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The geological structure of the Waverley gold district being the type of the structure of most of the other known districts, the importance of ascertaining the correctness of the views I had expressed respecting the origin, distribution, and general course of the lodes, and the laws to which they were subjected, acquired some interest, for, if generally true, some mining operations would be much facilitated in a country sometimes deeply covered with drift clays and gravels. Hence I quote, with much satisfaction, the following testimony from the Chief Commissioner of Mines, taken from his official report for the year 1869, p. 9:—

"*Waverley*.—Operations have been carried on in this district by the Lako Major, Rockland, American Hill, and Waverley Gold Mining Companies, and by Leopold Burkner, Esq. The most noticeable feature in this district is the tracing of the southern outcrop of the celebrated Tudor lode, by a series of openings connecting two points eleven hundred feet distant, and thus proving the correctness of the views entertained by Professor Hind, of the geological structure of this district, as described in his report, and fully exemplified in the map accompanying that report. The South Tudor has been now traced for upwards of eleven hundred feet, and the mean difference between the outcrop assigned by Professor Hind and the actual outcrop, disclosed by shafts, does not exceed twenty-five feet six inches throughout that horizontal distance."

Mr. Rutherford, the Provincial Inspector of Mines, also states as follows in his official report for 1869:—"A short distance west of his workings on the Tudor lode, Mr. Burkner has sunk a series of shafts on a lode ranging in a somewhat parallel direction with the South or Nigger lode, formerly worked by him. Five shafts are being sunk on this lode, their present depth being about 50 feet, and the lode is taken out, by underhand stopping, the entire range of the shafts, with the exception of a bulkhead or divisional piece, four feet thick, which is left in the centre of space between each shaft. The lode varies in thickness from twelve to five inches; it dips to the north-west. The trending of the strike of this lode towards the north and east has been followed from the shafts to within a few feet of the old workings on the Tudor lode, and its identification with that lode been established, and the construction assigned by Professor Hind to this part of the Waverley district confirmed."

The so-called barrel quartz, at Waverley, is a fair representation of a corrugated lode occurring on the crown of an anticlinal. In nearly all the gold districts the same form of quartz beds may be seen, and in similar relative positions. The corrugated structure is not confined to the quartz, but spreads fan-like into the overlying rocks, and appears to be in part the result of unequal pressure during the folding of the strata.

The foregoing observations apply to the old contemporaneous beds of auriferous quartz; but there is another class of lodes which have generally a bedded structure, but are of subsequent origin, and may be styled intercalated beds. These will be noticed in subsequent paragraphs.

In every district in Nova Scotia, it is remarked that the gold frequently "runs in streaks," that is to say a zone of rich auriferous quartz occupies a certain breadth as the lode, while to the east and west of that zone the quartz is comparatively poor in the precious metal. It is also found in different districts that the "gold streak" has a different angle with the horizon, and that sometimes the course of the rich zone corresponds, or is coincident with the ripples or swells in the lodes, and also that the gold streak varies in direction in different leads.

\* For details, see letters entitled "Theory and Practice at Waverley," appended to a "Preliminary Report on a Geological Series, underlying the Gold-bearing Rocks of Nova Scotia." G. M. Anther, Halifax, 1870.

The position and dip of the gold streak being found on one side of the anticlinal, it can be traced to corresponding lodes on the other side, with such variations in dip as agree with the section of the curve of the anticlinal.

The term "gold streak," in Nova Scotia, is synonymous with the term "chimneys," in California, and "pipes," in Australia.

## IV.—STRUCTURE OF SHERBROOKE GOLD DISTRICT.\*

If a slightly undulating line be drawn on a course S. 83° West (true), or N. 75° W. magnetic, from area 773, on the east side of the St. Mary's River, it will represent part of the axis of the Sherbrooke anticlinal. On the north side of the axis, the lodes dip to the north, at an angle generally of about 45 degrees, except when approaching the axis, where they commence to curve. On the south side, the dip varies from 80 degrees to vertical, except when making the curve. Proceeding south from the axis, the lodes become more persistently vertical, until they acquire a slight northerly dip, thus showing that the form of the anticlinal is that of a slight overturn to the south, as represented in the sections. On making the curve, some of the lodes sweep gradually round with a dip, varying from 80 degrees south to 60° S.W., 35° S.W. by W., 26° W., then gradually increasing until they acquire the normal dip on the north side of the anticlinal, of about 45 degrees north. The plan of the Root-hog lode shows this curvature with some degree of detail. The strata and contemporaneous lodes at Sherbrooke, like those at Waverley, may be described as beds of slate and quartzite, with thin sheets of auriferous quartz folded in an overturn anticlinal form, and subsequently tilted to the east by a cross anticlinal. The denuded crest of the intersection of the anticlinals has exposed the sheets of quartz in the form of long semi-ellipses, whose bases rest upon Cambrian gneiss, from which the Silurian quartzites and slates have been removed by denudation. Numerous dislocations, having generally a north and south course, occur at Sherbrooke. These appear, like those at Waverley, † to have taken place during the north and south folding; some of them are represented on the plans and in the sections.

## V.—THE AURIFEROUS LODS.

As much misapprehension might arise from the broad statement that all the auriferous lodes in Nova Scotia are sheets of quartz, generally traceable from one side of a tilted anticlinal to the other side, in unbroken continuity, it is necessary to state distinctly that, although the sections exhibit this relation, yet it holds good only with reference to certain lodes which have been so traced, and to groups of lodes. This arises from the structure of the lodes. In many instances they are not continuous for very long distances, that is to say, they "thin out" and "take up again." In some instances the same lodes can be traced at the surface for many hundred yards, and even for miles, but it is safe to assume that generally, as stated in my report on Waverley gold district, they resemble thin lenticular sheets of quartz, whose edges overlap one another, especially in bands of slate. In making cross-cuts at some distance below the surface, lodes are frequently cut which do not appear in the surface trenchers, and in broad bands of slate, lodes thicken to the breadth of 10 to 12 inches, and thin out to a film of quartz, or disappear altogether in the space of a few hundred feet. But before they thin out altogether, another lode begins to appear, separated from the first by a few inches, more or less, of slate or quartzite. This cannot be strictly regarded as a continuation of the lode which has "thinned out," although

\* The gold district of Sherbrooke is situated about twelve miles from the mouth of St. Mary's River, in the county of Guysborough. It is eighty miles east of Halifax on an air line.

† For a description of the dislocations at Waverley see report on that district.