REPORT
ON THE
PATCH AREA, GILPIN COUNTY, COLORADO.

SITUATION:-
The area known as the Patch is situated on the eastern flank of Quartz Hill, about a mile from the City of Central. It is entirely covered by a network of mining claims, mostly patented, as shown in the accompanying Plat (No. 1); on which is also indicated the ownership of the various properties. Its dimensions cannot be stated exactly, as the surface is largely covered by debris, mine dumps, and surface slide rock; but it appears to be approximately oval in form, with a maximum length of 700 feet along its E-W axis, and a maximum width of 450 feet from N-S. The net area may be estimated as 5-1/2 acres.

DESCRIPTION:-
This area is enclosed by the complex archean rocks of the Front Range, which here vary from granite to mica-schist. By some agency which the existing evidence does not permit us to define, these rocks in the Patch have been shattered, locally mineralized, and interspersed with blocks and sheets of porphyry of all sizes. This action is possibly connected with an andesite dyke, which limits it on the south, and extends for nearly a mile to the west paralleling the California-Gardner vein. Not improbably, the whole area may be underlaid at great depths by a mass of this eruptive; and its mineralization may have been effected by the hot magmatic waters given off by the latter on cooling.

(1)
The whole area, to some extent, and more particularly the kaolinized portions and the interstices between the shattered rocks, have been mineralized with pyrite, zinc-blende and chalcopyrite, in a gangue of quartz. Occasionally galena, siderite, and calcite occur. It is worthy of note that zinc-blende predominates throughout the greater part of the area, and that the presence of chalcopyrite characterizes the southern portion, adjoining the Gardner-Roderick Dhu vein.

There would seem to be some tendency for higher gold values to coincide with portions of the ore-mass in which chalcopyrite is visible. With this exception, it is difficult to distinguish the more auriferous from the more barren mineralized areas; certainly the gold is in no way proportionate to the percentage of sulphide minerals.

Within this general mass, enriched portions of considerable extent occur. These do not appear to have necessarily any particular form, excepting at the west end of the San Juan claim, where they are elongated lenses, often with one definite wall, which continues out into the unaltered country-rock as a narrow vein. Other veins, such as the Climax, enter the Patch and lose their identity in the mass of fractured and mineralized material. Many of the enriched portions, especially above the La Crosse Tunnel level (250 feet from surface), have been worked out leaving extensive open chambers, often 20 to 40 feet wide and over 100 feet high. It is remarkable that the ground in the roof and sides has stood safely in this way without support for many years.

The principal of these open stopes are those of the San Juan, Roderick Dhu (Protection) and Modoc; and there is satisfactory
evidence that from those in the former a gross production of nearly $400,000 has been made. The Protection stope, a little south of the San Juan shaft, and the Modoc workings, a little north of the same point, have produced $85,000 and $20,000 respectively.

**DEVELOPMENT:**

The Patch is traversed from N - S, through its center, by the La Crosse Tunnel; which was driven about forty years ago for the purpose of draining the east end of Quartz Hill to the level of Nevada Gulch. The depth from surface - at the San Juan shaft - is 250 feet. From the La Crosse Tunnel a level connects with the 4th level and shaft of the San Juan mine. To the east, moreover, a level has been driven to connect with the Climax shaft. These and other workings at the La Crosse level are shown on the accompanying plats; part of the lower workings from the San Juan shaft being also indicated by broken lines.

Besides the above the Patch is traversed from S - N, a little further east, by a cross cut from the Quartz Hill Tunnel, some 350 feet below the La Crosse. This cross cut was intended to meet a cross cut south from the Phoenix shaft, but was stopped when the two ends were separated by a space of 150 or 200 feet. At still greater depth, the Patch is found in workings from the San Juan and Rose-Gardner as deep as 300 feet from surface, from the Mackey-Burroughs at 1000 feet and from the Phoenix-Burroughs in a short cross cut at the 1300-foot level; all the last-mentioned points being outside the surface boundaries of "Patch" ground. So far as the evidence exists, in fact, it suggests that the mineralized area, in depth, extends outwards in every direction. None of the above workings are now accessible, and it was therefore not possible to sample them.
GENERAL OBJECT AND THE RESULT OF EXAMINATION AND TESTS:—

The main question which it was the object of my examination to solve, was whether this entire area can be profitably worked on masse, by glory-hole or otherwise, through the Newhouse Tunnel, a vertical depth of 1600 feet below. The two main facts to be taken into account in considering this, are, obviously, quantity available and grade.

As to the former, the Patch contains some tongues and masses of unaltered, or very slightly altered, granite and schist, which would have to be included under the plan of operations contemplated. I consider the ore-body reasonably proved down to a level of 50 feet below the La Crosse Tunnel, above which it will contain approximately 4,500,000 tons. There is reason to expect that "Patch" material will be found to extend more or less continuously down to the Newhouse Tunnel level.

As to the average grade, Plats 2 and 3 may be consulted. The former shows in color the average assay results obtained from 139 large and carefully taken hand-samples, of which 116 were taken by Mr. W. H. Wiley, and 23 by myself. In Plat 3 are similarly indicated in color the results of 20 mill-runs, on samples of from 7 to 84 tons each, which were treated by amalgamation and concentration at the Hidden Treasure stamp-mill at Black Hawk. Details of these mill-runs are tabulated in Appendix 2, and all assays from my own hand-samples in Appendix 1.

By comparing these it will be seen that the general results are very similar; excepting that the mill-runs gave higher results than the lowest hand-sample averages, and lower results than the higher hand-sample averages. In other words, the mill-runs are more uniform.
They indicate that, from a total of 576.86 tons milled, a total average value of $550.96 was extracted, or at the rate of $1.08 per ton. Of this saving, 85% was in the form of retorted gold. The concentration facilities at the Hidden Treasure mill are limited, and not very well suited to ores containing so small a proportion of concentrate. My experiments indicate that an additional 10¢ per ton could be saved from the average material by close concentration of the pulp.

I am of opinion that these mill tests fairly represent the mass of the Patch, which I therefore estimated to contain an average value in gold of $1.58, from which a net saving of $1.10 can be made by amalgamation and concentration.

The actual receipts from products sold were somewhat lower, $0.84 per ton. This however was partly due to the small quantity of concentrates marketed, the commercially unsalable values in blanketings, etc. For various reasons which it is unnecessary to detail here, I may say that I consider the net selling values of the products, on a large scale of working, would in practice amount to $1.00 per ton, or the actual gold yield shown by the mill-runs; and that, as stated above, 10¢ per ton could be added to this by close concentration.

The working costs, on a scale of 500 tons or more per day, I estimate as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining by open cut and glory-hole</td>
<td>$0.25</td>
</tr>
<tr>
<td>Tramming to main shaft and lowering to tunnel level</td>
<td>.10</td>
</tr>
<tr>
<td>Transportation through Newhouse Tunnel to mill</td>
<td>.10</td>
</tr>
<tr>
<td>Milling</td>
<td>.40</td>
</tr>
<tr>
<td>Taxes, administration and general expenses</td>
<td>.15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$1.00</td>
</tr>
</tbody>
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This shows a profit margin of only 10¢ per ton or $450,000 on the entire tonnage of 4,500,000 which may be regarded as now proved.
Obviously, the profit margin is insufficient to warrant the purchase of the properties and the considerable expenditure necessary for their equipment.

The costs estimated above are liberal, and are more likely to be reduced than exceeded. It is moreover probable that at some future time they might be reduced by one-half, in view of the fact that I have quarried and milled at a profit somewhat similar deposits in Cornwall, the yield of which (tin-ore concentrates) was then worth only 20¢ per ton. These considerations however would not justify the large investment necessary to purchase and equip the Patch under Colorado conditions at the present time.

**MILLING METHODS AND RESULTS:**

The milling tests were made with one battery of a slow-drop stamp-mill of old Gilpin County pattern, using high drop and high discharge, and crushing very fine. In this type of mill most of the amalgam is saved on the inside plates. After passing over outside apron plates 8-1/2 feet long, the pulp goes through an amalgam trap, over blanket sluices, and is then concentrated on Gilpin County bumping-tables with amalgamated copper bottoms, before going to waste. As a general rule, even the lowest grade ores yielded at the rate of about 10¢ per ton in high-grade blanketings, and an equal amount in amalgam recovered from the amalgam traps, bumping-table plates, etc. In the present case, these secondary sources of saving were disappointingly ineffective. At the final clean-up, only .20 oz. of impure bullion, worth probably $12.00, was recovered from the amalgam traps for the entire quantity of ore milled, and nothing at all from the bumping-table plates. The blanketings (excluding those from Lot No. 3) were so low in grade as to be unmarketable, and the only alternative to throwing them away was to run them through together.
with Lot No. 21; which however was no doubt a very ineffective way of saving their values.

The total saving of gold effected, reckoned from assays of products saved and waste, was 63.5 %, which is as good as could be expected working on material of such extremely low grade. As above stated, closer concentration would add a further saving of about 10 ¢ per ton. 

It was worthy of note, notwithstanding the extremely small quantities of amalgam deposited, no difficulty was experienced in keeping the plates in proper condition: and there was no securing action. Another interesting point was that the grade of the concentrates was low in proportion to the extremely low grade of the material treated. As a rule, Patch concentrates (from the more enriched portions) are worth from $10 to $20 per ton net.

DISCUSSION OF SPECIAL TESTS:-

By referring to Appendix 2, it will be seen that mill-run Nos. 15 and 16 were made on material from the same place. This was screened through a grizzly with 1-1/2 in. spaces; the coarse and fine being milled separately. These fines, made by blasting and handling, amounted to only 40 % by weight of the total, but yielded 72 % of the total value saved, running $1.53 per ton as against 30.41 per ton for the coarse.

If the Patch were broken in an open cut, run through a glory-hole and a long rock chute with a succession of stops, such a differentiation in grade between coarse and fines could doubtless be carried much further. These facts are significant, and point to the possibility of improved results by the adoption of some method of mining from below upwards in a succession of chambers, each of which when exhausted would be filled with the coarse rock screened out from the material mined in the chambers above it. This method would
moreover permit of leaving the more barren portions of "Patch" unbrok:en. In some such way as this, I am inclined to think that the better portions of the Patch will ultim:ately be mined, reducing the bulk of the milling ore to one-fourth or less of the mass, but raising the grade almost proportionately.

Composite samples of waste from mill-runs prove that, in the portions of the Patch which show more or less copper, the tailings carry an average of 0.20% copper, and in the balance of the area 0.90% zinc. Large portions of the Patch, indeed, carry fully as much zinc as much of the "sheet-ground" now mined in the Joplin district.

In my mill-tests, neither copper nor zinc were saved to any appreciable extent, the chalcopyrite and zinc-blend being too completely slamed by the fine crushing of the high-discharge stamp-mill. Nor can I imagine that any considerable commercial saving of either could be made under any possible system of handling the Patch as a whole. Under the method of mining by separate chambers, however, I have no doubt that both copper and zinc might be made notable sources of increased saving.

PROSPECTS IN DEPTH:

The only levels open for examination, traversing the Patch ground below the La Crosse Tunnel, were the 5th, 6th and 7th levels of the San Juan mine. Of these, the San Juan 5th level shows no appearance of impoverishment. The 6th is poor, but is so short that no conclusion can be drawn from it. The 7th level, on the whole, compares unfavorably with the upper levels.

It would appear that no considerable Patch ore-bodies were opened up in the San Juan below the 7th level. On the other hand, the workings were not directed in search of such ore-bodies, exploration
having been centered in the neighborhood of the Gardner vein and its accompanying dyke,—where several good ore-bodies were in fact found. This was done by the then manager of the San Juan mine, Mr. Perkins, in pursuance of a theory that the mineralization which impregnated the Patch was likely to be concentrated, in depth, along the line of weakness established by the dyke. So far as the ore-returns at the Hidden Treasure mill can be relied on to throw light on the question of Patch values in depth, it appears that the ore at the time work in the lower levels of the San Juan was suspended, about 1885, was of equally good grade as in preceding years.

As to other points at which the Patch has been opened in depth, we have to rely on the sifted accounts of other observers. According to Mr. R. Sykes (through written communication to the writer) the material tested from his cross cut from the Quartz Hill Tunnel yielded about $12.00 per cord (equal to say $1.50 per ton). That from the cross cut in "Patch" at the 1300 level of the Phoenix-Burroughs mine yielded at the rate of $14.00 per cord (equal to $1.75 per ton). According to Mr. Jas. Rule, who was in charge of the Roderick Dhu when work was suspended, their Protection shaft, from 400 feet to the bottom, was in "Patch" material of good grade. Leasers in the Rose-Gardner property, driving east at a depth of about 900 feet, broke into good "Patch" ore, and shortly thereafter into the back of a level from the San Juan,—but were prevented from working by the management of the latter mine. Some six months ago, when the leasers in the Mackey-Burroughs mine were compelled to cease working by the rising water, they were shipping and milling undoubted "Patch" ore (the appearance of which is most characteristic); its average milling yield being about $5.00 per ton. Combining this somewhat vague and scanty positive evidence with the
lack of negative evidence, I am of opinion that it may be taken as proved that the "Patch" material continues to a depth of at least 1000 feet from surface, and as highly probable that similar enriched areas to those worked at and above the La Crosse Tunnel level will be found at this depth. There is no sound evidence of progressive improvement of gold values in depth, in this part of Gilpin County.

**SUMMARY OF CONCLUSIONS:**

1. The Patch contains, to a level of 50 feet below the La Crosse Tunnel, or say 300 feet from surface, approximately 4,500,000 tons of material which will yield $1.10 per ton by amalgamation and concentration milling on standard lines.

2. The cost of working by the glory-hole and open-cut on a large scale, would not exceed $1.00 per ton.

3. Under present conditions, the purchase and equipment of the Patch, for the purpose of working on this plan, is not recommended.

4. There is evidence of the continuation of mineralized ground to much greater depths, and reason to anticipate that enriched portions will continue to be found in it.

5. Thorough exploration of the Patch from the Newhouse Tunnel level, with a view to the working of its enriched portions, is recommended as a good speculation.

6. Purchase prices of Patch ground, with a view to such exploration, should be based only on prospective value.

Respectfully submitted,

George E. Collins.

Mining Engineer.

Denver, Colorado,
420 Boston Building,
September 24th, 1907.