as early as 1824, and this first American mine has been worked continuously since 1846. Since 1799 quicksilver has played another part of prime importance in the history of nations, due to the invention of fulminate of mercury by Howard in that year. No modern war can be fought without its aid and the blasting cap is a necessity in mining.

Present Uses of Mercury.
 The uses of mercury are certainly well enough established, and over a sufficient period of time, to place mercury mining and reduction in the class of basic industries. Some of the important uses of the metal today are the recovery of gold and silver from ores by amalgamation, the manufacture of fulminate for explosive caps, of electrical appliances and scientific apparatus, vermilion, felt, anti-fouling paint for ship bottoms, and wood preservative, and much is used in the manufacture of drugs in over 400 preparations.

It appears that with the new uses being discovered there is no great danger of the supply so far exceeding the demand that mercury production will ever become unprofitable.

Production and Consumption.
 Since 1850, America and Spain have been the most consistent producers. Italy comes next with heavy production during the past 25 years and now far exceeds America. California is America's leading mercury state, with some production in Oregon, Washington, Arizona, Nevada and west Texas. With the recent discovery in Arkansas, this state is added to this list and may in time become the most important.
 All American mines to date have operated on comparatively low-grade ore, running only seven or eight pounds of mercury per ton, while it is believed that the average will be far above 20 pounds to the ton in the Pike and Clark counties district.

Between 1850 and 1917 California alone produced \$101,992,560 worth of quicksilver of which there is a record, and one can only speculate on how much more there has been of which there is no record available. America, by a wide margin, is the largest consumer of mercury, with Germany and the British Empire coming next. Neither of the last two is a producer. This fact would seem to place America in a preferred position from the producer's standpoint.

Topographical Formation.
 The area under discussion is located in Pike and Clark counties in south Arkansas, about 10 miles north of Murfreesboro. The land around the mineralized zone is comparatively smooth, but the cinnabar belt is rough, with the hills lying mostly parallel and rising rather abruptly from a narrow valley to a height of from 100 to 300 feet.
 The rock in the area is principally a hard sandstone. Assays taken from the surface have shown values from one-half of one per cent to three per cent mercury. Other assays from varying depths have shown values up to 36.60 per cent mercury. In some instances free mercury has been obtained in small quantities.

Method of Extraction.
 During the hundreds of years of use of mercury, the process of extraction from the ore has passed through many stages. Today 90 per cent of the quicksilver ore mined in America is reduced in the Gould rotary furnace. With this type of equipment the reduction of cinnabar is simple. The ore is crushed to sizes that will pass through a half-inch to a 2 1/2-inch ring, then goes into a roaster, or kiln, heated to 400 to 600 degrees. During this roasting process the mercury fumes are liberated and passed into a condensing system, from which the pure mercury is drawn into 76-pound flasks, ready for shipment. The average price for this quicksilver is from \$75 to \$100 per flask.

It is the opinion of well-informed men that this cinnabar deposit in Pike and Clark counties in Arkansas is of vast importance to the owners, to the operators, to the state, the United States and to the world.

CINNABAR MINING AROUSES INTEREST
Rapidly Become an Important Industry of Southwest Arkansas.
 Sept. 8, 1935

Much interest is being displayed regarding the cinnabar mine south of Amity, Clark county. Many persons who recently have visited these mines see prospects of one of the greatest mining developments ever undertaken in southwest Arkansas.

The Amity Quicksilver Company is going ahead with arrangements for heavy production. On a head frame 50 feet high the ore is hoisted from the 50-foot shaft. The ore is dumped automatically from the carriage, and is carried to the crusher by gravity. After the run through the crusher it is carried by trucks to the refining plant at Amity. The refining plant is nearing completion and will be ready for business by the time the crusher is installed.

Shaft to Be Extended.
 The shaft is being sunk deeper. Later it will branch out with tunnels following. The ore will be brought into the main shaft in cars. This work is done by a large steam engine that stands at the foot of the head frame. This engine operates the hoist, the pump that carries the water from the pit, and the crusher.

A large sawmill on the site furnishes lumber for the plant and other building purposes. Messers Garrett, Vanduff and Wheelers have charge of the work at the mines, while Rex Evans has charge of the refining plant.

Workmen in the shaft uncovered recently a vein of cinnabar ore two feet across and in a V shape, which means that it will get wider as the shaft proceeds. It is said that the ore will run 50 per cent pure cinnabar.

Refining Plant Rumored.
 There is a rumor that the Mid-Continent Cinnabar Company will begin installing a large refining plant at its mines soon. This would eliminate trucking the ore to the Yount plant between Kirby and Murfreesboro which has been done for some time. This company is working the Bemis mines, purchased from the Bemis estate. It is said to have an inexhaustible supply of cinnabar.

FOUR FIRMS WORK IN CINNABAR AREA

Early Intensive Development of Deposits in Three Counties Forecast.

Special to the Gazette, 9-29-35
 Prescott, Sept. 28. — Early intensive development of Arkansas cinnabar deposits in Clark, Pike and Howard counties is forecast by preparations being made by the four companies holding leases in the field.

Mercury Producers, Inc., has an option on about 1,000 acres in the west end of the field and has installed a 20-ton Gould plant. Louis & Funk have a lease on 7,000 acres, are prospecting in three different areas and have contracted for a 20-ton plant. Atlas Quicksilver Company has leased 600 acres north of Graysonia across the line in Pike county and is working 25 men. The Mid-Continent Quicksilver Corporation which in March leased 1,900 acres in the east end six miles northeast of Graysonia, is installing a 50-ton plant on the bank of Antoine river.

Field 43 Miles Long.
 The proved field is 43 miles in length east and west and from a few feet to a half-mile in width. Deposits of the quicksilver bearing ore cinnabar have been discovered in the east end from the surface to a depth of 124 feet, while the depths in the west end range from the surface to 238 feet deep.

One of New Reducing Plants



Proven territory near the Antoine river is known as the east and that near the Little Missouri river as the west end of the field. The entire field is on a row of hills commonly called the "Hump-back ridge," and extends from a point seven miles east of the Antoine river in Clark county across Pike county and to a point 18 miles north of Nashville and seven miles west of the eastern boundary of Howard county.
 Cinnabar deposits in the west end are found in either sandstone formation or the Stanley shale while that in the east end is in the Jackpot sandstone. The ore-bearing stone is drilled and blasted with dynamite, the drills being operated by compressed-air hammers or drills, and the deposits or "muck" hauled in trucks to the treating plants. The average production in the field is 15 pounds of quicksilver to a ton of "muck." The rock is crushed to a half-inch in diameter, heated to a temperature of 1,675 degrees Fahrenheit and the mercury or quicksilver passes as a vapor into condenser pipes over which water is sprayed, and comes out as a liquor in large redwood tanks. The fumes, which are poisonous, enter the condensers at a temperature of 450 degrees F.

Plant Costs \$100,000.
 The Mid-Continent Quicksilver Company by November 15 will have expended more than \$100,000 since March 15 in building a plant, its general manager, Leo Yount, says will be the best quicksilver production plant in the world. This company has 2,200 feet of tunnels, one running through a hill, the maximum depth of the tunnel being 124 feet. These tunnels are lighted by electricity and are piped for compressed air to be used in the operation of drills. Fans are being installed to furnish pure air in the tunnels and mines.

This company is building a bin which will hold 550 tons of rough ore, and two Diesel engines are being installed to furnish lights. Fuel oil from the Arkansas oil fields will be used in the mammoth Herrshoff reduction furnace. Eight jack hammer crews are working in the field and in all 75 men are rushing the construction of the new plant. Water will be pumped from the Antoine river to the plant, a distance of 408 feet.

It is estimated that in the last four years \$210,000 worth of quicksilver has been produced in this field and sold. The metal is shipped in flasks weighing 76 pounds to the flask and has brought an average price of \$70 per flask. More than \$20,000 worth of metal has been mined and sold from a pocket on the Mid-Continent lease which measures 30 by 50 feet and is 35 feet deep. Yount said he estimates his company has a five-year run in sight following the first year's run when the plant will operate only half time.

Survey Will Reprint Article on Cinnabar

Reprints on an article on "The Cinnabar Deposits in Southeast Arkansas," appearing in the January-February issue of Economic Geology and the Bulletin of the Society of Economic Geologists, will be secured by the Arkansas Geological Survey and will be available from that office, Dr. George Branner, state geologist, said today.

The report covers 28 pages in the magazine and includes 10 illustrations. It was prepared by Noel H. Stearn of St. Louis, formerly connected with the Arkansas survey.

New Deposits Of Cinnabar Are Reported

Amity—New impetus was given cinnabar mining in this vicinity last week by the discovery of a new field of cinnabar, or mercury ore, in section 1, township 7, range 23, west, on Jack mountain about seven miles miles southeast of Amity, and east of the now producing mines of the Midcontinent Mining Corporation and the Rich Mountain Co.

The discovery was made by Noah Higgins, who is prospecting for the Midcontinent Company and the Funk & Lewis Company.

Also another discovery in section 34-7-23, which is said to be on property belonging to capitalists in St. Louis, and made last week.

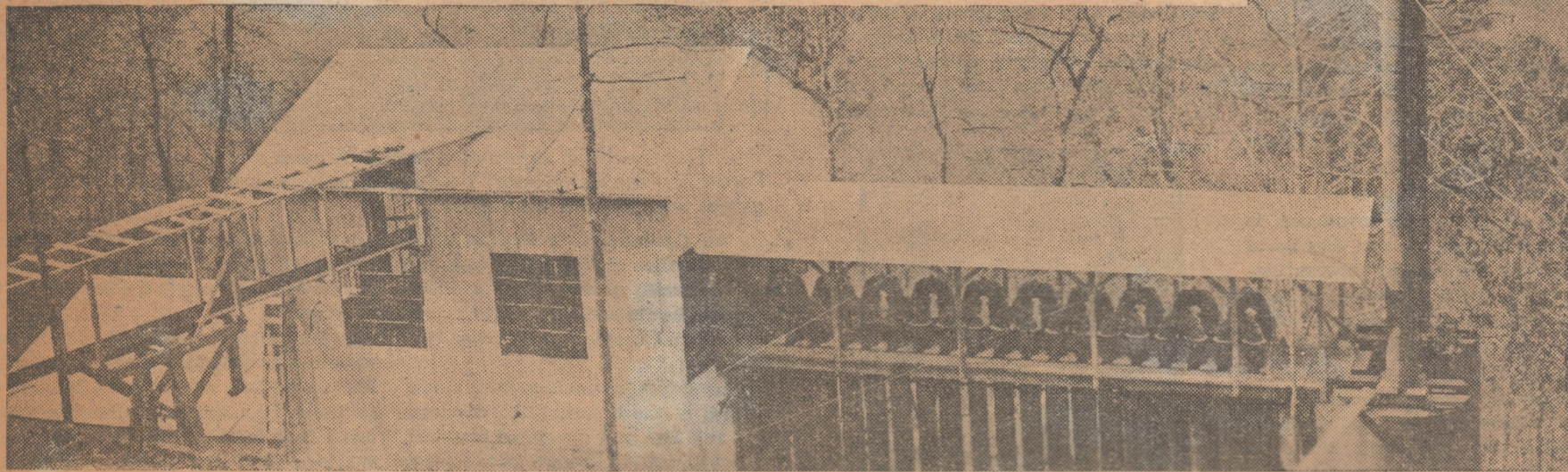
Much of this land on which these discoveries have been made belongs to the Southern Kraft Paper Co., and has not been leased for mining except parts of the territory, which it is understood the Funk & Lewis Co. has leased. All of the newly discovered cinnabar beds lie in Clark county.

The Midcontinent Company which took over the Bemis holdings, is going ahead with production. This company recently erected a \$50,000 plant at its mines which lie in Pike county, and is said to be now working in newly discovered lead of ore that is rich in quicksilver.

New Discovery of Cinnabar In Clark County.

Special to the Gazette.
 Arkadelphia, March 28.—A new discovery of cinnabar between Amity and Arkadelphia, in Clark county, has encouraged promoters. Noah Higgins, prospecting for a company, found a rich strike seven miles southeast of Amity, on Jack mountain, in Section 1, township 7 south, range 23 west. Another discovery was made on property of St. Louis capitalists in 37-7-23. Some of the ore assays 35 to 40 per cent. The Amity Quicksilver Company, closed for several weeks, is preparing to resume operations. Its holdings are four miles south of Amity, also in Clark county.

Mining Mercury **IN** Western Arkansas

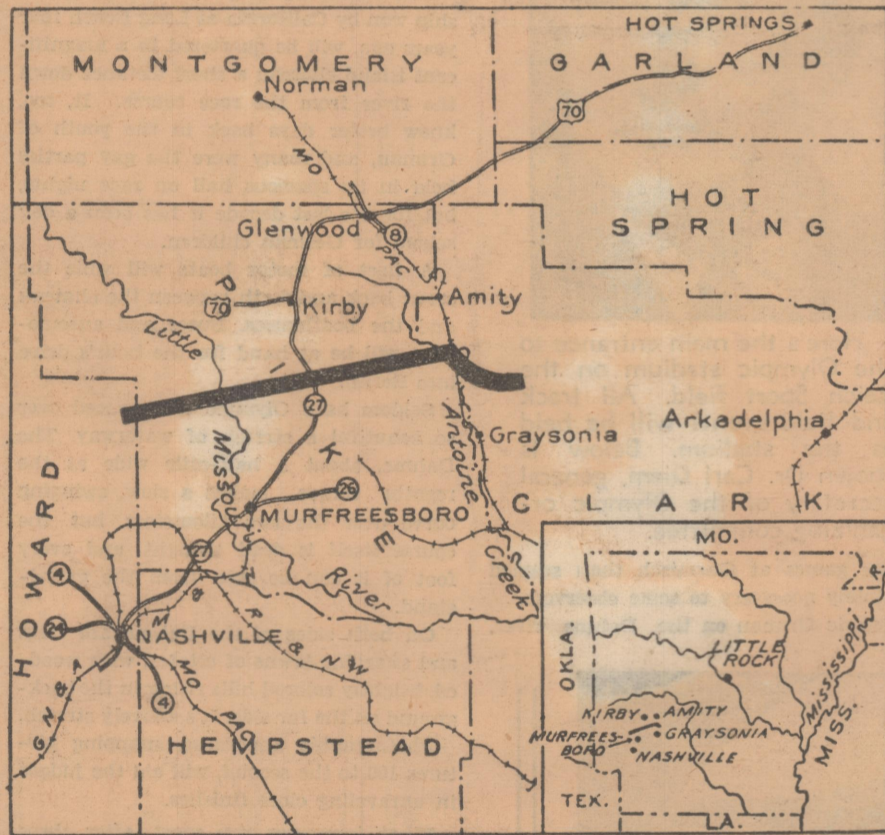


Located on Antoine Creek, Is a Reduction Plant Where Mercury Is Made by Condensing the Vapors Produced by Heating Cinnabar Ore.

By HOWARD A. MILLAR

It is almost universally true that when an important mineral discovery is made, it is by accident or by one entirely untrained in mineralogy and geology. In the latter case, the discoverer usually possesses some kind of intuition that this or that rock may contain minerals or metals of unknown richness and he generally seeks someone who he believes can enlighten him as to its value. The trained geologist and mining engineer, in making an examination of the same area, often will fail to make the discovery.

That prospectors have been searching for quicksilver in Arkansas for nearly 50 years is evidenced by the fact that quicksilver lode claims were filed in Pike county as early as 1897. While farmers constructed rock fences of cinnabar ore around their hillside farms many years ago, ignorant of its value, and section hands of the Missouri Pacific railroad ballasted the tracks near Amity with rocks containing the ruby-red crystals, its identity remained unknown until a mountain boy brought into



Map of cinnabar district now being developed.

Kirby a piece of rich cinnabar ore that he had found near Cowhide creek. He gave it to a prospector, who sent it to an analytical chemist, who pronounced it to be cinnabar, or the sulphide of mercury. This was in June, 1931.

The discovery was made in the rough hilly country known as the Athens plateau, which marks the foothills of the Ouachita range of the Ozark mountains. The principal outcroppings of cinnabar occur along the flanks of a low broken ridge that traverses this plateau from Howard county on the western extremity, across Pike county and into Clark county, a distance of over 30 miles. Developments may extend this length, as new discoveries are constantly being made.

Cinnabar is readily identified by its ruby-red crystals which sometimes are very small crystalline grains filling cracks, fractures and pore spaces in the sandstones. Every schoolchild in the district recognizes it now on sight. Free mercury

in small spherical globules is found in rare instances, as are some of the more common mercury minerals.

Geology tells us that the origin of cinnabar was hydrothermal, usually occurring in locations near where evidences of volcanic action or hot springs are found. The ascending waters, laden with mercury vapors, followed the fractures and crevices in the rocks. Cooling and release of pressure caused the crystallization of cinnabar in these depositories.

Hot Springs is less than 50 miles north; 10 miles to the south occur volcanic craters.

The rocks carrying cinnabar without exception are shattered and broken up, usually walled upon one side by shale, which, being finegrained and impervious, rarely carries any values in cinnabar.

The formation of the ridge, caused by the mountain-making forces in Pennsylvanian time, in which the cinnabar is found, consists chiefly of alternating bands

The condensing system of quicksilver reduction plant on the Antoine.

of sandstones and shales that have been steeply folded until they now stand almost vertical with an average dip of more than 75 degrees. The softer formations of shale naturally erode much faster than the more weather resisting sandstone members, thus the valleys and gullies and the lower surface levels are composed of shale; while the ridges, peaks and higher altitudes consist mainly of sandstones. Many of these folded bands of sandstone are distorted and twisted from faulting until the strike of the rock bands is sometimes found running at right angles to the main segments of the ridges. Much of the faulting was minor thrust faults that caused some of these sandstone bands to be broken and fractured, leaving spaces where the quicksilver vapors could crystallize. The source of these mercurial vapors was doubtless in volcanic strata many hundreds of feet below these sandstones.

The value of cinnabar ore depends upon the amount of red crystals in it. There are great variations in richness, some being extremely high grade. This carries as much as 50 per cent in mercury. Such specimens are not plentiful, but the bulk of the Arkansas cinnabar is much higher grade than that found now in other districts in the United States, as most of the quicksilver for the past century has been reduced from ores that contained less than one-half of one per cent, or in quicksilver parlance, less than 10 pounds of metal to each ton of rock. Arkansas cinnabar averages slightly under 20 pounds of quicksilver to the ton of ore.

Mercury is one of the easiest metals to extract from its ore. It is our only metal liquid at atmospheric temperature.

Mercury or quicksilver (as it is commonly called) when heated to a temperature exceeding 824 degrees F. is transformed into a colorless, odorless but poisonous vapor, or gas. This gas, upon cooling, condenses back into the liquid metallic state at ordinary atmospheric temperature.

Many kinds of apparatus using this principle have been devised. One is a simple pipe retort filled with broken ore and closed at the ends, with a small tube leading the vapors into a vessel of water. The retort usually is heated in a pine knot fire for several hours. The modern multiple-hearth rabble-stirred furnace plants are heated by oil. The ore in these furnaces is crushed to one inch and less and is fed into the furnaces at the top and stirred around inside the roasting chamber by rabble teeth until it drops from the top hearth to the next lower one and so on until it reaches the bottom of the furnaces, (Continued On Page 15.)

having traveled slowly for an hour and 40 minutes in an automatic-controlled temperature of 1,500 degrees that liberates every bit of mercury in a gaseous form. The gas is drawn off continuously by a draft fan through dust collectors into a condensing system. Finally the gases pass through washers where the last trace of mercury vapor is condensed and other gases pass out into the atmosphere through wooden stacks. One of these modern plants is now working 24 hours a day in the Arkansas field.

Quicksilver is one of the most useful of our rare metals and is needed in nearly every line of manufacturing. Some of its principal uses are for drugs and chemicals, for detonators for explosives, for recording instruments and gauges, for the manufacture of vermilion and paints, for germicides, for use in refining oil, for power plants in the mercury turbine, for the manufacture of felts, for electrical apparatus and a great many other things.

As the United States imports more than two-thirds the amount of quicksilver it consumes, and since mines on the West

coast that have furnished much of the domestic production for the past century are now being rapidly depleted, it makes the virgin Arkansas quicksilver district of major importance, because of the richness of the ore being mined and because of the large area that it covers. It already has produced several thousand flasks. A flask contains 76 pounds of mercury and is the standard unit of measurement. The present market price of quicksilver is \$77 per flask, or slightly more than \$1 per pound.

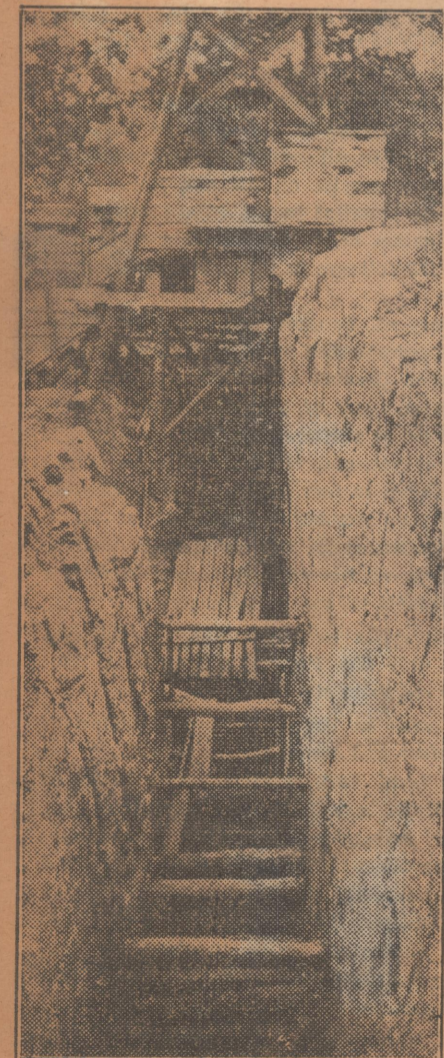
New Cinnabar Deposits. Arkadelphia—Cinnabar has been discovered in two new places in Clark county, according to Noah Higgins of Amity. One is on Jack mountain, 12 miles southeast of Amity, on land owned by the Camden Paper Mill Company, and the other is said to be on Chalybeate mountain. Jack mountain is 20 miles from Arkadelphia. Development of its cinnabar property in Clark county has been begun by the Midcontinent Company. Cinnabar is the ore from which mercury is extracted.

2 New Cinnabar Are Reported Both Are Said to Be Located in Clark County

New discoveries of cinnabar in Clark county have been reported by Noah Higgins of Amity. The locations are on land owned by the company that operates the paper mill at Camden and by a St. Louis firm. One of the finds is 12 miles southeast of Amity on Jack mountain. This is 20 miles from Arkadelphia. The other discovery place was not divulged other than that it is on Chalybeate mountain. The Midcontinent Company has begun operation on their property in Clark county.

New Mining Company Seeks State Charter. The Miller-Kanady Mining Company of Murfreesboro, Ark., filed petition for a charter today, giving its principal office as Miami, Okla., and its principal place of business at Murfreesboro. It listed \$300 as its capital stock. Incorporators are W. C. Miller, Gerald E. Miller, G. Herald Kanady, and Edwin P. Kanady of Miami, Okla., and G. H. Kanady of Murfreesboro.

INCORPORATION MATTERS. Articles of incorporation were filed in Secretary of State C. G. Hall's office yesterday by the Sevier Mining and Smelting Company of De Queen, showing \$1,000 as capital with which the firm will begin business. Incorporators were shown as C. A. Archer, C. C. Hanchey, W. T. Harrell, J. E. Harrell and Leonard Lee, all of De Queen.



Open cut mine of quicksilver located west of the Little Missouri river in Pike county.