Pioche, Nevada.

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By JAMES W. ABBOTT.

Pioche, the county seat of Lincoln county, Nevada, is situated 28 miles almost due north by wagon-road from Caliente, a station on the San Pedro, Los Angeles & Salt Lake Railroad, better known as the Clark road. It is expected that a branch line now in process of construction from Caliente will be opened to Pioche in September of this year, when the town will be 352 miles by rail from Salt Lake City and 485 miles from Los Angeles.

Leaving Caliente, a picturesque town at 4,400 ft. altitude, the branch railroad runs for about two miles through a canyon. This widens out into Meadow valley, which ends 18 miles above Caliente in an oasis of trees and green fields, the site of an attractive agricultural settlement known as Panaca. Again the line penetrates a canyon, very narrow in places and about three miles long, when Duck valley is entered and followed to an opening on the northern slope of the Pioche spur of the Ely range. From the valley there is a gentle rise to the town of Pioche, which lies at an altitude of about 5,800 feet.

After the vicissitudes that marked the early history of the Comstock had passed, and a daily overland stage service over the central route had been established, Nevada secured from the mining world that intense interest which had been given to California. In spite of arid climate, hostile Indians, absence of railroads and settlements, the adventurous prospector gradually scattered over Nevada; the camps of Austin, White Pine, Pioche, and Eureka, with a score of smaller ones, sprang into life and added their record to the growing frenzy. Next to Viginia City, with its world-renowned bonanzas, Pioche was for years the most famous mining camp of that period.

William Hamblin, one of Brigham Young's missionaries to the Indians, was visited at his home near St. George, Utah, in the fall of 1863, by a delegation of his wards, who had brought with them some *panacare*, which in their language meant 'silver ore.' He soon closed a bargain to pay them for their information, and going with them found and located the Panacker lode, which was his phonetic interpretation of the *panacare*. Hamblin returned home, told of his find, and brought in other prospectors, who made locations.

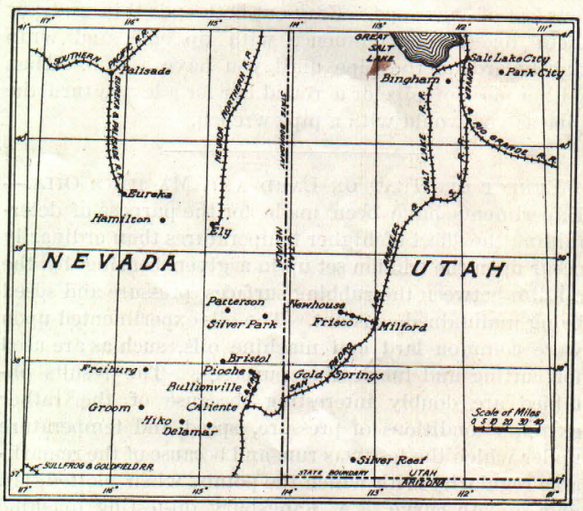
For years Indian hostilities delayed the opening of the camp, but each year visits were made to it and many of the locations were kept alive. In 1868 F. L. A. Pioche deputed Charles E. Hoffman to purchase for him some of the rich claims. Pioche was a native of France, an argonaut of '48, and reputed to have become very rich. Hoffman was a metallurgist of considerable note. He secured for Pioche some of the best claims, which the latter conveyed to the Meadow Valley Mining Co., a corporation organized by him for that purpose. This company soon acquired other properties and became one of the two principal factors in the region, and Pioche's camp came to be known as Pioche.

John H. Ely and William H. Raymond, who had been operating unsuccessfully in a district considerably farther south, came in a little after Hoffman and secured an option on the Burke claim, which soon developed into a high-grade mine. They then organized the Raymond & Ely Mining Co., which at once became the great rival of the Meadow Valley.

The surface ore was principally horn silver (chloride), argentite (silver sulphide), galena (lead sulphide), and cerussite (lead carbonate), in varying proportions. Naturally the first attempt to reduce them was with crude furnaces. The necessary material for these was packed on mule-back from Elko on the Central Pacific railroad. It had come by way of San Francisco around the Horn, for the railroad still lacked hundreds of miles of a connection with the Union Pacific. The fire-bricks came from Glasgow, Scotland, and were said to have cost over a dollar apiece.

It was a most wasteful process, but the ores were so rich that it yielded a profit. Hoffman had added another furnace, a Frenchman named Chubar had erected one, and so had Raymond and Ely, before everyone realized that the excessive cost of fuel and fluxes, of shipping the lead-silver bullion to distant refineries that levied heavy charges, and the impossibility of obtaining sufficient lead to recover all the precious metals in the rapidly increasing output of ore, necessitated the adoption of some other method.

Raymond and Ely brought in a five-stamp mill that they had used in their southern operations, and erected it near Panaca on a natural millsite, which came to be known later as Bullionville. It was a crude affair, crushing wet, with 750 lb. stamps, vats, pans, and settlers. The ore was simply crushed and amalgamated



Map of Eastern Nevada.

in the pans, without chemicals or heat. For many months they crushed ten tons per day, half the precious content went into the tailing, there was a cost of $30 per ton (which probably included mining and hauling), but there was a daily profit of $900, and the Raymond & Ely Co. prospered greatly.

The Meadow Valley Co. erected an elaborate 20-stamp mill at Dry valley, 10 miles east of Pioche, at a cost of $100,000. Their metallurgist was Alexis Janin, who had acquired valuable experience at White Pine. Here the regular Washoe process was practised with salt, copper sulphate, and heat, but the ores were treated raw. The amalgam was strained in boiling water. At this temperature the lead, remaining liquid, comes through with the quicksilver and a much higher grade of bullion is produced. As the lead amalgam cools, the lead crystalizes out, so that at the next straining, cold, the lead remains in the bag and lead bullion, low in silver and gold, is obtained.

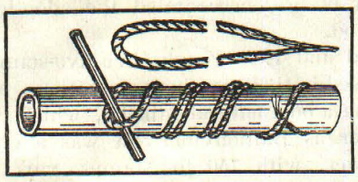
Production increased with astounding rapidity and with it a pathetic call for mills to treat the ore. The Pioneer five-stamp mill of the Raymond and Ely was followed by one of ten, soon enlarged to 20 stamps. Then came a custom 15-stamp mill with a Stetefeldt furnace in which the ore was roasted with salt to convert the gold and silver to chlorides. Then came another ten, the

in mind engineers having active relations with syndicates who can be fully depended upon for trustworthy advice. The personal equation determines their fitness or unfitness. In the search for a technical advisor it must be clearly recognized that the most reliable estimates of a professional man's ability can be obtained from members of his own profession.

HOWARD D. SMITH.

San Francisco, July 28.

EMERGENCY PIPE WRENCH.—A file, cold chisel, and monkey wrench make an efficient pipe wrench, except when the pipe is too large, such as a 5 or 6-in. pipe. In such emergencies the device here illustrated will be found



very effective, says the *American Miller*. Take three or four feet of new rope. Fray out both ends thin and put them together. Commence with tip ends and wrap tightly around the pipe until you have a loop. Then with a piece of pipe or a round bar for a lever, turn the pipe as you would with a pipe wrench.

EFFECT OF HEAT ON LARD AND MACHINE OILS.—Experiments have been made for the purpose of determining the effect of higher temperatures than ordinarily occur upon the friction set up in a given bearing by the oil film between the rubbing surfaces, pressure and speed being maintained constant. The oils experimented upon were common lard and machine oils, such as are used for cutting and lubricating purposes. The results obtained are doubly interesting, because of the rather extreme conditions of pressure, speed, and temperature under which the test was run, and because of the remarkable regularity with which the points, when plotted, fall on a smooth curve. A Kingsbury oil-testing machine was used, in which a vertical spindle ran between two opposed brasses in a bath of the oil under test, which was contained in a surrounding cylindrical case. The load on the bearing was applied by a heavy helical spring, passing through the side of the case and adjusted by a screw. The oil case and its attachments were mounted upon a hollow vertical spindle free to turn on the frame of the machine. The moment of friction of the journal tending to rotate the case was balanced by the torsion set up in a tempered-steel wire by which the hollow spindle was supported, and the displacement of the case was read off in degrees from a circular arc on the frame of the machine. Heat was applied to the case and contents by means of a gas flame. The results showed that up to 180° F. the coefficients of friction of both the lard and machine oils ran nearly togther, the difference being about 3% in favor of the machine oil. As the temperatures increased, producing a corresponding decrease in the viscosity of the oils, the plotted curves showed that the friction coefficients become less, reaching a minimum at 190° for the machine oil, but continuing to decrease as much as 10% more with the lard oil, the curve becoming nearly asymptotic to the temperature axis, and showing no signs of change up as high as 280°. Evidently above 190° the machine oil disintegrates, and the film between the bearing surfaces begins to break down; hence the friction increases very rapidly with the temperature.

Benitoite.

This is a new gem mineral determined and described by George Davis Louderback, associate professor of geology in the University of California.

As the investigation has shown that it is a new mineral species, it has been called benitoite, because it occurs near the headwaters of the San Benito river, in San Benito county.

The most striking characteristic of the mineral is its blue color, and selected crystals cut in the right direction produce a beautiful gem stone that rivals the sapphire in color and excels it in brilliancy. The color, however, although fairly characteristic, is not an essential property, for very commonly parts of a crystal are colorless, while occasionally perfectly colorless small crystals are found. The color also varies in intensity in different crystals or in parts of the same crystal. When pale it is a rather pure blue. When more intense it assumes a violet tint. In addition to this variation in color in different parts of crystals, there is a difference at any one point, depending on the direction in which the light passes. In other words, the mineral is strongly dichroic, the ordinary ray being colorless, the extraordinary, blue. A section cut parallel to the basal plane is practically colorless, while sections parallel to the principal axis show the deepest color. To get the finest effect, therefore, gems should be cut with the table parallel to the principal axis, and this is in contrast to the sapphire, which shows its color best when cut perpendicularly thereto. If such a section, cut so as to give the strongest color effects, be examined with a dichroscope, the contrast between the images is most striking. The image of the extraordinary ray being freed from the colorless image of the ordinary ray, presents a remarkable intesity of color, very much deeper, of course, than can be seen by looking at the mineral in any direction with the unaided eye. In the lighter parts this color of the extraordinary ray is a slightly greenish blue inclining to indigo as it becomes darker, and is very similar to one of the axial colors shown by some cordierites; but in the more highly colored or thicker parts it is an intense purplish blue.

The mineral has proved to be interesting from the standpoint of its chemical composition. Prof. W. C. Blasdale, who kindly undertook the chemical analysis, reports the following composition: SiO_2, 43.71; TiO_2, 19.32; and BaO, 36.97. Benitoite is then a very acid titano-silicate of barium, and stands in a class by itself, both as regards acid silicates and titano-silicates. The blue color of much of the material may be due to a small amount of titanium in the sesquioxide condition.

ALTHOUGH India has long been associated traditionally with gems and gem production, it yields at present but a small part of the world's supply of such minerals. All the gems produced in that country do not approach in value the unset stones and pearls imported, which had an average value of over a half million pounds sterling per year. By far the most important gems of Burma are the rubies. The blue sapphires formerly obtained in the Kashmir State appear to have been exhausted of late, and no records are procurable. Ruby spinel is a common associate of the true ruby in Burma both in the gravels and in the limestone rock, and is often mistaken for it. Another Burma gem stone is the red tourmaline (rubellite), and some attempts have been made to work it, as it is of fine quality. The data of production, however, are variable and imperfect. There is considerable garnet production in Jaipur, in the mica schists of Rajmahal; also near Sarwar in the adjacent State of Kishengarh.

Raymond and Ely 30-stamp battery, crushing dry, with its chloridizing furnaces, and still another 10 stamps. All of these were erected at Bullionville. The Dry Valley mill was enlarged to 30 stamps, a 10-stamp plant was built in Condor canyon, a 20-stamp in Pioche, and the Mendha 10-stamp at Highland, eight miles west. But these did not fill the needs and ore was sent to Silver Park, 42 miles to the north, and even to White Pine, 160 miles away.

A smelter was built at Bristol, 20 miles to the northwest to treat the rich ores of that locality, and later a stamp-mill with pans and settlers was erected, and still later another smelter.

All this activity meant life at full tide. The following are a few of the high lights in an intensely interesting picture: A daily line of six-horse Concord coaches carrying U. S. mail and Wells-Fargo express to the Central Pacific railroad at Palisade, through Hamilton (White Pine), a similar line to Salt Lake City, both operated by the famous Western stage-men, Gilmer and Salisbury; three daily lines, two of them running six-horse Concord coaches, to Bullionville; three lines of railroad organized to build into Pioche with the utmost possible speed; the Salt Lake City, Sevier Valley & Pioche railroad (a Mormon line), the Elko, Hamilton & Pioche (a Gilmer & Salisbury line), and the Palisade, Eureka & Pioche railroad (controlled by D. O. Mills), the Western Union telegraph to San Francisco by way of Palisade (Pioche was long one of the Western Union's principal Western offices), and the Deseret telegraph (Brigham Young's line), through Salt Lake City, 32 steam-hoists with their chorus of whistles, a fast freight mule-line running day and night, with regular stations for change of stock, carrying freight under contract for delivery in five days (with penalty for failure) from Palisade to Pioche (260 miles), a narrow-gauge steam freight railroad from Pioche to Bullionville, past the mills at Dry Valley and through Condor Canyon, two daily papers with Associated Press service, in the cemetery the graves of 78 men who died a violent death, 72 saloons, 3 hurdy-gurdies (dance-halls, two white and one variegated), 32 *maisons de joie*, with intimate correlation in the last four items, two good theatres, two breweries, two gravity water-systems with street mains and fire plugs, and two hose companies, a livery stable with 300 horses, and a population in Pioche and immediate vicinity of about 10,000 people.

The Pioche range is an east and west anticlinal fold, about fifteen miles in length with Pioche near its centre, joining on the west the Highland range, the general direction of which is a little west of south. The formation normally consists of Cambrian quartzite below, shale in the middle, and limestone on top. The composition, texture, and metamorphic condition of each member differs in different places, but the quartzite is hard and tough, so that there is little tendency to disintegration either at surface or underground.

Facing the town, there is a typical fissure-vein; it runs nearly east and west, approximately parallel to the anticlinal fold in the quartzite, which has been raised between two fault-planes to a height considerably above the flanking members. This vein splits.

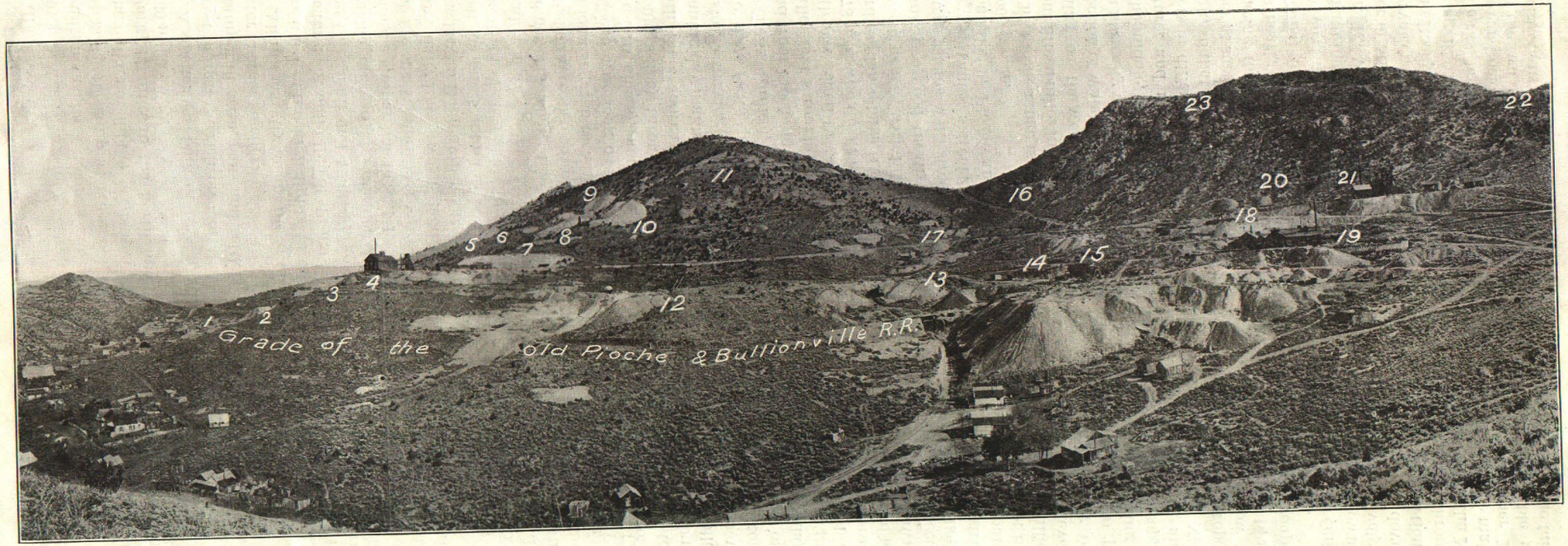
Dr. R. W. Raymond, then United States Commissioner of Mining Statistics, visited Pioche in 1872 and his observations are recorded in 'Mineral Resources West of the Rocky Mountains,' 1873, pages 176 to 180. Imagining his reader standing on the surface where this vein forks, he says: "Behind him rises the mountain, before and below him clusters the town of Pioche. To the right the two divergent branches of the vein are thickly set with shafts and hoisting works. They differ in their course about twenty degrees. To the left (west) the single vein continues, barring a break, caused by a barren cross-course of brecciated mineral mischievously interjected by nature to help the lawyers. West of this bifurcation the Meadow Valley Co. holds 340 ft.; east of the same point the same company holds 1,520 ft. of continuous mining ground, through the whole of which the workings of the company extend, constituting a magnificent mine. Next to the Meadow Valley mine on the west comes the Panaca mine of the Raymond & Ely Co., containing the most remarkable body of high-grade ore now to be seen on the Coast."

Several hundred feet south of this vein, between it and the top of the mountain and also running approximately east and west, is a porphyry (rhyolite) dike, which has probably played a controlling influence upon the formation of all the orebodies in the hill. Running into this dike in various directions, through it, across it, and alongside of it, are seams of all sizes and kinds. Upon the veins and seams above described were located the claims of the numerous companies whose varying fortunes constituted in the main the history of Pioche, a history so complex and involved that no analysis of it could be made in a short article. Remoteness from the railroad, the inevitable change in the character of the ore as depth was gained, legal controversies, quarrels about how the drainage should be handled, and the water problem generally below 1,200 ft., frenzied gambling on the San Francisco Stock Exchange, the failure of the Bank of California in 1875 (which bankrupted the principal stockholders in both the great companies) were all contributing factors in the decadence and final paralysis that followed the boom.

A new day has dawned for Pioche. When the railroad comes the mines will again be opened. Large bodies of ore that could not be handled profitably in the early days are still left in the various properties. Much virgin ground exists above the water-level, the vein dips toward the porphyry dike, in which splendid bodies of ore were disclosed before the pumps were pulled. What is to be found where the vein and the dike join will not be known until the junction is reached, but there is reason to expect important orebodies. The old dumps at Bullionville, Dry Valley, Condor Canyon, and the mines of the district possess ore known to be worth $5,000,000, and this material will all be profitably treated. What the district has actually produced in money received for ore and bullion will never be known. There is good reason to believe that it exceeded $40,000,000. This came principally from high-grade ore. The new Pioche will be able to produce a large tonnage, with all facilities for handling medium-grade complex ores. Gold, silver, lead, copper, and zinc in large quantities are now found in Pioche and its tributary camps.

The Nevada Utah Mines & Smelters Corporation owns the property once held by the Raymond & Ely and Meadow Valley companies, including some of the best mines in the Bristol district, the Half Moon and Manhattan groups, and its joint holdings with the Ohio Kentucky.

The Ohio Kentucky Mining Co. (a Newhouse corporation), owns a group of which the Susan Duster, a comparatively new discovery of great promise, has been most developed. A porphyry dike having no known connection with the main prophyry dike of the region runs through this property. The company owns jointly with the Nevada Utah some of the best of the old mines on the main porphyry dike. The Phœnix Reduction Co. (another Newhouse corporation), owns an extremely valuable group of silver-lead-iron claims near Pioche and the tailing piles at Bullionville and Dry Valley.



Panoramic View of Pioche, Nevada.

No. 1. Dump of No. 9 originally operated by the Pioche Mining Co. on the north, or Meadow Valley, branch of main vein.

No. 2. Meadow Valley No. 7 dump, on north branch of main vein.

No. 3. Dump of cross-cut tunnel to Burke mine, on south branch of main vein. Shaft obscured by shaft-house.

No. 4. Shaft-house over Meadow Valley No. 5, on north branch of main vein.

No. 5. Dump of Yuba, or American Flag, on the porphyry dike. A great producer.

No. 6. Dump of Arkansas, a cross-vein from the dike.

No. 7. Dump of the Washington and Creole, on the south branch of main vein.

No. 8. Dump of the Chapman, on cross-vein from the dike.

No. 9. Dump of the Huhn & Hunt, on cross-vein from the dike.

No. 10. Dump of the Mazeppa, on the porphyry dike.

No. 11. Dump of the Desdemona, a cross-vein.

No. 12. Meadow Valley No. 3 east of the fork, on north branch of main vein.

No. 13. Dump of the Newark, on the porphyry dike.

No. 14. Mouth of Zero tunnel running off toward the south.

No. 15. Ruins of hoist over Panaca shaft, west of the fork on main vein. Out of this shaft came most of the ore from which the Raymond & Ely Mining Co. paid 17 dividends, aggregating $2,115,000 between March, 1871, and September, 1872.

No. 16. Susan Duster hoist.

No. 17. Dump at mouth of Amador tunnel. The mine is now generally known as the Williams.

No. 18. Pioche West shaft-house. Belongs to Ohio-Kentucky.

No. 19. Nevada-Utah machine-shop and Pioche Water Co.'s lower tank.

No. 20. Alberta, one of the Ohio-Kentucky group.

No. 21. Shaft over the Independent, now used as Nevada-Utah No. 1.

No. 22. Upper water tank of the Pioche Water Co. About 400 ft. east of this tank the porphyry dike disappears under the shale.

No. 23. Here a porphyry dike crops out through the limestone.