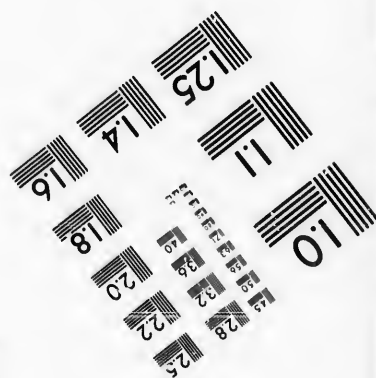
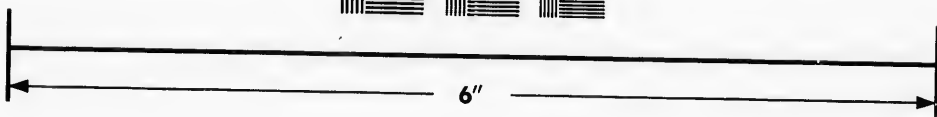
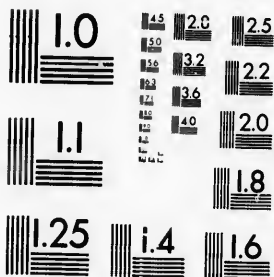


**IMAGE EVALUATION
TEST TARGET (MT-3)**



**Photographic
Sciences
Corporation**

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

**CIHM/ICMH
Microfiche
Series.**

**CIHM/ICMH
Collection de
microfiches.**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1987

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- Coloured covers/
Couverture de couleur
- Covers damaged/
Couverture endommagée
- Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée
- Cover title missing/
Le titre de couverture manque
- Coloured maps/
Cartes géographiques en couleur
- Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)
- Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur
- Bound with other material/
Relié avec d'autres documents
- Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- Additional comments:/
Commentaires supplémentaires:

- Coloured pages/
Pages de couleur
- Pages damaged/
Pages endommagées
- Pages restored and/or laminated/
Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées
- Pages detached/
Pages détachées
- Showthrough/
Transparence
- Quality of print varies/
Qualité inégale de l'impression
- Includes supplementary material/
Comprend du matériel supplémentaire
- Only edition available/
Seule édition disponible
- Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/
Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

The copy filmed here has been reproduced thanks to the generosity of:

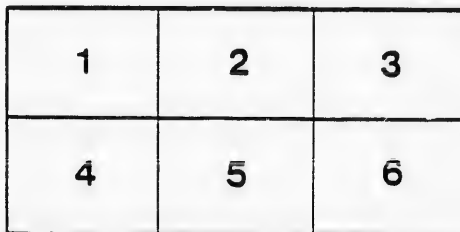
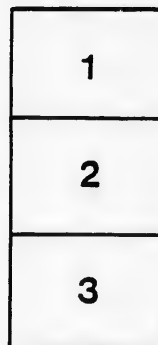
Library,
Geological Survey of Canada

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

Bibliothèque,
Commission Géologique du Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

ON THE GOLD MINES OF CANADA,

AND THE MANNER OF WORKING THEM.

From the Canadian Naturalist for February, 1863.

The existence of gold in the sands of the Chaudière valley, to the south of Quebec, was, so far as we are aware, first announced to the world by General Baddeley (then Lieutenant) of the Royal Engineers, in the year 1835, and by him communicated to Prof. Silliman. (see American Journal of Science for that year, vol. xxviii. p. 112.) In 1847, and the three or four years following, careful examinations were made in that region by the Geological Survey, and it was found that the precious metal is not confined to the valley of the Chaudière, but exists in the superficial deposits of a wide area.

The source of the gold throughout this extent appears to have been the breaking up of the crystalline schists of the region, in which the metal has occasionally been met with. One example of this is in a vein of quartz in clay state, in the parish of St. Francis, on the Chaudière, where it occurs with argenteriferous galena, arsenical pyrites, cubic iron pyrites and sulphuret of zinc,—the latter two ores containing a notable proportion of gold. The results of assays of all these materials will be found in the reports of the Geological Survey for 1853, page 370. During the past year, another vein of quartz, about one hundred yards from this last has yielded very rich and beautiful specimens of native gold, also accompanied by arsenical pyrites. The precious metal occurs again not far from the Harvey Hill copper mine, in Leeds, at a locality known as Nutbrown's shaft, which is sunk on a vein of bitter-spar, holding specular iron, vitreous copper ore, and native gold, generally in small grains or scales. Some specimens from this locality, however, have weighed as much as a pennyweight. The only attempts as yet made at gold-mining in Canada have been in the diluvial deposits. We extract from the General Report of the Geological Survey of Canada, now in press, and soon to appear, the following details with regard to these deposits, together with the results of some of the trials hitherto made to work them, and suggestions as to the best mode of obtaining the gold.

“These rocks of eastern Canada may be traced south-westwardly through New England, along the Appalachian chain, to the state of Georgia, and furnish gold in greater or less quantity in nearly every part of their extension. They constitute the great gold-bearing formation of eastern North America, which in its

GEOLOGICAL SURVEY

mineralogical and lithological characters is similar to that of the western coast, and to those of Russia and Australia. These auriferous rocks in Canada, belong for the greater part to the Quebec group, of Lower Silurian age; but the quartz veins containing gold, mentioned above, are found cutting strata, which are supposed to belong to the Upper Silurian period. The auriferous drift covers a wide area on the south side of the St. Lawrence, including the hill country belonging to the Notre Dame range, and extending thence south and east to the boundary of the province. These wide limits are assigned, inasmuch as although gold has not been everywhere found in this region, the same mineralogical characters are met with throughout. In its continuation southward in Plymouth, and elsewhere in Vermont, considerable quantities of gold have been obtained from the diluvial deposits. In Canada, gold has been found on the St. Francis River, from the vicinity of Melbourne to Sherbrooke; in the townships of Westbury, Weedon, and Dudswell, and on Lake St. Francis. It has also been found on the Etehemine, and on the Chaudière, and nearly all its tributaries, from the seigniory of St. Mary to the frontier of the state of Maine; including the Bras, the Guillaume, the Rivière des Plantes, the Famine, the Du Loup, and the Metgermet. Several attempts have been made to work these alluvial deposits for gold, in the seigniories of Vaudreuil, Aubert-Gallion, and Aubert de l'Isle, but they have been successively abandoned; and it is difficult to obtain authentic accounts of the result of the various workings, although it is known that very considerable quantities of gold were extracted. The country people still, from time to time, attempt the washing of the gravel, generally with the aid of a pan, and are occasionally rewarded by the discovery of a nugget of considerable value. In the years 1851 and 1852, an experiment of this kind, on a considerable scale, was tried by the Canada Gold Mining Company, in the last named seigniory, on the Rivière du Loup, near its junction with the Chaudière. The system adopted for the separation of the gold from the gravel was similar to that used in Cornwall in washing for alluvial tin, and the water for the purpose was obtained from a small stream adjoining. Great difficulties were however met with, from a deficient supply of water during the summer months. The gravel from about three-eighths of an acre, with an average thickness of two feet, was washed during the summer of 1851, and yielded 2,107 pennyweights of gold; of which 160 were in the form of fine dust,

Y 2 A 3 1 1
 V 2 W 1 2 1 2 0 0 0 0 0 0 0

mingled with about a ton of black iron sand, the heavy residue of the washings. There were several pieces of gold weighing over an ounce. The value of this gold was \$1,826, and the whole expenditure connected with the working \$1,643, leaving a profit of \$182. In this account is, however, included \$500 lost by a flood, which swept away an unfinished dam; so that the real difference between the amount of the wages and the value of the gold obtained should be stated at \$682. The average price of the labor employed was sixty cents a day."

"In 1852, about five-eighths of an acre of gravel were washed at this place, and the total amount of gold obtained was 2,880 pennyweights, valued at \$2,496. Of this, 307 pennyweights were in the form of fine dust mixed with the iron sand. A portion was also found in nuggets or rounded masses of considerable size. Nine of these weighed together 468 pennyweights, the largest being about 127, and the smallest about 11 pennyweights. Small portions of native platinum, and of iridosmine, were obtained in these washings, but their quantity was too small to be of any importance. The washing season lasted from the twenty-fourth of May to the thirtieth of October, and the sum expended for labor was \$1,888, leaving a profit of \$608. A part of this expenditure was, however, for the construction of wooden conductors for bringing the water a distance of about 900 feet from the small stream. As this work would be available for several years to come, a proper allowance made for it would leave a profit in the year's labor of about \$680. It thus appears that from an acre of the gravel, with an average thickness of two feet, there were taken \$4,323 of gold; while the expenses of labor, after deducting, as above, all which was not directly employed in extracting gold, were \$2,957, leaving a profit of \$1,366. The fineness of the gold dust of this region was 871 thousandths; another sample in thin scales gave 892, and masses 864. A small nugget of gold from St. Francis gave 867 thousandths, the remainder in all cases being silver."

"Although the greater part of this gold was extracted from the gravel on the flats by the river side, a portion was obtained by washing the material taken from the banks above. As has been before remarked, the distribution of the gold-bearing gravel over the surface of the country took place before the formation of the present water courses, and the reason why the gravel from the beds of these are richer in gold than that which forms their banks, is that these rapid streams have subjected the earth to a

partial washing, carrying away the lighter materials, and leaving the gold behind with the heavier matters. According to Mr. Blake, it is found in California, that the gold in the diluvial deposits, which have not been subsequently disturbed by the streams, is not uniformly distributed, but is accumulated here and there in quantities greater than in other places. It would seem that during the first deposition of the earth and gravel, the precious metal became in some parts accumulated in depressions of the surface rock, constituting what are called pockets by the miners. It would appear from the facts here given that the quantity of gold in the valley of the Chaudière is such as would be remunerative to skilled labour, and should encourage the outlay of capital. There is no reason for supposing that the proportion of the precious metal to be found along the St. Francis, the Etchemin, and their various tributaries, is less considerable than that of the Chaudière."

"What is called the hydraulic method of washing deposits of auriferous gravel is adopted on a great scale in California, and to some extent in the states of Georgia and North Carolina. In this method, the force of a jet of water, with great pressure, is made available, both for excavating and washing the auriferous earth. The water, issuing in a continuous stream, with great force, from a large hose-pipe, like that of a fire-engine, is directed against the base of a bank of earth and gravel, and tears it away. The bank is rapidly undermined, the gravel is loosened, violently rolled together, and cleansed from any adhering particles of gold; while the fine sand and clay are carried off by the water. In this manner hundreds of tons of earth and gravel may be removed, and all the gold which they contain liberated and secured, with greater ease and expedition than ten tons could be excavated and washed in the old way. All the earth and gravel of a deposit is moved, washed, and carried off through long sluices, by the water, leaving the gold behind. Square acres of earth on the hill sides may thus be swept away into the hollows, without the aid of a pick or a shovel in excavation. Water performs all the labor, moving and washing the earth, in one operation; while in excavating by hand, the two processes are of necessity entirely distinct. The value of this method, and the yield of gold by it, as compared with the older one, can hardly be estimated. The water acts constantly, with uniform effect, and can be brought to bear upon almost any point, where it would be difficult for men to

work. It is especially effective in a region covered by trees, where the tangled roots would greatly retard the labor of workmen. In such places, the stream of water washes out the earth from below, and tree after tree falls before the current, any gold which may have adhered to the roots being washed away. With a pressure of sixty feet, and a pipe of from one and a half to two inches aperture, over a thousand bushels of earth can be washed out from a bank in a day. Earth which contains only one twenty-fifth part of a grain of gold, equal to one-fifth of a cent in value to the bushel, may be profitably washed by this method; and any earth or gravel which will pay the expense of washing in the old way, gives enormous profits by the new process. To wash successfully in this way requires a plentiful supply of water, at an elevation of from fifty to ninety feet above the bed-rock, and a rapid slope or descent from the base of the bank of earth to be washed, so that the waste water will run off through the sluices, bearing with it gravel, sand, and the suspended clay."

"The above description, and the added details are copied from a report on the gold mines of Georgia, by Mr. William P. Blake, who has carefully studied this method of mining in California, and by whose recommendation it has been introduced into the southern states. He states that in the case of a deposit in North Carolina, where ten men were required, for thirty-five days, to dig the earth with pick and shovel, and wash it in sluices, two men, with a single jet of water, would accomplish the same work in a week. The great economy of this method is manifest from the fact that many old deposits in the river beds, the gravel of which had been already washed by hand, have been again washed with profit by the hydraulic process. He tells us that in California the whole art of working the diluvial gold deposits was revolutionized by this new method. The auriferous earth, lying on hills, and at some distance above the level of the water-courses, would, in the ordinary methods, be excavated by hand, and brought to the water; but by the present system, the water is brought by aqueducts to the gold deposits, and whole square miles, which were before inaccessible, have yielded up their precious metal. It sometimes happens, from the irregular distribution of the gold in the diluvium in California, that the upper portions of a deposit do not contain gold enough to be washed by the ordinary methods; and would thus have to be removed, at a considerable expense, in order to reach the richer portions below. By the hydraulic

method, however, the cost of cutting away and excavating is so trifling, that there is scarcely any bank of earth which will not pay the expense of washing down, in order to reach the richer deposits of gold beneath.

“The aqueducts or canals for the mining districts of California are seldom constructed by the gold workers themselves, but by capitalists, who rent the water to the miners. The cost of one of these canals, carrying the waters of a branch of the Yuba River to Nevada County, was estimated at a million of dollars; and another one, thirty miles in length, running to the same district, cost \$500,000. The assessed value of these various canals in 1857 was stated to be over four millions of dollars, of which value one-half was in the single county of Eldorado. The Bear River and Auburn Canal is sixty miles in length, three feet deep and four feet wide at the top, and cost in all \$1,600,000; notwithstanding which, the water-rents were so great that it is stated to have paid a yearly dividend of twenty per cent, while other similar canals paid from three, to five and six per cent., and even more, monthly. The price of the water was fixed at so much the inch, for each day of eight or ten hours. This price was at first about three dollars, but by competition has now been greatly reduced.

“From these statements, it will be seen that the great riches which have of late years been drawn from the gold mines of California, have not been obtained without the expenditure of large amounts of money and engineering skill. This last is especially exhibited in the construction of these great canals, and the application of the hydraulic method to the washing of auriferous deposits, which were unavailable by the ordinary modes of working, on account of their distance from the water-courses, or by reason of the small quantity of gold which they contain.

“In order to judge of the applicability of this method of washing to our own auriferous deposits, a simple calculation based upon the experiments at the Rivière du Loup will be of use. It has been shown that the washing of the ground over an area of one acre, and with an average depth of two feet, equal to 87,120 cubic feet, gave, in round numbers, about 5000 pennyweights of gold, or one and thirty-eight hundredths grains to the cubic foot; which is equal to one and three-quarters grains of gold to the bushel. Now, according to Mr. Blake, earth containing one forty fourth part of this amount, or one twenty-fifth of a grain of gold,

can be profitably washed by the hydraulic method, while the labor of two men, with a proper jet of water, suffices to wash one thousand bushels in a day, which in a deposit like that of Rivière du Loup would contain about seventy-three pennyweights of gold. It is probable however that a certain portion of the finer gold dust, which is collected in the ordinary process, would be lost in working on the larger scale. It has already been shown that the gold is not confined to the gravel of the river channels, and the alluvial flats. The beds of interstratified clay, sand, and gravel, which occur on the banks of the Metgermet, were found to contain gold throughout their whole thickness of fifty feet, and even though its proportion were to be many times less than in the gravel of the Rivière du Loup, these thick deposits, which extend over great areas, might be profitably worked by the hydraulic method. The fall in most of the tributaries of the Chaudière and of the St. Francis throughout the auriferous region, is such that it will not be difficult to secure a supply of water with a sufficient head, without a very great expenditure in the construction of canals; and it may reasonably be expected that before long the deposits of gold-bearing earth, which are so widely spread over southeastern Canada, will be made economically available."

T. S. H.

