When gold was first discovered in California, and for several years following, placer mining was the only branch of the mining industry practiced or known to the thousands who labored with pick, shovel and pan to rob mother earth of her golden treasure; and, if any other branch of mining was known to a few of the great multitude of miners who rushed to the gold fields, they either forgot their knowledge of that branch or did not consider it worth bothering with, when gold could be obtained so easily in the placers as it was in those days. But, as the years rolled on and the best placers were worked out, many of the miners who had found quartz, rich in gold, in the gulches and ravines where they had worked, began to look for the gold in quartz. Their researches were rewarded, and that period marks the first step forward toward the development of the many rich quartz mines we have on this coast today.

Ever since that period when quartz mining first attracted the miners' attention on this coast, science has advanced with rapid strides in this industry, until to-day the Pacific coast and California in particular, leads all other parts of the world in improvement and progress in this industry. The latest improved machinery and methods of working gold and silver ores are Pacific coast designs, and the MINING AND SCIENTIFIC PRESS has been the chief factor in bringing this stage of advancement about, by giving to the world, through its columns, a reliable and authentic account of all the different discoveries, processes, improved mechanical appliances, etc, which have been invented from time to time. The three different branches, viz., placer mining, quartz mining, and pocket mining, are each an interesting study and a science, so to speak, within themselves. At the present time, pocket mining is attracting more attention among prospectors and those in quest of knowledge pertaining to mining than either of the others, for the reason that it is new and has not yet reached the advanced stage which the other branches have; consequently there are more opportunities for the prospector to make new discoveries and realize a profit from such for a small outlay than there are in prospecting for placers or milling propositions in quartz. All the capital the average “pocket hunter” requires is a pick, pan, shovel and grubstake; for, if he is successful in finding a pocket, he generally gets all the gold in a short time without further expense.

Pockets occur under certain conditions in a certain class of formation, hence the term “pocket formation.” This pocket formation extends along the mineral belt from Fresno county on the south, in California, to Douglas county, in Oregon, on the north, as far as it is known and pockets have been found. This pocket formation also occurs in places through Nevada, eastern Oregon, Idaho, Montana, and Washington, and, in fact, in most of the different sections where gold and silver are found, west of the Rocky mountains. Pocket formation invariably carries the following-named minerals besides gold, and sometimes silver: iron, copper, lime, sulphur, and, in many places, lead. As a general rule, the formation is a soft porphyry, or gray slate, which slacks and decomposes rapidly by exposure to the air and sun. Pockets vary in size in different localities according to conditions. But some people may ask the question, What is a pocket? So it would be well to explain what a pocket is before we proceed further. A pocket is a mass of valuable mineral concentrated within a small space in a ledge, lead or vein; or, in other words, they are very rich spots in ledges, veins, seams or feeders, while the rest of the ledge is either barren or very much lower-grade ore than those spots or bunches which are called pockets. While the majority of the pocket ledges are barren except where the pocket occurs, yet there are many milling propositions that carry a paying quantity of gold all through, that are pocket ledges. Pocket ledges generally cut or cross the formation, while in the same district the milling ledges run with the formation or course of the country rock. Throughout the coast mineral belt the course of the pocket ledges is nearer to an easterly and westerly direction, while the milling ledges, on the contrary, run nearer to a northerly and southerly direction. This is more particularly noticeable in the northern districts, through southern Oregon and northern

California, than it is in the other districts east and south. The chief minerals which predominate in the pocket formation through the first named sections are iron and lime, and the formation itself is principally porphyry. The outer edge of this pocket belt is so well defined in places that the experienced pocket hunter can tell within a few feet how far it extends. This statement may not be credited by some of our mining sharps, but nevertheless it is a fact, for there are several places in Jackson and Josephine counties, in southern Oregon, where small pockets ranging from $5 to $100 have been taken out on the border [when gold was $20.67 per oz.], next to the granite and gneiss, and within 50 feet of those pockets---in granite and gneiss formations--- small ledges or stringers, bearing gold their whole length, have been found. But all search so far has failed to discover a pocket or bunch on any of those stringers, while in the porphyry on the other side, a few feet from the contact of the gneiss and porphyry, or the granite and porphyry, the veins carry no gold except in pockets.

In the series of articles to follow I will endeavor to illustrate, in plain language, the different theories of what causes gold to occur in pockets and what forms them, and no particulars pertaining to pocket mining on the coast from Mexico to Alaska will be omitted.

A pocket, as stated in the first article on this subject, is a concentrated body of gold, silver or other valuable mineral occurring in certain spots in ledges, lodes, veins, etc., of quartz and mineral-bearing rock. In nearly all the districts on this coast the mineral-bearing veins or ledges that run parallel with the formation of the country rock are almost invariably what are commonly called milling ledges, because they carry about the same amount of mineral all through the pay chutes, while on the contrary all the ledges that run crosswise of or cut the formation are pocket ledges. The pocket-belts, or streaks of formation which are prolific in pockets, are mostly porphyry or of a porphyritic or quartz-porphyry nature running parallel with the slate, granite, lime, etc., and are readily detected by the professional and experienced prospector owing to the chemical and mineral composition and general appearance to the eye. This pocket-bearing formation does not always exist in belts, but sometimes occurs in spots or patches throughout the mineral belts of the coast. In fact, there is hardly a mineral district west of the Rockies in which those spots do not occur. The chemical or mineral composition of this pocket formation is generally silica, lime, soda, alumina, potash, copper, lead, magnesia, iron, gold, quartz and water, although these conditions differ in each locality. (Here I note a problem in terminology. The author uses 19th century mineral terms that I have difficulty translating. Calcite was not used in those days, but the term for it he used was lime, so I substituted calcite in places for today's readers. Soda and potash may have referred to sodium and potassium feldspars, but I'm guessing here. Magnesia may have been magnesite, MgCO. I don't know what the contemporary equivalent for alumina is. He interchanged terms for elements with those for minerals, so the particular minerals containing lead, sulfur and copper may have been understood by his contemporaries, but I don't know what he meant. Chloride puzzles me. Chloride had a meaning among mining men in those days that is no longer used and leaves me mystified) What forms the pocket, or, in other words, what causes the gold to concentrate in a small space at certain points, is owing to a peculiar combination of other minerals which exist at or near that point and some of the minerals in this peculiar combination having an affinity for each other naturally concentrate and in turn combine to form an affinity or attraction for the others contained in the same formation, and so on until the combination is complete and possesses the affinity for the gold, quartz, and other lateral properties. What those minerals are and how to detect them will be given in future articles in this series. Pockets occur in three distinct and different conditions, viz., decomposed or free pockets, intact or specimen-rock pockets, and pay chute pockets, and they each form from separate causes and under different conditions.

The first, decomposed or free pockets, with which this article is mostly concerned, occur upon ledges, seams, feeders, etc., and are generally near the surface and throw out a strong trace, and as a rule are easily found. Those pockets are generally small compared with the specimen-rock or intact pockets and rarely exceed 100 ounces. At the point where the pocket occurs in the ledge or seam the combination of minerals at that point decomposes the ledge and leaves the gold free so that it can be panned out, and often it is so well freed from the quartz, iron, and other minerals that it does not require crushing in a mortar to make it salable as free dust. In this class of pockets there is always another cross seam or ledge which cuts, crosses or comes in contact with the ledge or seam at the point where the pocket occurs.

This cross or contact ledge or seam always carries or is entirely composed of a different mineral from that which predominates in the ledge which contains the pocket and is often very small, sometimes not more than a fourth of an inch in thickness. This ledge or seam which is composed of or carries the mineral that is required to complete the combination which decomposes the ledge at the pockets and causes the pocket to form at the point where it comes in contact, always runs at an angle to the general course of the main ledge. There is often a loose place running out from the pockets of this class resembling an old caved in gopher hole, from which gold will be found scattered on the surface. This would be a decomposed remnant of the vein on the surface which has eroded down over time.

The trace from a free or decomposed pocket is always on top of the ground, in the grass roots as it is termed, and rarely if ever is found down any depth in the soil unless it be of a very loose nature so that the gold can readily sink down into it. But if the soil be firm and compact and the hill or mountain side steep, the biggest prospect will be obtained by scraping the loose dirt and gravel on top down, say an inch, to where the ground is hard and compact, for very little of the gold will work down into the solid ground if it has any chance at all to work down hill. I have panned on traces where other prospectors, who were in the habit of going down to bedrock for their dirt to pan had worked, and where they could not raise a color on bedrock where the soil was not more than 14 inches deep, and have gotten as high as 25 cents per pan by taking the loose dirt on top of the ground. [very roughly about .4 gram, allowing for silver content, Au at $20.67/oz.]

It may be well to explain what a pocket trace is, for the benefit of the novice and those who are inexperienced. A pocket trace is the gold and other minerals which are liberated or forced out from the pocket and by their specific gravity gradually work down hill, naturally spreading out over the surface more or less in its downward course, until it finds its level or works into some gulch or ravine. In the case of pockets of this class which have been capped over by slides and locked up, as it were, from longer giving a trace, or where a great space of time has elapsed since gold has eroded from the pocket, the gold in the course of time works down into the soil and finally reaches bedrock. But in the majority of cases the gold and the mineral that comes with it from the pocket are in the surface dirt.

The professional pocket-hunter, upon finding a trace from a free or decomposed pocket, goes to work tracing it in the following manner: He first ascertains by panning where the gold lies; whether on top of the ground in the grass roots, or down deep in the soil, or on the bedrock. When he finds out where the gold lies, or, in other words, where he gets the biggest prospect, he then pans across the trace to find the center. Gold, on account of its great specific gravity, will work down hill in the same course from the pocket as water would from the same source, and when he finds the center of the trace, which he determines by the prospect he gets in the pan, the largest prospect always being in the center of the trace, he then closely examines the gold in order to find out whether he has more than one kind or not. When he is satisfied that he is getting

only one kind of gold he tries a pan full from the center of the trace farther up the hill. If the trace is a slim one and he only gets a very light prospect in the center of the trace, say three or four colors to the pan after panning carefully to save everything that has greater specific gravity than dirt, particles of broken rock, etc., he closely examines the result in order to find out what goes with the gold. He does this so that he can follow that mineral, which comes from the pocket also, should the gold give out entirely in the trace before he reaches the pocket.

To find out what mineral comes from the pocket with the gold, he pans across the trace the same as he did to find the center. If he gets a considerable amount of any mineral substance or crystals in his pan samples in the center of his trace and does not get it on either side, it invariably comes from the pocket or from the ledge that gives the pocket, so by following what comes with the gold, when the gold gives out, it will lead to the ledge at the point where the pocket exists. When there is one or more kinds of gold in the trace it shows that there are two or more traces run together, or lapped over each other, and coming from as many different pockets.

Sometimes the second gold found in the trace comes from a seam or ledge running parallel with the trace, which gives out a little gold all along, and on which the pocket exists. Oftentimes prospectors who are inexperienced and cannot always tell pocket gold, work on what they suppose is a pocket trace when in reality it is gold thrown off from one of those blind ledges or seams that run in an up-and-down-hill course and give out a little gold all along, and does not "pocket" at all.

When there is sufficient gold in the trace to follow, and the largest amount is on top or in the grass roots, the prospector follows the gold until it gives out and then drops back and finds the "feeder,"the place where the gold trace goes into the ground, which leads him to the pocket. If he fails to find the feeder without disturbing much of the ground in the vicinity of where he thinks the pocket is, he then cuts a trench down to bedrock, up and down hill, at the end and in the center of the trace, commencing a little below where the gold gave out and extending it up above where he got the last gold. By doing this, he cuts across the ledge or seam which gives the pocket, and then it is an easy matter to find the feeder on the ledge. Should he fail to find a ledge or seam in his trench, he then digs another trench, at right angles with the first one, a short distance below where the gold gave out, and in this trench he will cut the ledge if it runs parallel or nearly so with his trace.

In this manner he is sure to find the ledge, and when once found it is an easy matter to find where the pocket is. I have seen places where prospectors had followed up traces until the gold gave out, and then dug hole after hole and tore up the earth in such a manner that it would be almost impossible for the next prospector who came along to find out where the gold gave out. When such prospectors fail to get the pocket, it is a soft snap generally for the professional who comes after him, for half the work is already done for him and he goes to trenching and soon finds the ledge which the first man has dug holes on both sides of, but not directly over.

In many places the ledges crop or give out considerable float, and in such cases the pockets are more easily found. At the point where the pocket occurs the ledge is more or less decomposed, and in most cases it carries a large amount of iron oxide. The stringer or ledge that invariably comes in through the country rock and contacts with the ledge at the point where the pocket occurs, is generally largely composed of calcite, iron, copper, or manganese.

If it is composed largely of quartz, or is a quartz ledge or vein it will be found to carry one or more of those minerals in large quantities.

In the northern counties of California above Shasta, (meaning the present day ghost town, not the volcano) and throughout southern Oregon, the contacting seam or stringer is calcite. The combination of minerals which exist in pockets of this class only decomposes the ledge where the pocket occurs, and the ledges in nine cases out of ten are barren of gold eighteen inches and

two feet on either side of the pocket. Sometimes a color of gold cannot be found six inches on either side of where the decomposition ends. Those pockets mostly occur in soft, yellow porphyry which contains a large percentage of calcite and iron and is prolific in small stringers of quartz and calcite. When the prospector is hunting for a trace, and he finds this soft porphyry formation, he forms his ideas as to how the ledges run. Then he commences panning around the base of the hill, point or ridge, taking his pan samples about 25 or 30 feet apart until he pans all around the base of it. If he does not find a trace then, and still believes that there are pockets above, he goes a hundred yards or so farther up the hill or rising ground and pans around the same as before, so that if there should be a trace above that did not reach down as far as the foot of the hill or point, he will catch it in his second panning around the hill.

Many pocket hunters follow this method: They find out where there has been a short gulch that paid well to placer mine, and, when they find out at what point the pay quit, they pan on either side of the gulch on the side hill until they find where the gold came into the gulch and then follow it up to the pocket or where the pocket has been. In most cases, where the short gulches have been rich, the pockets which fed into them are all out and gone; but if the pocket-hunter once finds the ledge where one of the principle pockets came from, he then has the main key to the situation. He follows along the same ledge, for it is likely to pocket in another place. Then, again, it often occurs that where the pocket is broken away and gone down into the gulch, there is one or more still existing underneath where the first one was. If he does not find a trace on either side of the gulch, and there is a little gold still in the gulch, he follows the gold until he finds where it leaves the gulch and follows it up the hill until it leads him to where it originally came from. I know where traces, and what would be called slim ones at that, have been followed for over half a mile to a pocket amounting to no more than 2 ½ oz.; and in one particular case in southern Oregon, I followed a trace over three-fourths of a mile and found the pocket.

The particles of gold found in free or decomposed pockets have a slight affinity for each other, as if magnetic. To demonstrate, it is only necessary to take the flour gold from one of these pockets and corner it down in a pan until it forms a string of an inch or so in length in the crease of the pan; then take considerably more water into the pan and by a sudden jerk movement try to scatter the flour gold by the action of the water carrying it over the bottom of the pan. No matter how fine your gold may be, you will find, try whatever way you may, that you cannot completely distribute and separate the particles of gold. You can always see it with the naked eye, and, if you will take a small magnifying glass and examine the bottom of the pan, you will find that the particles of gold lie in bunches or clusters and not completely scattered, each particle laying separate by itself.

The flour gold from a milling vein, or, in other words, from a vein or ledge that carries an equal amount of gold all along, when treated in this manner will completely separate, and it will be found by examining the bottom of the pan closely with the glass that each particle will be seen lying by itself and not gathered in clusters or bunches the same as the pocket gold.

There may be several other minerals found in this class of pockets, but a pocket without calcite, iron, copper, lead, and sulfur has not yet been found. They are always present in free or decomposed pockets. They may not always occur in the same form, but they are generally in a chloride or metallic state. These five minerals are the key to the pocket and are what cause the pocket to form. Of course gold is included and makes the sixth mineral. Several other minerals may be found in pockets besides those five above named, but they do not play an important part in forming the pocket. Wherever this combination of these five minerals is found in a ledge, and there is any gold, there is generally a pocket on the ledge, although, either from some curious action of nature or from the peculiar action of some other foreign mineral upon this combination

of five, it sometimes occurs that no pocket forms even when those five necessary minerals are present, but this seldom happens.

It is nearly always safe to count on finding a pocket on a ledge near the surface where those five minerals exist at one point, no matter in what form they may occur so long as they are there. The size of the pocket can very often be determined by the size of the ledge proper. A large ledge nearly always gives a large pocket, while small ledges and seams do not appear to have the body to support a large deposit of those minerals, consequently, the pockets are small. The rim, ledge, or seam which comes in contact with the ledge proper, at the point where the pocket occurs, is as essential to forming the pocket as the combination of the five minerals; and in every pocket yet found of this class, this contacting seam or ledge has always been found. It appears to be the feeder through which the minerals are carried to the pockets, although sometimes the pocket occurs on the this feeder instead of the ledge. Those cases occur oftener where the ledge is barren quartz than where the ledge is more mineralized. The first step that the prospector should take, who intends to follow this branch of mining, is to make a study of those five minerals, so that he can readily detect them in any form; and when he has acquired that knowledge he then has the main key to finding this class of pocket. I have known men who were so expert at detecting, with their eyes, those minerals and the different indications of a pocket, that, after a close examination of the ground, they would walk directly to the spot and mark the place on top of the ground where the pocket was, and upon digging down, the pockets were found directly underneath the spot they had marked.

The reason why pockets of this class are always found in decomposed quartz is because the combination of the five minerals, mentioned in article No.4, which are always present in this form of pocket, acts upon the quartz, and, being a strong decomposing agent, soon rots away the ledge at the point where they concentrate.

The gold in those pockets is generally rough and “scraggly,” and pieces are often found all honey-combed like pumice-stone where the quartz has decayed away and left nothing in a solid form except the gold. Sometimes in the larger pockets of this class there is smooth gold, similar to well-worn placer gold, found in the center of the pocket; but, upon examination it will be found that those smooth nuggets have a coating or glazing of copper on the smooth surface and are more of an orange tint than the rest of the gold in the pocket. Sometimes those nuggets or pieces which are found in the center of the pocket are rough and scraggly on one side and smooth and glazed on the other. Those smooth pieces are found only in large pockets, and in pockets where they are found there is always a large percentage of copper in the mineral combination. Whenever the majority of the colors found in a free pocket trace are in the shape of needle points broken off or “arrowheads,” as the pocket hunter calls them, the trace is seldom worth following up, for the pockets that give traces are invariably small and seldom amount to over $5 or $6. (About a quarter oz. of gold, more or less, probably worth some effort these days)

They occur on small stringers of quartz not over a half inch in width and often not more than six or eight feet in length, and generally cut through soft, yellow porphyry. The best free pockets are always found in the porphyry or on or near the contact with the porphyry and serpentine. The most of this class of pockets when laid bare are very deceiving to the eye, for the reason that little or no gold is visible, it being coated and concealed by iron oxide, manganese, etc.; but, when washed thoroughly in a pan, the decomposed matter will be found to be very rich. Then, again, in other cases, the gold being free from coating, will show so distinctly that the inexperienced pocket miner will think that the decomposed matter in the pocket is much richer than it really is. The flour gold is always in the top and bottom of the pocket; consequently, the

flour gold in the trace will be found in largest quantities nearest the pocket when it is still in place, and, again, when the pocket is out and gone, the flour gold will be found in largest quantities near where the pocket originally was.

The experienced pocket hunter will soon detect by the flour gold he gets in his trace whether the pocket is still in place or not. He does it in this way: By carefully examining the flour gold--if he finds the most of it very light in weight as well as in color, which he can readily detect by his manipulations with the pan and by watching closely how the gold acts--he soon finds out whether the majority of the flour gold came from the bottom or top of the pocket. His judgment is based upon the following facts: Say, for instance, that a free pocket contains 200 ounces of gold. The gold which comes from the top of that pocket we will say is worth or assays $17 per ounce; then it will be found that the gold in the center or middle of the pocket will be worth less, say $16.75 per ounce, and the gold in the bottom of the pocket will be worth still less, or about $16 per ounce, so thus it will be seen that the gold gradually diminishes in value from the top to the bottom of the pocket. Where the gold is more alloyed with silver rather than copper this feature is more plainly noticeable; and the prospector, finding the majority of his gold a light color and light in weight, and intermingled with white particles resembling gold coated with quicksilver, naturally concludes that the gold being examined came from the bottom of the pocket, and it is out and gone, and he is only getting the gold from the bottom of the pocket in the trace.

Free or decomposed pockets occur generally upon ledges that are barren except where the pocket exists, and the size of the pocket depends upon the size or width of the ledge and the amount of the mineral combination which concentrates where the pocket forms.