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Concentrates.

SHELDON JACKSON'S Laplander reindeer scheme for carrying mails along the Yukon river is a total failure.

THE New York price of tin Oct. 1, '96, was 13 cents per pound. The New York price to-day is 25 cents.

A CUBIC FOOT of newly fallen snow weighs 5½ pounds and has twelve times the bulk of equal weight of water.

DENVER, Colorado's, Mining Stock Exchange is about to receive a badly needed shaking up and reorganization.

IN a 12-foot boat built with good lines, with a 12-inch propeller, a ½ H. P. engine should make six knots per hour.

THE New York City street railways in '98 earned $13 per capita population; those of San Francisco $13.90; in Chicago $9.95.

IT costs about $14,000 to patent an invention "all over the world." There are sixty-four countries in which a patent may be procured.

THE only effectual preventive of electrolysis of water pipes is to have the entire electric power circuit effectually insulated from the ground.

SULPHIDE ores contain a large percentage of pyrites or other sulphides; basic ores contain lime, manganese, baryta, or iron oxide; acid or siliceous ores, quartz, sand, or silica.

WOLFRAMITE is tungstate of iron, and is a black heavy mineral of iron color. Wulfenite is molybdate of lead and occurs in beautiful honey yellow to orange red tabular crystals.

THE exhaust of a gas engine can be muffled to make it nearly noiseless by connecting with an iron box or cylinder of say four gallons capacity, with several diaphragms of ⅛-inch mesh wire cloth.

A SINGLE BELT 1 inch wide traveling at a speed of 1000 feet per minute is capable of transmitting 1 H. P.; a double belt 1 inch wide traveling with a speed of 700 feet per minute has the same capacity.

SUCCESSFUL conversation has been carried on over telephone wires between Little Rock, Arkansas, and Boston, Mass., a circuit of 1900 miles; and between San Diego, Cal., and Boise, Idaho, a circuit of 2100 miles.

ACCORDING to *Comptes Rendus*, the latest determination of the speed of sound has been made by A. Leduc, who finds that the rapidity of propagation of sound waves through dry air at 0° C. (32° F.) is 1088.58 feet per second.

TIME was when a California State tax of 10 cents on transfer of mining stock certificates was a source of revenue to the California State Mining Bureau to the amount of $2500 per year, but the tariff was abolished some years ago.

PROBABLY the cause of the deterioration of aluminum mentioned by E. J. F. of Butte, Montana, is an impurity in its alloying. The presence of sodium even to the extent of only .3 of 1% will make aluminum susceptible of attack by water.

PRACTICAL electricians say that current from street railway wires should not be considered available for light or power purposes in any building. Insurance agents are shy of placing policies where such a dangerous practice is known to exist.

FORMULÆ for the preparation of flash-light powder for photographic purposes have been repeatedly published herein. The following, it is believed, has not been previously given: Magnesium, 40 parts; permanganate of potassium, 40 parts; peroxide of barium, 20 parts.

SINCE his return from the Transvaal, South Africa, Chas. Butters has put a great deal of personal effort into experimental cyanide work at Shasta, Cal., and Spencer, Utah, but says he is not yet ready to give out anything in the way of definite results. He is at present in London.

THE present effort of the California Anti-Debris Association in Nevada Co. is merely an effort to show cause for continuance of its attorney's salary. The California Debris Commission has sole and final federal authority, and was thus taken out of the local courts six years ago.

GRAPHITE, if very pure, is of commercial value as a lubricant for machinery, and of fine quality makes "lead pencils." It is nearly pure carbon. An interesting expert article on graphite written for this paper by the State Mineralogist of California, appeared in the issue of Feb. 4th, '99.

LIQUID AIR has been used for blasting purposes as an experiment by Linde of Munich, near Cologne, Germany, the trial being reported to be successful. Details are lacking, but Mr. Linde has gone to Switzerland, where the new method of blasting by liquid air is to be adopted in running the Simplon tunnel.

THE relation between one avoirdupois ton of 2000 pounds to one troy ounce is the same as that between one assay ton, 29.166 grams, and one milligram; so that if one assay ton of an ore sample is used in a gold assay the weight of the bead resulting therefrom in milligrams indicates the value in ounces per ton.

SOME Paris Exposition mining exhibit propositions take unique form, as, for instance, the Utah miners' scheme to furnish $346,000 gold for a life size statute of a favorite actress. The resultant advertisement to Utah and the actress would justify the fulfillment of the idea provided the gold could be definitely considered in the light of a loan.

ALL nitro-glycerine compounds freeze and become hard at about 42° F. A contrivance for thawing giant powder was described and illustrated in the issue of Dec. 24th, '98. An apparatus especially designed for such purpose is sold by dealers in mining machinery. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo., advertise such a device.

COLORADO advices are to the effect that above 8000 feet no snow has yet begun to melt. In some places over 40 feet of snow was reported. Traffic and general business has been resumed, and a big year is looked for. Throughout the California Sierras, generally, there was heavy snow. At the upper dam of the Tuolumne County Water Co. the depth was 12 feet, which, unless suddenly melted, should furnish abundance of water for the mines there long after the streams would have run dry. Like conditions are reported in Utah.

NOTICES are appearing in different California papers published in mining districts calling for miners' meetings to adopt the old mining district laws as to recording, etc., abrogated by the law of March 26th, '97, which was in turn repealed by the last California Legislature, thus permitting a reversion to the customs of the preceeding generation.

A NUMBER of grades recently made in hillsides on the sites of new mill or other mine buildings in California have been cut out by hydraulicking similar to the hydraulic mining method, the soil and loose debris being removed to bedrock. This has been done where the cost of preparation for the application of this method has not been too great.

IN a survey of mining claims upon which application for a United States patent is made, a surveyor may change his survey as marked on the land at any time before the return to the land office. But when an owner accepts a patent issued in conformity with the surveyor's return he waives all right to dispute the correctness of the boundaries as fixed by such return and the warrant.

TO FAIRLY and correctly state the relative advantages of roller mills and stamp mills would require an exhaustive treatise, and the conclusions would hardly be of general acceptance. The ore, its character, quality and amount; the locality and surrounding conditions go far toward determining which is best or more economical, and no general rule would apply to all local cases or requirements.

THE recent $5,000,000 organization of the North Star Mines Co. of Nevada Co., Cal., was, in connection with the North Star mine whose stock is to be listed in Boston, the same as Merced of Mariposa, Santa Ysabel of Tuolumne, and Pioneer of Placer, counties. Of the stock of the new New Jersey corporation $2,000,000 is to be exchanged for the North Star mine, and $500,000 offered to stockholders at $10 per share.

ELECTRIC currents have long been a disturbing element in observatories, it being found extremely difficult to separate in the record the variations produced by recorded changes in terrestrial magnetism from those caused by the trolley, and the former domain of the magnetic needle is seriously interfered with by the electric engineer. A correct and satisfactory solution of the problem presented has not as yet been reached.

CHLORINE and carbon dioxide have long since been liquefied—the former in its liquid form is used in the chlorination process in central California's leading gold producer, as narrated by that mine's superintendent in the issue of July 2nd, '98. All the elemental gases have been liquefied, even helium yielding to pressure, and the next advance in that direction may be the artificial production of solidified air, in blocks like any other inert mineral.

THE real economy of the electric motor does not lie in its ability to do any more work for each horse power than could be done by the steam engine, but in the fact that the power for many motors can be generated at one central station under conditions of much greater economy than can be secured in the locomotive or in small separate plants, and also in the greater efficiency, for special purposes, of a rotary motor over the reciprocating action of an ordinary steam engine.

A MINER was killed a few days since in the Norwegian mine in Tuolumne county, Cal., through the criminal practice of strapping timbers, lagging, etc., to the outside of the skip. The unfortunate man and a companion were near the bottom of the shaft when a plank which had been tied to the outside of a skip which was being lowered, becoming loosened, fell with the result stated. There is no excuse to justify this method of handling timbers or lumber in any mine.

ADMIRAL DEWEY'S "flag ship," the Olympia, is a "protected cruiser," 5800 tons, 340 feet long, 53 feet wide, with twin screws, each shaft driven by its own triple expansion engine. The normal coal supply is 400 tons. She was built by the Union Iron Works of San Francisco. The contract called for 13,500 H. P. On trial she developed 17,313. Her official trial speed is 21.68 knots. The total amount of power estimated as necessary for the Paris Exposition is 20,000 H. P., of which 15,000 is allotted for lighting and 5000 for motive power.

PRESIDENT MCKINLEY this week issued a proclamation setting apart 130,000 acres of land on the south side of Lake Tahoe, California, as a forestry reserve and public park. The proclamation defines the limits of Lake Tahoe forest reservation as follows: Townships 11, 12 and 13 north, range 16 east, Mount Diablo base and meridian, California; townships 11, 12 and 13 north, range 17 east, and south of township 11 north, range 18 east, as lies west of the Sierra Nevada range of mountains in El Dorado Co., Cal. Entries of lands already made are excepted from its reservation.

IN the case of Howeth vs. Sullinger, 45 Pacific Reporter, 840, the Supreme Court of California held that, "under the laws of the United States, Sec. 2324, which provides that the location of a mining claim must be distinctly marked on the ground, so that the boundaries can be easily traced, there is a sufficient identification of a lode claim where a stake or monument is placed at each corner, and at the center of each end, with one or more notices of location. It is immaterial that the lines and monuments of an official survey of a mining claim are not identical with those of the original location, the location being void only so far as it exceeds the statutory requirements."

A METHOD of depositing metals direct from the ore is reported from Germany, which is said to have proved so successful that a number of metallurgical works are to be equipped for this process of treating the ore. The process has been applied most for the refining of copper. The copper ore is first ground fine, then placed in a hot solution of copper chloride to dissolve the copper, silver, lead and nickel, and to change the solution to cuprous chloride. By the action of lime the arsenic, bismuth, antimony and iron are eliminated, and the solution, after being filtered, is passed into a receptacle divided by a diaphragm. Here electrolytic action occurs. The anode being carbon and the cathode copper, the copper of the solution is deposited in the cathode chamber, while the chlorine set free in the anode chamber combines with the solution to form cupric chloride, which serves to dissolve more of the copper ore. There is no loss of the solution, as the action is continuous. It is claimed for the process that the yield is far in excess of the usual methods, and that silver, lead and nickel are also obtained in a free state.

NO INFALLIBILITY is claimed for technical statements made herein, the idea being to attempt concise, correct answers to the great variety of questions asked. Where error is pointed out the mistake is cheerfully corrected, when manifest that a mistake was made. The exact technical nature of the information usually sought makes a high degree of exactness necessary for the answer to be of value, but at best and with the greatest care the result can only be approximately correct. Nor can answers be given immediately. It is always easier to ask questions than to answer them, and to properly answer an apparently easy question often takes considerable time.

NO PACIFIC COAST smelting company and no similar concern on the Atlantic coast is in the new smelter combine, which includes eighteen of the principal smelting companies in Illinois, Nebraska, Missouri, Texas, Colorado and Montana. It is understood that E. W. Nash is to be president, and S. B. Grant chief metallurgist, but this latter is not definite. It is stated that the policy of the combine will be to go slow as regarding the price paid miners for ores, looking rather to an advance price for the product. The total capacity of the combine is about 4500 tons daily. The main idea seems to be ability to fix the selling price of its product, and regulate the market itself, which is a comprehensive plan. The new arragements go into effect May 1.

MILL tailings at the Alaska-Treadwell mine average about 50 cents per ton. The concentrates are treated by the chlorination process, about 90% of the assay value being saved. Doubtless, as in other cases, a higher percentage might be saved, but where 90% is saved at a profit, it is more satisfactory from a commercial point of view than to lose money saving an extra 5%. There is no data to hand since the 520 new stamps began operations last month, but it is learned that during the preceeding ten years the mill crushed 2,536,013 tons ore, yielding $5,705,697.30 in free gold, and $2,183,170.64 in concentrates. During that time the average cost of mining and milling was $1.47 per ton, and, at times, the cost of milling was 30 cents per ton. During the ten years mentioned the aggregate profit was $4,167,154.99.

OF the 147,403 square feet of space allotted to the United States for display purposes at the Paris Exposition, 8000 square feet have been set apart for mines and mining, and 48,000 square feet to machinery and appliances allied to the mining industry. There are to be two distinct mining exhibits: one on the surface and one underground. The space above ground is for the display of mineral specimens and ore-separating machinery. Underneath the hill on which stands the Trocadero will be an exhibition of underground mining. What a revelation it would be to millions were such an exhibition of California hydraulic mining fitted up and shown as that which constituted so great an attraction at the Mechanics' Pavilion in San Francisco on the occasion of the Golden Jubilee and Mining Fair in February, '98!

POWDERED coal is utilized in the production of steam. Coal ground to pass through a 60-mesh screen is fed into a hopper in front of the furnace. At the bottom of this hopper is a grating which can be agitated 150 times a minute. The powdered coal drops through the grate into the bend of an air supply pipe which enters the furnace at the top of the furnace door. As it falls an induced draught carries it into the furnace which is lined with firebrick a length of 10 feet, and has two firebrick bridges. There is no grate and no fire doors, combustion being observed through two small apertures. Some Berlin experiments resulted as follows: The dry powdered coal evaporated from and at 212° 9.12 pounds of water per pound of dry coal as compared with 6.48 pounds solid coal fed by hand stoking. It is known as the Wegener system. It is figured that grinding the coal costs about 10% of its first value.

THE chief liability to explosion in a horizontal tubular boiler and any externally-fired shell boiler is from overheating of the shell, due to accumulation of mud, scale or grease on that portion of the shell lying directly over the fire, or a double thickness of iron with rivets, together with some scale, over the fire, or to low water uncovering and exposing an unriveted portion of the shell directly exposed to the hot gases. Vertical tubular boilers are, mostly, liable to explosion from deposit of mud, scale or grease upon the lower tube sheet, and from low water allowing the upper part of the tubes to get hot and cease to act as stays to the upper tube sheet. Locomotive boilers may explode from deposits on the crown sheet, from low water exposing the dry crown sheet to the hot gases, and from corrosion of the stay bolts. Double-cylinder boilers have exploded on account of the formation of a steam pocket on the upper portion of the lower drum, the steam being prevented from escaping from out of the rings of the drum by the lap-joint of the adjoining ring, thus making a layer of steam about one-fourth of an inch thick against the shell which was directly exposed to the hot gases. In the absence of details it is impossible to state the cause of the recent boiler explosion at Seattle, Wash.

HOW TO TEMPER and magnetize steel rods was the subject of a "Concentrate" in the issue of the 15th inst. Another method is to wind three or more layers of insulated copper wire around the full length of the steel to be magnetized, leaving two ends of the wire exposed, which are then connected with either two or more batteries or to a dynamo current. The latter is considered best, as it will magnetize in a shorter time. Care should be taken to have the steel thoroughly clean, free from rust, dirt and other substances which are liable to prevent the charge from entering the steel with its full capacity to obtain the very best results. The best results may be obtained by annealing and polishing a piece of cast steel before charging it. Certain specimens of magnetite surpass most kinds of steel in their capacity of retaining magnetism. Specimens of magnetite from Moravicza, in Siebenburgen, recently tested, have been shown to possess a greater degree of permanent magnetism than steel manufactured by the puddling, Bessemer or Siemens processes, but are surpassed in this respect by certain crucible steels and by tungsten steel, a Westphalian specimen of the latter showing a permanent magnetic moment of 62 units, as against 37 for "diamond steel," 34 for Reschicza crucible steel, 29 for Martin steel, 15 for puddling steel and only 3 for Bessemer steel. In 122 days a rod of magnetite only lost 1.5% of its permanent magnetism.

Some Characteristic Features of Veins in Granite in California.

Written for the MINING AND SCIENTIFIC PRESS.

Skirting the foothills of the Sierra Nevada mountains in California are three well recognized and distinct mineral zones or belts. These are known as the west or copper belt, the mother lode and the east lode. They are approximately ten to twelve miles apart, converging somewhat northward. The copper belt also contains gold mines, but the central and east lodes are chiefly gold-bearing, though copper ores also occur in a few places. The veins of the east lode traverse slates, mica schist, quartzite, limestone and other metamorphic rocks, and also occur in diorite and granite or, more properly, in grano-diorite, and it is more particularly to the latter occurrence that attention will be directed. Granite areas in which gold-bearing veins occur are found in Riverside county west of Perris, in Madera county near O'Neills, in Mariposa county near Hite's Cove, in Tuolumne county near Groveland, and at Summersville and vicinity, in Calaveras county at West Point and vicinity, in Amador county at Pioneer, in El Dorado county at several localities, and in Nevada county at and near Grass Valley and Nevada City.

In the several granitic areas referred to occur a large number of veins, some of which appear entirely independent of all others, and in other instances are found systems of connected fissures which were evidently produced by a common cause. These veins have definite characteristics, and the ores are noticeably similar throughout the entire granitic region referred to. They are usually easily distinguishable by their physical appearance from the ores occurring in other formations, whether in the same vicinity or from some distant point.

The strike and dip of these veins in granite are not at all uniform, in this respect differing greatly from the veins of the central belt which almost universally strike west of north and dip easterly. In the granite areas the veins have no uniform strike, but are found from true east and west courses around to north and at all angles between them. The dip is no more uniform than the strike. Whatever the direction of dip of a vein it is usually not persistent at or near any particular angle, but varies from a low angle to nearly or quite perpendicular. Not infrequently, in depth a vein will dip in an opposite direction from that at and near the surface.

The veins occur along lines of fissuring. These fissures are found singly, in pairs and in many places as zones of fracture of varying width, comprising several fissures having an approximate parallelism. These fissures, singly and in groups, are often planes of movement, as evidenced by slickensides, clay and gouge seams. In many cases these zones of fracture are found to consist of crushed granitic material, greatly altered, and in some instances containing vein quartz in a granulated condition, indicating that a movement of the rock masses has taken place subsequent to the deposition of the quartz. In certain more rare cases this brecciated or granulated quartz has been cemented by a still more recent infiltration of silica. In these crushed zones the feldspars are thoroughly kaolinized; the bi-silicates are altered to chloritic mineral and the whole mass is soft and, when wet, sometimes mushy, forming dangerous ground to mine. Often it is gold-bearing, too, though seldom rich.

In the same fissure plane or zone are found the concentrated mineral deposits forming the ore bodies proper of the mines. In some cases they lie at the side of these crushed, partially silicified zones, either in direct contact with them or separated by a rib or wedge of hard granite, but little altered. In other instances they are found as separate ore shoots, connected with the previously described crushed zones only by a clay seam. Other masses of quartz occur in these fissures which contain very little of either gold or sulphide mineral.

The veins are undoubtedly the result of substitution of silica, calcite and other minerals for the original soluble constituents of the granite, having been conveyed to the point of deposition by mineral solutions, probably derived from a deep-seated source. The most complete replacement has evidently occurred where the fissuring and crushing has been greatest. The vein quartz is found exhibiting every phase of condition from a partial alteration of the granitic mass, almost a normal granite (though the feldspars are always carious, and a small percentage of finely divided iron sulphide may usually be observed) through the various stages of transition, finally reaching the most complete alteration to crystalline quartz, sometimes heavily impregnated with the sulphides of iron, lead, copper, zinc and silver, with gold and other minerals more rare. Calcite is a frequent accompaniment, both in the quartz and in the crushed zones of granite. The vein quartz occurs in a variety of conditions—as a vitreous, colorless, granular rock; a milk-white, semi-greasy kind; a bluish-black variety, usually vitreous; also in alternating bands of bluish and white rock, and as granulated quartz. All of these varieties are gold-bearing and again all kinds are barren. All are associated with sulphide minerals and all again occur with scarcely a trace of them. The banded varieties are usually of fair grade in gold, and the appearance of galena is often an index of value. Some of the zinc ores are also high grade. The sulphide minerals contain from $50 to over $1000 per ton in gold and some are also correspondingly rich in silver, though the silver contents are usually relatively small. The sulphides are pyrite, marcasite, chalcopyrite, galena, blende and pyrrhotite. The latter is peculiarly characteristic of granite formations throughout California, particularly in the ore bodies of larger size. Tellurides of gold occur sparingly in several localities.

The ore shoots vary greatly in width and length and occur as lens-shaped masses, often of irregular form. Some of the shoots are several hundred feet in length and have a width of 30 feet or more, as in the Black Oak mine in Tuolumne county. Ordinarily, however, the shoots are less than 100 feet in length and average between 6 inches and 2 feet in width. Often the lenses have an average length of 20 feet, but succeed each other immediately, the ends often overlapping, thus forming practically a continuous shoot of considerable length.

Occasionally are found two veins approximately parallel and separated by 1 to 4 feet of granite in a more or less advanced condition of alteration, as is the case in the Good Hope mine, near Perris, in Riverside county. The branching tendency of the fissures is a pronounced characteristic. Usually one wall at least is well defined—generally the foot—the zone of fracture and crushing extending to various distances into the hanging wall. Now and then a perfectly defined hanging wall will be found, but progressing along this wall it is seen to diverge gradually from the plane of the foot and its influence as a bounding plane is lost, another slip or wall taking its place. This continues indefinitely until the identity of the entire vein is lost in the numerous branching cracks which extend into the granite. Often a well-defined vein several feet in width will thus pinch out to the merest crack in which is found no sign of clay or of movement, and it requires the most careful observation to follow it at all; but usually by persisting in the general direction of the course of the vein, it may be found to reopen and new shoots of ore found. Sometimes, however, after drifting fruitlessly some distance, a crosscut is advisable. In some instances these pinches are more than 100 feet long and the ground very hard.

The formation of many short shoots of rich ore in portions of the fissure where the walls are several feet apart is an interesting feature. It is not uncommon to find a wedge of quartz forming on the footwall, which gradually widens to 1 or 2 feet, when it leaves the footwall, crosses the fissured zone at a low angle and joins the hanging wall, where it thins out and is lost. Between the short shoot of ore thus formed and its parting from the footwall there may be found several stringers of quartz parallel with the foot, or the entire space may consist of a reticulated group of small veins and seams, while along the footwall a second wedge-shaped vein of quartz will appear which will repeat the peculiarities of the shoot adjoining, as described. The granite adjacent to the vein, and occurring as horses within it, is frequently gold-bearing to a considerable extent, sometimes in sufficient quantity to be visible to the eye.

It is the custom to sort out the granite as waste, but it should be done with caution, for it not infrequently pays to send the entire contents of the vein to mill, when in the pay shoot.

The fact that several old dumps have been worked at a profit is evidence that early methods were careless in this regard. In some respects these mines are worked at a disadvantage, for it is easy to lose the vein where a pinch occurs, and it has led in numerous cases to the closing of what are probably good mines. What has been described as occurring along the vein horizontally is equally applicable to the fissure in depth, and a pinch in the shaft does not signify that the limit of the vein has been reached any more than it does when occurring in the face of a drift.

These disadvantages are generally offset, however, by the high grade of ore, which is uniformly much higher grade than that in larger veins in other formations. Often the ores from the veins in granite may be shipped to distant smelters with profit after rough sorting.

Dykes are of frequent occurrence throughout the granite area in the neighborhood of the mineral belt. They are of various types, but the most common are granitic dykes of coarse crystallization and dark green diorites of fine grain, extremely tough and hard. The former are characterized by the occurrence of masses and crystals of albite, tourmaline and biotite. The peculiar interwoven, grate-like structure of quartz and feldspar, known as graphic granite, is of frequent occurrence. These granitic intrusions are usually older than the veins, though there are exceptions. The diorite dykes, however, are generally younger and cut the veins. The dykes, as a rule, cross the line of strike of the veins, though not always. Whether or not these dykes have any important influence on ore deposition is a question.

In some instances ore shoots are found lying with the granitic dykes, the downward pitch of the ore body being coincident with the dip of the dyke. The influx of large quantities of water is a usual accompaniment of the development of these veins. It often comes with a rush at unexpected times. A mine may be developed to considerable depth and have encountered but little water, when without warning a blast will break into what is called by the miners a reservoir or pocket, though usually, in fact, a system of fissures filled with water derived from the surface. The deeper the point in the mine at which these water crevices are struck the greater the force of the water. Often the lower levels are completely flooded, and weeks are required to pump out the water, but in time the reservoir is exhausted and things resume their usual condition. Another water rush may not occur in many months, and again in some cases they have been found in quick succession. In one instance a water crevice was broken into in the Black Oak mine in Tuolumne county at a depth of 600 feet. With considerable difficulty a bulkhead was constructed and the pressure gauge indicated at one time a standing pressure of 180 pounds to the square inch, indicating that the height of this reservoir was not less than 400 feet. The flow being controlled by means of a valve, the pumps in time removed the water and a normal condition was again reached. After several months the bulkhead was torn out and a round of holes was drilled in the face and discharged, upon which the water again rushed into the mine workings in as great volume as before.

The probability is that in some manner the vent to the reservoir had become clogged and the flow of water stopped. The force of the blast removed the obstruction and the water again poured into the mine workings, but it finally was drained to a considerable extent. This shows the necessity for an abundant capacity to handle water. Some claim that large flows of water are an indication of valuable ore deposits, but there is really no apparent relation between ore deposits and large flows of water. The ore was deposited by ascending currents and the water found in mines is always found coming down from the direction of the surface. Sometimes water may be seen bubbling up from the lowest levels of a mine as though from an ascending current, but a case of this kind is due to hydrostatic pressure, the water flowing in coming from some point higher, through a series of connected cracks or fissures.

A peculiarity of these veins in granite near the surface may often be observed in the occurrence of open cracks, traversing the vein in a horizontal direction, reaching from wall to wall, and dividing the vein into blocks by a series of floors, as it were, at quite regular intervals of a foot or thereabouts, depending somewhat upon the width of the vein. The blocks are separated by 1 to 4 inches of space, in which have accumulated clay and grit, quartz crystals, iron oxide and other secondary products and gold. The amount of gold is often largely in excess of the amount found in an equal weight of quartz of the vein itself. This peculiar occurrence is undoubtedly due to a sort of molecular expansion of the granitic mass, chiefly due to the alteration of the feldspars, and in a less degree possibly to the change which has taken place in the other constituents of the granite caused by surface decay and meteoric agencies generally. It is an interesting fact, and affords food for study and investigation.

The occurrence of gold in the silt-like material lying on these floors may be due partly to the quartz itself, but more probably comes from the oxidized sulphides and also in part perhaps by infiltration from the selvages of the vein, if not from the granite itself, which may have become gold-bearing by impregnation from the fissure. Attrition, due to movement, may also have been partly responsible for the occurrence of this gold. When the oxidized zone is passed and the granite becomes normal these floors no longer appear.

In many places the quartz is perfectly free from both walls, and again but one wall is free, the opposite side being frozen. In an equal number of cases the vein is frozen on both walls. These variations are not constant, for a vein may be free at one place and frozen in another. These changing conditions may be considered as indicating something of the relation of the original fissure to the ore deposit. Where both walls are free, it is not unlikely that the ore is filling the space bounded between two fissures. Where one wall is free the mineralization has progressed along one side of a fissure plane only; and where both walls are frozen, it would seem to indicate that ore deposition progressed outward from a single crack, or possibly, in the case of a large ore body, the mineralization has impregnated the walls beyond the limiting planes of the fissured zone, to an extent sufficient to constitute ore and has stopped only when the mineral solutions were unable to penetrate farther from the fissure plane itself.

W. H. S.

EVERY commercial and manufacturing industry is either directly or indirectly dependent upon mining in some form or other. Even those which seemingly are the farthest removed will, at a moment's thought, be seen to depend upon the mines for existence, whether it be for coal, iron or some of the base metals, or for gold or silver.

It is not intended here to discuss the matter in all its applications, but merely to give figures from actual experience with small units. It will be noted how closely the actual oil consumption checked the figure found by the engine builders in a 30-minute test-run at their works before the engines were sent out. They reported a consumption of 0.9 lb. Beaumont crude oil per brake horsepower hour, running the engine on full load (25 h.p.). As 0.9 lb. is equivalent to 0.115 gal., and as our plant requires 40 brake h.p., this would figure out to a consumption of 110.4 gal. per 24 hr., whereas the actual daily consumption over several months was 106 gallons.

The engine operates without any accessory carburettors or other appliances for vaporizing the oil, the same being sprayed into the hemispherical head of the cylinder which is kept red hot by the explosions which give the piston its impetus. No trouble is experienced with ignition, as is often the case with electric sparkers or heated tubes on gasoline engines, and the crude oil is completely consumed except for a slight deposit of carbon which clings to the walls of the vaporizer head. The necessity for cleaning this out every 36 or 48 hours (the work of a quarter-hour) requires an extra engine for such service as smelting, where no interruption is permissible; but such extra engine would be installed in any case, as is done in steam-plants to provide against break-downs. In a pinch the plant could run with two oil-engines, allowing 15 minutes each day for partial shut-down in order to clean out one engine.

We had some difficulty with these engines while employing engine tenders not fitted for the work, and I would strongly counsel anyone installing such a plant to employ at least one first-class mechanic versed in oil engines, notwithstanding manufacturers' statements to the effect that a Mexican farm-hand can run them. Since competent men have handled this installation, reliable and cheap power has been the result.

Gold Mining in Egypt.

In a recent Bulletin of the Institution of Mining & Metallurgy, London, Ernest H. S. Sampson describes the ancient mine workings of Atallah in Upper Egypt. He says that the quartz varies in color from pure white through various shades of blue to almost black, and contains galena, pyrite, and blende. The percentage of silver remains fairly constant, notwithstanding the fact that the gold content varies from a few pennyweights up to as much as 14 or 15 oz. to the ton of 2,240 lb. The quantity of base metal visible to the naked eye affords, as a rule, an excellent criterion of the amount of gold in the ore.

Fairly conclusive proofs that the mines were hurriedly abandoned by the ancients, owing probably to an unsettled state of affairs in the government of the country at that period, are to be found in the form of small piles of rich quartz left on the floors of some of the stopes, and also in the fact that some of the working faces had been left absolutely untouched after the fire-setting was actually completed. There is abundant evidence that fire-setting was the chief method employed for the disintegration of the quartz. The hanging, and sometimes the foot-wall, of the veins is in most places blackened by the smoke from the brush-wood fires, and charcoal may be found in considerable quantities in many instances where the workings have not been filled with sand and rubble. The only tools so far discovered are two almost perfect specimens of iron picks (very similar in design to the modern miner's pick) and, probably more ancient than these, a stone implement in the nature of an ax-head, identical in shape with a specimen that was found near Kimberley in the early days of the diamond-fields. Numerous stone hammers also were found; these may or may not have been contemporaneous with the iron tools above mentioned. Two classes of stone grinding mills were also found in considerable numbers, while at the Eridea mine a few months ago, a wooden scraper was discovered, shaped something after the fashion of a Dutch hoe, the blade being about 10 in. long by 4 in. wide, and semicircular in shape, and the handle two feet long. In the old workings at Atallah some wooden props were found, evidently placed in position with the intention of supporting the roof. The wood was a hard variety of acacia similar to that growing in the wadies at the present day, and was still in a perfect state of preservation, notwithstanding the fact that it had probably done duty for 2,000 years. In the same stope were also some stone supports arranged after the manner of the monoliths at Stonehenge, that is, two upright slabs supporting what is technically called a cap or head-tree.

An Authoritative Opinion.

By John C. Branner.

During the past week Mr. John C. Branner, professor of geology in Stanford University, delivered an address at San Jose. Among other things, he said:

Ever since I have been in California I have been making a study of the geology of the Santa Cruz range of mountains. The work of mapping out the fault which lies along its surface was completed about six weeks ago. Immediately after the earthquake I went out to see if these fault lines had been doing any business. I found, as I expected, that they had.

Where we had located the line on the map was a great furrow, marking the line of the disturbance. Roads were pushed out of their places, pipes were broken, fences were disarranged, and the surface of the earth was broken up on the summit of the range along the full extent of the fault line, and all of the manifestations of a violent character were within a very short distance of the line.

This fault begins a short distance south of San Francisco. That city is not along the line of the fracture, as it enters the ocean near Mussel Rock. From there it runs over the mountain, through San Andreas lake, through Crystal Springs lake, through the village of Woodside, over Black mountain, along Stevens Creek canyon, across Campbell creek two miles above Saratoga, through Wright's station and Skyland. Along this course we traced the disturbance and it was marked in a perfectly distinct way.

It showed a lateral displacement of at least eight and a half feet. There was no vertical displacement. Of this movement there were evidences in great abundance. Near the coast a road is broken and thrown out several feet. At Woodside a six-foot displacement was noted. A water pipe was broken in two and the ends are seventy-three inches apart. A fence has been offset eight feet. At another point a fence was jammed together the length of a panel. Some water pipes were found which were telescoped. Near Woodside the fault ran under a big oak tree, which was uprooted. In Stevens Creek canyon were landslides without number. Near Skyland a house was broken in two.

The greatest effect of the slipping of the fault was noticed in the trees. The houses did not seem to be much more badly damaged there than they are in the valley; but limbs of trees were snapped off. Trees were uprooted. On the other side of Loma Prieta, along the line of the fault, the forest looked as though a swath had been cut through it two hundred feet in width.

At Black mountain I found beside the main fault, which ran through the mountain, a sort of branch. Following this the whole side of the mountain seemed to be shattered as though it had been picked up and allowed to drop. In a little over a mile I counted no less than 345 cracks running in every conceivable direction.

I am sure that the slippage of the fracture was at least eight or nine feet. The fault was an old one. All the large surface stones had been previously broken up. The soil was deep and was not in a condition to show the full extent of the movement.

Although I have not made a personal examination of the territory north of San Francisco, I am sure the same fault extends to that region. After leaving the coast it follows the bed of the ocean to Bolinas bay, to Tomales bay, then to Fort Ross, over the hill to the bed of the Wallala river and the Garcia river, thence to a point near Manchester, where it enters the ocean again. This is undoubtedly responsible for the great disturbance in that region.

Some people are surprised that there was no tidal wave overwhelming Santa Cruz. Many expected to see one coming up the Santa Clara valley from San Francisco bay. The explanation of this is simple. The movement was lateral and could not cause a wave. If a vertical movement of the same extent had come there would certainly have been a wave of probably considerable size. There need be no fear, however, that San Jose will ever be overwhelmed by one. The configuration of the bay is such that it could not get here; at least until the people had time to get safely out of its way.

As to the cause of the pressure which produced this slipping there are three theories. I will give them to you and let you take your choice. The first is that the increase of temperature in the earth, gradually coming toward the surface, has caused an expansion of the rock and a consequent pressure outward. The second is that rocks which were hot have become cooler and contracted, producing a strain in the other direction. The third is that the shifting of the load on top of the earth produces the pressure.

It is as though Mt. Hamilton were transferred to the Santa Cruz mountains. The shifting is not accomplished in this way, of course, but it is continually going on by the streams carrying sand and mud from one section to another.

The question is sometimes asked seriously whether the weather has anything to do with causing earthquakes. The question has been given serious consideration. Scientists have made lists of all earthquakes that have been known, have tabulated them, have noted the phases of the moon, have taken into consideration the weather condition. Their conclusion is that if there is an earthquake just ready to go off, a change in barometric pressure may start it. But it is not possible to conceive of an earthquake being created by weather of any sort.

It was expected when I was invited here, of course, that I would soothe your troubled spirits and explain away all possibility of a repetition of the shock of a month ago. Well, I shall leave prophecy to the prophets. That is not in my line. I cannot tell whether there will be another earthquake or not.

My confidence, however, is based on this fact. The rocks forming the crust of the earth on the coast have been broken up so by the past disturbances that no great strain can accumulate. The faults slip more easily than if they were two masses of solid stone pressing against each other. Our hope is that the little earthquakes may continue. They relieve the strain, and do not give an opportunity for any great pressure to develop.

So far as this matter is concerned, however, there is no part of the world that has any assurance that it will be free from temblors. Missouri had a very severe earthquake a great many years ago, and yet if scientists had been asked to pick out a section that would probably be free from earthquakes, that would likely have been the spot they would have settled on. So much for prophecy. I feel safe in saying, though, that California will probably never experience any violently destructive shock, and for the reason I have mentioned. So far as California is concerned, I would rather live here with its earthquakes than anywhere else without.

Cheap Mining.—Mine superintendents sometimes receive more credit for cheap mining than they are really entitled to. In one instance a new superintendent finds the property without ore, but with a large amount of deadwork done. He continues the work a short time and develops payable ore. This at once distinguishes him as a capable miner and good manager. In another instance the superintendent develops a good orebody, discontinues development work, thus cutting down expenses, while producing good results at minimum cost. He goes to another locality and leaves an exhausted mine for his successor, who must find more ore, if he can, at the expense of profits previously made. The owners, if not practical people, naturally make a comparison between these men to the disadvantage of the new man. They tolerate him, possibly until the expiration of the term of his contract, during which time he has vigorously carried on deadwork. They then offer extraordinary inducements to the former superintendent to return, which he does, and finds the mine in such a condition that it proves no hardship to place it quickly on a paying basis once more—at the expense of the reputation of the man whom he has just succeeded. A superintendent may gouge a mine taking out ore at low cost and apparently leaving a large amount of ore in sight but he may have carried on his work in such a way that this ore can only be reached at great expense, or it cannot be mined at all at a profit by reason of the previous application of improper mining methods. The cheapest mining is that which permits the extraction of the ore at a minimum of expense, and at the same time makes available an amount equal, at least, to that removed, until the mine is exhausted. Makeshift, and short-sighted methods, which take no heed of the morrow, cannot in the end give the most satisfactory results.

Korea.—The mineral output of Korea is principally gold, recovered both by placer and quartz mining, with over 120 workings, and an annual production of about $2,250,000. Placer gold represents 66 per cent of the total. There are silver deposits but only experimental workings have been made. Copper is found mostly in the northern and southern portions of the peninsula. The Kapsan mine is producing some 270,000 pounds of refined copper per annum. Iron is found in several provinces but the expenses of mining and smelting have retarded the exploitation. There are some coal deposits at Pyeng-Yang consisting of smokeless coal, and the others of rather inferior bituminous. Excellent crystal is found in north Kyeng-Seng, and is a famous product of Korea.

Gold Veins in Granite in California.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS

The gold-bearing veins occurring in granite in California have distinct characteristics, and are in many respects unlike the veins found in stratified rocks, though resembling, somewhat, those occurring in other massive rocks.

The largest areas of granite in this State are those in the Sierra Nevada, but there are other granitic exposures in the Coast range, and in the desert country south of the Tehachapi mountains. Whenever veins are found in these granitic rocks, they possess many structural features in common, and to such an extent are these peculiar conditions similar that it may be concluded that they are due to the fact of their occurrence in a rock of almost identical character, whether in the Sierra, or in an isolated desert mountain.

In these several granitic areas are found a large number of veins. Some of them appear to be entirely independent of all others, though in many instances there are found systems of connected fissures, produced by the same cause and having many things in common. It has been remarked that the minerals occurring in these veins in granite are similar throughout the State, and it has been further observed that they differ materially in this respect from the veins found in the andesites, diorites, quartz-porphyries and other massive rocks, whether these rocks occur in the vicinity of the granites or at a great distance from them.

In some instances veins pass from granite into greenstone or slaty rocks. Wherever this occurs, there is a distinct difference between the veins, not only in their structural features, but in the ore.

There is no uniformity in the strike and dip of veins in the granite. They strike in various directions, even in the same district and in the same vicinity. In several districts there occurs a main fissure, usually large and well-defined and of relatively great continuity, from which branching veins extend outward at an angle of 30 to 45°, sometimes on one side, more often on both sides of the main fissure. Occasionally these branching veins cross the main fissure, but as often their continuity is interrupted by it, though, at some distance from the point of intersection, a vein will be found branching from the opposite side of the principal fissure.

In some instances it might be thought that the cross-fissures were the older and had been cut by the larger fissure, with a displacement by faulting along the plane of the more recent vein. The structural condition of the veins at the point of branching, however, does not bear out this theory in any instance which has come under my notice.

The dip of these veins is no more regular than their strike. In the veins occurring in slaty and schistose rocks, the strike and dip usually conform with those of the inclosing rocks, or nearly so, and in the foothill region of the Sierra Nevada, this strike is almost uniformly a few degrees west of north, with a dip to the eastward, varying from 30 to 90°, but usually between 45 and 65°. The veins in granite strike indiscriminately in any direction, dipping in the same erratic manner, and frequently changing dip, rendering economical development a puzzling problem to the mine manager, who, to avoid losing his vein, usually follows it wherever it may lead him until he has measured the inconstancies of dip and determined where it will be most advantageous to sink a new shaft at a uniform angle. It is nothing uncommon for a vein in granite to dip in quite another direction in depth from that near the surface, and in some instances these changes of dip are numerous. These fissures are found occurring singly and in pairs, and in many places, as zones of fracture of varying width, comprising several fissures having an approximate parallelism. Not infrequently these fissures, both those occurring singly and those of multiple fracture, are planes of movement. This is evidenced by the striations on the walls, and by the polished surfaces, gouge and seams of clay. In many cases these zones of fracture are found to consist of crushed granitic material, much altered, and in some instances containing vein-quartz in a granulated condition, indicating that the movement of the rock-masses had again occurred or continued long after the original deposition of the silica in the zone of fracture and crushing. The occurrence of polished faces on planes within the vein itself is another evidence of this. In more rare cases, veins have been fractured by movement of the walls and silica, infiltrating, has recemented the angular fragments, forming a brecciated vein. It is strange, however, that only rarely are veins of this type payable. They usually contain gold and sulphides, but not enough to constitute a profitable mining proposition.

In the zones of crushing, the feldspars are invariably kaolinized, and the bi-silicates are altered to chlorite and other secondary products. The whole mass is soft, and when wet, often mushy, and dangerous to mine, requiring prompt and close support. This soft, decomposed, granitic mass usually contains iron sulphide and gold, but is generally too low-grade to constitute profitable ore.

In these same fissure-planes or zones are found the concentrated mineral deposits commonly called 'ore-shoots.' In extent they vary greatly, from short bodies less than a rod in length to those several hundred feet long. Where small shoots occur it is not uncommon to find them succeeding each other at short distances, forming practically a continuous run of ore two hundred to three hundred feet long, or even much longer.

The ore-shoots usually lie to one side of the crushed zone; sometimes there is soft material on both sides of it. In other instances the pay mineral is separated from the zone of fracture and alteration by a strip of hard granite, indicating the periods of mineralization, only one of which resulted in the formation of ore. Occasionally the ore-shoots are distinctly separate, succeeding each other at greater or less distances, and connected by nothing more definite than a clay seam of knife-blade thinness. Large masses of quartz occur, ten to twenty feet wide, white, partly crystallized and showing beautiful structure, with clean walls, but almost destitute of gold or silver minerals, and but little sulphide, and that low grade. In some instances, a large quartz vein of this description will be found accompanied by a small pay-streak of rich pyrite, but more commonly the richer ore is found in separate shoots, filling the fissure in which it occurs, from wall to wall, and not infrequently the richest ore is found in veins branching out from the larger vein, as above described. There are several instances of this character in Tuolumne county, near Soulsbyville and Carters.

That these veins are the result of the substitution of silica, calcite, and other minerals for the more soluble portions of the crushed granitic mass there seems no reason to doubt. These vein minerals have been conveyed to their point of deposition by mineral solutions, probably issuing from a deep-seated source. The most complete replacement has taken place where the fissuring and crushing of the original granite has been complete. The vein quartz is found exhibiting every phase of condition from a partial alteration of the granitic minerals to a complete substitution of silica, calcite, pyrite, pyrrhotite, and other sulphides, for the altered granitic mass. Even rock that is almost normal granite in appearance, will carry payable gold and auriferous sulphides. This will occur both within the vein and in the wall-rock adjacent to the fissure, proving that the mineral solutions which deposited the sulphides and precious metals in the vein were not confined wholly within the limits of the fissure, but also penetrated the adjoining rock to a distance of a foot or more. It will be understood that where these minerals occur in hard, apparently normal granite, close inspection of such gold-bearing rock will show it to be altered. The quartz grains may appear normal, and doubtless are, but the feldspars will be found white and opaque; finely disseminated pyrite is always present, and in many instances galena will also be present. The appearance of galena, though not without exception, is generally an indication of gold, whether within the vein or in the wall-rock.

In the silicification of these zones of crushed granite every phase of alteration is noticeable, from that wherein the presence of foreign quartz is scarcely observable, through every stage of transition, to the most complete alteration to crystalline quartz. Calcite is of common occurrence, and quartz crystals are frequently found.

A characteristic occurrence in these veins is that of a brilliant iron sulphide appearing in groups of fine crystal aggregates, often tarnished and iridescent, forming beautiful cabinet specimens. So characteristic are these occurrences that it is often difficult to distinguish ores of this kind in one granite district from those of similar kind in another district many miles distant, and possibly in another granitic area. Pyrrhotite is another characteristic mineral. Mispickel, galena, zinc-blende, chalcopyrite, pyrite are abundant and occasionally telluride minerals are seen. In some localities the vein quartz is normally fine-grained and flint-like, but it is often found crushed to a sugar-like condition, as white as snow and containing little if any sulphide mineral. The flinty, hard masses, occurring as a nucleus of the white granulated rock, sometimes show faint bluish stains and, more rarely, the minute dark flakes of a telluride mineral. Such rock not infrequently also shows free gold, and assays well; but owing to its limited occurrence it is likely to prove disappointing. Of the many varieties and conditions of ore found in these veins in granite the most satisfactory is the heavy sulphide ore, generally containing twenty to sixty per cent sulphides and assaying from $20 to over $100 per ton. In some mines, ore of this character runs from $200 to $500 per ton. When concentrated, the sulphides are usually high grade, occasionally running up to $1000 per ton. Some of the mispickel ores are rich and in a few instances the zinc-blende is found to carry large amounts of silver or gold, and usually both. Again, the quartz ore—in granite—containing pyrite only is high grade, as compared with the ores of the slate and greenstone belts.

Although the veins vary greatly as to width, there is nothing approaching a constant ratio between size and value. The wide vein may be rich and the narrow vein poor, and vice versa, but ordinarily the smaller veins are the richest. Nor can the physical appearance of the ore always be depended upon as an index of value, for the pieces broken in different mines may look much alike, but differ greatly in value. Pyrrhotite and mispickel are the most characteristic minerals of veins in the granitic areas, the former being particularly abundant in the larger orebodies, and the latter in the smaller veins.

Ore-shoots often overlap at their ends, being apparently in a chain of fissures following a general direction, and connected by small crossing seams or fissures, though these latter are obscure. Occasionally two veins may be seen approximately parallel, but separated by a strip of much-altered granite, one to four feet wide. In both strike and dip these veins will, in some instances, be found to unite, forming a single vein, only to part again further on and possibly to send other off-shoots, or branches, into the walls. This condition would suggest the formation of a system of intimately connected fissures, produced at the same time and by the same cause. This branching tendency is one of the most pronounced characteristics of the veins in granite in California.

Usually one wall is better defined than the other, generally the foot-wall, the zone of fracture extending into the hanging-wall granite, to varying distances. Sometimes the line of demarkation between vein and wall is sharp and clearly defined, though there may be no gouge, selvage or seam between the two rock-masses; each presents its own peculiar physical characteristics; the vein being, in the phraseology of the miner, 'frozen.' In other cases a clean well-marked hanging wall may be seen which gradually diverges from the foot, the vein practically filling the zone from wall to wall. Where the space between these walls is narrowest, the vein is likely to consist of solid well-mineralized quartz, but as the distance between the walls increases, the vein material gradually takes on the granulated appearance of the granite; mineralized portions of the altered granite itself may be found, though there may be masses and reticulations of solid sulphide ore mixed with this otherwise unpromising material. When the grade of the best ore is high, this granitic vein-filling is also likely to be payable.

When the two walls have diverged four to six feet, another interior slip is found forming a second hanging wall a foot or less from the foot-wall, which diverges in the same manner as before, and this in turn is succeeded by a third, and so on throughout the length of what may be considered the pay-shoot, which in this instance is made up of a succession of irregular wedge-shaped orebodies.

Large veins, well defined, and mineralized will gradually become smaller, finally pinching out and disappearing in a few small seams that are lost in the country rock. When this occurs, if the mine workings are driven straight ahead, another lens or orebody is likely to be encountered, or, if not appearing in the drift, judicious cross-cutting will usually discover it, offset to one side. If to the left, the next shoot is also likely to be to the left. The characteristics described as occurring longitudinally in these veins, may to a great extent be anticipated in following the vein on its downward course also.

At many of the mines occurring in granite it is the custom to sort out what is considered waste from the recognized ore. Where the payable ore is clean quartz with or without sulphide mineral, this may be done to advantage, but when the quartz ore becomes much mixed with the partly altered granite, sorting cannot be practiced so effectively, and instances are known where the richest ore was the decomposed granite, the quartz containing more mineral but less free gold. It is not an uncommon thing to see coarse gold in the granite of the vein proper and also in the walls at a distance of a foot or more from the walls. This must be watched closely by the miner or rich ore will go to the dump. The fact that several old granitic dumps at California mines have been profitably sorted and milled is sufficient proof that such care was not always observed.

enrichment[3]. The arsenopyrite is readily converted into a soft earthy red limonite, which stains everything a yellowish red. In the more open portions of the shoots the alteration has proceeded downward for nearly 200 feet.

The ore minerals, with the gangue, are interesting and peculiar. The value is in free gold, with some gold held in the pyrite and arsenopyrite. The gangue consists of quartz and albite in about equal amounts, or with a preponderance of the feldspar, and ankerite containing manganese. All these minerals are of the same age, being crystallized one on the other. The gold is coarse, at times as large as grains of rice, and in the oxidized zone it is frequently (and actually) 'rusty.' It is of good grade, worth over $18 per ounce. The arsenopyrite, albite, gold, and pyrite were in part earlier than the others, but the latter stage of their deposition coincided with the earlier stage of the deposition of the main masses of quartz and ankerite. A marked peculiarity of the ore is a deposit of glistening small cubes of pyrite clustered over the surface and sharp edges of the flat rhombohedrons of ankerite. In the numerous vugs in the veinlets through the dike and slates some fine crystals of all the minerals are developed. The clear glassy tabular feldspars are especially fine. The later pyrite occurs, with few exceptions, on the carbonate, showing that the latter mineral possessed some power of precipitating the sulphide from the containing solution. The ankerite is peculiar in its content of manganese, the reaction for which was obtained with the blowpipe. The zone of oxidation is marked by a large amount of secondary wad, the earthy oxide of manganese, which gives a hint concerning the nature of the black opaque substance shown by the microscope in the dike rock. The source of the ore is connected with the dike itself, as the gangue minerals are the same. The solutions were evidently rich in alkaline carbonates, and probably represented the last stages of consolidation of the acid magma below. Further, the rather large amount of hydrothermal action between the intrusive rock and the slates indicates a pneumatolytic character, in part at least, of the dike.

There are a number of other mining properties near Shady Run. The only one now producing is the Rawhide, situated about two miles south on the north fork of the American river. Ten stamps are dropping. The ore is a gold-bearing quartz, said to be rich. A large quartz vein outcrops to the east of Shady Run, from Blue Cañon to the railroad. It strikes north and south, and the greatest width exposed is over 50 ft. Nothing is yet known of its value. This whole belt of country is well mineralized, and needs much more intelligent examination. And this is true of all the larger area of the so-called 'east country.'

DURING the past seven years, from 1900 to 1906 inclusive—the fiscal year ending June 30—the Homestake has disbursed for mine labor $10,253,532.78, and for dividends, $7,648,600. During the fiscal year of 1906, it paid in dividends $1,310,400 and for labor $1,665,798.22—about 32% of the gross yield of the mine for the year.

IN the degree that 'organized common sense' or science has been a factor in the lives of men and nations, men and nations have been happy and effective. The ultimate function of science is the regulation of human conduct.

[3]This fact supports strongly the recent experiments of Stokes upon the solubility of gold in ferric sulphate. In spite of the large amount of this reagent that has been formed by the oxidation of the ore, no perceptible transposition of the gold has occurred. See *Economic Geology*, Vol. I, No. 7, p. 650.

Decisions Relating to Mining.

Specially Reported for the MINING AND SCIENTIFIC PRESS.

While in some instances courts have questioned the necessity of an actual discovery of mineral upon gold placer ground, it is now the established rule that appropriate discovery is as necessary to the location of a placer claim as to the location of a lode claim.

Steele *v* Tanana Mines R. Co., 148 Fed. 678.

A showing of colors of gold in each instance of panning, and the fact that many of the pans gave what miners call "good prospects" of gold, was held insufficient to justify a person of ordinary prudence in further expending labor and means with a reasonable prospect of success. Such prospects were insufficient to show that the land was so valuable for mineral as to take it out of the category of agricultural lands, and to establish its character as mineral land, in a contest between a mineral claimant and another claiming the lands under other laws of the United States.

Steele *v*. Tanana Mines R. Co., 148 Fed. 678.

When the controversy is between two mineral claimants, the rule respecting the sufficiency of a discovery of mineral is more liberal than when it is between a mineral claimant and one seeking to make an agricultural or other entry under the land laws. The reason for this distinction is said to be that, when land is sought to be taken out of the category of agricultural lands, the evidence of its mineral character should be reasonably clear, while in respect to a controversy between rival claimants to mineral land, the question is simply which is entitled to priority.

Steele *v*. Tanana Mines R. Co., 148 Fed. 678.

The owners of three-fourths of a certain mining claim gave another person permission to enter into possession of the claim and make the location of another claim; thereafter the owner of the remaining one-fourth executed a ratification of the abandonment of the first named claim; under such facts, it was held that subsequent locators could not complain that the initiation of the second claim was by trespass, and that the ratification did not validate it.

Oberto *v*. Smith, (Colo.) 86 Pac. 86.

In an action to recover possession of unsurveyed Government mineral lands, where prior possession was the sole question involved, the court ruled that it was not necessary for the plaintiffs to allege that they had the necessary qualifications, such as being of lawful age, etc., to enter Government lands nor to state a good cause of action and entitle them to recover.

Davis *v*. Dennis, (Wash.) 85 Pac. 1079.

Where a person was induced to purchase mining stock by fraudulent representations, it was decided that he was not prevented from rescinding the sale on account of such fraud, because the stock had decreased in value.

Barron *v*. Myers, (Mich.), 109 N. W. 862.

A mining claim may be said to be abandoned when the locator leaves it without any intention of returning, and without regard as to what becomes of the claim or who may appropriate it. But the mere leaving of a claim with intent to return later is an abandonment.

Davis *v*. Dennis, (Wash.) 85 Pac, 1,079.

A lease giving the lessee for a term of years the right to mine and operate for oil and gas, does not constitute a sale of the oil and gas in place, and the lessee has no vested estate therein until gas or oil is discovered; but under such a lease it was held that when such oil or gas was found, the right to produce became a vested right, and when gas or oil was extracted, the title vested in the lessee, and the consideration or royalty paid for the privilege of [illegible] production was rent for th[illegible]

Headley *v*. Hopp[illegible]

The East Country of the Mother Lode.

Written for the MINING AND SCIENTIFIC PRESS
By JOHN A. REID.

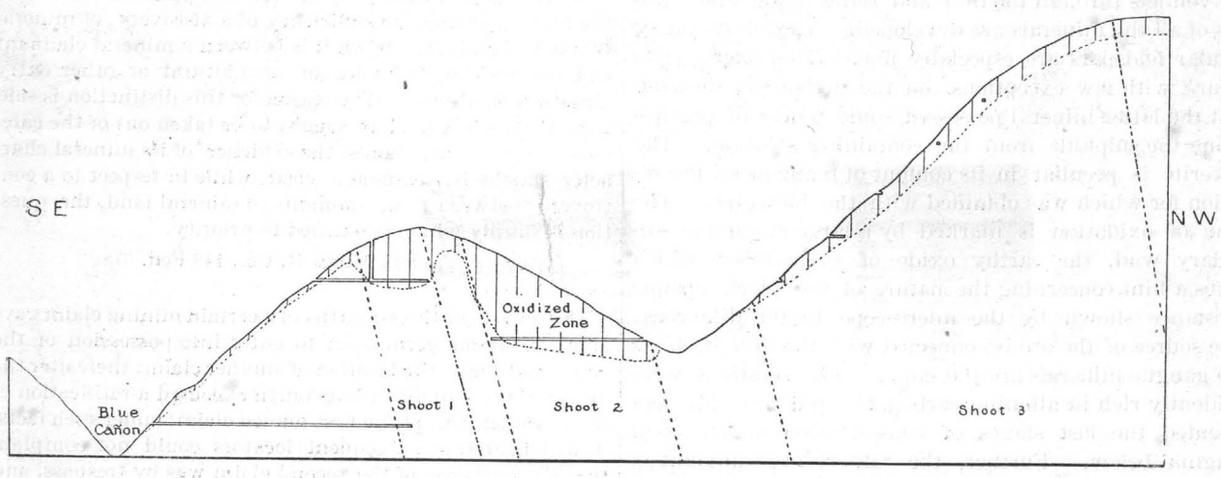
Although gold mining in California has flourished for over half a century, our knowledge of all the mineral resources of the State is still fragmentary. Particularly is this so in regard to that region lying between the middle belt of the Mother Lode and the crest of the Sierra Nevada. Many promising mineral deposits are known to exist in this tract. In this connection the Shady Run mine presents some interesting features.

The Shady Run mine is situated in Placer county, near the railroad, at Midas. This station is four miles west of the village of Blue Cañon, and eight miles east of the mining town of Dutch Flat. The surrounding country marks the upper limit of placer mining, and the old river channel which is cut by the railroad at several points near Shady Run, was mined extensively before the anti-debris litigation.

Topographically, the region is a flat-topped divide separating deep cañons. The relief is great and the cañons are so rugged as to be almost impassable. The mining claims reach from Blue Cañon creek, at an elevation of 2,600 ft., to a line near the railroad, at an elevation of 4,000 ft. A difference in elevation of 1,400 ft. is gained in less than three claim-lengths. Timber is plentiful in the cañons and other spots not easily reached, though largely culled on the ridges. Water is also plentiful. The oldest rocks of the immediate locality are all part of the auriferous slate series, of Carboniferous age. At the mine these are fissile dark clay-slates, with a few quartzose beds, striking N. 41° W., and dipping from 80 to 85° NE. A 16-in. lens of limestone, showing traces of crinoid stems, also appears at one spot 100 yards east of the vein. The later rocks comprise volcanic tuffs and flows, and the auriferous gravels.

The great rarity of igneous rocks in the Blue Cañon formation has been noted by Lindgren[1], yet a surprisingly large number of feldspathic dikes occur in the locality and follow the slates in strike and dip. The dikes are all similar, and chemically almost identical. On physical grounds they may be divided broadly into two types. One of these constitutes a series of about ten thin intrusions from three to twenty inches wide, constituting one large multiple dike. When fresh the color is a light pearl-gray, and the grain exceedingly fine. [illegible] is first white; on further ex- [illegible] lete oxidation appear, [illegible] the whole becomes a [illegible] red pulverulent mass. Outcrops are never visible. The second type occurs in one or two larger dikes, from four to twelve feet wide, in part not showing on the surface, and in part outcropping strongly. The fresh rock is of a rather dark-gray color, suggesting a diabase, and the grain medium, with feldspar crystals averaging one-eighth of an inch long. Pyrite is visible in small grains. Toward the periphery of the dikes there is an evident effect on the slates, and the intrusive rock has assumed a schistose appearance — but it is only an appearance.

Under the microscope both types are seen to consist of albite feldspar (ankerite), and a small amount of original pyrite. The albite is in tabular crystals, with frequent Carlsbad twins, as well as the usual albite lamellæ. In the finer grained rock the pyrite is evenly distributed throughout in small grains; in the other rock the pyrite is in larger grains, many of which are secondary. Also, in the partly oxidized coarser rock the tabular feldspars show much black opaque substance between them. This is probably secondary manganese dioxide, from the decomposition of the ankerite, which reacts for manganese.



Vertical Section through Vein

Scale 1in = 250 ft.

Dikes of this nature have been noted by Turner and others[2], and still present a field for research, bearing both upon the mining geology and the general geology of the Sierra Nevada.

The ore deposits at Shady Run, like the dikes, are divisible into two parts: (1) A quartzose pyritic gold ore; (2) an ore rather low in silica, heavy with arsenopyrite, and containing free gold. These two are distinct, yet grade from one to the other. The first kind is associated with the thin dikes, in seams either parallel to the dikes or cutting in all directions across them. The gold contents are low, but pockets containing coarse free gold occur. A large 'stringer lead' of this character exists about 600 ft. east of the main vein. The second type of deposit is connected genetically with the coarser grained dikes, and consists of a well-defined vein in, or adjoining, the dikes. Small seams of ore and gangue run from the vein into the dike and slates more or less horizontally, the whole carrying, in the ore-shoots, considerable value in gold. The ore-shoots are three in number, as shown in the accompanying sketch. In the largest, the northern, the gold is evenly distributed; in the other two, it occurs irregularly distributed; the more so in the south shoot. This condition is rather common in deposits of arsenopyrite.

There is a distinct zone of oxidation, but no secondary

[1] W. Lindgren, Colfax Folio, U. S. G. S., text.
[2] H. W. Turner. 'Further Contributions to the Geology of the Sierra Nevada.' 17 *An. Rept.* U. S. G. S. Pt. 1, p. 663. C. A. Aaron. 'The Shaw Mine Lode in Eldorado County.' *Eng. & Min. Jour.*, Nov. 19, 1892.

BONDURANT MINE, MARIPOSA COUNTY, CALIF.

Source: M.A.Thesis of Dooley P. Wheeler, Jr.,Univ.Calif.,1940.

Location: 130 mi. air line E of San Francisco; 14 miles by road E of Coulterville, Mariposa Co.

Production of District: About $ 8,000,000, mainly from the Red Cloud, Marble Springs, Hasloe and Banderita mines.

General Geology: The country rock in the immediate mining district appears to be the Calaveras formation, which here includes biotite quartzite, biotite schist, slate, sericite schist, phyllite and meta-conglomerate. In general the country rock is graphitic, micaceous, fine-grained and massive.

b Bondurant Veins: There seem to be two veins, the Bondurant-Louisiana and the Reynolds. They strike about N70W.

Bondurant-Louisiana Outcrop. Toward the east,vein strikes N73W,dips 71N. Here the FW is banded quartzite, N70W, 59S. 400' to the west,vein strikes N75W,dips 34N.

The outcrops are very narrow , 0-10". At the No.2 shaft, the vein pinches out within 20' of the collar, being replaced by a shear zone which reaches the collar. The widening downward of the vein (into good ore),shows, with corresponding widening on the surface west of the No. 2,that the vein widens raking E.

The vein formed by accretion, shown by repeated smooth planes of shearing within the vein, separating bands of different vein types. An abra lined with large quartz crystals occurs on the FW.

The most extensive mining along the outcrop has been where the vein pinches from large size to small. (I take this to mean pinching down the dip and at the same time along the strike,) i.e. Where gold and sulphides occur in a wide vein, they are concentrated in a zone less than one-third the total width.

In general, the best ore shoots are marginal features of thick qtz lenses. Since zigzag structure controls vein width, i.e. change of strike causes vein pinching, such changes are favorable places for ore.

The intramineral faulting that facilitated entry of the ore metals cleanly sheared the wide parts of the vein (he means one wall of these wide parts), leaving most of the total width impervious. Hence the wide parts are metallized only in zones about 1" wide. In general, where fault movement caused smooth shearing of the vein, there is no good ore. These instead of the favorable brecciation, are common in the wide parts of the vein.

Reynolds Vein Outcrop. Most productive part underground is near the east end, where there is no outcrop. The pinching takes place near a change in strike.

Mineral Paragenesis. Qtz.,py, pyrrhotite, blende, ankerite, ccpy, galena, gold. Overlaps. At least 90% of the qtz preceded all the other hypogene minerals. Qtz is gray-white to milky, coarsely crystalline, but the crystal form shows only in vugs, which are common. The pyrite fills vugs and open fractures, and develops its cubic form by replacing qtz. Galena is the most abundant sulphide. The gold is mostly associated with galena and late ccpy.

Ore Textures. The ore consists of coarse-, even-grained gray-white quartz with coarsely crystalline, even-grained sulphides filling fractures and vugs. Quartz crystals a quarter to two inches long within the same vug are common. Unfilled vugs are not common in the ore, because fracturing broke into the vugs, which are scattered at random through the quartz;the vugs were thereby filled with sulphides, making sulphide patches 1-5" wide. The best ore consists of streaks of such patches, and irregular but usually elongated areas of these filled vugs. The filling of crystal-lined cavities is the main textural feature of the ore.

Roughly banded ore due to sulphide-filled fractures is common. Polished sections of the bands show that in between the rough bands of sulphides there is intensely brecciated and recemnted quartz. Bands due to country rock inclusions are not common.

n The Bondurant ore is upper mesothermal, as shown by the coarse, even graine texture of gangue and sulphides, the consistently large crystals lining the vugs, the presence of unsymmetric and rough banding due to fracture filling;the common vugs, the uniform color and the dense, compact nature of gangue and sulphides.

There is supporting evidence. If mesothermal ores form in metamorphic rock which shortly before had been metamorphosed in the mesozone, then the minerals in the metamorphic rocks would be in equilibrium under the ore-forming conditions. Hence there would be little hydrothermal alteration.

The Bondurant vein follows an aplite dike (plutonic). Plutonic rocks are most stable under hypothermal conditions of ore formation, least stable under epithermal. The latter condition would result in all elements of the plutonic rock, other than those corresponding in composition to the vein, being replaced by silica from the hydrothermal solutions forming the vein. The most stable (hypothermal) conditions would result in the formation of coarse muscovite from the orthoclase in the dike, but probably in no silicification. The aplite dike is sericitized, indicating intermediate conditions.

Spessartite dikes (post-mineral; hornblende-lamprophyre) not less than 12" wide are holocrystalline and persist for great distances without radical change in size; hence the country was still too hot for epithermal conditions even after all mineralization had ceased.

Finally,as additional evidence for the upper mesothermal deposition,there is the simplicity of the vein system-the lack of a complicated fault and vein pattern. But the deposit is raised to the upper mesothermal because of the vugs, the milky quartz and the sericite.

Misc. The width of the aplite dike which the vein follows is not affected like the width of the vein is, by changes in attitude of the fracture. But the dike pinches upward like the vein.This is evidence against the presence of any real openings along the vein fracture,and evidence for the growth of the vein by accretion,by repeated slight differential movements of the fracture walls.

No ore outcrops; the outcrops are 2-10" wide, and abnormally steep. There are abundant flat-lying gash veins, indicating reverse movement at the time of ore deposition.

The best ore occurs where the vein is less than 3' wide. The vein is widest where the strike is nearest to E-W and the average dip greater than 40° N. Where the vein is widest the strike is at an acute angle to the direction of fault motion. In the narrow parts, where the good ore occurs the dip is less than 40° N.

The stoped area west of the shaft is on the upper margin of a wide strong vein which strikes near E-W.

A large, gentle structural feature capable of developing an extensive but not too strong vein is favorable, in addition to the ore rims mentioned.

The structures causing great width of vein is not based on dip alone, but also on the slightly larger component of lateral fault motion.

In the zigzag control, the crest of the change of attitude is the best place for ore.