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GOLD PLACER DEPOSITS OF THE EASTERN TOWNSHIPS, PART E

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PROVINCE OF QUEBEC, CANADA

Department of Mines and Fisheries

Honourable ONESIME GAGNON, Minister L.-A. RICHARD, Deputy-Minister

BUREAU OF MINES

A.-O. DUFRESNE, Director

ANNUAL REPORT

of the

QUEBEC BUREAU OF MINES

for the year

1935

JOHN A. DRESSER, *Directing Geologist*

PART E

Gold Placer Deposits of the Eastern Townships
by H. W. McGerrigle



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PLATE

(After page 62)

The Stoke hills from a point five miles to the east (Showing abrupt rising of the igneous area of the Stoke hills above the flat plain. Also shows part of the highwestern ridge, or Stoke Mountain proper, in the back-ground).

GOLD PLACER DEPOSIT OF THE EASTERN TOWNSHIPS

by H. W. McGerrigle

INTRODUCTION

The term *Eastern Townships* is applied to an area of some 10,000 square miles in southeastern Quebec. Roughly outlined, the limits of this area are the International boundary on the east and south; Beauce county and the seigniory of Lotbinière on the north; and the Yamaska river and Missisquoi bay on the west.

Geologically, the townships are characterized by a wide variety of rock types and great complexity of structure, study and interpretation of which have raised highly intriguing and controversial questions for generations of geologists. More important, from the economic standpoint, is the fact that, in a number of localities, these rocks contain valuable mineral deposits — asbestos, talc, chromite, copper and sulphur ores, and gold. Deposits of some of these minerals have been exploited for many decades, while others have considerable potential interest. In the latter class are the occurrences of placer gold.

The gold placer deposits of southeastern Quebec first attracted attention in 1823, when gold was discovered in alluvials near the mouth of the Gilbert river, a tributary of the Chaudière. Since that time, placer gold has been found widely distributed in the Chaudière drainage system, and in paying quantities at several localities. Also, it has been reported from many of the streams in the eastern half of the Townships, more especially in the area between the International boundary on the one side and the line of the Massawippi-Ascot-Stoke hills, and the continuation of this line to the Chaudière, on the other. While the majority of these reported occurrences have not produced gold and have no economic future, there are some that have distinct possibilities.

SCOPE OF REPORT AND METHOD OF WORK

The object of this report is to present a description of all the known occurrences of alluvial or placer gold in the Eastern Townships, except those of the Chaudière drainage system. The area reviewed is indicated on the accompanying sketch-map No. 371, which embraces the entire area in southeastern Quebec in which placer gold is known to occur. The work was undertaken with a view to determining the economic value of the various occurrences, the source of the gold — whether local or brought from a distance — and whether the placers are of Recent, Glacial, or pre-Glacial age.

The work on which the report is based was carried out during the summer of 1935 by the writer and his assistant, Joseph Mathys, student

at L'École Polytechnique, Montreal. In some places local labour was secured for the purpose of digging test pits. Each locality examined was gone over superficially first, and panning tests were made of the Recent gravels in the present stream beds. In many places this was all that could be done or that was needed, but in some localities test pits were put down to a depth of several feet with a view to examining the deposits resting on bedrock. This, of course, was not everywhere possible, owing to the thickness of the overburden. The characteristics of each stream and its valley were noted, as factors bearing on the potential worth of a placer deposit, and an examination, generally brief, was made of the bedrock in the area drained by the stream.

A part of the field season was devoted to a reconnaissance study of the rocks of Stoke mountain and their extension southward to the Saint-François river at Sherbrooke. This bedrock geology is not described in the present report, but the formations met with are shown on the accompanying geological map.

Aside from recording the work done by the writer during the season of 1935, this report will have its main value in the summary it gives of the history of each working, as culled from earlier reports.

ACKNOWLEDGMENTS

The writer is indebted to Mr. H. Andrews, of East Angus, for his aid in piecing together the history of the work done in the Stoke Mountain area; to Mr. A. E. Cowling, of Scotstown, for information relative to his recent work in Bury township; and to several individuals for their kindness in indicating places where work had been done.

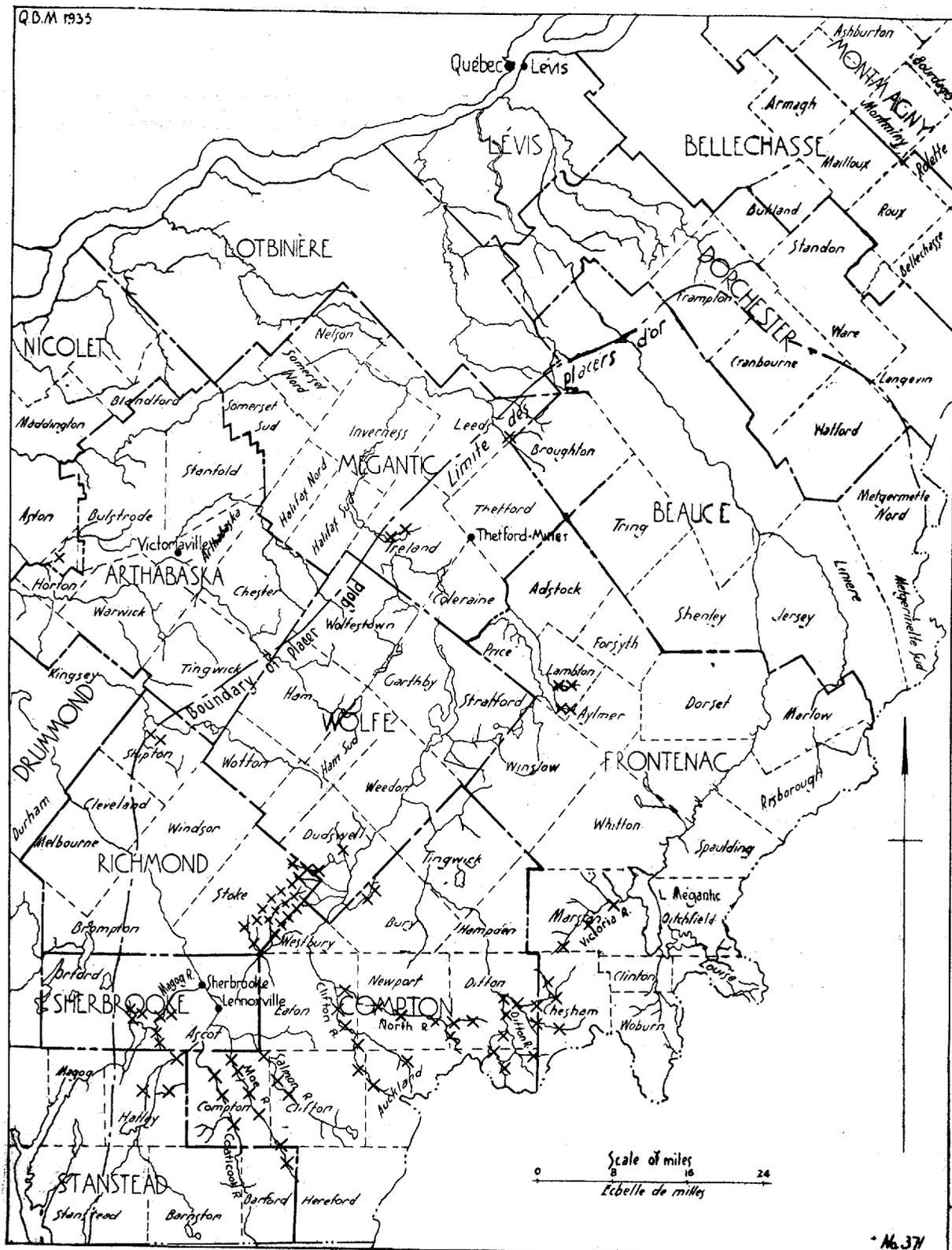
SUMMARY

Before entering the field, the writer was furnished with a list, prepared by the Bureau of Mines, of all reported occurrences of placer gold in the Eastern Townships. During a field season of four months, all of these occurrences, except those in the Chaudière drainage system, were visited and examined, as well as a number of others which were not included in the Bureau of Mines list. As will appear from the descriptions that follow, many of these reported occurrences of placer gold offer little or no promise for commercial exploitation, but our examination indicates that some of them merit further attention. Of these latter, mention may be made in particular of the following :

Ascot Township, range XIII, lots 1 to 5. This is the site of the old 'Golconda' mine. A small acreage remains that probably could be worked with profit on a small scale.

Chesham and Ditton Townships. Work was being carried on here during 1935.

Stoke Mountain Area, especially in Dudswell and Westbury townships, where the old or pre-Glacial channels have not hitherto been prospected, because of the thickness of the overburden. Drilling is recommended as likely to be the most satisfactory method of exploration in this area.



Map No. 371.— Index map, showing boundary of area in which alluvial gold is known to occur in southeastern Quebec, and localities examined by the writer.

Moe River, Compton township, where some of the bars gave good gold showings.

Other areas examined:

1. Ascot township, range XI, lots 8-11.
2. Auckland township.
3. Bury township, range X, lots 18-27 (not on Ms. list).
4. Hatley township, range VI, lot 14.
5. Horton township, range II, lot 17.
6. Ireland township, range V, lot 11.
7. Lambton township, range A, lots 1-8.
8. Leeds township, range XV, lot 13.
9. Orford township, range V, lot 19; range VIII, lots 17-19; range IX, lots 17-18.
10. Shipton township, range V, lots 13-15. May have values but overburden too deep for quick pit prospecting except in an area a few feet square on lot 14. Of interest because of probable existence of some pre-Glacial material.
11. Saint-Gilles de Beaurivage Seigniory. No placers present.

Other rivers examined:

In addition to the localities on the list provided by the Bureau of Mines, the following rivers were examined: the Coaticook and Salmon, in Compton township; the Clifton, in Eaton and Clifton townships; the Eaton, in Eaton township; the North, in Eaton and Newport townships; and the Victoria, in Marston township. Gold was found in the bars of all these rivers, except the Coaticook.

TYPES OF DEPOSIT:

Three types of placer gold deposits are met with in the area: pre-Glacial, Glacial, and Recent. The *pre-Glacial deposits* were formed before the spreading of an ice sheet over this region during the Glacial, or Pleistocene, epoch. Material laid down during the advance and retreat of the ice sheet constitutes the *Glacial deposits*. Lastly, the *Recent deposits* were formed after the melting away of the ice, and, as the term is used here, they include only those deposits which have resulted from the reworking of older deposits by the present streams, as in gravel or sand bars.

Pre-Glacial deposits occur in the following localities:

Ascot Township, range XIII, lots 1 to 5.

Bury Township, range X, lots 18 to 27 (not throughout).

Chesham and Ditton Townships, Mining brook (Little Ditton), Salmon river, and Chesham river.

Shipton Township, range V, lots 13 to 15.

Stoke Mountain Area, streams in Dudswell and Westbury townships.

PREVIOUS WORK

Discoveries of placer gold in the Eastern Townships are briefly recorded in the reports of the Geological Survey of Canada for the years 1847 to 1851. The references, however, are mainly to the Chaudière area. In *Geology of Canada*, published in 1863, Sir William Logan summarized

the known data relating to the distribution and origin of the gold (11b)*. The principal placers known up to 1864 are mentioned in *The Miner's Guide* (15) for that year, as follows:

- (1) Saint-François river, from Melbourne to Sherbrooke.
- (2) On the edge of lake Saint-François.
- (3) Chaudière and Etchemin.

In 1865, Robert Bell (5) outlined the area in which gold was known to occur and briefly described the physical characteristics of the area. In the following year, Logan (11c), correlating the results of Michel's examinations (see below), stated that the gold-bearing gravels apparently were older than the Glacial deposits. In the same report, Michel (14) gave the results of his examination of the following localities:

Orford township, range V, lot 19.

Ascot township, range XIII, lot 6.

Lambton township, ranges A and B, lots 1 to 3 ; range A, lots 7 to 13 ; range III, lot 11.

He also reported at this time on certain localities in the Chaudière area. Also in this report T. Sterry Hunt lends his support to the theory of Logan, stated above.

Twenty years later, in 1886, Ells (9a, pp. 44-57) presented a generalized account of the placer gold deposits, mainly a review of older writings. This was to some extent repeated, with little addition, in his report of 1889 (9b). In 1890, Obalski (16a) described the Chaudière and Ditton areas. A third report by Ells (9c), in 1896, dealt mainly with the question of the source of the gold.

Between 1895 and 1898, four reports on placer gold in southeastern Quebec were written by Chalmers. In that of 1895 (6a) he described the work done, or being done, in the Ditton area (very briefly) and in the Stoke Mountain area, and gave the general succession of deposits for the several areas within the region which yield placer gold. The relations of the old river channels to the present channels are indicated, and an outline of the course of events leading to the distribution of the gold and the formation of placer deposits is given. In the report of 1896 (6b), it is stated that development work was going on at Dudswell, Ditton, Massawippi lake, and in Beauce (Chaudière area), and some details are given of the work at Massawippi lake (Hatley township), and in Magog and Dudswell townships. A discussion of the source of the gold found in these placer deposits forms the main part of his report of 1897 (6c). The last and most important of these four reports was that of 1898 (6d), in which he gives an excellent and detailed account of the gold-bearing placers in the region, each occurrence then known being described. The Glacial and Recent history of the region is treated fully.

Obalski's most detailed report on these gold placers was published in 1898 (16b), and carried discussion, including production figures, of the Chaudière, Ditton, Stoke, and "vicinity of Sherbrooke" areas. He also gave a brief general account of the subject in a paper presented before the Canadian Mining Institute in 1908 (16c). In the same year, Dresser (8d)

* Throughout this report, numbers within brackets refer to numbered items in *Bibliography*, page 9.

- (c) The Gold-Bearing Deposits of the Eastern Townships of Quebec; Jour. Fed. Can. Min. Inst., Vol. II, 1897, pp. 13-28.
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Alluvial Gold Deposits in Quebec; Eng. & Min. Jour., Nov. 24, 1911.
- (8) Dresser, J. A.:
(a) A Petrographic Contribution to the Geology of the Eastern Townships; Am. Jour. Sc., Series 4, Vol. 14, 1902, pp. 43-48.
(b) An Investigation of the Copper-Bearing Rocks of the Eastern Townships, Province of Quebec; Geol. Surv. Can., Ann. Rept., Vol. XV, Part A, 1902-03, pp. 304-318.
(c) Igneous Rocks of the Eastern Townships of Quebec; Geol. Soc. Am., Bull. 17, 1906, pp. 497-522.
(d) Report on a Recent Discovery of Gold near Lake Megantic; Geol. Surv. Can., Rept. No 1028, 1908.
- (9) Ells, R. W.:
(a) Report on the Geology of a Portion of the Eastern Townships, relating more especially to the counties of Compton, Stanstead, Beauce, Richmond, and Wolfe; Geol. Surv. Can., Ann. Rept., Vol. II, Part J, 1886.
(b) Report on the Mineral Resources of the Province of Quebec; Geol. Surv. Can., Ann. Rept., Vol. IV, Part K, 1888-89.
(c) The Gold Deposits of the Eastern Townships, Quebec; Jour. Fed. Can. Min. Inst., Vol. I, 1896, pp. 109-126.
- (10) Goodwin, W. M.:
The Ditton Gold Placers of Southeastern Quebec; Can. Min. Jour., Nov. 1933, pp. 417-420.
- (11) Logan, Sir William:
(a) Gold; Geol. Surv. Can., Rept. of Progress, 1852-53, pp. 70-72.
(b) Geology of Canada; Geol. Surv. Can., 1863, pp. 518-520, p. 739.
(c) Gold; Geol. Surv. Can., Rept. of Progress, 1863-66, pp. 7-8.
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Mount Megantic Area, Southeastern Quebec; Que. Bur. Mines, Ann. Rept., Part D, 1934, pp. 63-104.
- (14) Michel, A.:
On the Gold Region of Lower Canada; Geol. Surv. Can., Rept. of Progress, 1863-66, pp. 49-77.
- (15) Miner's Guide:
The Gold Mines of Lower Canada, or the Miner's Guide; Quebec, 1864.
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(a) Mines and Minerals of the Province of Quebec; Dept. of Crown Lands, 1889-90.
(b) Gold in the Province of Quebec; Dept. of Colonization and Mines, 1898.
(c) Gold in the Eastern Townships of the Province of Quebec; Jour. Can. Min. Inst., Vol. XI, 1908, pp. 250-255.
- (17) Selwyn, A. R. C.:
Notes and Observations on the Gold Fields of Quebec and Nova Scotia; Geol. Surv. Can., Rept. of Progress, 1870-71, pp. 252-289.
- (18) Webster, A.:
Quoted by A. R. C. Selwyn, Geol. Surv. Can., Rept. of Progress, 1879-80.

DESCRIPTION OF PLACER LOCALITIES

ASCOT TOWNSHIP

There are two small streams in Ascot township that, for a time, witnessed considerable development work and some reported production of placer gold. They enter the Magog river from the south and are about two miles apart. Felton brook, the more easterly of these streams, is some six miles southwest of Sherbrooke. It flows through ranges XI and XII. The other stream, variously known as Grass Island brook and 'The Golconda', is in range XIII. Some work has also been done on the south bank of the Magog river, in lot 11 of range XI, about one mile downstream from the mouth of Felton brook.

The work at the last-mentioned locality (lot 11 of range XI) was done by the Ascot Gold Mining Company in 1865. The results were apparently not so favourable as has been reported, for the work was discontinued after one year (1b, 14) and there is no record of any further attempt to exploit the property. Michel (14) reported on this locality as follows: "Remarkable results are said to have been recently obtained from what is called the Ascot Gold Mines . . . , belonging to an American company. A notice in the *Sherbrooke Gazette* of November 18, asserts that from October 20 to November 14, 1865, there were extracted from this mine by 553 hours of labour an amount of gold equal to \$996 — corresponding to \$1.81 per hour for each labourer — the largest masses of gold having been found on the banks of the Magog river, in that lot". The workings had been abandoned at the time of Michel's visit and he therefore was unable to examine them. The statement as to the amount of gold recovered was reported without comment. The locality is again referred to by Obalski (16b, p.71) and by Chalmers (6d, pp.131-2)*, both of whom merely cite Michel.

The present writer was unable to learn whether the gold here occurred in the Glacial gravels bordering the Magog or in older deposits. The former is more probable in view of Logan's reference (11b, p.739) to gold in cemented gravels on the Magog "156 feet above the level of the Saint-François nearby". If such is the immediate source, it would be possible, but not probable, that gold to the value quoted was removed from the small area worked. The writer found no indications of gold at this locality.

In this regard it is well to consider Michel's conclusions as to the value of the gravels bordering the Magog, based on his examinations in lot 6 of ranges XIII and XIV. He wrote as follows (14, p.64): "It would appear from the results of my examinations, as well as from the information received from the country people who have sought for gold in this vicinity, that although the alluvions of the Magog may be said to be auriferous, the precious metal in them is in too small quantity to warrant working. Exceptionally rich deposits, which are found in all alluvial gold regions . . . , may however of course be met with".

* A misprint gives the locality as in range IX instead of range XI.

FELTON BROOK:

Felton brook was prospected in 1897 and 1898, as well as long before and immediately after this period, and again in 1913. Most of the work has been done on lot 8 of range XI.

C. E. Kennedy, of Stanstead, did some prospecting here from September to November, 1897. Obalski (16b, p. 71) visited the locality in May, 1898, and found work going forward on the south half of lot 8, where five to seven men had been employed from March of that year. The works consisted of "cuttings in the bed of the brook and on the banks", with bedrock usually being reached at a depth of seven to eight feet, although "on the right bank, a shaft 15 feet deep was sunk which had not yet struck the rock". "The gold is found in a bed of gravel and appears to be rather irregularly distributed. . . . There are two layers of gravel separated by a little clay, the upper layer containing a little fine gold. . . . Washing is done with sluices and a puddling machine has just been put up. Hitherto, about a hundred dollars worth of gold has been got out".

No details are available of the later work, but it is stated in the report of the Mines Branch for 1913 (p. 54) that some prospecting was done on Felton brook.

The writer's examination of this stream was largely superficial. No tests were made of the gravels mentioned by Obalski, which apparently lie, at least locally, on the bedrock. It was determined that the floor of the present stream is composed of boulder clay. Evidently, therefore, the gravels mentioned by Obalski underlie this clay and so may be pre-Glacial. The boulder clay is overlain by stratified clays, which in one place form a bank thirty feet high.

The above remarks apply to that part of the stream beginning with the road at lot 7, range XI, and extending through lot 8 of the same range and lot 9 of range XII (after a recent map) to the Magog river. In this distance of more than a mile, the general succession of unconsolidated deposits is as follows:

Stratified clay	0-30	feet
Boulder clay.	0-15 +	"
Pre-Glacial (?) gravels.	0-1½?	"

The valley floor averages about 200 feet in width through lots 8 and 9, becoming wider toward the Magog. Generally, it is bordered on the east by bedrock, which often rises in steep cliffs up to 25 feet in height, and on the west by banks of stratified clay or wide, low flats. These features probably indicate that the present stream generally is somewhat east of the pre-Glacial channel. The valley itself is seldom more than 50 feet below the general level of the surrounding country.

The ground along the stream from 300 feet below the highway has been worked through a distance of 400 feet, and in this distance evidently has been given a thorough testing. Test pits have been put down from the highway almost to the Magog river. The results quoted by Obalski for this area are not encouraging, although fairly rich pockets are indicated.

On the whole, it is not to be expected that this part of Felton brook has any future as a placer-gold locality.

There is still less possibility that the part of the stream above the highway is of any importance. Here, the brook flows for the most part in a very shallow and broad valley and there would be little protection against the scouring action of the ice sheet. Its bed is boulder-clay almost throughout, with rock appearing at very infrequent intervals.

About 1,000 feet above the highway, in lot 7 of range XI, at a small fall over slate bedrock, some sluicing has been done at a date evidently more recent than the work below the highway. This probably represents part of the prospecting referred to in the 1913 report of the Mines Branch. There does not appear to have been any pre-Glacial material at this point, for the sections cut by the stream to bedrock show Recent stream gravels overlying a thin deposit of boulder-clay which, in turn, rests on bedrock. Panning by the writer of gravel and sand caught in bedrock cracks yielded a colour or two of gold; but above this point, we found no gold along the stream course.

For about three-quarters of its course, from lot 6 of range XI to its junction with the Magog river, the bedrock of this stream is a black, highly folded, and wrinkly slate or slaty schist. It is probably of Ordovician age. The road traversing lot 6 is close to the boundary between the sedimentary slates and the earlier, igneous, quartz porphyries and sericitic schists of the Ascot hills. It is among these latter rocks that the stream takes its source. In the upper quarter of its course it is within a mile of several copper prospects and mines, including the Suffield, King, Howard, and Silver Star mines, many of the veins of which contain some gold. This proximity suggests an obvious source for the alluvial gold that occurs in Felton brook.

GRASS ISLAND BROOK:

Attention was first directed to the placer possibilities of Grass Island brook about 1863, at which time a company was formed by General H. P. Adams, of the United States, to exploit the stream and also certain quartz veins that outcrop in its valley and nearby. While the life of this enterprise was short, the actual discovery of gold here and the extensive prospecting that was carried on combined to create widespread interest in the locality, so that from time to time until the present day it has been prospected by various individuals. Actual mining was confined to lots 2 and 3 of range XIII, Ascot township (Figure 1).

The earliest published reference to this occurrence appears in a report by Andrew Russell, in 1865 (1a), in which it is stated that Mr. W. S. Hunter, former owner of the lands then under development by General Adams, had sent to the Quebec Department of Crown Lands some "fine gold, and several small nuggets" which he had washed out from the "subsoil" in the valley of Grass Island brook. Forty men were on Adams' payroll during the summer of 1865. "Part of the sluices had been worked for about half of the time for three weeks, and between \$1,000 and \$2,000 worth of gold extracted". By reason of the narrowness of

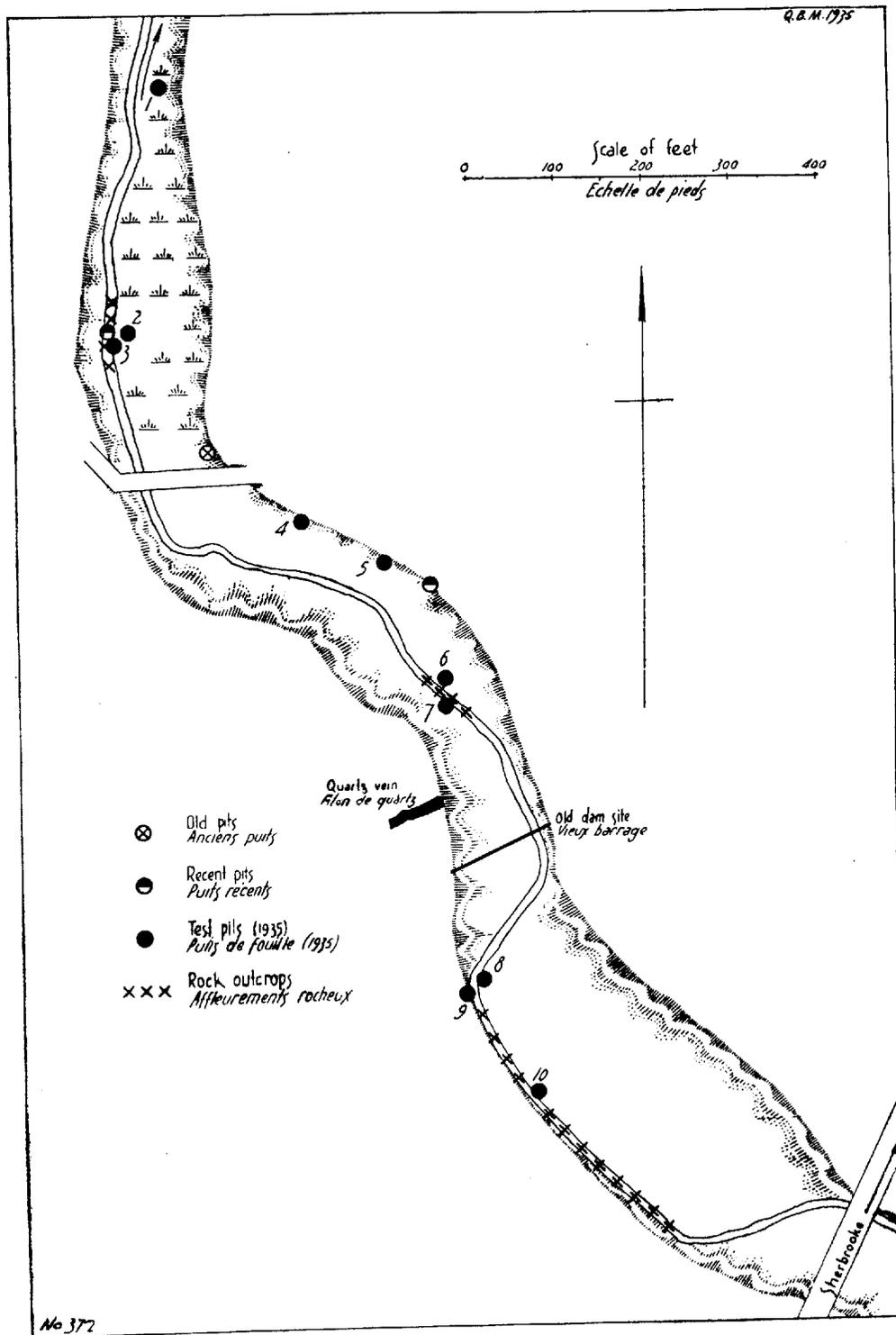


Figure 1.— Plan of area exploited on Grass Island brook (Showing position of old workings and of tests made by the writer).

the valley and the shallowness of the pay-dirt, Russell concluded that little placer gold could be obtained here.

In 1866, J. K. Gilman (1b) reported as follows:

“ The Company [Golconda Mining Company] have got an engine of forty horse-power, two double stamps, and two amalgamators . . . I should think that the work which has been done is entirely of an experimental character. It seems they have crushed the pay dirt, the tailings of the sluices, and the slate . . . as well as the quartz. This mine is represented as being very rich. The tailings of the sluices, after crushing, yielding as high as thirteen dollars per ton. The Company find very great difficulty in extracting the gold, on account of the sulphur with which it is combined . . . The quartz yields from five to seventy-five dollars per ton, and the slate seems to be the richest of all, yielding as high as three hundred dollars per ton ”.

A shaft was down ten feet on one of the quartz veins here at the time of Gilman's visit.

It is apparent from Michel's report (14), also published in 1866, that his examination of the property led him to question the accuracy of some of the statements set forth in the Company's prospectus. Thus, he says:

“ The reports which form a part of the prospectus published by . . . the Golconda Mining Company, with a capital of \$5,000,000, ascribe [an] . . . extraordinary richness to lots 2 and 3 of range XIII of Ascot . . . They speak, in fact, of \$14,000,000 of workable gold, of which \$3,000,000 are supposed to be in the alluvions; while the quartz and the slates found on the property are declared, according to published assays, to contain an average of \$153 in gold, and \$7.53 in silver, to the ton. When, for the first time, I visited this place in June last, several workmen were employed in washing the auriferous gravels . . .

“ The quantity of gold which was then shown me as the result of the month's work, as well as the results of the washing before my eyes of numerous pans of the gravel, were such as to give me a favourable opinion of this alluvial deposit, which, however, my subsequent examination of Grass Island brook has greatly modified. As to the quartz and the slate, which, if not auriferous, were abundant, I regretted not to find, in the hands of the director of the workings, duplicates of the specimens mentioned in the prospectus, especially of a white quartz, which was said to yield \$3,326.10 of gold to the ton. If ever an enterprise of this kind merited to be carried on with energy it might be supposed to be one supported by such reports, and by multiplied assays so highly favourable, yet all working at the Golconda mine has been abandoned since September last ”.

In 1898, Obalski (16b, p. 69) reported on the locality as follows:

“ We have no complete information respecting the works of this Company [Golconda], which operated for a couple of years and, according to some, got out large quantities of gold. A two-stamp mill was also erected to crush the quartz, several veins of which cross the brook, and a shaft 30 feet deep was sunk on one of these veins ”. Obalski states that the quartz was reported as yielding \$10 to the ton.

"In the catalogue of the Sherbrooke Exhibition, in 1865, a specimen weighing 10 ounces is mentioned as coming from this mine . . . About 1880, these properties were again worked by Mr. A. Bowen and Mr. Stewart and are reported to have yielded a little gold. They were after-ward abandoned and are now the property of Colonel Charles King, of Sherbrooke".

Also in 1898, Chalmers (6d, p. 131) quotes excerpts from Michel's report, but without adding anything new.

Obalski again reported on this locality in 1906 (2g). He states that, in 1905, Mr. C. E. Kennedy, of Beebe Plain, prospected here. Kennedy "found a little alluvial gold [and] . . . observed numerous veins or lentilles of quartz in which gold could be seen". Obalski personally inspected the ground in 1906, and reports finding four quartz vein-zones, each several feet thick, within a distance of a quarter of a mile. He states that gold was visible in the quartz and that some that he got out by crushing and panning was "of the size of a millet seed". The "quartz veins are ill-defined and . . . are mixed among the schists in the shape of lentilles. The alluvial gold found in that region seems of local origin and to be due to the decomposition of those rocks . . . A Company, called the Eagle Mining Company, of Rock Island, P. Q., has been organized for the purpose [of working the ground] and numerous licenses have been taken for other lots in the vicinity".

Although nothing has been published since 1906 concerning these gold occurrences at Grass Island brook, it is reported locally that, about the year 1905, prospect pits were put down at intervals along almost the entire length of the stream and that gold was found in all that reached bedrock. Also, it is stated that some work has been done by E. Gagnon, of Sherbrooke, on lot 3 of range XIII during the past two years and that a little gold was taken out.

RESULTS OF THE PRESENT EXAMINATION:

The unconsolidated deposits along Grass Island brook vary somewhat from place to place. They may be treated under three locality headings.

(1) *Lower Part of Stream.*— From near the Magog river upstream to within about 600 feet of the blind road on lot 3, the brook floor is either stratified lake-clay or boulder-clay, with little bedrock showing in the valley. In this distance, the stratified clays vary in thickness up to at least four feet, while the boulder-clay reaches a thickness of at least 20 feet, as shown in some of the banks. Near the mouth of the brook, Michel (14, p. 63) had three pits dug, "one in the bed of the stream, and the two others upon its banks. The bedrock was met at an average depth of six feet. The sections resembled those in Orford, and the gold seemed irregularly distributed in the gravel, but more abundant. I doubt, however, if the auriferous zone, having this stream for its axis and extending about twenty-five feet on either side, could be wrought with profit". The fact that gold occurs at each end of the area above outlined would seem to indicate that it may occur continuously under the boulder-clay from lot 3 to the Magog, and local reports support this view. However, the gold-bearing gravels examined by Michel are Recent, at least in large

appears to be present in increasing abundance as the northwestern part of the area is approached. It had been found during the work of 1934 that, along the eastern edge of the Dartmouth River area, there seemed to be only sandstone and shale in this series, but, at the western edge, the definite presence of limestone in the series is clearly in evidence in exposures on Dartmouth river, near the northeast corner of the present map-area. In these exposures, the limestone forms a zone 50 feet thick, and also occurs in a few thin beds lower in the series. Coming farther west into the Upper York River map-area, limestone beds are more abundant, occurring in at least five distinct and widely separated horizons along Clearwater brook, in the northern part of Fletcher township, but sandstones still predominate. Farther west again, in the northwestern corner of the map-area, the limestone members are still more prominent and they are even more abundant than the sandstone. Beyond the limits of this map-area, in the region investigated in 1931, sandstones are found in only a few horizons and in the work of that year no differentiation was made between this series and the main body of Gaspé limestones — all being mapped together as Lower Devonian. The York Lake series may extend as far as the western side of Holland township, but possibly it ends there, with the older limestones occupying its place on the surface as a result of an eastward plunging of the folded rocks. Approaching the southeastern corner of the map-area, the limestone beds seem to be less abundant, and in some places only features, to be mentioned below, serve as guides in recognizing the rocks of this series.

The sandstones of the York Lake series resemble in many ways some of those in the eastern part of the peninsula that have been classified as Middle Devonian in age. In general, however, the sandstones of this stratigraphically lower, York Lake series are argillaceous, fine in texture, and of buff to greenish-buff colour, while the younger, Middle Devonian sandstones contain an abundance of coarse, green to greenish-grey sandstones. Also, some other features of the York Lake series have been observed which, so far as is known at present, have not been recorded in the younger formation. One is the frequent occurrence of shale-filled worm borings of a characteristic shape, as will be described below. Another feature that has as yet been observed only in this series, and not in the one overlying, is the presence of a few beds of white to light-grey quartzitic sandstone and quartzite, containing many rusty specks, about the size of a pin-head. Brown quartzitic beds, also, were observed in some places. Some fragments of unrecognizable, carbonized plant remains, and thin bands and lenses of carbonaceous matter, are present at various horizons, but these are not distinguishing features as they are also found in the higher series.

The limestones of the York Lake series do not differ in appearance from those in the upper part of the Gaspé Limestone series. They are mediumly hard to hard, bluish-grey to grey, and in places they contain chert. The shales, possibly more abundant than is indicated by the few exposures, are dark olive-green, or perhaps better described as dirty or muddy green. Three beds of conglomerate, 18 to 36 inches thick, were observed in a zone 150 feet wide among rocks presumably belonging to the York Lake series.

These, exposed on York river about 5,600 feet downstream from Bear brook, contain scattered, well-rounded pebbles of calcareous shale and soft limestone up to one inch in diameter in a matrix of sandstone, and in the beds there are two-inch layers composed almost entirely of these pebbles. This is the only place where a true conglomerate was observed in the area, but in many places the sandstones may be called conglomeratic, where they contain widely scattered, but not abundant, flat, oval-shaped pebbles of shale.

Fossils were found in sandstone in the escarpment west of the upper part of York lake. These are: *Leptæna rhomboidalis*, *Hipparionyx proximus*?, and *Spirifer* cf. *submucronatus*, according to the determination of Dr. E. M. Kindle, who stated their horizon as being probably Oriskany. Another, *Spirifer* cf. *arenosus*, also of probable Oriskany age according to Dr. Kindle, was found in a block of sandstone on Oat Cake brook, about 9,700 feet downstream from Oat Cake lake. This block was loose, but is believed to have come from a formerly nearby outcrop. Some fossils were also collected from an outcrop of hard, dark grey, magnesian and slightly arenaceous limestone on the upper part of York river, about two and a quarter miles downstream from York lake. This occurrence has been included in the York Lake series, but it is not far from the contact with the Gaspé Limestone series and it may even belong to the latter; the contact is shown stratigraphically below this fossil horizon because of the apparent presence of sandstone in the intervening zone. From this outcrop there were collected the following species: *Pholidops* sp., *Chonetes*? sp., and *Spirifer* sp. Dr. Kindle, who made these determinations, states that the fossils, few and poor, are probably of a Lower Devonian horizon. Two fossils, *Phacops logani* var. *gaspensis* Clarke?, and *Leptocalia* cf. *flabellites*, were found in two loose fragments of limestone, 6,900 feet northeast and 6,000 feet east, respectively, of the upper end of Oat Cake lake. The association of limestone and sandstone débris in this locality suggests that the underlying bed-rocks belong to the York Lake series. In addition to these fossils, shale-filled worm trails were observed in the sandstones of this series in many places, too numerous to mention. These trails are usually about one inch long and one-sixteenth to one-tenth of an inch wide, but they present a range in length from five-eighths of an inch to two inches. They are nearly always curved to the shape of a rounded hook, with one side about half the length of the other. These trails appear to be characteristic only of this series.

The fossil evidence shows that part, at least, of the York Lake series is of Lower Devonian, probably Oriskany, age, and, if the lithological character and the structural features of the rocks are reliable criteria, most, if not all, of the rocks that are mapped as belonging to this series may be considered as being Lower Devonian. The information available is not sufficient, however, to be certain of such a conclusion, and it is possible that, in some places, this series as mapped may contain some Middle Devonian. Also, some of the lower, Gaspé Limestone series may have been included where evidence is not well exposed. The base of the York Lake series is placed at that horizon where sandstones first appear above the Gaspé Limestone. In places, this position can be marked with little difficulty, but in others only an approximation can be made. As well as could be

deduced — the contact itself never being visible — the York Lake series rests conformably on the Gaspé Limestone series. More difficulty is encountered in setting the upper limit of the series in this area. It is placed, wherever the information is available, at the last appearance of limestone, the succeeding rocks being predominantly sandstone of the Middle Devonian type. This line of division, it can be readily understood, is difficult to mark in any better than an approximate fashion. The fact that, elsewhere in Gaspé peninsula, there is a distinct unconformity between the Lower Devonian and Middle Devonian formations, suggests that a similar condition would prevail in those parts of this map-area where rocks of these two periods might be present. This factor is employed, especially in the southern part of the area, to show the possible presence of a Middle Devonian series. In the sandstone belt that crosses York river above Whitehouse brook and, again, below Random Hill brook, there are no limestones exposed along the river in the group of rocks that has been mapped as York Lake series, although limestone is found in the débris on the neighbouring hills; furthermore, some sandstones containing worm trails, and the presence of quartzitic members, show that some of these rocks belong to the York Lake series. Along the river, the contact between this series and the overlying, supposedly Middle Devonian, series is placed near the points where a change from steep to low dips occurs in a short distance across the strike of the beds; this sudden change may represent the unconformity mentioned above.

The thickness of the York Lake series, as mapped, varies. From calculations based on the dip of the beds and the width of the belt underlain by these rocks, the thickness is about 4,000 feet along Clearwater brook, in the northern part of Fletcher township. In the southeastern part of the area, along York river below Random Hill brook, the thickness of the series indicated by the belt as mapped is only about 2,000 feet, but the thickness here may actually be greater if, as interpreted, low-dipping Middle Devonian sandstones rest on steeper-dipping beds of the York Lake series. The work of 1934 indicated that this series diminishes considerably in thickness toward the eastern part of the Dartmouth River area (near Lady-step brook), apparently due to erosion of its higher members before deposition of the Middle Devonian sandstones.

It is still necessary to determine the relationship of this series to the formations that have been observed and classified along the coast in the vicinity of Gaspé bay, and to determine to which part of the coastal section the York Lake series belongs. While there is a possibility of some of these rocks, or their equivalent in age, being represented in the Grande Grève formation (the uppermost division of the Gaspé Limestone series in the Gaspé Bay section), it is believed more probable that the York Lake series, if present in that eastern region, is represented in the lower part of the Gaspé Sandstone series. Farther south along the coast, at Percé, there are limestones, with interbedded sandstones, of Oriskany age, and, according to a communication from Dr. E. M. Kindle, some white, quartzitic sandstone, similar in appearance to certain beds in the York Lake series of this map-area and containing Oriskany fossils, were also found near Percé. That interbedded limestones and sandstones occur not far

inland from Gaspé bay, even though they may not have been recognized under such relations in the vicinity of the bay, is indicated by the records of some of the wells that were bored during the search for oil in the eastern part of this Devonian belt. The drilling records show that in No. 22 well of the Petroleum Oil Trust, a white sand was encountered near the bottom of the hole (3,130 feet deep) after the boring had passed through 350 feet of limestone. And, in No. 37 well of the same Company, the drill, after passing through sandstone for a distance of 455 feet from the surface, penetrated 190 feet of limestone and then, according to the record, went through 1,955 feet more of sandstone. Further evidence of rocks occurring in conditions similar to those of the York Lake series is indicated by the work of R. Bell (1), who found limestone beds in horizons composed of arenaceous shale and sandstone at the mouth of Patewegia brook and on Silver brook, tributaries of York river southeast of this map-area. From the occurrence, a six-foot bed on Patewegia brook, Bell obtained the following fossils: "*Zaphrentis*, *Orthis*, *Strophomena*, *Chonetes*, *Rensselæria ovoides*, *Leptocalia flabellites*, *Avicula*, several species of acephala of undetermined genera, *Orthoceras* and *Dalmanites*; and, on Silver brook, *Spirifer* and *Cyrtodonta*". Further work in this region is suggested in order to determine better the age relations and distribution of these rocks. This problem has a practical bearing on any work that may be done in a search for petroleum in eastern Gaspé. Further knowledge of these rocks is needed for the precise interpretation of the age relations and structural features of the various formations.

QUARTZ-FELDSPAR PORPHYRY:

The only igneous rock observed in place in this area is in a sill, 20 feet thick, exposed in the escarpment west of the upper part of York lake. It has been intruded along the bedding planes of sandstones of the York Lake series. Nearly all this rock is deeply weathered at its outcrops and has a yellowish colour, but a few specimens indicate that the unweathered rock is probably pale bluish-grey. It has a coarse, porphyritic texture, with phenocrysts of feldspar and quartz up to one-quarter of an inch in diameter, the average being about one-eighth of an inch. One thin section made of this rock showed it to be composed of abundant phenocrysts of albite, orthoclase, and quartz in a coarse groundmass of the same minerals, with, as accessory minerals, a little calcite, hornblende, apatite, and iron oxide (probably derived from pyrite). In this particular section, albite is more abundant than orthoclase and only ten per cent of the material is quartz, but, in similar rock associated with a volcanic series three miles west of this point and outside this map-area, sections have been examined in which orthoclase predominates and quartz is present in greater quantity than in the section just described.

This porphyry sill was traced as far as it was possible to find it by its exposures. It probably extends for a greater distance than shown on the map, but is concealed by the overburden of moss and vegetal débris. A

(1) In *Geology of Canada*, 1863, p. 885.

few, scattered pieces of the same type of rock were found for a distance of six miles eastward from the lake. These fragments probably have been transported by glacial or stream action, but it is also possible that some small intrusions of the porphyry may exist in this more eastern part of the area. Such intrusions, especially if small, may readily be passed unobserved in this heavily wooded region, where rock outcrops are few.

The age of the porphyry is assumed from the relations it and the adjacent rocks have with a series of rocks at the Miller copper claims, three miles west of York lake. The porphyry in this map-area resembles, and is probably of the same age as, that which is found with the mineralized volcanic rocks (tuff and rhyolite) and associated sediments at the Miller claims (1). The porphyry at the latter place is intimately related to the volcanics; in some cases it may be simply a coarse phase of the volcanics and, in others, it may represent the fissure-filling of the same igneous material that reached the surface of that time to form the volcanic series. It was shown in 1931 that the volcanics are of Lower Devonian age, and the work of 1935 points to the possibility of their being a westward extension, and probably near the base, of the York Lake series (also believed to be Lower Devonian, particularly in this part of the area, on the basis of fossils found in the sandstones near the porphyry sill). If, then, the porphyry of the two localities is of the same age, and if that at the claims is of the same general age as the volcanics, it follows that the porphyry sill in the present map-area also is Lower Devonian in age.

The information now available has a bearing on the probable age of intrusions in central Gaspé. In earlier reports, the age of the large intrusive bodies of granite and their associated rocks in central Gaspé has been variously considered as being late Lower Devonian to early Middle Devonian, the writer tending to favour the latter as investigations advanced. The main reason for having favoured an early Middle Devonian age was the presence, in Lemieux and Lesseps townships, of sandstones below a thick series of basic volcanics. These sandstones were thought to represent the Middle Devonian Gaspé Sandstone series, which they resemble and which is definitely represented above the volcanics. Thus, an early Middle Devonian age was assumed for these basic volcanics and for the large intrusions which appear to be later in age than part at least of the volcanics, but which do not intrude the overlying thick series of Middle Devonian sandstone. Now, after the more recent work, the possibility is suggested that these volcanics and the sandstones below them may be Lower Devonian, perhaps equivalent to the York Lake series, and, consequently, the possibility of a late Lower Devonian age of the large intrusions must be considered.

MIDDLE (?) DEVONIAN

The youngest rocks in this region occur, as indicated on the accompanying map, in two synclinal belts in the northern and southern parts of the area. If the geological conditions are correctly interpreted, these belts

(1) See Que. Bur. Mines, Ann. Rept., 1931, Pt. C, pp. 65-69.

are limited in extent by the plunging character of the folds. The axes of these synclines plunge easterly at the western end of the belts and, at the opposite end, they plunge towards the west. As a result, the rocks in these belts, supposedly of Middle Devonian age, are enclosed on all sides by rocks of the older series.

The rocks that are mapped as being possibly Middle Devonian are mostly sandstones; there are shales, also, but of unknown amount, since exposures of this type of rock are few. In the southern belt, as exposed along York river in the vicinity of Beaver brook and again farther downstream in the vicinity of Bear brook, the sandstones are fine-grained, cross-bedded, greenish to yellowish-grey, and in thin and massive beds. They are not as coarse nor as predominantly green in colour as the typical Middle Devonian sandstones that are exposed farther down the river beyond this area. There is some doubt as to whether they should be mapped separately from the underlying York Lake series of rocks. But, in order to draw attention to the possible presence of Middle Devonian rocks in this part of the area, this southern belt is indicated as being of that age. A factor, already mentioned, that suggests a major difference in age between this group of rocks and the York Lake series as mapped, is the sudden change from steep to low dips noticeable in a short distance across the strike of the beds at the position where the possible contact has been placed. This change may represent the unconformity that is known to exist elsewhere between Lower and Middle Devonian formations.

In the northern belt, more confidence is felt in designating the rocks as Middle Devonian. The sandstones, medium to coarse in grain and usually dark greyish-green in colour, resemble the typical Middle Devonian sandstones. Also, no limestone outcrops were observed in this belt, and very little was observed in the way of debris of limestone or of other rocks peculiar to the underlying York Lake series. In addition, the many low dips of the beds in this belt suggest that these rocks have not been tilted as much as the older formations of the Devonian system, again pointing to the possible representation here of the unconformity between Lower and Middle Devonian rocks.

In eastern Gaspé, the Middle Devonian rocks are classified under the name Gaspé Sandstone series, but, as it now appears that in that series there are rocks of Lower Devonian age, it is considered inadvisable to employ this name for the possibly Middle Devonian rocks in this area; nor is any other name suggested under the present uncertain circumstances. Furthermore, as the information concerning this younger series in this area is as yet inadequate, its classification as being Middle Devonian must be considered as being only tentative, until more is known concerning it.

STRUCTURE

The rocks of this region, as in most of Gaspé, are folded into a series of synclines and anticlines, and in some places they are faulted where the rocks broke during the folding movements. It is believed — although some of the features must of necessity be inferred — that the major structural conditions of this area are portrayed on the accompanying map, at least

Actual mining, by sluicing, was carried on for a part of the 1933 season on Mining brook a few hundred feet above the bridge (La Patrie-Chartierville road). During 1934 and 1935 no mining was done and only a small amount of development work. Several of the lots that were operated as individual mining claims have reverted to the Pope interests, while others are retained by Harvie.

Brief reference may be made to operations in other sections of the Ditton area, some of which, in the writer's opinion, have possibilities for placer gold production. Several years ago, on that branch of the Chesham river listed above as No. 3, some shafts were sunk to bedrock, on which also a 300-foot tunnel was driven, and a sluice several hundred feet in length was installed for washing the gravels. The amount of gold resulting from these operations is rumoured to have been of the order of several thousand dollars. A relatively small part of the ground having possibilities has been exploited. Mr. H. Henderson, of Boston, holds claims on the land in which these old workings are situated and has done additional work, which the writer inspected in the autumn of 1935. Since that time he has reported finding gold-bearing gravels at a depth of about 19 feet, beneath 5 feet of stream gravels and 13 or 14 feet of boulder-clay.

A property on the Salmon river just east of the boundary between Chesham and Ditton townships was worked several years ago. A few pits and a short tunnel were opened, but there is no official record of the amount of gold taken out. Some development work was done here in 1935, but the results are not known to the writer.

On the Salmon river, just above the Little Canada road, the work done in the past and recently has been of a prospecting nature only, with test pits put down where the glacial or other overburden was shallow. Many of these pits, and others opened by the writer's party in 1934, showed good values.

The occurrence, character, and source of the gold in the Ditton area is discussed in some detail in the writer's report on Mount Mégantic map-area (13). Only the conclusion in regard to the source need be repeated here, namely, that the gold was derived from the quartz veins that cut the bedrock.

DUDSWELL TOWNSHIP

For a discussion of the placer localities in Dudswell township, see under *Stoke Mountain Area* (p. 38).

HATLEY TOWNSHIP

Alluvial gold is reported from a single locality in Hatley township. This is in range VI, lot 14, in a stream that flows into the west side of lake Massawippi about three miles south of North Hatley village. The stream is known locally as Hermit creek.

Some work was done here between the years 1865 and 1870. Obalski (16b, p. 72) reports, "I am told that, about thirty years ago, Mr. Leclerc, of Montreal, worked there and got out about \$750.00 worth, the largest nugget being worth \$5.00". The locality was prospected later by Charles

Rodrigue, a Beauce miner, but he was unsuccessful (6d, p. 133). "In 1894 or 1895, Mr. Wm. Jamieson, of Magog, Que.... did some sluicing and reported having extracted about \$50 worth of gold. It was then purchased by an English company, represented by Mr. James Stark, of Liverpool" (6d, p. 133). In 1896, Stark had 22 men employed here, but the work lasted only a month or two. "Some gold was found in the gravels, but not in sufficient quantities to pay for working them". The main object of this work was to find gold in the quartz. These latter activities are reported a little less completely by Chalmers in 1896 (6b, p. 74) and are referred to also by Obalski (16b, p. 72).

The stream in question is a small one, with a channel-width of three to four feet and with a length of little more than a mile. In the lower 700 feet of its course it flows with steep gradient through a narrow V-shaped gorge cut through bedrock, in some places to a depth of 25 feet. It is in the lower 500 feet or less of this part of the stream that most of the placer work must have been done. Panning of the gravels here by the writer yielded colours at only two places — in gravel at the mouth of the brook and in bedrock-cracks 300 feet from the mouth. Nothing suggestive of pre-Glacial material was noted. The gorge itself seems to have been formed after the glaciation. Upstream from the gorge, and above it on either side of the valley, evidences of glaciation are plentiful. Hence, it appears that whatever gold was taken out of this brook was from Recent gravels, and it is very unlikely, therefore, that gold in paying quantity occurs here.

As to the source of the gold, there may have been a certain amount of concentration of the metal from the glacial drift, or it may have been derived from the several quartz veins that cut the bedrock along the brook. The veins are mineralized with considerable pyrite and some chalcopyrite, but assays of samples collected by Chalmers, Obalski, and the writer yielded only traces of gold, and the several prospect pits put down by the miners evidently showed nothing encouraging. Chalmers (6d, p.133) considered that the gold was probably derived locally, citing as evidence that it is "rough and apparently has not travelled far". The small colours seen by the writer were rather well worn, but this cannot be considered as evidence of long-distance transportation.

The bedrock in the lower part of the stream is for the most part highly folded and schisted slate with thin interbeds of quartzite. Such rocks occur along the west shore of the lake for a least four miles from North Hatley. Along the stream there are also talcose schists that probably are of sedimentary origin. Intruding these and the definitely sedimentary rocks are fine-to medium-grained basic igneous rocks allied to diorite. Three bands of this igneous rock, paralleling the general structure, were observed in the lower 700 feet of the brook. The bands vary in width from 15 feet to 50 feet.

HORTON TOWNSHIP

Obalski mentions, without comment, a reported occurrence of gold in range II, lot 17, of Horton township (16a, p. 67). The writer failed to find anyone in the neighbourhood who had ever heard of any such discov-

ery. The locality is on the Nicolet river, about a mile southwest of the village of Saint-Samuel-de-Horton. In this district, the land is flat, and the deposits, to a depth of at least 20 feet, as cut through by the river, are sand and clay. These deposits were formed at the time the area was submerged beneath the ' Champlain sea ' at the close of the Glacial epoch. No bedrock was observed within a mile of the reported gold locality, either in the stream or elsewhere. The bars along the stream are sand and clay. No gold was found here by the writer.

IRELAND TOWNSHIP

Placer-gold is reported at one locality in Ireland township, in range V, lot 11, on Raguet creek, about seven miles west of Thetford Mines. There are two references to the locality in the literature, both by Obalski (16a, p. 68 ; 16b, pp. 72-3). In the second of these, it is stated that: " About 1885, Messrs. John McCaw and Caverhill worked on the Raguet creek, Ireland, Mégantic. When I visited these works they were making small excavations along the creek, in a fine gravel in which a little gold was found. I was shown a nugget worth several dollars that was found there. The work has since been stopped and I have heard nothing further about that stream".

The writer followed this brook upstream for about 4,000 feet from the road leading to Black Lake village and got a few small colours from several pans of the Recent stream gravels. While no pre-Glacial material was seen, it may occur under the heavy overburden generally present. No test could be made with the means at our disposal of any lower gold-bearing gravels that may be present. However, along the section of the brook between one thousand feet and two thousand feet upstream from the road, there are a number of old test pits, which, judging from their size, may well have reached bedrock. Obalski's records show that these workings met with little success. Thus, the available information indicates that the locality has little value as a placer prospect.

Beginning about 800 feet above the road, the stream-cuts show Glacial gravels resting on boulder-clay. Between this point and the road, the stratified gravels of a delta rest on the boulder-clay for a distance of about 300 feet, beyond which stratified gravels only are exposed. The delta deposit evidently marks a higher level in the post-Glacial history of adjacent Trout lake.

The gold that occurs here may have been derived from the Glacial drift. If, however, it occurs under the boulder-clay, another source must be sought. Beginning about 500 feet above the road, bedrock occurs almost continuously along the banks of the stream and frequently outcrops in its channel. The rock is a chloritic, talcose schist, usually greenish but occasionally black in colour on fresh surfaces, and weathering brownish to grey streaked with rust. It is so prominently banded in places as to suggest a sedimentary origin. Quartz veins and stringers are common.

LAMBTON TOWNSHIP

Two brooks in Lambton township have been worked for gold. They flow from the east into lake Saint-François, near its southern end, each passing within a mile or so of Lambton village. The placer possibilities of these brooks have been discussed by Michel (14, pp. 65-6), and both Obalski (16b, p. 72) and Chalmers (6d, pp. 129-30) make brief reference to them. Obalski says: "I am not aware of any work having been done in that district, and when I visited it some years ago I noticed nothing worthy of attention and found only some colours in the bed of the above mentioned brooks". Chalmers stated that gold had been found here, "but only in small quantities", and that no work had been done in the district between the time of Michel's visit and 1898.

The first locality reviewed by Michel is a little over a mile south of Lambton village, in lot 1 of range A, and along the lake shore in lots 1, 2, and 3 of range A. He reports as follows: "Particular regard was had to a stream which traverses lot 1 of range A, running northwards, for the reason that, some ten or twelve years since, explorations were there made, resulting in the discovery of considerable quantities of gold. At the commencement of my examinations, I found, in the bed of the stream, in a place which had not been worked, and almost at the surface, a small mass of gold differing entirely in form and in size from that generally found in the region. A large and deep excavation at this place, and the working of a large amount of the materials extracted, gave no more gold like that first found, but only a few rare and fine particles.

"The exceptional fact of the presence of this mass of gold at the surface, which I mention without comment, can have no bearing on the value of the alluvions which I have examined in this township. Although richer than those of the Magog river, I am persuaded that they cannot be wrought with profit. I found, nevertheless, an appreciable quantity of fine and scaly gold in the gravel from a large number of excavations on the lots already mentioned. The auriferous gravel here reposes upon a yellowish clay, which holds boulders and great masses of rock, and is so thick, and at the same time so hard and difficult of excavation, that I did not think it worth while to carry the excavation to its base. I was informed that pits thirty feet deep had been sunk here without finding the bottom of the clay. In one case, however, on lot 3 of range A, I sank to the clay-slate bedrock without finding a trace of gold, even in its crevices. The washing of about one hundred cubic feet of these clays extracted from different excavations did not furnish me a single particle of gold; so that these boulder clays would seem to be equally sterile with the similar clays of the Chaudière and the Magog. . . I was assured that in lot 2 of range A, some particles of gold which seemed whitened with mercury were obtained".

Evidence of work having been done along the lake shore at this locality was not noted by the present writer. Along the brook, the work done apparently consisted in the removal of large boulders and the washing of gravels that rested on boulder-clay in the stream bed. The maximum length of the area worked would be 500 feet, from the lake shore to the Lambton-Disraeli highway. Laterally, the area worked would seldom

exceed 20 feet. Several pans taken by the writer from the Recent gravels between the highway and the lake shore yielded but one small colour of gold.

The stream is small, and from its source to the highway above-mentioned it has a gradient of three feet in fifty feet. From the highway to the lake, the gradient is somewhat steeper. In this latter distance, the stream has cut some five to ten feet below the surface, but above the highway there is no valley, and the stream, averaging four feet in width, has cut from two to three feet below the surface. From the lake upstream for 1,000 feet, bedrock does not show in the stream or in the area bordering the stream. After this distance, however, sandstone and slate, interbedded, occur, and are exposed by the removal of less than three feet of Glacial gravels. Considering the above, there is little question that the stream is following a post-Glacial course. This being so, there is little likelihood that gold occurs here in workable quantity, for there has not been sufficient time for the required concentration from quartz veins or bedrock since the last Glacial period. There is the possibility, of course, that a pocket of more or less rich gold-bearing gravel occurred here and has been in whole or in part traversed by the stream, although no evidence suggesting such an occurrence has been noted. In view of the evidence, the writer doubts that a "considerable quantity" of gold was taken from this locality.

The other Lambton stream reported as having gold has two branches, which rise three and four miles, respectively, due east of Lambton village. They follow roughly parallel northwest courses through low hills until they unite about one mile north of the village and a few hundred feet west of the Sherbrooke-Quebec highway. The lower part of the stream, from the highway to lake Saint-François, was examined by Michel (14, p. 66), who states that he had "learned while at Lambton that gold has been found at several places, and in appreciable quantities, in this stream". He made two short trenches on lot 8 of range A, about 150 feet apart, each starting in the bed of the stream and extending into the left bank in one and the right bank in the other. "I here found gold disseminated throughout a layer of gravel resting upon a decomposing slate, which was so tender as to be readily removed with a shovel to a depth of from one to two feet. The gold seemed to me to be more abundant on either side than in the bed of the stream, and its quantity was such that the gravel might be wrought with profit if the auriferous area were more extended. The superior limit appeared, however, to be the lot 9, which, like 8, was traversed by veins of quartz; explorations on the lots 10, 11, and 12 gave but insignificant quantities of gold. The precious metal in this vicinity is generally so rough and angular, and even dendritic, in form as to suggest that it has not been brought from a great distance".

The present writer followed this brook from the lake shore upstream to the junction of the two branches and then followed the south branch for a mile or so to beyond the western edge of the low hills. Panning tests were made at intervals along this distance, both in the stream bed and in the banks. A few small, worn colours of gold were found in material from lots 8 and 9 of range A, in the same part of the stream that Michel found to have the most promise. Like Michel, the writer got better

showings on lot 8 than on lot 9, but it is not indicated that any place along this stream could be worked with profit. The gold found by the writer occurred in bedrock cracks, both in the stream bed and under two to three feet of stratified stream gravels immediately beside the stream.

The brook has practically no valley from the point where its two branches leave the low hills downstream to the lake, and it has cut only a shallow channel into its floor of bedrock and boulder-clay. Where the stream has cut most deeply, in the lower mile of its course, it runs between banks less than twenty feet high. The land surface over which the stream flows has a gentle slope, being glaciated bedrock with an overburden of boulder-clay and Glacial gravels. In view of the limited erosion and also of the nature of the surface, there can be little doubt that the stream is post-Glacial in age, at least beyond the limits of the hills. Consequently, accumulation of any important quantity of gold along its course is unlikely.

The gold may have been derived from the Glacial drift, as seems to be the case with the other Lambton stream, described above, or it may have been derived from the bedrock over which the stream runs. The gold found by the writer gives little indication of its source, for it was in very small particles and well worn. Michel, however, evidently with larger pieces to judge from, intimated that the source was local, for the gold was "rough and angular and even dendritic in form". This being so, the most evident source is the bedrock in the lower two miles of the stream.

Bedrock occurs frequently in the bed of the stream and along its banks from the mouth upstream almost to the junction of the two head-water branches. It is banded, arenaceous limestone with some interbedded sandstone and slate for a few hundred feet upstream from the lake shore. In the remainder of the distance, sandstone and slate predominate. A granite dyke, four feet wide, striking northeast and dipping vertically, was noted in the stream about 300 feet from the lake. Many quartz veins, lenses, and stringers cut the sandstone and slate, occurring more frequently and in larger size here than at any other place examined by the writer. While these veins are not known to carry gold, they occur in such abundance that it would be surprising if some did not. The locality is only three or four miles from the granite intrusions in Stratford township, across lake Saint-François, from which the dyke mentioned above probably is an offshoot. And, although the stream has not cut deeply into the bedrock, much quartz has been broken up, as testified by the great number of quartz boulders strewn along the stream bed and banks. The veins are not well mineralized. They are sometimes rusty, but generally white or milky, and they contain inclusions of sandstone and slate. Calcite occurs in small patches with the quartz.

A little prospecting has been done on the south branch of this brook, about a mile above the highway, some ground having been staked in 1933 and re-staked in 1934. This was in lot 12, range B, of Lambton township. The writer was assured by a farmer in the locality that gold had been found here, but was unable, himself, to find any, or anything to indicate that the locality is worthy of attention.

LEEDS TOWNSHIP

There is but one locality in Leeds township reported as having yielded placer gold. This is close to the village of Saint-Pierre-de-Broughton, in the south half of lot 13, range XV. The only published statement in regard to the occurrence is that Mr. P. Turcotte, of West Broughton, panned four ounces of gold here in 1917 (20).

The stream is a small one, flowing from the hills in the southwestern part of Broughton township through the village of Saint-Pierre-de-Broughton and then steeply down to the flats bordering the Palmer river. The writer examined only that part of the stream between the village and the river. In the upper three-quarters of this distance, the stream flows in a strong valley and in several places has cut a gorge through Glacial material into bedrock. Very little of the sediment picked up locally or brought down by the stream remains in the gorge; it is carried down and spread out on the flats bordering the Palmer river. Whether the gold reported as panned here was obtained from the gorge or on the flats lower down, or from both places, was not ascertained either by observation or enquiry. Several pans tried by the writer from the gravels on the flat close to the mouth of the gorge yielded no trace of gold, and only a few, small, bright-coloured flakes were found in material from the gorge. This latter material consisted of Recent sands taken from cracks in the bedrock. The only place where any apparent previous test had been made was well up in the gorge, about 500 feet below the village. Here, some 50 feet of trenching had been done parallel to and bordering the stream on its east side.

The bedrock is mainly a talcose schist, displaying structures that indicate its origin to have been sedimentary. With this is associated some definitely igneous rock that resembles closely certain phases of the 'Serpentine series'. A few small, barren-appearing quartz veins were seen in the rocks along the brook. It is of interest, in connection with the question of origin of the placer gold here, that Logan (11b, p. 257) noted 'native gold' and other minerals in a quartz vein on lot 14 of range XV, Leeds township.

MAGOG TOWNSHIP

In 1896, Chalmers reported that: "On lot 5, range XV, Magog, near the foot of Orford mountain, mining for gold was undertaken by a Mr. Lacroix, and several men were at work in a pit in the bank of a small stream at the time of my visit" (6b, p. 75). No gold was found here by Chalmers. The locality was not visited by the present writer.

ORFORD TOWNSHIP

One of the two localities in Orford township reported as yielding placer gold is in lot 19, range V. Two small streams, a quarter of a mile apart, traverse this lot and fall into the Magog river within a mile below Rock Forest, or some seven miles southwest of Sherbrooke.

This locality was examined in 1866 by Michel (14, pp. 62-3) and was one of a few localities listed in 1889-90 by Obalski (16a) with the bare

statement that they had been exploited by companies and were to be considered important. Both Obalski (16b, p. 71) and Chalmers (6d, p. 132) refer to the occurrence in reports published in 1898, but in each case only to quote the original report by Michel.

Michel's report is, in part, as follows: "The examination of lot 19 of range V, of Orford, presented a special interest owing to the discoveries reported to have been made on the neighbouring lots, several of which had been sold at high prices as containing workable auriferous alluvions. The explorations which I made upon the lot above mentioned were not very satisfactory, although gold was found in three out of five trial-pits sunk pretty far apart in the beds or on the banks of two rapid streams. . . . Beneath a layer of vegetable earth, the argillaceous [auriferous?] gravel is found resting directly upon the slate. The gold is distributed irregularly and very sparsely throughout this layer of gravel, whose thickness is extremely variable, and did not seem to be more abundant nor in larger grains on the bedrock than elsewhere. One of the excavations, however, offered an exception to the conditions just described. It was sunk to a depth of twenty-nine feet, and, after two or three feet of vegetable soil and a similar thickness of auriferous gravel, presented a mass of extremely compact bluish clay enclosing boulders, and continuing down to the bedrock, which consisted of white quartz and black slate. Thirty cubic feet of the gravel, washed by the rocker, yielded a few small particles of gold, but not a trace of the precious metal was found in the residues from the washing of twenty-five cubic feet of the bluish clay extracted from various depths. . . ."

These two streams, each less than a mile in length, run in rather shallow valleys cut in Glacial material. In the lower part of their courses, the bedrock exposed has been glacially scoured and reduced to a smooth surface. Below the line of the Canadian Pacific railway, which here borders the Magog river, sharp gorges have been cut through the glaciated surfaces into the bedrock, particularly on the more westerly stream, and the brooks fall sharply to the Magog river. In view of the above, it is extremely doubtful that either of these streams had a pre-Glacial history, and therefore such gold as occurs probably is in the Glacial drift. The information given by Michel supports this view. There would be some concentration of gold from the drift along the courses of the streams. But, while a few scales of gold were found by the writer, the metal is not present in sufficient quantity to warrant further attention being given the locality. A similar conclusion applies to the other small streams flowing into the Magog river between this locality and Sherbrooke, on some of which gold is locally reported to occur.

About four miles west of the locality described above, some work was done on two branches of a brook that flows into the northern end of lake Magog. The only information in regard to this work is given by Obalski (16b, pp. 71-2), who says: "In the autumn of 1897 and the spring of 1898, some prospecting was done on the Red brook. . . . by the representatives of the Canadian Mining Exhibit Company. The works seem to be on lot 17 or 18 of ranges VIII and IX. Small quantities of gold are reported to have been found".

The junction of the two main branches of this brook is half a mile from the lake. One branch comes down to the junction from the north-northwest, largely through range IX. This branch runs in a broad valley that apparently once contained a more extensive lake Magog. It is bordered by swamp lands for a mile above the junction. At the upper end of this distance, on lots 17 and 18 of range IX, old prospect pits and short trenches can be seen, evidently part of the works mentioned by Obalski. Owing to the swampy nature of the ground, very little digging was done along this branch by the writer. Panning of the gravel bars in the stream bed gave very occasional colours that were small and scaly. It is not likely ground for important deposits of placer gold, although it should be added that we do not know what occurs beneath the stratified clay and boulder-clay that form the floor of the branch throughout most of its distance. The bedrock is dark slate with interbeds of sandstone, and it is cut by occasional small veins of white quartz.

The other branch of this brook follows a southerly course through range VIII until about a mile above the forks and then swings to the southwest. It flows in an open valley for the most part, but from a few hundred feet below the road leading to Saint-Elie-d'Orford upstream for half a mile, it runs through a sharp gorge cut through Glacial material and bedrock. At two localities in this distance we found gold in bedrock cracks, where it was associated with a yellowish, sticky clay. While the clay resembles that associated with pre-Glacial material elsewhere, we cannot be certain that it is pre-Glacial in this case, for it was found in one place at the edge of the stream under no overburden, and in another under gravels of Recent origin in the banks of the stream. Panning at one of these localities yielded only a few small colours of gold, while at the other a well-worn and tarnished piece of gold having a value of about one cent, as well as a few colours, were found.

While alluvial gold probably could be found at several places here, particularly in the much-cracked bedrock along the stream, it is unlikely that it is present in workable quantity. The bedrock is much the same here as on the branch of the brook described above. The rocks are probably Ordovician in age in both cases.

SHIPTON TOWNSHIP

The one locality in Shipton township reported as yielding placer gold is in range V, lots 13 to 15. It is about two miles south-southwest of Danville on a brook known now as Danville river. Obalski reports on this locality as follows (2a, p. 26): "In the vicinity of Danville, some prospecting has been done on Clark brook, where several shafts have been sunk, the deepest being 15 feet, and a kind of gravel was struck of fairly good appearance, resting on talcous bedrock. In fact, two beds of gravel are found, separated by two or three feet of soft clay, and I found some colours of gold in these two beds of gravel. Gold has for a long time been found in this stream, but it seems neither coarse nor abundant".

It is reported locally that, in 1898, prospect pits were put down at intervals from the road leading to Danville, where Blanchette's saw-mill is located, upstream for about half a mile and downstream for 700 feet.

It is stated, also, that a few colours of gold were found in at least some of the pits on the upstream side of the road, but that the best showings were obtained downstream from the road.

Much of the ground that was prospected is now under water, owing to the construction of a dam immediately above the road. The writer, therefore, was unable to examine this part of the stream. However, the valley is relatively broad and shallow and has the appearance of being rather heavily filled-in with Glacial materials. Furthermore, it lies almost directly along or parallel to the southwesterly direction followed by the ice sheet in this region, and hence in all likelihood would have been thoroughly scoured. This applies to most of the stream as far as its headwaters in Windsor township.

Just above the road for 60 feet or so, to the dam, bedrock is exposed in the stream bed and consists of slate with interbeds of sandstone, cut by occasional quartz veins. A few colours of gold were obtained here by the writer, and he was shown a nugget of gold, worth about 75 cents, which was said to have been taken from about the same place. This nugget was very well worn, pitted, chunky, and rather dull in colour. The gold found by the writer was panned from a yellowish, sticky clay which fills cracks in the bedrock; dark silt and sandy material occurring in other cracks yielded no gold. The yellowish clay has the appearance of pre-Glacial material as known elsewhere, and the fact that it carries gold while the darker material does not further indicates its pre-Glacial age. In the south bank of this stream, just below the dam, some test pits were put down recently by Mr. Evan Jones, of Asbestos, who very kindly supplied a summary of the results of his work here. In one pit, four and a half feet deep, he found a reddish, plastic clay resting on bedrock and overlain by blue clay. The blue clay was seen by the writer and is boulder-clay, while the reddish clay, described as plastic and as containing black sand, may be pre-Glacial material. The fact that it underlies the boulder-clay strongly favours this conclusion as to age.

Downstream from this locality to the first fall, a distance of about 700 feet along the winding course of the stream, bedrock is meagrely exposed, but at the fall and immediately above it the bedrock rises in sharp banks. Just above the fall, on the west side of the brook, is a small flat, on which there is evidence of three pits. According to local report, they were put down in 1898, thirty feet to bedrock, and some gold was recovered. No information could be obtained regarding the nature of the materials cut through or the value of the gold recovered.

It is not likely that gold occurs in sufficient quantity along the section of the brook reviewed to be profitably worked. However, the locality is one of interest in view of the probable presence of pre-Glacial material, even though in small amount. In such case, while some of the gold along the stream may be washed in from Glacial gravels, the source of that which occurs in the pre-Glacial materials must be either from the quartz veins that cut the slates at the locality itself or from those which are associated with the sedimentary schists and rocks of the Serpentine series along the headwaters of the stream.

MOE AND ADJACENT RIVERS

The Moe is one of a group of rivers, in the southern part of the Eastern Townships, which drain into the Saint-François. This group includes, in east to west order, the North, Eaton, Clifton, Salmon (not that of the Ditton area), Moe, Coaticook, and Massawippi rivers. All of these streams, except the Coaticook and Massawippi, are locally reported to carry some gold, but only the Moe has been prospected to any important extent.

The North, Clifton, and Eaton rivers form an eastern unit, with the two first named draining into the Eaton and so into the Saint-François, at East Angus. The Salmon, Moe, Coaticook, and Massawippi form a western unit, with the Massawippi eventually receiving all the drainage and emptying into the Saint-François, at Lennoxville.

All of these streams have broad and relatively shallow valleys which have been heavily filled-in with Glacial and immediately post-Glacial gravel, sand, and clay. Boulder-clay and stratified clays were seen at various places in all of the valleys, exposed in stream-cut banks. Bedrock is infrequently exposed along the valleys and only very rarely in the stream channels. It is evident, throughout almost the entire courses of all these rivers, that they have not been able since Glacial times to cut down to their old channels. In almost every instance where the present river cuts across bedrock, as it does more frequently on the Moe than on the others, it is seen that an earlier, pre-Glacial, channel lay to one side or the other of the present channel.

The writer found gold in the gravel bars of Recent age at many places in all these streams except the Coaticook and the Massawippi. There is probably no particular significance in the fact that these two most western streams gave no showings. They are more sluggish and broader than the others, and their bends and associated gravel bars are less pronounced, so that situations favourable to the accumulation of gold are less common than along the other rivers. The gold found in these several streams was almost without exception in flakes of paper thinness, and of a bright colour. The best showings were found on the Moe and Salmon rivers, with, apparently, better concentration locally on the Moe than on the Salmon.

MOE RIVER:

The first official mention of the occurrence of gold on Moe river was made by Obalski (2j), in 1908. He stated that, in that year, a boring machine was used to test gravels along this river, "the results being important enough to justify the formation of a Company, the Compton Gold Dredging Company, which proposes to work these deposits by means of dredges". It is not recorded that this Company did any further work. Some prospecting was done in 1910 (2k, p. 59) and 1913 (2m, p. 54), but the results are not reported. In the past three or four years, a little work has been done by individuals, but without obtaining any important results.

The Moe river rises near the northwestern foot of Hereford mountain about five miles southeast of Coaticook, and follows a north-northwesterly course for about 17 miles to its junction with the Salmon river. The stream has its source at an elevation of 1,800 feet and, in the upper three miles of its course, it slopes to the 1,400-foot contour. In the remaining distance of 14 miles, the gradient is gentle and fairly even, a 500-foot elevation being reached at the junction with the Salmon. Thus, the average slope, apart from the upper three miles, is about 65 feet to the mile.

The river flows in a valley that averages a quarter of a mile in width and 150 feet in depth. The present bed of the stream is flanked by terraces, usually three in number and occasionally four. When four are present, the two lowermost do not total more than 15 feet in height above the stream. Usually, there is a lower terrace at five to ten feet elevation, with the river as a base, followed upward by two other terraces, each with an additional rise of 25 feet. Thus, the level of the uppermost terrace is about 60 feet above the floor of the valley. Above the highest terrace, the land rises with fairly steep slope at first and then gently to the divides on either side. The terraces are river-carved and are cut in stratified Glacial and Recent gravels and post-Glacial stratified clays.

Underlying the stratified gravels, which occur throughout the valley, boulder-clay appears in less continuous distribution. Boulder-clay was noted in stream-cut banks from the latitude of Coaticook down to the first road crossing the stream below Moe River village. The thickest and the most continuous deposits of boulder-clay occur between the first and the second roads crossing the river above the village. In this area, several cuts expose a thickness of 25 feet of the clay. One exposes at least 35 feet of the clay, overlain by 35 to 40 feet of stratified gravel.

There are also several exposures of material combining the characteristics of boulder-clay and of varved clay in this part of the river. It resembles boulder-clay in its compactness, its blue colour, and the presence of cobbles and pebbles, which, however, are much less common than in typical boulder-clay. On the other hand, it is very distinctly, but thinly, bedded. The bands average thirty to the inch and are composed of blue clay and grey silt in alternating layers, layers of silt being the thinner. Deposits identical with these occur on all the other rivers mentioned above, and are particularly well developed on the North river.

Gold was found by the writer in the Recent alluvials along the Moe from the latitude of Coaticook to that of Milby. No tests were made above or below these points. The best results were obtained between Milby and the first road crossing the stream above Moe River village (Figure 2). In this distance, several bars occur, in which gold to the value of 50 cents was indicated by panning. It was common to have 20 colours and flakes to the pan at the most favourable points of the bars, but such showings were not generally uniform and the indicated values usually decreased with depth.

While the bars along this stream are more or less permanent in position, the materials of which they are composed are subject to change. The gravels shift each year, or several times a year, depending upon the number of floods. The river is extremely sensitive to rainfall, quickly rising to low flood stage and as quickly subsiding. Each time the flood

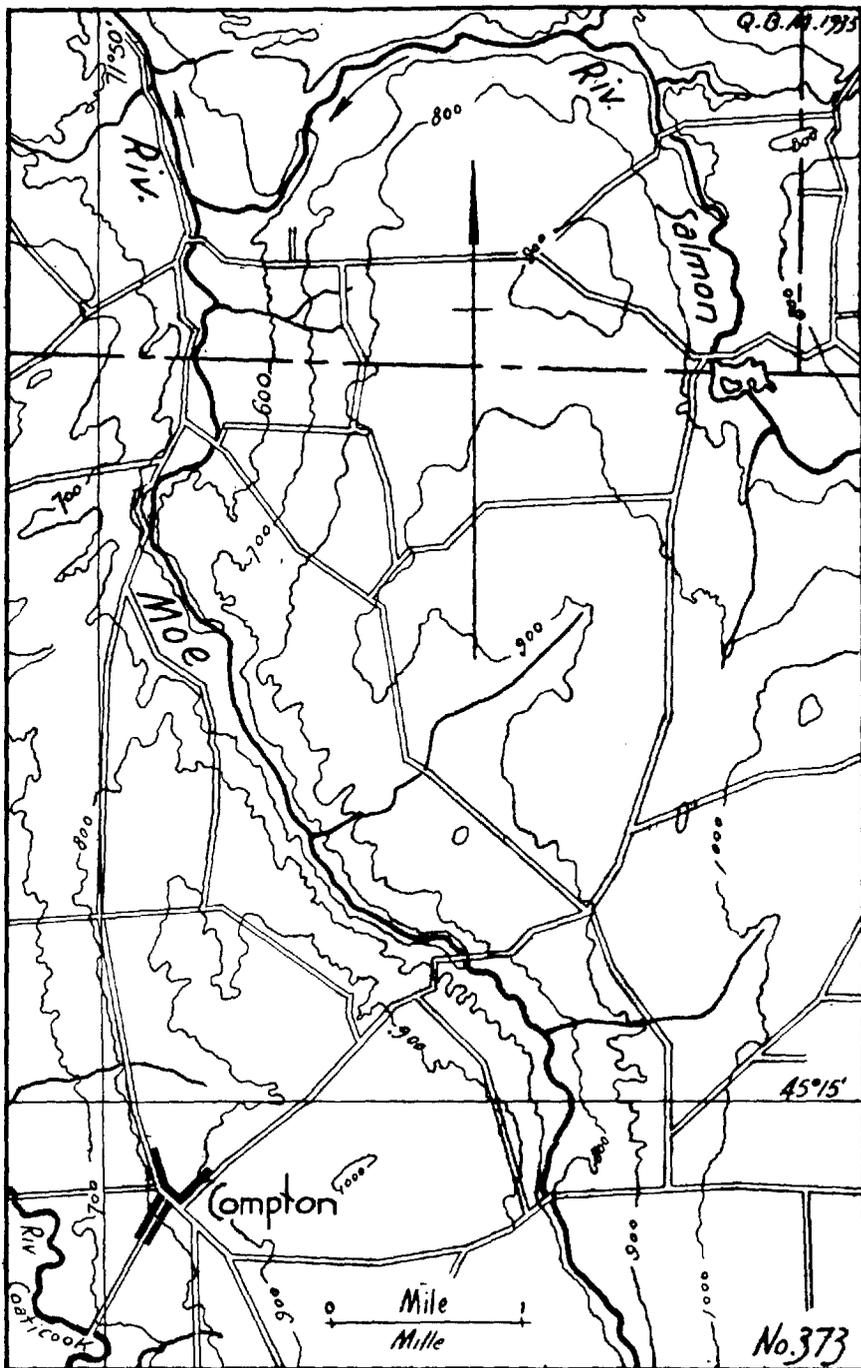


Figure 2.— The section of Moe river having the most apparent value as placer ground.

stage is reached, the gravels are moved more or less extensively. Such conditions, taken in conjunction with the flakiness of the gold, help explain the apparent fact that the gold is more abundant near the surface of the bars than it is two or three feet below the surface. Nevertheless, some of the individual bars tested to a depth of no more than four feet — the depth of the tests being limited by water—contain a quantity of gold estimated, on the basis of our panning and weighing, to have a value of \$600 or thereabouts.

The question of the source of the gold placers along Moe river is not easily answered. No pre-Glacial deposits were found and consequently such cannot be pointed to as the definite source. The alternative possibility is that the gold is being washed from the Glacial gravels that are so abundant in the valley. Whether the gold was derived locally from the bedrock of the Moe drainage basin, or was brought in from some distance to the northwest, is also a matter of doubt.

The fact that at no place along the river could the writer discover any definite evidence of pre-Glacial deposits favours the theory that the gold in the stream is being washed in from the Glacial material. Also, the gold is well worn wherever found, and it occurs well upstream beyond the point where bedrock was first noted in the valley. This latter fact implies that there would be little or no opportunity for pre-Glacial materials being cut into by the stream with consequent release to the stream of any gold that may have been present. On the other hand, the best values were found below the point where outcrops were first noted, namely, a few hundred feet above the first road upstream from Moe River village. The gold is flaky and of a bright colour, and, while it resembles in these respects the gold in the adjacent streams, it differs in the same respects from the gold in the Ditton area to the east, the Magog River area to the west, and the Stoke Mountain area to the north. Thus, the gold of the Moe river and adjacent streams seems to have an individuality which probably could not have resulted if it had been brought to these streams from any distance. Finally, very few, and always very small, colours were obtained from the streams tributary to Moe river. Better showings are to be expected from the gravels in these tributaries if the Glacial material is the immediate source of the gold. In view of the above, the writer's belief is that a more extended search would disclose the presence of pre-Glacial gravels on Moe river. He also believes that the gold was derived locally from quartz veins cutting the bedrock in the drainage basin of the river.

Quartz veins that occasionally are mineralized, and varying in thickness up to four feet, are common along the river. The bedrock is sedimentary in origin and of Ordovician (probably Beauceville) age. It is very like the sedimentary sequence of the Ditton area and consists of interbedded slates, sandstones, and occasional limestones. A few dykes of lamprophyre type, in width up to three feet, were noted at intervals cutting the bedrock along the river.

VICTORIA RIVER:

The Victoria river is the only stream belonging to the Chaudière drainage system that was examined by the writer. The discovery of

gold in quartz veinlets cutting a granite dyke on lot 19 of range IV, Marston township, led to the Victoria river being solidly held under prospecting licenses from its mouth almost to its headwaters (8d). This was about thirty years ago. It was soon learned that this attention probably was not warranted, and there is no record of any of the properties actually being claimed with a view to working them as placer deposits.

The Victoria river rises along the eastern slope of Mégantic mountain, in Chesham township, and shortly enters Marston township. It follows a northeasterly course through Marston township to Victoria bay, the very evident drowned continuation of the river, in lake Mégantic. Throughout its length of about 15 miles, it flows through a broad valley that has received a heavy fill of Glacial material. In the lower mile of the valley, above the road paralleling the lake shore, several kames and short eskers occur. A few depressions resembling kettle-holes also were noted. Higher up the stream, kames occur at rare intervals and are much smaller in size than those nearer the lake shore. The banks limiting the stream are generally low, except where an esker or kame has been cut through, and the land bordering the stream is swampy. Occasionally, blue boulder-clay is exposed in the stream-cut banks. Along the south side of that part of the stream that lies between the road and the bay, there are deposits up to 75 feet in thickness of cross-bedded sand, with some gravel. These deposits may represent a delta built by the river into a formerly larger lake Mégantic, or, more probably, they are part of an esker that formed along the edge of the valley here and that was later sectioned by the stream.

In view of the above, and also of the fact that not one outcrop was observed anywhere in the entire length of the valley of this stream, it is concluded that the Victoria river has not yet cut down to its pre-Glacial floor. Whether or not pre-Glacial deposits occur in the valley cannot be stated. They may well do so, at least locally, for the valley is a large one and would lie athwart the general course of the ice-sheet in this region. The only practical means of locating the old channel and determining the presence or absence of pre-Glacial deposits would be by drilling, and there is little to recommend that this should be attempted.

It is reported locally that gold has been found in the bars of the river as far up as the mouth of the small stream that flows close by the locality where gold was found in quartz. From this observation, it has been assumed that the gold in the Victoria was derived from the quartz and bedrock over which the small tributary ran. The writer agrees with this conclusion in part, but for reasons that are somewhat different from that given above. We found occasional particles of gold in the Victoria River bars in the stretch within two miles of Valracine village, that is, to within five miles of the head of the river. Thus, gold occurs in the Victoria well above the mouth of the small tributary referred to above. However, we found it to be more abundant downstream from the mouth of the tributary. While the finding of this gold does not at all signify that any commercial values are present, it went further than usual towards indicating the source. In the lower part of the stream, practically all the gold particles seen were tarnished to a bronze colour. So far as the writer's experience goes with alluvial gold in the Eastern Townships, this colour is almost unique. On the other hand, it corresponds with vein-gold visible

in a specimen collected by Mr. P. Lord, of the Federal Geological Survey, from the 'McLeod mine'. In view of the above observations, it is concluded that some, if not all, of the gold in the Victoria river has been derived ultimately from the neighbouring bedrock, although it may now be washing mainly from the Glacial drift into the river.

STOKE MOUNTAIN AREA

This area is included within the townships of Dudswell, Stoke, and Westbury; these are corner townships and belong respectively to the counties of Wolfe, Richmond, and Compton. The map No. 349 outlines the area and shows, in particular, the several streams that are referred to below.

The chain of hills commonly called Stoke mountain rise to a height of 2,125 feet at mount Chapman (Bald peak). It begins some seven miles northeast of Sherbrooke and follows a northeasterly course for about eleven miles with an average width of two miles. The higher hills are in Stoke township and in the extreme north of Dudswell. In position and general geological character, the Stoke hills are part of a band, composed of igneous rocks, that extends southward to the Saint-François river at Sherbrooke and then, rising, continues southward through the Ascot hills.

The hills slope rather abruptly down to the general elevation of the region, 800 feet, on the western side, while on the eastern side there is a more gentle slope to an altitude of 700 feet. The streams which drain the Stoke hills almost without exception carry gold.

Alluvial gold has been known from this area at least since 1851. However, little work seems to have been done until 1891, and the earliest published reports on any part of the area are those of Chalmers (6a) and Obalski (1k), in 1895. These reports deal mainly with operations (Chalmers' with conditions also) on the Kingsley and Willard brooks. Two other brief reports by Chalmers were published subsequently, one in 1896 (6b) and the other, his final report, in 1898 (6d, pp. 125-30). In the earlier of these latter reports, Chalmers recounted the work done on Kingsley brook during 1896 and mentioned workings on Rowe brook. His report of 1898 outlined the history of mining in the area, with notes on the Hall, Rowe, Kingsley, Willard, and Big Hollow brooks. Obalski's more general report on gold in the Province was published in 1898. In this report (16b, pp. 64-6) he outlined the work done on each stream from the Hall southward to the Big Hollow, giving most attention to Hall and Kingsley brooks. The five reports mentioned above give the essential data of explorations and operations in the Stoke Mountain area. Other reports in which there is brief mention of the area, or some part of it, will be referred to in the discussions of the individual streams.

The following account considers each stream separately and begins with the northernmost, Hall brook.

HALL BROOK:

Hall brook crosses the northern tip of the Stoke hills. It follows an easterly course throughout its length of about six miles and empties into Dudswell pond, which, in turn, drains into the Saint-François river. One

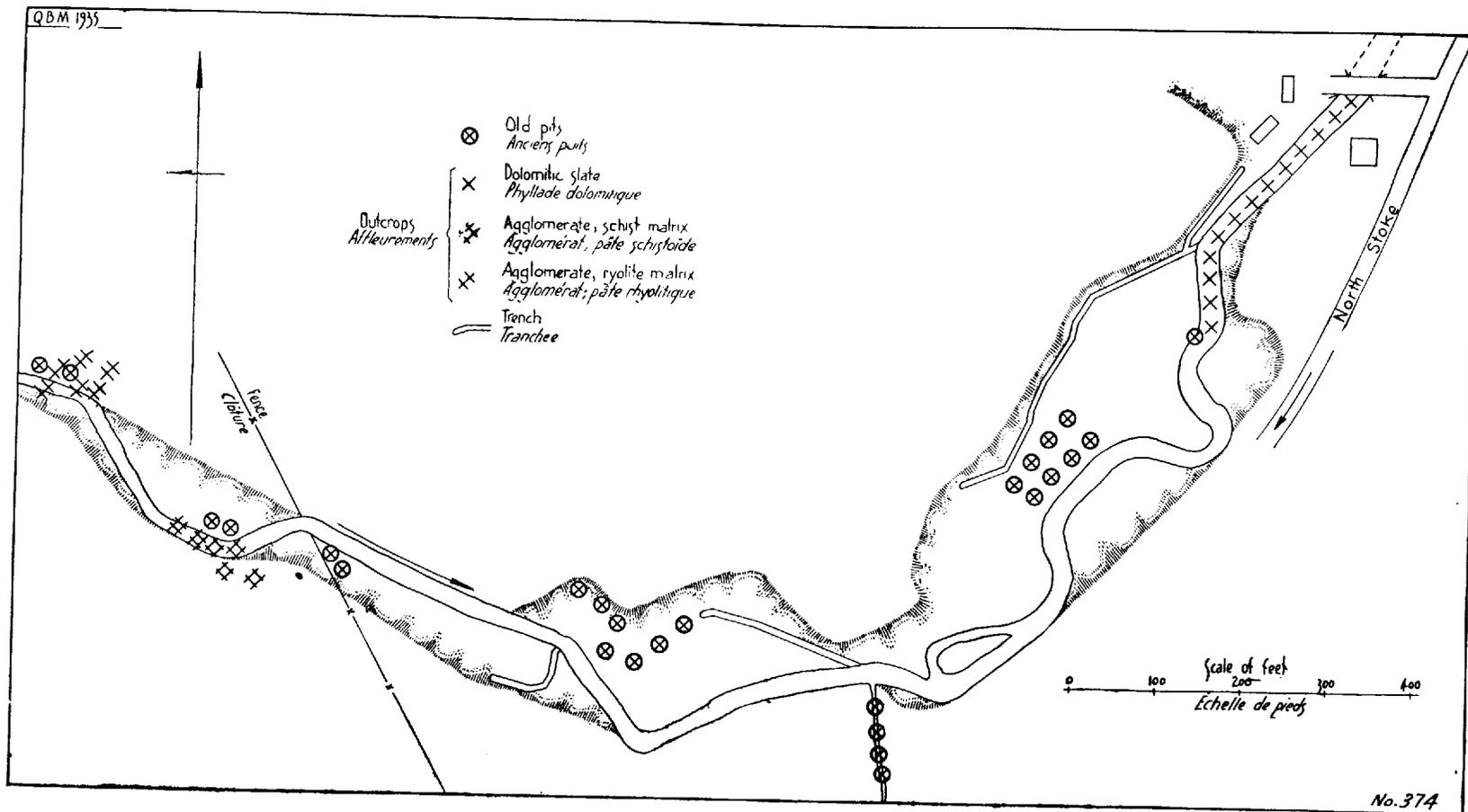


Figure 3.— Plan of part of Hall brook, Dudswell township (Showing the part having potential value as placer ground, and position of old workings).

of its two main branches rises in an area underlain by sedimentaries, while the other rises among the igneous rocks of the Stoke series. At the junction of these two branches, the bedrock is igneous, but about a mile downstream it is sedimentary, and the sedimentaries continue to Dudswell pond. The greater part of the mining on this brook was done just below the junction, that is, probably on sedimentary rocks. The brook runs in a strong valley where it traverses the igneous bedrock, and in a broad, shallow valley where it crosses the sedimentaries. The gradient averages one foot in 30 to 35 feet until a few hundred feet below the above-mentioned contact, and then becomes much flatter.

References to placer mining operations on Hall brook appear in the following reports (see *Bibliography*, page 9): 1 (h, j); 6a, p. 91; 6d, p. 126; 16b, p. 64.

Practically all of the work on this stream was done on lot 11, range VI, Dudswell. Prior to 1890, a 10-stamp mill was erected by an operator from Boston, named Brook, to treat the material along the stream bed, which was said to contain gold too fine to be easily recovered by washing. No results of this early work are known, other than that a shaft 27 feet deep was sunk to bedrock and some gold found (16b, p. 64). Between 1891 and 1894, work was done here by two Beauce miners, Charles Rodrigue and Louis Mathieu. It is reported (16b, p. 64) that they recovered gold valued at \$500 to \$600, this including a nugget worth \$90 and others worth up to \$10. Evidently, this gold was obtained almost entirely from shallow diggings close to, or in, the brook. Some deep pits, yielding poor returns, were sunk, one 40 feet, another 50 feet, and a third at least 12 feet deep. The first two pits are known to have reached bedrock, and from the bottom of the 50-foot pit a drift was run for 27 feet along the down-sloping bedrock. From the descriptions given, it is evident that the deepest part of the old channel was not reached. Operations were abandoned here because of the difficulty in keeping the workings free from water (6a, p. 91). Figure 3 shows the part of the stream most worked and the position of the old workings.

The writer's examination of Hall brook was necessarily superficial. While a few colours of gold were found in Recent gravels and in bedrock cracks in the lower part of lot 11, and again in gravels on the branch coming out of the Stoke hills, near the road, there was nothing directly indicative of the presence of distinctive values. The possibilities of the locality have to be considered indirectly, taking into account the results of earlier work and the local geology and topography.

In the lower part of lot 11, the bedrock along the brook is dolomitic and argillaceous slate. It is probably the same to within a few hundred feet of the upper limit of the lot, but is not exposed. Then, upstream for more than a mile, the bedrock along the brook is agglomerate with some fine-grained amygdaloidal and porphyritic igneous rocks that are alternately acidic and basic.

The unconsolidated material immediately along the brook consists of Recent gravels, that is, re-worked Glacial gravels for the most part, and boulder-clay. Morainic material overlies the boulder-clay on the side slopes of the valley. It is probable that the major part of the overburden through which the 40- and 50-foot shafts were sunk (see above)

consisted of boulder-clay. A stream-cut bank of this clay, 20 feet in height, was noted near the lower boundary of lot 11.

The valley through lot 11 is rather steep-walled, with short, abrupt slopes leading up from the valley floor. In a few places, it is obvious that the present stream is flowing through a recently formed channel, as, for example, at the lower end of lot 11, where the stream cuts across reefs of slaty bedrock. Towards the upper limit of the lot, the bedrock closes in on both sides in such a way as to make it probable that the present stream is not far above the old, pre-Glacial bed. Farther downstream, however, where the bedrock is slate, the valley floor is much broader. It was in this latter part that the test pits were sunk for 40 and 50 feet before getting to bedrock and without reaching the bottom of the old channel. There is thus an indicated difference of relief of more than 50 feet within a linear distance of, at most, 400 feet, and the linear distance to be considered may be much less. It is indicated, therefore, that a sharp change in the profile of the stream bed occurs at the contact of the igneous with the sedimentary rocks; there may even have been a 'fall' here. This circumstance, combined with the change in bedrock to one that has natural riffles, would create a catchment area for gold coming down the stream.

It is not surprising, in view of the depth of overburden generally present, that recent efforts, including the writer's, have found only traces of gold along this brook. Any real values that may occur would be along the line of the old and well-buried channel. It is evident, therefore, that only a series of drilled holes could test this ground effectively. There is justification for further testing at this locality. In the first place, gold, some of it coarse, to the value of \$500 to \$600 has been recovered here. Secondly, the theoretically best ground, that along the old channel, has not yet been examined. Thirdly, the locality is at the upper end of the (locally) best terrain, topographically and structurally, for the lodgment of gold coming down the pre-Glacial stream. And finally, it is reported (6a, p. 91) that pre-Glacial gravels occur here.

The main objections against further work here are that the overburden is heavy, up to at least 50 feet, over the old channel; that the workable area may be confined to one lot, although it might be extended downstream if the old channel could be followed; that the water supply gets very low about mid-summer; and that more than usual expense would probably be entailed in the disposal of tailings.

ROWE BROOK:

Rowe brook is the second stream south of Hall brook. It rises near mount Chapman, the highest point of the Stoke hills, and one of its headwater branches is within a few hundred feet of the head of one of the Hall branches. It follows an east-southeast course over igneous rocks of the Stoke series from its head to the Sherbrooke-Dudswell road and then swings to an easterly direction and follows that course over sedimentaries blanketed by unconsolidated material to the Saint-François river. Where it crosses the Sherbrooke road it is about three miles south of Dudswell pond, into which Hall brook drains.

The first three-quarters of a mile of its course is very steep with a fall of 400 feet in that distance; in the following half mile the stream flows through a depression resembling a cirque, in which the total drop in elevation is about 100 feet; then the profile flattens and in a distance of a little more than a mile the fall is only 25 feet; the gradient then steepens, and to within 2,000 feet of the Sherbrooke road, or in a distance of about one mile, the fall is 300 feet. From the Sherbrooke road to the Saint-François river, the gradient is gentle and regular. Above the road, the valley is strong, with ridges rising to 1,500 feet on the north side and to 1,300 feet on the south, or about 300 feet and 100 feet, respectively, above the valley floor. In the upper two miles of its course, the valley has a shape suggestive of valley glaciation, particularly as regards the cirque-like shape near its head, and much of the bedrock of the stream has been glacially scoured, with striae in the direction of the valley course. Below this stretch, however, where the gradient steepens, the stream has scoured the bedrock and has cut small gorges into it, and the bedrock along the shoulders of the stream valley is largely concealed, so that evidences of valley glaciation are not apparent. In this lower part, low falls and rapids over bedrock are common. This condition holds to within 2,000 feet of the Sherbrooke road, after which, to the road, the valley floor is underlain almost entirely by unconsolidated material. It was in this part, and for a short distance below the road, that mining operations were carried on some 45 years ago, and it is with this part that we are here particularly concerned.

The account that follows of work done on this brook is taken from the following reports (see *Bibliography*, p. 9) : 11, 1m. 2a, 6b p. 76, 6d p. 128, 16b p. 64.

The first work on Rowe brook was done in 1896, when two miners, Hayemal and Sotero, reported sluicing gold "in paying quantities" (6d, p. 128). "A clean-up witnessed while visiting this stream seemed to prove this statement, about \$3.00 worth of gold being obtained as the result of three-fourths of a day's work by one man. The gold was coarse and unworn" (6d, p. 128). Obalski (16b, p. 64) reports that "Messrs. Sotero, Brown, and Hanman got out about a hundred dollars, one nugget being worth \$10.00; Mr. Walcott also worked a little in 1897". It seems evident that the operations reported by Obalski and Chalmers, featuring Sotero, are the same, and, if so, the claim that gold was found in paying quantities was not well founded. The work done in 1897 was on a very small scale. In 1898, three miners, Biron, Laurendeau, and Boucher did some drainage work and took out some fine gold. Since 1898, little, if any, work has been done on this brook and it is not again mentioned in the official reports.

The above-mentioned workings were restricted to lot 8 of range XV, Dudswell, that is, to that part of the brook from a little below the highway upstream for about 2,000 feet. The sketch (Figure 4) indicates some of the conditions over this part of the stream and the position of the workings. It will be seen that most of the work was done in an 800-foot stretch between 800 feet and 1,600 feet from the road, and that it was largely confined to the bed of the stream and to its banks. Thus, for the most part, only shallow deposits were worked, and there is no evidence of any

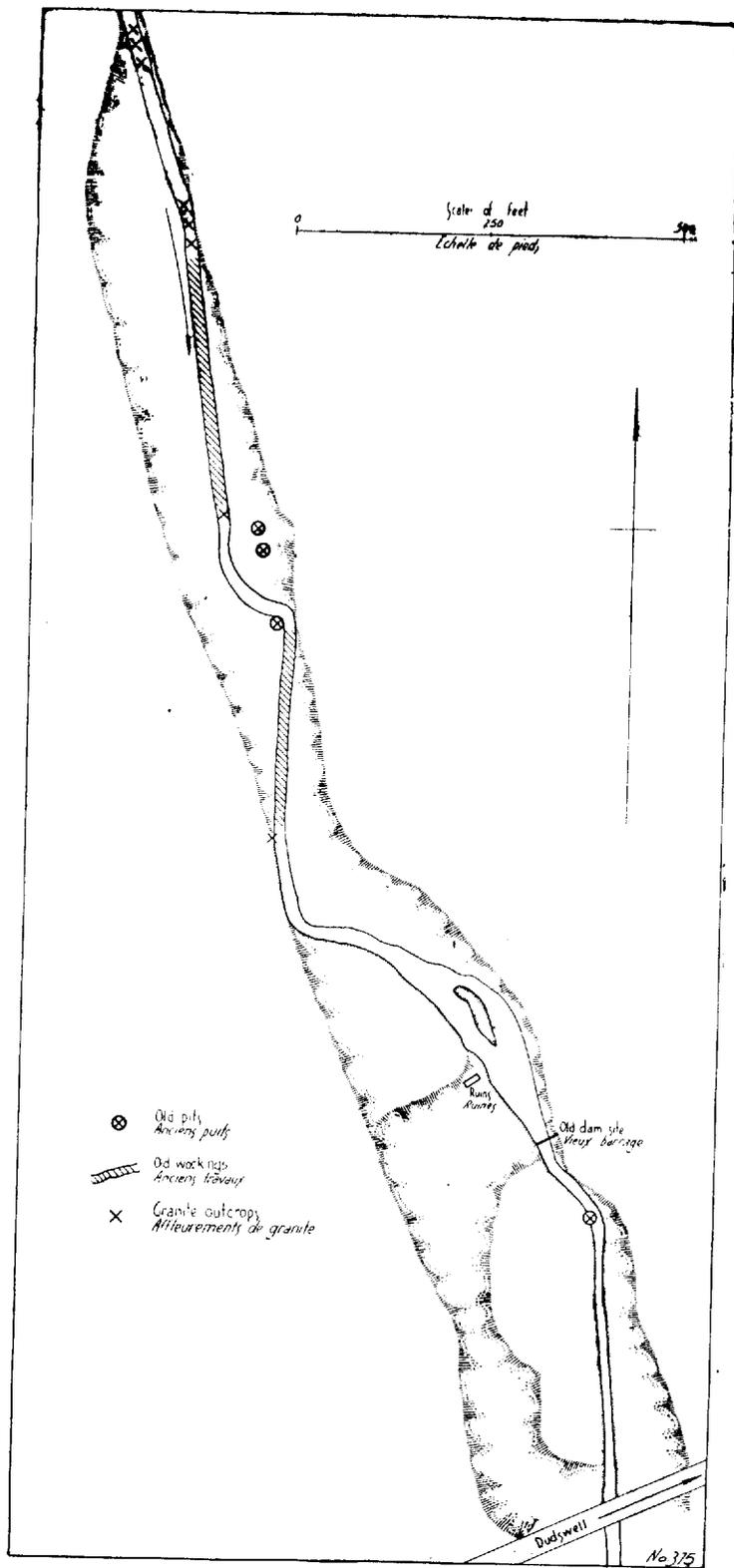


Figure 4.— Plan of part of Rowe brook, Dudswell township.

attempt having been made to trace out, or even locate at any one place, the position of a pre-Glacial channel.

The unconsolidated material along the floor of the valley here is re-worked Glacial material, with boulder-clay underlying. The latter is exposed locally in stream-cut banks up to ten feet in height. Chalmers (6d, p. 128) reported that "the depth of the superficial deposits seems to be about 8 or 10 feet". In the writer's opinion, this estimate would apply only to certain parts of that section of the stream course where granite bedrock occurs at the level of the stream (see Figure 4), that is, where the mining was done. Between the lower end of this section of the stream and the highway, or where sedimentaries probably constitute the bedrock, the overburden is much thicker.

We know so little about the succession of unconsolidated deposits here, particularly as to their thickness and whether or not pre-Glacial deposits remain, that there is little basis for discussion of the possibilities of the stream as placer ground. Evidently, but a small amount of gold has been recovered; it is also evident that little, if any, deep prospecting has been done. This locality, as that on Hall brook, probably includes the contact between the igneous rocks of the Stoke series and the younger sedimentaries. Consequently, it is probable that a catchment area for gold coming down the brook in pre-Glacial times existed here as on Hall brook. The water supply is more uniform than on Hall brook and could be ponded more easily; also, the tailings could be disposed of more easily. But the probable workable area is about the same size. The stream should be considered as a possibility in connection with others if boring or other prospecting for placer gold were attempted in the general area.

ANDREWS BROOK:

Andrews, or Jenkerson, brook lies immediately south of Rowe brook and parallels that stream within half a mile. The head of the brook is a small, shallow lake at the eastern foot of mount Chapman, and for a mile downstream from the lake the brook traverses swamp land. The topography in this upper part again suggests valley glaciation, as on Rowe brook, with a shallow, cirque-shaped head and a broad, flat valley. Outcrops are rare in this part. Those seen are low and weathered, and the few glacial markings observed on them are generally at a slight angle to the course of the valley. The evidence of valley glaciation, resting on the shape of the valley, disappears at almost the same position downstream as on Rowe brook. After the swamp is passed, the stream runs over almost continuous outcrop of igneous rock to within 1,000 feet of the Sherbrooke highway, and falls 300 feet in this linear distance of a mile and a quarter. Except in the upper mile of its course, the stream flows through a rather sharp gorge almost to the highway. From the highway to the Saint-François river it flows in a shallow valley cut through Glacial and Recent unconsolidated deposits that here cover sedimentary bedrock.

The only mention of placer mining on this brook is that "Mr. Cunningham got out a few dollars worth" of gold (16b, p. 64). This would have been in 1897 or 1898. Recently, in 1933 and 1934, some work was

done in lot 7, range III, Dudswell, a few hundred feet above the highway, and it is reported locally that wages were made by three or four men. Two or three weeks work were done each season. Judging from the ground turned over, the gold taken out in this recent work was obtained from Recent gravels resting on boulder-clay at the edge of the brook and in the bed of the brook itself. Two or three feet of overburden at the most were removed. There is no evidence that any deep testing was done along this brook at any time.

Tests made along the brook just above the highway showed that gold occurs in gravel bars in the stream and under a few inches to four feet of Recent gravels resting on boulder-clay at the edge of the stream. That wages were made during a small part of two seasons by three or four men seems possible, and operations on a similar scale might still give wages for a short time. However, neither the reported findings of others nor those of the writer give any indication of the values, if any, underlying the boulder-clay in the pre-Glacial channel of the brook. The distance along the stream that should be tested by boring includes about 1,000 feet above, or west of, the highway and some few hundred feet east of the highway. Throughout this length, the stream has cut through unconsolidated gravels almost to boulder-clay, or into it for a few feet, and in doing so has removed a thickness of 50 feet to 5 feet of the gravels along its course. The thickness of gravels removed diminishes evenly from the hills outward, that is, in an easterly direction, for the gradient of the stream is much less than the slope of the surface through which the stream has cut. The thickness of the boulder-clay may be conjectured only, but it is in excess of five feet. Inasmuch as, in the 1,000-foot distance west of the road, the stream crosses the contact of the igneous and sedimentary rocks, the geological conditions, and hence probably the topographical conditions, of the pre-Glacial valley duplicate those of Hall and Rowe brooks.

KINGSLEY BROOK:

Kingsley brook is the smallest of the Stoke streams to be considered in this report. Rising near the foot of mount Chapman it follows a course parallel to, and a little more than a mile south of, Andrews brook to a third of a mile below the Sherbrooke highway. It then swings sharply northward to join Andrews brook and so enter the Saint-François river. Like Andrews brook, the upper mile of the course of Kingsley brook is through swamp land in which low bedrock knobs are scattered. In this distance, the total fall is less than twenty-five feet, and the valley is broad and shallow. The swamp is maintained on boulder clay, and a pit put down into this clay near the lower end of the swamp failed to reach bedrock at a depth of nine feet. From the lower edge of the swamp almost to the Sherbrooke highway, a distance of about a mile and a quarter, the stream falls 400 feet. It passes over many falls and bedrock rapids in this distance and, particularly towards the lower end, flows through a rather prominent gorge. The bedrock along the stream is remarkably consistent in kind compared to that on most of the other streams, and, while granitic, is generally different in character from that met with else-

where in the Stoke area. It is almost throughout a dark grey, generally fine-grained but occasionally porphyritic, granitic rock. It is thought that the contact between the igneous rocks of the Stoke series mentioned above and the later sedimentaries occurs about 1,000 feet above the road.

The sketch (Figure 5) shows some of the conditions present on this stream over the ground that has been worked and over that which still has distinct possibilities as placer ground. It will be noted that the valley floor gradually narrows from the highway upstream through a distance of about 1,400 feet, after which the floor is practically equivalent in width to the width of the stream. Throughout the distance of 1,400 feet, the stream is floored and bordered by Glacial and Recent gravels, which have been cut through to a depth of thirty or more feet towards the upper end. Above this distance, the valley walls are bedrock thinly mantled with soil, and, as indicated above, the valley is floored almost continuously by bedrock.

The operations that were carried on forty years ago in the lower part of the gorge were apparently attended with good results. The gold-bearing gravels rest on bedrock on the floor of the valley in a zone about 500 feet long. These gravels appear to have been well cleaned out, and we turn to Chalmers (6b pp. 75-6, 6d pp. 127-8) for a description of the deposits: "A section of the beds in descending order is as follows: (1) One to three feet of mould or alluvial wash, becoming coarser in the bottom. (2) Gravel, brown and ochreous, with angular or slightly worn pebbles, and a few boulders, some of which are from five to ten feet in diameter. These stand up above the surface and are glaciated. The materials of the gravels seem to be local, or transported only short distances by the stream, and are auriferous; thickness, one to two feet. (3) Compact, ochreous gravel, generally in thin detached masses; the materials as in number (2), but so hard and compact that a pick is required to remove them. This is probably the equivalent of the yellow gravels of other river-valleys — the remnants which have escaped denudation. They contain gold; thickness from three inches to two feet. (4) Grey, schistose rock, slaty in places, non-glaciated. In the crevices of this, and below reefs and ledges, or in the lee of the large boulders, most gold is found in the gravels".

Below this worked area, where the pre-Glacial gravels occur and where the gravels have a total thickness of only a few feet, there follows immediately an area in which the pre-Glacial bed of the stream has been covered by a thick overburden of Recent and Glacial materials. The sketch (Figure 5) shows the position of two test pits that were put down here by the early miners. Both pits are partly filled-in but are yet about 25 feet deep. Persons living in the locality state that the pits were at least 40 feet deep and did not reach bedrock. They were abandoned because of difficulty from water. The significance of this seems to be that a deep basin or gorge exists immediately below, and for an unknown distance downstream from, the part that yielded some thousands of dollars worth of gold to the early miners. It is assumed that a fall developed at the contact between the igneous rocks of the Stoke series and the later sedimentaries lying to the east, this contact occurring about 1,000 feet above the highway. Evidently the fall and the gorge worked upstream for perhaps 400 feet into the igneous rock area. Had there been no glaciation

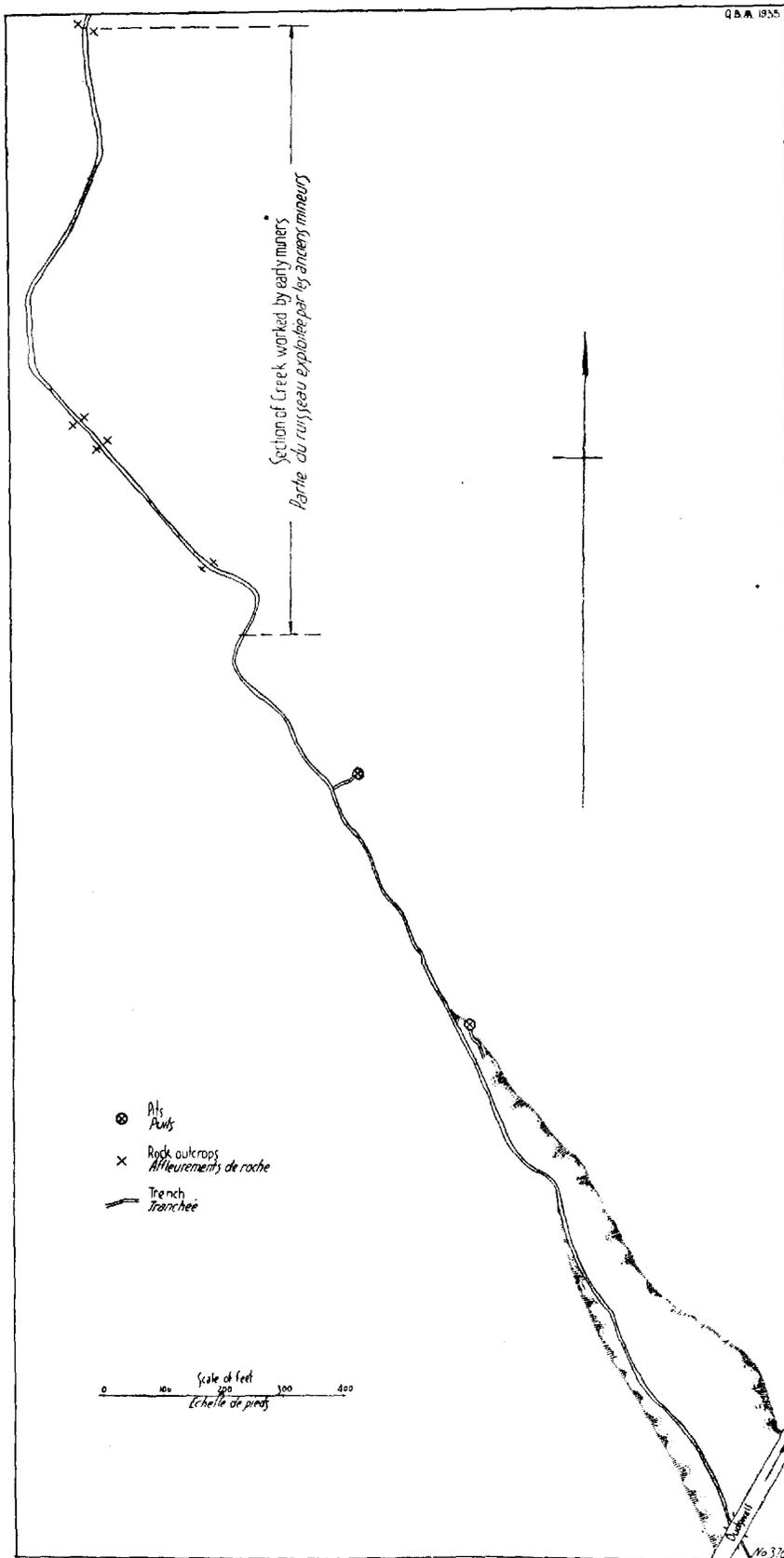


Figure 5.— Plan of part of Kingsley brook, Dudswell township.

here it is altogether likely that a much greater quantity of gold would be found downstream from the present fall than was taken out above it. As it is, that part of the pre-Glacial channel lying between walls of igneous rock would likely be more protected from glaciation than the part above the fall, where pre-Glacial gravels and gold remained although the gorge feature was much less developed. Also, if the pre-Glacial gorge continued out into the area underlain by sedimentaries, a large measure of protection against glacial scouring would there, also, be accorded any gold-bearing deposits along its floor.

The account of work done on this brook is gathered from the following reports (see *Bibliography*, page 9): 1 (k, l, m), 2a, 6 (a, b, d), 16b.

The earliest work on Kingsley brook seems to have been done in 1893, by Rodrigue and Mathieu. By 1895, "several thousand dollars worth of alluvial gold" is reported (6a, p. 85) to have been taken out, including "two nuggets worth about \$90" (6d, p. 127-8). Work was carried on in 1895 by Coupal, Mathieu, and others on the same ground, and a claim was taken out on the upper part of the stream by Osgood and Hall. A "considerable amount" of work was done in 1896 and the Rodrigue Mining Company was formed to work the entire stream, all the mining rights having been secured. A dam was constructed near the source of the brook and an 80-horse-power boiler and a hydraulic pump were installed. Donnell, the manager of the Company, stated that gold in paying quantities was being found in the gravels and to a depth of two or three feet in cracks in the bedrock (6b, pp. 75-6). This was in 1896. "In the summer of 1897, the Rodrigue Mining Company was still carrying on operations, but did not seem to be meeting with the success that was anticipated. The occurrence of the gold was found to be irregular; water became scarce in the midsummer months, and the large boulders met with in the valley were found to be a serious hindrance to hydraulic work. Attempts were made to obviate these difficulties, first by raising the dam, and second by blasting or removing the boulders by derricks" (6d, pp. 127-8). "The work of this Company yielded about \$4,000.00 worth of gold, the largest nuggets being worth \$45, \$39, \$27" (16b, p. 65). In the autumn of 1897, "the properties passed into the hands of Mr. C. A. Parsons, of Boston, who has not yet done any work" (16b, p. 65). The stream has been prospected at intervals since 1897, but no serious work has been done. It was reported (2a) that in 1899 the Dominion Mining Company, controlling all of Kingsley brook, did some preparatory work for a hydraulic installation but that no mining was done. The locality that yielded the values mentioned above is held at present by Messrs. E. Galvin, of Lennoxville, and H. Andrews, of East Angus.

There is difficulty in arriving at a precise estimate of the total production of gold from this locality. Chalmers (6a, p. 85), in 1895, stated that several thousand dollars worth had been taken out up to that time. Again, in 1898 (6d, pp. 127-8), he refers to "several thousand", as if meaning that sum to cover the total production up to 1898. On the other hand, Obalski passes over the period of 1893-95 with the statement that "paying quantities" were recovered, but states that gold having a value of \$4,000 was obtained by the Rodrigue Mining Company during the period 1896-

98. In any event, \$4,000 seems to be the minimum. It is believed locally that much more than that amount was taken out.

The area that was intensively worked during these operations was small. It began about 1,500 feet above the highway and extended upstream for 1,000 feet. The writer has it on the authority of Mr. H. Andrews, who witnessed the operations, that practically all the gold was recovered from the lower 500 feet of the area worked; and certainly the workings in the upper 500 feet appear to have been of a prospect nature only. Therefore, there is justification for the belief that the gold recovered here was taken from an area about 500 feet long. The width worked corresponds to the width of the valley floor, the average being about 20 feet. Practically the only overburden to be contended with was the large boulders. The depth of gold-bearing alluvials varied from zero to three feet (6d, pp. 127-8); also, the upper two or three feet of the bedrock being decayed, "and full of joints and crevices, contained quite an appreciable amount of gold" (6d, pp. 127-8). Four feet would seem to be an outside figure for the average depth of deposits worked, including the material extending into cracks in the bedrock. However, if we take this figure, and 500 feet and 20 feet for the length and width, respectively, we arrive at the estimate of 1,480 for the cubic yardage. Even on a basis of \$4,000, the amount stated by Obalski to have been recovered here, the value per cubic yard would be \$2.70 (old price) — this is rich ground; and besides, there is the apparently additional "several thousand" dollars worth mentioned by Chalmers as having been taken from the same locality.

The writer wishes to stress three points in connection with the Kingsley Brook placer ground. Firstly, the original value of the ground is attested by the reports of both Chalmers and Obalski. The writer has panned a little gold at this locality and has seen two or three nuggets worth 50 cents taken out; always from bedrock cracks and in ground that had been worked over by the early miners. Secondly, the gold rested in a place not at first sight favourable to its retention, remaining on the floor of a narrow, gorge-like valley above a fall. It would be expected that the rush of water here would carry most of the gold and pre-Glacial material over the fall. Finally, there is the evident possibility that much more gold was carried over the fall and into the basin or gorge below than remained behind. Deep testing is necessary to ascertain whether the gold has remained there, and boring appears the only feasible method of attacking the problem.

WILLARD BROOK:

The brook now designated the Willard was formerly known as the 'Maynard' or 'Harrison', more commonly the latter. It is the largest of the streams so far considered and one of the largest flowing from the Stoke hills. Rising among the higher hills which include mount Chapman, it follows a course a little east of south for four miles to the Sherbrooke highway. In the upper mile and one-third of its course, it falls 500 feet, below which it flows quietly for three-quarters of a mile through swamp land where the total fall is 25 feet. Then, as on the other streams, the

gradient quickly increases and in the remaining distance of about two miles, to the highway, the fall is 400 feet. From the highway, the stream falls 150 feet to the Saint-François river in a distance along the stream of two miles. From its source almost to the highway, the stream passes over igneous rocks of the Stoke series, and thence to the Saint-François it traverses an area underlain by later sedimentary rocks mantled by Glacial and post-Glacial gravels.

The history of placer work on Willard brook is obtained from the following sources (see *Bibliography*, page 9) : 1 (k, l, m), 2a, 6a p. 86, 16b p. 65.

No detailed information is available of the work done on this stream. The earliest work seems to have been that of Fred. Harrison, in 1895, and it is stated (6a, p. 86) that he met with "fair success". Obalski (16b, p. 65) reports that about \$200 worth of gold was taken out by Harrison, and that Henry Hughey began prospecting in the spring of 1898 on lot 28 of range XII, Stoke. Hughey's workings, of which no signs were observed by the writer, would be about a mile above those of Harrison, in the lower part of range VI, Westbury. It is reported (2a) that Hughey got out a "small quantity" of gold. The only other mention of work on this stream is to the effect that prospecting was carried on during the years 1895, 1896, and 1897 (1 k, l, m). A little work has been done during the past two or three years at the spot where Harrison operated, but this does not seem to have been profitable.

The valley of this brook is broader than that of any so far considered, and bedrock is much more generally concealed. Going upstream from the highway, the first bedrock observed is at about 2,500 feet, that is, at the reservoir dam. In this distance, the valley floor or flat averages 250 feet in width and the stream flows over Glacial and Recent materials. On the east side of the brook and about 850 feet above the highway, some old prospect workings show in an area 25 feet by 50 feet. There is no indication that these workings were on bedrock, although one pit was dug to a depth of at least ten feet through gravel.

Upstream from the reservoir for 1,000 feet, the valley floor averages about 150 feet in width. At the upper end of this distance are the Harrison workings. This is, also, the first locality above the reservoir where bedrock is exposed in the stream bed. There is a terrace about 75 feet wide and 275 feet long on the west side of the stream at this locality. Its elevation above the stream varies from six to eight feet. Three trenches in all were dug in this terrace, extending back from the edge of the stream. The uppermost trench is near the upstream end of the terrace and represents the major part of the recent workings referred to above. It is not on bedrock and was cut entirely in gravel to a depth of four to six feet. A pit seems to have been dug at the upper end of this trench, but, if so, it has become filled in. A pit dug by the writer in the bottom of the trench, near its upper end, was stopped at a depth of eight feet, because of difficulty with water, without reaching bedrock. The lower seven feet of this pit was in yellowish clay containing scattered pebbles. This clay is faintly and rudely stratified, with the layers sloping at an angle of about 45 degrees toward the brook. The lower two feet of the section contained more pebbles and boulders than the upper part. Inasmuch as the pebbles

in the clay have been glaciated, the deposit is either Glacial or post-Glacial. Thus, toward the upper end of the terrace, about six feet of loosely compacted Recent gravels overlie seven-feet-plus of compact, yellowish clay containing pebbles and boulders.

The two lower trenches, as well as the washing of some Recent gravels in the bed of the stream nearby, represent work done by Harrison. The trenches are within 50 feet of each other. The lower one is about 60 feet long and curves to within ten feet of the other, which is 80 feet long. Both trenches were carried down to the granite bedrock, which shows at the edge of the stream. Their greatest depth was seven feet. Several pans taken by us from the gravels overlying the bedrock yielded no gold, but almost every pan of material taken from hollows and crevices in the bedrock gave gold. It was well worn, some of it flaky and some coarse. Two nuggets worth about 20 cents each, and two others worth about 50 cents each, were recovered here by a prospector who was panning during the time of our visit. The writer estimated that the ground in the vicinity of these two lower trenches has a value of around 50 cents a cubic yard. This estimate apparently is in close agreement with the indicated value of the ground, calculated on the basis of \$200 worth of gold recovered, as reported by Obalski, and the amount of ground turned over. This would be interesting ground provided the conditions in the vicinity of the trenches are maintained over a larger area. As it is, two or three men in a few weeks' time could clear off the bedrock shelf that apparently exists here, and probably would make a small profit.

It is indicated above that the bedrock shelf on which gold occurs is of small area, at the most 200 feet long and 75 feet wide. Where seen in the trenches, the granite is cracked and weathered to a depth of a foot and a half. This weathering suggests that the rock has not been glaciated at all, or only slightly. Chalmers (6d, p. 127), with the opportunity of examining these trenches when freshly made, stated that "the succession of the deposits and mode of occurrence of the gold are very much the same [on the Willard] as in Kingsley brook, except that the beds are rather deeper, and the valley wider. Great quantities of black sand were noted here". This statement implies the presence of pre-Glacial deposits on the bedrock shelf. Yellowish, sticky clay, characteristic of pre-Glacial deposits elsewhere, occurs in the bedrock cracks. This, along with the weathered condition of the bedrock, makes it probable that pre-Glacial deposits are present on the shelf; but they must be relatively thin.

The writer had a small pit put down on the east side of the stream, immediately opposite the lowest trench. This pit was only five feet deep, passing through a foot and a half of Recent stream gravels and three and a half feet of yellowish boulder-clay. The pit was begun almost at stream level on a small flat. Bedrock is exposed about 15 feet distant on the west edge of the stream and to a foot above stream level. While no colours were obtained in panning material from the pit, the fact was disclosed that a buried pre-Glacial channel exists here. The floor of the old channel is at least six feet below the level of the lowest part of the rock shelf and at least five feet below the level of the present stream. How far this deeper and pre-Glacial channel extends up and down the stream is impos-

ble to predict. Nor is it possible to state precisely its width at this locality, although it is less than 50 feet.

Upstream from this locality, no spot in particular could be singled out for special examination. Colours of gold were panned at intervals from the Recent gravels in the stream bed as far as the forks near the head of the swamp, and also for about 2,000 feet along the branch leading toward mount Chapman. Two shallow pits were put down in the swamp area, one near the head, and the other near the foot, of the swamp, and within a few feet of the stream. In each of these, glaciated bedrock occurred under a few feet of boulder-clay. Toward the middle of the swamp area, the thickness of boulder-clay probably is much greater, for outcrops are absent and the clay occurs under a few inches to two feet of swamp muck.

While the quantity of gold taken from the Willard brook is small, the writer would emphasize the fact that the possibilities of the brook have not yet been well tested. The prospecting that has been done has been limited to shallow depths and there has been no attempt to follow out the pre-Glacial channel that certainly exists in the vicinity of the Harrison workings. The fact that the rock shelf here carried gold, and that the surface of this shelf was not scoured off, argues favourably for the possibilities along the narrow pre-Glacial channel. There is no direct evidence for or against the possibility that a gorge or basin occurs near the contact between the igneous rocks and the later sedimentaries; this contact, while concealed, is close to the Sherbrooke highway. But there is no indication, except a generally more mature valley, that conditions on this stream are very different from those on the others, on which a basin does occur on the downstream side of the contact. Certainly, this brook merits a further trial from the vicinity of the highway, upstream for at least a mile. As in the case of the other streams considered, the overburden on Willard brook is generally so thick that satisfactory tests would necessitate boring.

BIG HOLLOW BROOK:

Big Hollow brook is one of the largest of the Stoke streams and is a little larger than Willard brook. It parallels the latter stream at a distance of a little more than a mile, following a south-southeasterly course for four miles, that is, to the Gosford road. It then swings more directly south for one mile before entering the Saint-François river. The upper mile and a half of the brook, to the foot of the Stoke hills proper, has a fall of 400 feet. Then, as on the three successive streams to the northeast, there is swamp ground extending along the brook for about half a mile. According to the contouring, the gradient in the swamp area is about the same as that below to the Gosford road, the total fall in this distance of two and a half miles being 500 feet.

Above the highway, for a distance of 2,000 feet, the valley flat is upwards of 500 feet wide, and the stream has cut through it to a depth of from five to ten feet. Bedrock shows only in the upper 500 feet of this distance, at the west edge of the valley. Upstream, the flat gradually narrows but is seldom less than 100 feet wide until the Stoke hills are reached. In other words, unlike the other Stoke streams discussed, except

the Willard, Big Hollow brook has a consistent flat bordering the present stream, and bedrock is rarely exposed except in the walls of the wider valley. The stream traverses igneous rocks of the Stoke series to within a few hundred feet of the Gosford road, whence it crosses an area of later sedimentaries blanketed by Glacial and Recent deposits to the Saint-François river.

The historical notes on placer mining operations or prospecting on Big Hollow brook have been summarized from the following reports (see *Bibliography*, page 9): 1 m, 2 (a, c, d, e, f), 16 b, pp. 65-6.

All of the reported work was done in lot 11 of range V, Westbury, that is, within a distance along the stream of one mile, beginning about 1,500 feet above the Gosford road and extending upstream to the county line. The first work was done about 1882 by Mr. Wm. Trenholme, of Montreal, "the surface owner, who got out about \$75.00, a shaft about 25 feet deep having been sunk" (16 b, pp. 65-6). In 1895, L. Mathieu found gold in the bed of the stream (16 b, pp. 65-6), and in 1897 Mathieu and Thibaudeau "worked regularly during the season. They first washed in the brook and got a little gold. They then sank two shafts of 24 and 27 feet which struck the bedrock; in the 27 feet shaft they found a little gold and are continuing their work, following the bedrock downwards" (1 m). Another shaft was put down by these men in 1898 to a depth of 50 feet without getting results (2 a). Their work up to this time yielded about \$100 worth of gold, apparently derived mainly from the bed of the brook; "the largest nugget, found on the clay, weighed 19 dwts" (16 b, pp. 65-6). During the summer of 1901, the "Dominion Mining Co., of Boston", worked on the Big Hollow; their stated plan was to mine the gold by the hydraulic method (2 c). Prospecting was done in 1902, "but without great result" (2 d). The Dominion Mining Company did some further development work in 1903, and Mathieu, it is said, got out another \$100 worth of gold (2 e). The last published reference to work on Big Hollow brook is that Parsons, of Boston, and of Kingsley Brook history, was making preparations to work there during 1905 (2 f).

There is little information available in regard to the succession of deposits following on top of the bedrock along Big Hollow brook. The only recorded section is a vague one given by Obalski (16 b, pp. 65-6), who states that one of the pits put down by Mathieu went through "the surface, a bed of gravel, three feet of clay, and nine feet of gravel resting on the bedrock". The total depth of the pit was 33 feet (this was presumably one of the two pits mentioned as having been put down in 1897, and later deepened). It may be that the lower nine feet of gravel was pre-Glacial, but the evidence for this is inconclusive.

The thickness of overburden in the lower mile and a half of the stream, as disclosed by the shafts, showed that we could not reasonably attempt to get to bedrock here. Consequently, we tried two pits farther up the stream, one near the head of the swamp and the other near the foot. The latter pit was sunk within 20 feet, horizontally, of glaciated granite bedrock and across the stream from it. The pit was discontinued, because of difficulty with water, after passing through two feet of Recent gravels and about three and a half feet of blue boulder-clay. The other pit was located at a place where no bedrock showed within several hundred feet. It reached a depth of 15 feet, passing through one foot of vegetable soil,

two feet of Recent stream gravels, and twelve feet of blue boulder-clay. While these pits give no positive evidence, it is unlikely that pre-Glacial material exists under the boulder-clay in the swamp area. The bedrock exposed around the edges of the swamp is glaciated, and here, as on the other streams, the swamp area suggests a bowl-shaped, shallow depression which either is entirely pre-Glacial in age or has been somewhat deepened by glacial scouring.

The lowest point at which old workings were noted on Big Hollow brook was 2,300 feet upstream from the Gosford road. A trench had been dug here through gravels for a distance of 20 feet on the east side of the stream. No attempt seems to have been made to reach bedrock. Beginning 450 feet beyond this point, the stream bed had been cleaned-up for a distance of 200 feet or so. About 500 feet farther upstream, there is an old shaft on the east side of the stream and about 40 feet from it, with a short trench leading to the brook. The only other workings noted were 2,000 feet upstream from the last, and consisted of a trench 250 feet long paralleling the brook on the east side. There was no evidence that this trench had been carried to bedrock. During the summer of 1935, a test was made of the gravels at the foot of a small fall near the lower end of the swamp, but no gold was found. A few small colours were panned here by the writer. This is the highest point on the stream where we found gold, but it is reported locally to have been found on one of the branches above the swamp.

It will be seen from the above account that while Big Hollow brook apparently has been much prospected, and a little gold taken out, its possibilities as placer ground have not yet been at all exhausted. There is here, as in the other brooks discussed, a deeply buried pre-Glacial channel, the bottom of which probably was not reached by any of the four or five shafts. Gold occurs along the present stream bed: colours were panned at intervals by the writer as far as the fall referred to above. Some \$200 worth of gold was recovered by Mathieu, and persons in the neighbourhood have panned gold from time to time. Some of the gold was in nuggets worth a few dollars, if local report is to be trusted. Mathieu is credibly reported (16b, p. 65) to have obtained one nugget which weighed 19 dwts. While no prediction as to the possible value of the ground is warranted, and while we know little of the sub-surface conditions that would be encountered if an attempt were made to work it, it is ground that should not be overlooked, particularly in connection with the other placer possibilities in the general area.

LITTLE BIG HOLLOW BROOK:

Little Big Hollow brook joins Big Hollow brook about 1,500 feet downstream from where the latter is crossed by the Gosford road. Its source at the foot of the Stoke hills proper is about a mile from Big Hollow brook. Following a straight course for two and a half miles in a southeasterly direction, it gradually closes in on Big Hollow at the junction of the two streams. The elevation at the source is 1,300 feet, and at the mouth 800 feet, the drop of 500 feet being evenly distributed along the course of the stream. Igneous rocks of the Stoke series are traversed to within half a mile of its junction with Big Hollow brook.

The stream has been prospected to a much lesser extent than the others discussed above. There is no mention of the Little Big Hollow brook or of the other streams to the southwest in any of the reports. A few colours of gold were panned by the writer from Recent gravels in the lower mile of the stream, but no attempt was made to get through the apparently deep overburden. Little attention was given to this brook and, therefore, we have no basis for prediction or comment as to the placer possibilities.

MILLS AND RYTHER BROOKS:

Mills and Ryther brooks were not examined in detail by the writer. Mills brook follows a south-southeasterly course from its source just within the eastern edge of the Stoke hills proper to the Saint-François river, a distance of three and a half miles. It parallels Big Hollow brook closely and enters the Saint-François river less than a mile from the mouth of that brook. Except for the lower mile, where it traverses an area of sedimentary rocks, it crosses the igneous rocks of the Stoke series.

Ryther brook is the most westerly of the Stoke streams. Its headwaters are well up in the Stoke hills, and its two main branches are two miles apart at their sources. The shorter of the branches is two miles in length. From the junction of the branches, half a mile east of the hills, the stream follows a south-southwesterly course for two and a half miles to the Saint-François river. The contact between the igneous rocks of the Stoke series and the later sedimentaries is about a mile above the Saint-François.

Mills brook rises at an elevation of 1,400 feet and falls 825 feet in its length of three and a half miles. Although Ryther brook rises farther back in the hills, its sources are at an elevation of only 1,200 feet, and the fall to the Saint-François in its length of about five miles is 625 feet. Swamp land and relatively broad flats occur in the upper parts of both brooks. In the lower mile of Mills and the lower two miles of Ryther, above the Gosford road, bedrock is extensively exposed, and, in Ryther brook particularly, there are several falls and rock-walled gorges.

Some unrecorded prospecting has been done on Mills brook at the first occurrence of bedrock, that is, about 1,500 feet above the Gosford road. An area of some 400 square feet immediately beside the brook, on the east side, was worked over to bedrock. The results are not known to the writer. Several colours of gold were found in our work here in yellowish, sticky clay in bedrock cracks at the edge of the stream. Colours were also panned by the writer from Recent gravels at intervals upstream for 2,000 feet. A 10-foot fall over granitic bedrock marks the place where the prospecting was done. Downstream from this fall, no bedrock appears in the valley. Also, in this lower part, the valley has widened considerably. It seems evident that a relatively deep basin, or gorge, exists below the 10-foot fall, one that duplicates those known to exist on other streams already mentioned. While the contact between the igneous and sedimentary rocks is concealed here, it apparently occurs a short distance downstream from the fall.

Although, on Ryther brook, there is no fall at the contact, there is a marked change in gradient, with the stream coursing relatively steeply over the igneous bedrock and then flattening out over the sedimentaries.

Colours of gold were found in several places in the bedrock cracks where the stream crosses the sedimentaries, but no colours were found where the igneous rocks occur. There has been some prospecting on this brook, a number of shallow pits and trenches having been dug to the slaty bedrock a few hundred feet upstream from the Quebec Central railway. We have no record of the results of this work.

Since neither Mills nor Ryther brook has been seriously prospected or tested to date, there is no basis for prediction that any important amount of gold exists along either of these streams. Nevertheless, they both have possibilities, particularly on the downstream side of the contact between the igneous and sedimentary rocks. It is especially desirable that the evident buried gorge on Mills brook, mentioned above, be investigated.

DUDSWELL, RANGE VI, LOT 20:

One other placer locality remains to be noted here, although it is not in the Stoke area proper. This is three and a half miles northeast of the Stoke hills, within the limits of Marbleton village, on the stream flowing out of Silver lake and emptying into the Saint-François river. The locality is just below the road leading to Lime Ridge, near the southwestern edge of lot 20, range VI, of Dudswell township. Unlike the Stoke streams discussed above, this one, including the extension above Silver lake, drains an area underlain entirely by sedimentaries, except for rare and small patches of the earlier (Stoke series) agglomerate*.

Slate is exposed along the bed of the brook for a distance of 800 feet downstream from the road. In the lower 300 feet of this distance, a few test pits were put down through shallow overburden of Recent gravels to bedrock and some shallow trenching was done. Boulder-clay was encountered at the downstream end of the bedrock exposures. No definite evidence of pre-Glacial deposits was noted here by the writer.

The owner of the claim at this locality informed the writer that about \$100 was spent in the last two years working this ground, and that the gold recovered amounted to only a few dollars. Thus, the locality was not worked profitably in the past, and it is unlikely that it can be worked with profit.

Included among the sedimentary rocks traversed by this stream is a thick, and often coarse, conglomerate, probably of early Devonian age. This formation is particularly well developed in the vicinity of Silver lake. It may be noted, in connection with the question of the origin of the placer gold along the stream, that traces of gold have been found in samples collected by the writer from this conglomerate. None of these samples contained visible quartz veins. While no distinctive values are so far known to be present, further testing of the conglomerate at scattered points might give interesting results. Mill tests, of course, would give much more satisfactory information than the usual assay-sample tests.

ORIGIN OF THE PLACER GOLD IN THE STOKE MOUNTAIN AREA:

The igneous rocks of the area mapped are cut in many places by quartz veins that vary in thickness up to at least two feet. As a rule, these

* Personal communication, Abbé J.-W. Laverdière.

veins are of white quartz, practically barren of other minerals, but at several places pronounced metallic mineralization has developed. While assays of many of these veins show traces of gold, only one, so far as is known to the writer, has yielded distinctive values. This vein attracted considerable attention locally some forty years ago, and the prospect on which it occurs was described by Obalski (16 b) and Chalmers (6 d). It is in lot 14, range VI, of Westbury, about half a mile east of Willard brook and a similar distance northwest of the Sherbrooke highway. Some prospecting was also done a few hundred feet to the east, in the adjacent part of lot 1, range IV, of Dudswell.

Several thin, quartz veins occur at intervals throughout the relatively coarse granitic bedrock that outcrops at this locality. While the writer saw no gold in the quartz, both Chalmers and Obalski have recorded the presence of visible gold. The bedrock is stated to be an arkose by both Chalmers and Obalski. However, we believe it to be more correctly interpreted as an altered granite and as part of the Stoke igneous series. Chalmers (6 d) reported on this locality as follows: Gold "was first discovered in a thin, quartz vein, from one and a half to two inches in thickness, traversing a mass of altered arkose, which consists principally of quartz, feldspar, and talc. Iron-pyrites and other sulphides are found in this arkose. . . . Whether the pyritous minerals occur throughout the whole mass of this rock has not been ascertained; but specimens from that part enclosing the thin, quartz vein carrying visible gold assayed in the laboratory of the Geological Survey, yielded 0.35 of an ounce of gold to the ton = \$6.40 ". Some time after Chalmers' first visit, he returned and obtained 387 pounds of the rock for a mill test. The rock consisted largely "of small quartz stringers, but including the arkose matrix and representing material that might be obtained in quantity ". The mill test gave a value of \$1.62 of gold to the ton, while assays of selected samples yielded from \$4.00 to nothing to the ton. Obalski (16 b) stated that a Mr. John Armstrong sank a shaft to a depth of 15 feet on this vein, and that a few hundred feet to the east, in Dudswell township, a Mr. Rodrigue sank a shaft to a depth of 12 feet in another vein. "These veins seem to be too small to be worked profitably, but it would be important to ascertain practically whether the surrounding conglomerate [granite] does not contain gold in paying quantities. A specimen of that rock taken from the surface and which I had analyzed gave 0.08 ounces of gold and 0.08 ounces of silver to the ton, say, a value of \$1.65 "

The mill test obtained by Chalmers gives the fairest idea of the value of this prospect and indicates that the locality has no economic future. However, the occurrence of these and other veins in the area is of special interest in view of their possible bearing on the origin of the placer gold deposits.

Except for the prospect described above, gold has not been reported in any of the veins of the area, apart from mere traces. To the south of the Stoke hills there are a number of copper prospects, long since abandoned. These have been examined in detail by Bancroft (4). In his report he describes eleven such occurrences, but none of them were judged worthy of further attention. In all of these prospects, the country rock is one type or another of the igneous rocks of the Stoke series or chloritic 'trap'.

So far as the writer's observations go, the most highly mineralized veins are in shear-zones and are usually associated with intrusions of chloritic 'trap'. The minerals in the quartz and immediate matrix or country rock consist generally of relatively abundant pyrite in cubes and grains, a little chalcopyrite, occasional bornite, azurite, and malachite, and rare galena. Calcite and chlorite occur in small pockets in the quartz veins. The shear-zones and mineralized veins have developed in rhyolite porphyry, quartz porphyry (sericite) schist, and granite. They are more commonly seen in the two last named types of rock, but this is probably because of the greater accessibility of these rocks rather than a consequence of the particular character of the rock. The association of shear-zones with mineralized quartz veins and chloritic trap is such a common feature that it indicates a relationship between the intrusive trap and the mineralization.

The mineralized veins examined by the writer include several of the copper prospects described by Bancroft as well as additional prospects located farther north, that is, within the Stoke hills and close to their southern limit. None of these veins have yielded more than a trace of gold, at least in reliable assays. To the south of the map-area, however, in the Ascot copper belt, the ore in several of the mines and prospects is known to carry gold associated with the copper. While the gold values are too irregular and pockety to warrant mining for the gold alone, they indicate the probable occurrence of gold in various places throughout the general belt of igneous rocks. A possible source for the gold of the placer deposits in the streams traversing this Ascot-Stoke belt of igneous rocks is thus indicated.

While visible gold in quartz in place has been noted but rarely in this area, it is reported that many pebbles of quartz showing gold have been found in the Stoke streams. Chalmers (6 d) reports in this connection as follows: "Pieces of quartz and conglomerate, generally yellowish in colour, and containing visible grains of gold, were found in the gravels of several of the small streams flowing off Dudswell [Stoke] mountain . . . Numerous angular pebbles have recently been discovered containing specks of gold". Obalski (16 b) speaks of "rolled boulders of quartz" containing visible gold. He states also that: "On the Hall brook, there was found a piece weighing several hundred pounds of quartz conglomerate, crossed by small veins of quartz, in which gold is visible". Unfortunately, the writer did not see any pebbles or boulders of any kind in which gold was visible; consequently, he does not know whether the "conglomerate" referred to by Chalmers and Obalski actually is conglomerate or not. If true conglomerate, the age of the formation from which the boulders were shed could be Devonian or Ordovician, for conglomerates of both ages are known in the area. It would be a matter of real economic interest and service to discover the source or sources of the "conglomerate" boulders mentioned by Chalmers and Obalski, for they indicate a source for the placer gold in the streams not only of the Stoke Mountain area but of the general region. Both the Devonian and the Ordovician conglomerate formations have a linear extent of many miles. They are traceable in intermittent exposures from at least as far south as the Saint-François river, near Sherbrooke, north-eastward to the Chaudière river and beyond. Samples from the Devon-

ian conglomerate collected by the writer for assay yielded traces of gold, and similar results were obtained by assaying samples from the Stoke series agglomerate. The Ordovician conglomerates were not tested by the writer. In connection with these assays, it is scarcely necessary to point out that formations having the areal extent of those with which we are here concerned are not fairly valued by assay of individual samples. Rather, a mill test on a sample of two to four hundred pounds of rock collected from many localities is necessary for the result to be of any practical significance.

On the basis of the information presented above, there is no reason to assume anything but a local origin for the placer gold in the Stoke streams. The gold would have been derived in part at least from quartz veins cutting the Precambrian rocks. Also, it may have been derived in part from quartz veins cutting sedimentaries and even from the sedimentaries themselves, that must have overlapped onto, and covered a large part of, the igneous area that is now exposed.

CONCLUSION

ORIGIN OF THE PLACER DEPOSITS AND SOURCE OF THE GOLD

The gold placers of the Eastern Townships include deposits that are pre-Glacial and others that are post-Glacial in age. The earlier deposits are the more important economically, both from the point of view of their own gold content and as providing the immediate source for the gold in the post-Glacial or Recent deposits.

The Recent deposits originated in two ways. Some are results of erosion of pre-Glacial deposits that became exposed to stream action, whereby there was a reconcentration of the gold immediately downstream from the pre-Glacial deposits. Others resulted from more indirect reconcentration of pre-Glacial gold-bearing deposits that had been picked up by the ice-sheet and scattered through the glacial drift. Reconcentrations of the first type are particularly apparent in the Ditton area, and the Recent deposits of the Moe river may be our best example of the second type.

Granting that the pre-Glacial deposits were the immediate source of the gold in the Recent or post-Glacial gold-bearing deposits, then our chief problem relates to the origin of the pre-Glacial placers and the source of the gold carried by them. Several localities where pre-Glacial deposits occur have been described in the present report. Reference to the reports of MacKay, Chalmers, Michel, and Logan will show that pre-Glacial placer deposits are widely distributed throughout southeastern Quebec. There can be no question at the present time of this wide and naturally discontinuous distribution of placers antedating any ice-sheet episode in the general region. Nevertheless, the belief that ice-sheets are highly efficient eroding or scouring agents has led some authorities to doubt that unconsolidated deposits of pre-Glacial age could withstand the grinding and scraping action of the ice-sheets. In this connection, we may suggest that probably only one ice-sheet passed over this general region. While three or even four advances and retreats of an ice-sheet, if not three or

four Glacial periods, are recognized by some authorities in other parts of North America, no good evidence of such multiple glaciation has been found here. Hence, our pre-Glacial deposits would have to withstand but one ice-sheet episode. Furthermore, local protection would have been afforded such pre-Glacial deposits as remain by the local topography, including hills or ridges and the direction and depth of the valleys. Also, it must be kept in mind that the pre-Glacial deposits that remain must be, in many cases, only the lowest part of the original deposit and that the upper part of the original deposit provided a measure of protection, at least for a time, against direct action of the ice.

Logan was one of the first to recognize that placer deposits of two distinct ages are present in southeastern Quebec. In 1863 (11 b), he stated that the auriferous deposits probably belonged in part to the "glacial drift, or boulder formation, and in part to newer stratified clays and gravels". He also stated that the gold apparently was derived from the schists of the Notre-Dame range. In 1866 (11 c), however, after receiving Michel's report, Logan concluded that "the original gold-bearing drift was of considerable antiquity, and that both it and the overlying boulder-clay had been partially disturbed by local denudation, which not improbably gave rise to the auriferous gravel found in some parts overlying the latter".

Ells (9a), in 1887, followed Selwyn (17) in attributing the placer gold of at least part of the Chaudière area to a local, quartz vein origin; but he believed that the placer gold occurring within the limits of what he mapped as Ordovician (Cambro-Silurian) had been brought in from some distance, and had been derived from quartz veins cutting "Cambrian" slates. Much of what Ells mapped as Cambrian we know now to be Ordovician, and consequently much of the point of his argument is lost.

Chalmers (6 d), in 1898, showed that the gold-bearing alluvials are not restricted to areas where a particular age of rock is present. Likewise, the gold-bearing quartz veins were shown to cut various formations without any age discrimination. Chalmers suggested that the gold in the pre-Glacial placers may have been derived from quartz veins that are associated with intrusions of "diorite". In his determination of the intrusive rock as diorite Chalmers was, in many localities at least, following Ells (1887). Included among the rocks mapped as diorite by Ells, and regarded as diorite by Chalmers, are the altered granite and gabbroic sills of the La Patrie (Ditton) area, and also the chloritic trap of the Stoke Mountain area. While the confusion of terminology in regard to these basic intrusives is unfortunate, it does not destroy the force of Chalmers' statement that: "The coincidence between the belts of these eruptives [intrusives?] and the districts in which traces of gold have been met with is, to say the least, remarkable" (p. 152). The writer's observations in the Stoke Mountain area indicate that the majority of the mineralized veins are associated with chloritic trap; this association supports Chalmers' suggestion. However, no evidence supporting this theory was found in the Ditton area by the writer.

In regard to the primary source of the gold, Chalmers (1898) followed Logan in relating it to the Precambrian crystalline schists, but not of the Notre-Dame range alone. This gold would be "brought up in solutions . . . and concentrated along with silica and the metallic sulphides in . . . faults

and fissures, thus forming auriferous veins " in the later sedimentary rocks. In addition, Chalmers suggested that gold would be separated and carried from the schists by the processes of weathering and erosion and incorporated in " a very fine state of division " in the later sedimentary formations. Thus, the more immediate source of the gold in the pre-Glacial placers would be, in Chalmers' opinion, local quartz veins as well as local sedimentary formations.

Cirkel (7), in 1911, found no good evidence that the principal gold-bearing deposits of the Chaudière area are local in origin. And, mainly for the reasons that much of the gold is well worn and that few quartz veins in the area are known to carry gold values, he concluded that the gold was derived from outside the area, " from sources as yet unknown ".

MacKay (12), in 1921, concluded that the gold of the Beauceville area, the same general area as that examined by Cirkel, was derived from quartz veins that occurred within the area itself. MacKay's conclusion was based on the following evidence:

(1) The stratigraphic position of the principal auriferous deposits showed that they and the gold were not brought to their present position by ice-sheets.

(2) The large size of nuggets and the rough, angular character of many of the smaller ones suggested that little stream transportation had taken place, and favoured a local origin.

(3) The presence of quartz with the gold in some of the nuggets, and the close association of rich placers and quartz veins on the Gilbert river, indicated that the placer values had been derived from the quartz veins.

(4) The auriferous character of some of the veins and the reported occurrence of visible gold in a vein at Devils rapids pointed to their being the original source of the gold.

The conclusion that the gold of the pre-Glacial placers in the Ditton area was derived locally and from quartz veins was reached by the writer in 1934 (13), a conclusion that was based on evidence essentially the same as that found by MacKay in the Beauceville area.

In the present report, it has been shown that each placer of pre-Glacial age in the Eastern Townships is so situated that its gold content could well have been derived from local quartz veins. Admittedly, however, there is no absolute or direct evidence that this is so. The fact that few quartz veins in the general region carry distinctive gold values, and that none are known to be of economic worth, is not more damaging to the theory of local, quartz vein origin of the placer gold here than in the great majority of placer regions. In the present case, the veins we see are but the roots of veins whose higher and perhaps richer parts have been eroded away. It has been shown in two areas, the Beauceville and the Ditton, that a thickness of some thousands of feet of rock has been removed. This 'lowering' must apply to the general region.

Since the pre-Glacial age of the primary gold placer deposits became established, there has been no incentive for attributing the source of the gold to a particular or distant region or type of rock, for no method of transportation of the gold, other than a glacial one, over a wide region and without regard to topography has as yet been made known; and it is obvious that a glacial method of transportation cannot reasonably be postulated for deposits that are pre-Glacial in age. Finally, there is no

particular point in trying to derive the placer gold of southeastern Quebec from any outside source, for no area carrying more, or more highly auriferous, veins than southeastern Quebec is known nearer than the northern Ontario-Quebec gold fields.

In view of the general considerations stated above; the more detailed evidence previously provided by the writer for the Ditton area and which applies generally throughout the region here considered; the evidence advanced by MacKay in the Beauceville area; and that presented by Chalmers for the general region of southeastern Quebec; the writer concludes that the source of the gold is local for each locality where pre-Glacial deposits occur. The gold was derived in the main from quartz veins and probably in some part from sedimentary bedrock.



The Stoke hills from a point five miles to the east, showing abrupt rising of the igneous area of the Stoke hills above the flat plain. Also shows part of the high western ridge, or Stoke Mountain proper, in the back ground.



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