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Goldfield and Its Present Boom

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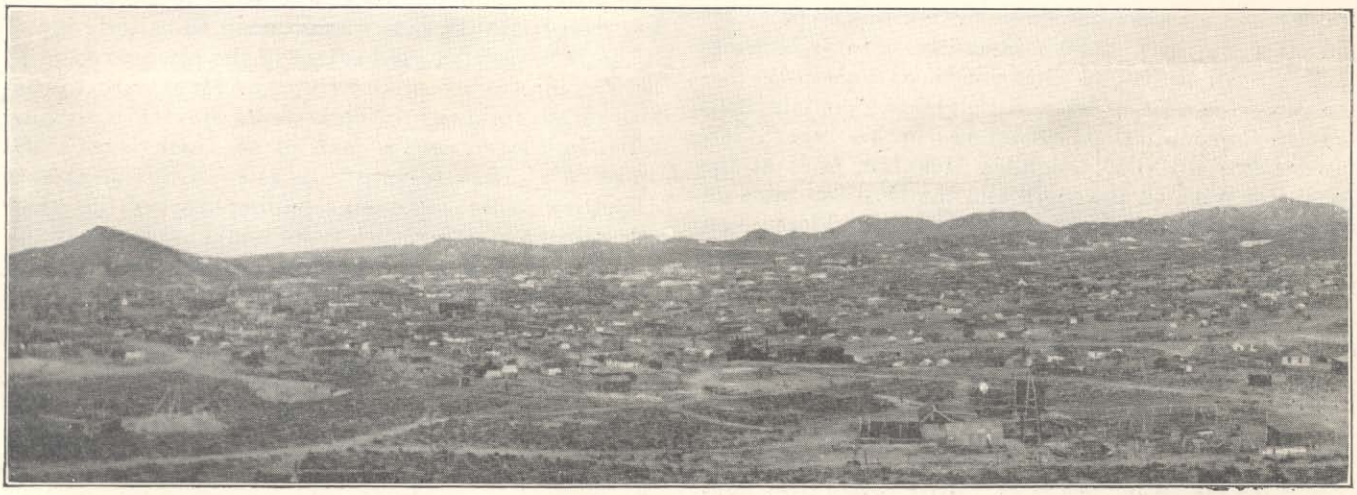
SYNOPSIS—The prediction of optimists that a second boom, of greater force than the first, was sure to occur, now seems about to be fulfilled. Based on the strike of high-grade ore in the Jumbo Extension mine, the camp is expecting more discoveries in other properties. Stocks are experiencing sudden inflation in value, and the beginning of an excitement appears to be at hand. The present article reviews the established theories of the Goldfield geology, correlating it with more recent studies and the new ore discovery.

The long-expected has happened. For a number of years, in fact ever since the decline of the last boom, optimists have been predicting a second boom for Goldfield.



Town of Goldfield and the Surrounding Country

They based this prediction on nothing more tangible than the fact that some of the other great gold camps, particularly Cripple Creek, had a second boom of greater intensity than the first. The recent strike of high-grade ore in large quantities in the now famous Jumbo Extension property furnished the necessary incentive for the present excitement.

At first it was quite hard for those who had stuck in Goldfield, in spite of their slogan "If you stick you will win in Goldfield," to realize that the present discovery was anything more than a small bunch of ore, and they believed it was only a question of a short time when it would "peter" out. But as the orebody continued to increase in size and value, it gradually dawned on them that here was the material to start the long-looked-for revival. The discovery was in new ground, apparently not connected with the known system of oreshoots, and it gave prospective value to a large amount of territory hitherto not deeply prospected. When the orebody passed from the latite to the latite-shale contact and was larger and richer than above, the news was spread broadcast and a large number of the "oldtimers" who had left the camp when it declined and spent their money in other places, began to return to share in the golden harvest about to begin.

A New Period of Activity

At the time of writing the boom is on full blast, and people are coming in from all over the country. The stock market, with Jumbo Extension as a leader, is in a furor. Old stocks, hidden away in trunks and pigeonholes and long forgotten, have been resurrected and in many instances turned into money at the present market prices. Various tales are told of persons who have dug up these stocks and turned them over for amounts of money sufficient to last them for the remainder of their lives. Of course, these tales grow with repetition and the effect is to excite the public. Maps of the Goldfield district, which have received but scant attention during the past few years as they hung on the walls, are now at a premium. The large one that hangs on the wall at the Goldfield Hotel is constantly surrounded by crowds eager to find open ground or trace the course of the new oreshoot. Copies of Ransome's report on the Goldfield dis-

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trict, now out of print, are eagerly sought by visiting engineers, and geological papers and articles published in the past are carefully read for some clew to present conditions. Is there after all a substantial basis for all this excitement? I believe there is, at least for a part of it.

F. L. Ransome's report, "The Geology and Ore Deposits of Goldfield, Nev.," issued by the U. S. Geological Survey, is excellent. It is the result of a careful study of the district, and his geological conclusions have been borne out to a great degree. I believe that the development work done in the past few years on the lower levels of the various mines has made clear some of the puzzling problems which Ransome encountered, and that it is now possible to formulate a theory supported by facts that will give a clear idea of the formation of the ore deposits. I do not intend to go into a technical discussion of the various rock flows, the geological sequences, or the processes of alteration and ore deposition with all the attending features, since this has been thoroughly covered by Ransome's report and other articles in the past few years. I intend merely to give a broad outline covering the structural features: the formation of the fissures now occupied by the ore deposits, and to correlate the facts already ascertained by Ransome, Locke, Byler and others.

Recent Study of Geological Features

E. A. Byler has been in Goldfield continuously since its discovery and has studied the various features of the geology carefully. By means of a glass model, constructed by himself, he has noted the detail features of the geology as they were developed by the numerous shafts and other openings, and his ideas have already been expressed.[1] All of the geologists who have studied the problem suggest a relation between Columbia Mountain fault and the mineralization. Ransome, in his report, terminates this so called Columbia Mountain fault at the Conqueror mine on the north and the Red Top mine on the south. Byler has extended it beyond the Florence on the south and to an east and west fault, extending westerly from Diamondfield on the north. The different dips of this fault, varying from 20° to 55°, have been puzzling and this in itself suggests that there have been several different movements.

Ransome concludes that the greater part of the total movement was prior to the dacite intrusion while Locke, touching lightly on this faulting, concludes that the main part of the movement was later. Byler agrees with Ransome. Correlating the known facts concerning the dip, we find that, in the immediate vicinity of Columbia Mountain, and where it is contiguous with it, the fault has an easterly dip varying from 50° to 60°. Toward the west, in the vicinity of the Conqueror mine, it flattens to 20° to 25°, still dipping to the east. Through the dacitic area south of the mountain the fault is irregular both in strike and dip, and has apparently dissipated itself into innumerable fractures which in the main dip easterly, from 30° to 55°, and even steeper. Upon passing into the latite, a general dip of 30° to the east is encountered and this seems to persist to depth.

Byler says: "The fault zone, shown in this section on its dip, corresponds approximately to sloping fault-contacts of dacite with latite, and latite and shale, and at deeper workings probably the fault contact of shale with alaskite. The downward throw on the east side of the fault has not been sufficient in amount to allow the approximately horizontal layers of latite and shale entirely to pass their corresponding layers on the west side. Therefore, the fault zone in places passes through latite upon both sides, and similarly through shale. In consequence of the dacite intrusion across this fault along a portion of its length, which practically obliterated it to a depth of about 300 ft., it follows that the relative position of the geological formations caused by the fault do not properly show above or at this intrusion, though they do below it.

After the dacite intrusion there has been a further small movement along this fault zone, and where the intruded dacite lies across the upward extension of the zone, no preëxisting fracture is present, and the movement, while following the extension in general, has been recorded in irregular fractures extending up to the surface having a steeper dip, and connecting below with the fault as shown in Fig. 6. The mass of eruptives and solidified dacite intrusion has settled irregularly, due to the additional movement of the fault in its original position below, and we consequently find many irregular fractures extending from this fault zone to the surface. These fractures connect below and finally merge with the original fault zone, the foot wall of which in effect forms the foot wall of the mineralization."

Ransome's Description of General Geology

We find that no matter what dip these various fractures have at or near the surface, at a depth of about 300 ft. they merge into the main fissure, with an easterly dip of 25° to 30°. This at least is true of the places exposed by the workings in the productive area. It is hard to conceive of an upthrust, or block fault, showing a slipping of the rock layers on the fault plane having such a flat dip as 25°. This movement has more of the appearance of faulting under a tension, a pulling apart of the rocks, rather than a shearing, such as we would have with an upthrust. This part of the faulting movement seems to be entirely separate from the movements caused by Columbia Mountain. Ransome's description of the general geology of the district suggests a solution of the question. Quoting from his report: "The structure of the Goldfield district, as previously stated, is broadly simple. A Tertiary volcanic series resting upon the worn surface of much older rocks has been elevated into a dome of gentle curvature, and this after some modification by faulting and igneous intrusion has been truncated by erosion so as to denude patches of the fundamental formations. This structure was afterward covered, at least in part, by flows of lava which have in their turn been eroded from all but the outlying parts of the district. Banner Mountain may be taken as the approximate center of the uplifted area. The uplift, however, is not symmetrical, and Vindicator Mountain appears to correspond structurally to a local protuberance on the dome. . . . The symmetry of the dome is further modified, as will later be shown, by irregular intrusions of the dacite and by the Columbia Mountain fault."

The consensus of opinion, deduced from a correlation of the facts, is that this uplift occurred some time after the out-pour of the Milltown andesite and before the intrusion of the dacite. The effect of this uplift would be twofold. It would tend to break up and disrupt the flows

[1] "Min. and Sci. Press," July 12, 1913, p. 959.

directly over the highest point of uplift, and, producing a tension at a certain radial distance from the center, cause a breaking and in many places a slipping of the rocks, or in other words, an approximately circular tension fault. This line of faulting corresponds closely with a circular line drawn through Ransome's area of alunitic alteration as shown in Fig. 1 (after Ransome). I do not believe that there was actual faulting around the entire circumference, but in the absence of faulting, there would be a crushing and fissuring of the rocks sufficient to produce a condition favorable to ore deposition. This faulting and breaking probably extend to great depths and

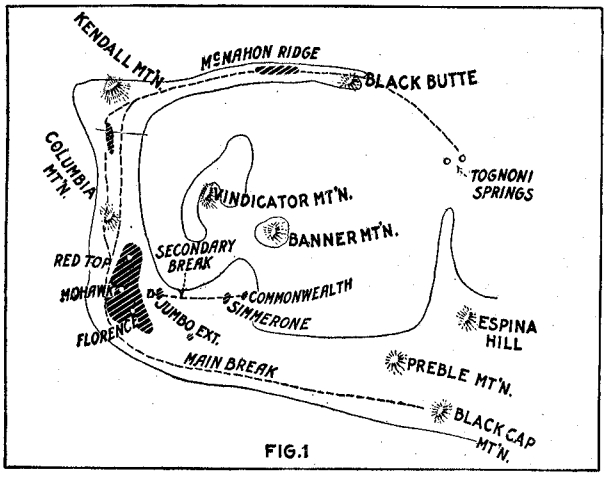

FIG.1

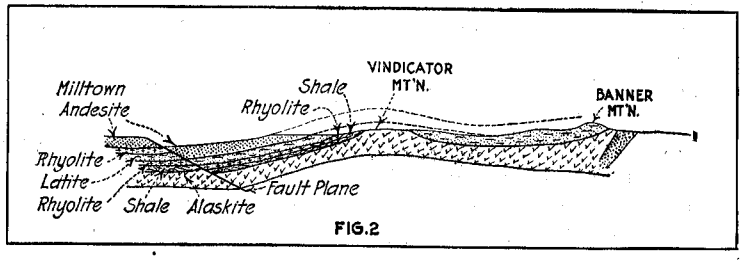

FIG.2

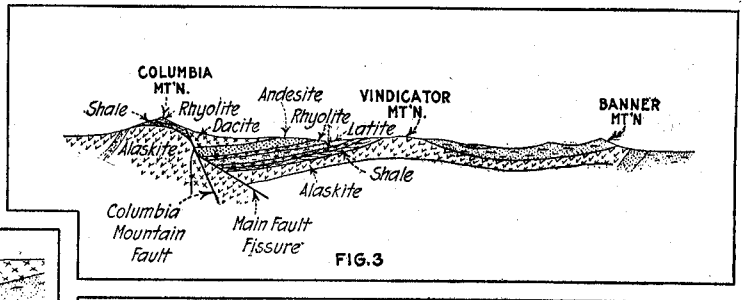

FIG.3

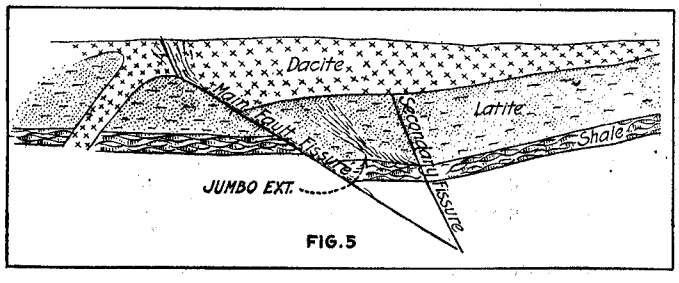

FIG.5

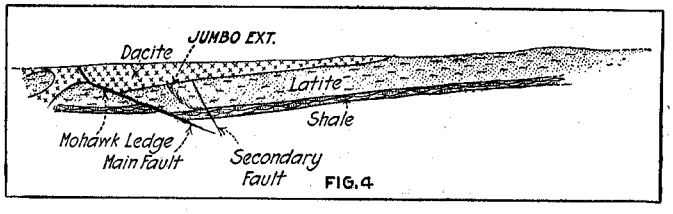

FIG.4

ILLUSTRATIONS OF GOLDFIELD GEOLOGY

connect with the source of the mineralizing solutions, furnishing a path of easy access to the surface. It is entirely probable, judging from the character of the ore deposits, that at this time and before the intrusion of the dacite, the formation of the orebodies began, and as a result we have those of the Black Butte, McMahon Ridge, Sandstorm and Kendall and possibly the lower end of the Mohawk series and the large orebody recently discovered in the ground of the Jumbo Extension company.

In a disturbance of such magnitude as this it is inconceivable that there resulted just one distinct fissure plane. During the time of formation of this one main fissure there must have been formed innumerable smaller fissures and cracks, some superficial and of no great extent, others larger and connecting in depth with the main mineralizing break. This latter condition, I believe, is what exists on the Jumbo Extension ground. The orebody is largely confined to the latite and the latite-shale contact. The dacite coming later over the latite practically sealed this surface and arrested the free flow of the solutions and stopping the ore deposition at this time.

SEQUENCE OF CORRELATED EVENTS

The general sequence of events which bests correlates with the facts as ascertained is as follows: (1) The deposition of the Tertiary rocks up to and including the Milltown andesite, on the old pre-Tertiary floor; (2) the domical uplift, with Vindicator and Banner mountains as the center of the dome, and the formation of the main fault fissure around the circular edge of the dome corresponding to a circular line through Ransome's area of alunitic alteration; (3) the first era of mineralization, aided by more or less continuous movement along fault plane, caused by readjustment; (4) the intrusion of the dacite, following the structural line of weakness, extending around the edge of the dome from Columbia Mountain to Black Butte. According to Byler there seems to

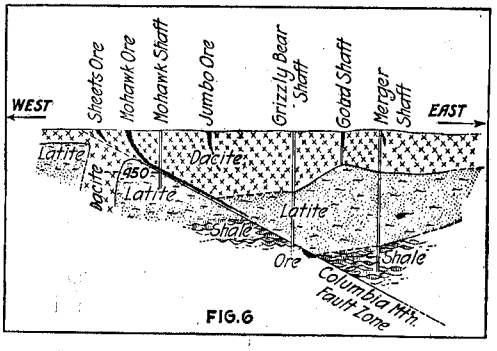

FIG.6

be considerable evidence that the dacite exists as a dike, at least for a large part of this distance, and that the dacite now exposed is partially intrusive and partially effusive (this, I believe, is also Ransome's idea); (5) the upthrust of Columbia Mountain, causing the Columbia Mountain fault. This fault is clearly defined and has a steep dip to the east where it is in immediate contact with the mountain. South of the mountain and through the known main productive area of the camp, the movement of the faulting dissipated itself in breaking and fissuring the body of dacite. The fault connects in depth with the main fault fissure caused by the domical uplift. The surface breaks in the dacite were irregular both in dip and strike, and extended into the Milltown andesite beyond the Florence. This breaking of the dacite, together

with the breaking caused by the cooling of the mass, made of the dacite along this line of movement a porous mass, the so called sponge described by Ransome; (6) the resumption of the flow of the mineralizing solutions. With the dacite covering shattered and broken over the area outlined above, the mineralizing solutions from the main fault fissure found ready access to the surface and circulation was renewed. The large dacitic orebodies of the Red Top, Mohawk and Combination and the andesite orebodies of the Florence were formed. Some slight post-mineral faulting occurred later which modified the position of the orebodies somewhat. In general, the ore deposits formed in this part of the district have followed down the breaks in the dacite to the main fissure, down this fissure through dacite and latite to the latite-shale contact, then down the trough formed by the fissure and shale into Atlanta ground, and no doubt at some point still deeper they will pass into the alaskite.

It is impossible to correlate the new orebody of the Jumbo Extension in its upward extremities with the main ore-zone of the Mohawk and Florence group. The bunches of ore occurring in the dacite above the main orebody are disconnected and do not coincide with any extensions of orebodies to the west. Upon entering the latite the vein or orebody becomes better defined with a northwest and southeast strike and a dip to the northeast. Down through the latite to the shale the deposit increases in size and distinctiveness until at the latite-shale contact its proportions are large and the value of the ore in gold, silver and copper high. The contact dips slightly to the northeast and the rake of the oreshoot is to the east.

Secondary Break as Mineral Resource

As stated before, I believe the immediate source of this mineral is a secondary break striking nearly east and west and extending from at least as far west as the Clermont claim and to the Commonwealth mine on the east, and connecting in depth with the main mineralizing break. I have indicated this break in Fig. 1, which is taken from Fig. 19 of Ransome's report. The evidence that this break exists is deduced from superficial examination. Its course is indicated on the surface by a gulch following quite closely the course shown on sketch. In addition to this we find small surface exposures of ore in the dacite following this gulch line, the significance of which will be explained later. Near the western end was the bunch of high-grade oxidized ore found on the Velvet claim almost directly above the present orebody, which yielded about $11,000 in 1907. Some ore was found on the Spearhead claim east of this point. Still farther east and on the Cimarron claim a small pocket of oxidized ore yielded between $5000 and $10,000. East of the Cimarron on the Commonwealth property, bunches of rich ore were found on the surface and to a depth of 100 ft. Across the gulch, on the Lone Star property from $15,000 to $20,000 of ore was extracted at or near the surface.

In the mining of this ore, it was impossible to follow the downward extension of the "pay crack." The reasonable explanation of this seems simple. The larger part of the mineralization from this secondary break took place before the intrusion of the dacite, in the latite and on the latite-shale contact. After the intrusion of the dacite the latite surface was sealed and the circulation of the mineral solutions stopped. As this part of the district was too far away to be affected by the Columbia Mountain uplift and not in line with the faulting, the breaking up of the dacite was slight. The porous mass, likened to a sponge, was missing, and ore deposition slight. The small ore deposits enumerated above were formed in small cooling cracks in the dacite, which connected through small seams with the break in the latite below. These small seams as they were formed allowed a very slight resumption of circulation of the mineral solutions. I believe that intelligent prospecting along the line of this indicated secondary break will very likely be rewarded by the exposure of other oreshoots. I also do not believe that this is the only secondary break connecting in depth with the source of the solutions. Prospecting will probably disclose others.

With the discovery of the large body of ore on the latite-shale contact, this contact has assumed too great importance in the public eye. It must be remembered that ore occurs in a very small portion of the dacite, latite and andesite formations, and that other conditions are necessary for its deposition. This is just as true of the latite-shale contact. This contact has been exposed in a number of places in the district and no ore found on it, and great care must be exercised by the investing public in placing their money where they at least have a chance.

I believe that the chances of discovering further ore in depth in the andesitic areas of McMahon Ridge and Black Butte are good, and it is quite possible that there are other places along the circular break that are mineralized and will stand intelligent prospecting. The effect of the present discoveries will be to stimulate work along these lines.

More or less familiarity with the geology of the Goldfield district as described by Ransome, Locke, Byler and others is necessary to understand the outline of the above theory as I have gone into but little detail. Fig. 1, after Ransome, gives an idea of the general circular break with Banner and Vindicator mountains as approximate center. The dotted circular line is only an approximation of the course of the main break and follows closely Ransome's area of alunitic alteration. Its actual course is masked to a large degree by the dacite intrusion. This area is no doubt the result of the circulation of waters through the main fissure, both from above and below. The secondary break is shown by a dotted line extending from a point east of the Mohawk shaft to the Commonwealth mine. The strike of this is assumed along the gulch line connecting the two points. The dip is problematic. Fig. 2 is a section through Vindicator and Banner mountains and represents the approximate position of the various rocks after the domical uplift and erosion at the highest point, and shows the faulting plane on the western edge.

Fig. 3 shows how this was further modified by the intrusion of the dacite and the upthrust of Columbia Mountain. The main fault fissure, instead of extending to the surface, is cut off by the dacite and the Columbia Mountain fault, as indicated in the sketch.

Fig. 4 after Ransome, is a cross-section through the Mohawk shaft showing the Mohawk ledge and the approximate position of the secondary break with reference to the main fault fissure and the Jumbo Extension ledge. The dip of the secondary break is entirely assumed. Fig. 5 is a portion of 4 enlarged. Fig. 6 is a copy of Byler's Sketch 1.