and northeastern part of the hydrographic area of the Rio Bokay, also the placer mines of gold along tributaries of the Wylawas, Attawas, Laccos, and Nagawas Creeks and the Rio Washpook have all been eroded and transported by currents of water from the lateral moraine (about 60 miles long and 300 to 1000 feet altitude above the level of the valleys) that extends northeastwardly from the Barbar Mountains (the easterly termination of the Matagalpa system of mountains) to the Rio Washpook; and on the southeastern side of this series of terminal and lateral moraines are the placer mines, also quite rich in gold, discovered in 1889 at Principulka.

P.S.—Since writing the above an opportunity occurred to pass through and hurriedly examine a part of "the placer" mines containing gold along one of the headwater confluents of Nagawas Creek (tributary to Rio Wanque) and they gave such results from panning as to indicate much gold in the deposits, although no satisfactory estimate of the quantity of gold in the cubic yard of the gold-containing gravels was made because the examination was hurriedly made and the "bed rock" on which the gravel deposits rested was either not reached or not examined at any place in that locality. These are drifts eroded and deposited by floods from the Glacial Epoch lateral and terminal moraines in that region.

NATURAL AND ARTIFICIAL CEMENTS IN CANADA.

BY H. PEARETH BRUMELL, GEOLOGICAL SURVEY DEPT., OTTAWA, CANADA.

IN the last report of the U. S. Geological Survey on the mineral resources of the United States, and under the heading of Cement, particular stress is laid upon the fact that there has recently been discovered in California an extensive deposit of natural cement rock, and the fact of its importance to the State is spoken of at length. The knowledge that a good, yet cheap, cement is of importance to any district has led the writer to prepare the following brief statement regarding cements in Canada.

We have in this country a practically illimitable store of materials applicable to the manufacture of natural and artificial hydraulic cements, of both of which we are now producing a considerable quantity, the production for 1891 being about 93,473 barrels of all kinds. Of this, however, the greater part was of natural cement, and the total production altogether that of the provinces of Ontario and Quebec.

Over a considerable portion of the Dominion are to be found the following materials, which are or may be used in the manufacture of cement: Argillaceous and pure limestones, magnesian limestone, marl, and clay. Of the limestones, probably the best known in Ontario is that constituting a band about eight feet thick and of Niagara age. This band is quarried along its exposure on the Niagara escarpment between Thorold and St. David in Lincoln County, and consists of a bluish-gray argillaceous limestone overlying black bituminous shales. Again, at Limehouse, in Holton County, the Niagara affords a good cement rock. The band here is nine feet thick and rests upon eight feet of bluish shales. As may be supposed, the shales underlying the cement rock in both the foregoing instances form a very distinct quarry floor, thus minimizing the danger of mixture with inferior rock. At Rynal station, Wentworth County, a similar cement rock is quarried. Many other bands of limestone and magnesian limestone in the Niagara formation in Ontario are known to possess hydraulic properties, though at present no others than those noted are being utilized.

Throughout the Onondaga formation, which is developed in Canada only in Ontario, are many beds of hydraulic cement rock, the best known being those of the Saugeen valley and vicinity and those in the neighborhood of Paris. The lower beds of the Lower Helderberg (Waterlime group) also afford impure magnesian limestones eminently suitable for the manufacture of cement.

In Eastern Ontario, cement is made from an impure limestone found at Napanee Mills, in Addington County, and in the township of Nepean, Carleton County, there is developed a bed of argillaceous magnesian limestone of Chazy age, from which the so-called "Huce cement" is made. An analysis of the crude Nepean rock gave Delesse:—

Carbonate lime	45 30
Carbonate magnesia	12.77
Alumina and iron oxide	12.52
Insoluble argillaceous residue	19.77
Water and loss	9.64
	100.00

In the Province of Quebec natural cement is made in Quebec City from a bluish-black dolomite, and at the Mountain Portage, on the Magdalen River, Gaspe County, is found a black dolomite, which is said to possess strong hydraulic properties. A similar band has also been noticed on the Grande Conde, six miles below Great Pond River, in the same county.

An analysis of the Magdalen River rock gave Delesse:—

Carbonate lime	43.17
Carbonate magnesia	32.12
Alumina with iron oxide	4.10
Insoluble (fine clay)	20.30
	99.69

Many other bands of rock suitable for the manufacture of natural cement are known in Canada, but the foregoing is thought sufficient to illustrate their geographical and geological distribution.

For the making of Portland cement, suitable clays and marls or limestones are found at many places in that juxtaposition necessary for economical and profitable working, mention will therefore be made only of those points whereat works are situated. These are, Hull and Pt. Claire, in Quebec; Napanee Mills, Marlbank, and Ocorn Sound, in Ontario. At Hull, Pointe Claire, and Napanee Mills clay and limestone are used, while at Marlbank and Ocorn Sound the cement is produced from clay and marl, which occur in quantity and of singular purity. Of the materials wherefrom the Ocorn Sound cement is produced the following analyses are available.

Marl.— Analyst, Ed. Chapman, Ph.D., Toronto.

Carbonate lime	96.41
Carbonate magnesia	1.64
Carbonate iron	0.42
Intermixed sand, clay, and organic material	1.16
Moisture	0.37
	100.00

Clay, underlying marl.— Analyst, R. R. Hedley.

Moisture	1.42
Silica	62.26
Alumina	14.70
Ferric oxide	3.22
Lime	5.28
Magnesia	0.63
Carbon dioxide	10.09
Potassium oxide, Sodium oxide	2.64
	100.24

Of the various manufactured natural cements, the following analyses only are at hand:—

	I.	II.	III.	IV.
Lime	53.55	43.05	39.70	52.49
Magnesia	2.20	18.02	9.58	Traces.
Silica	29.88	28.43	—	27.40
Alumina and iron oxide	12.70	10.50	19.74	12.16
Insoluble argillaceous residue			30.98	
Sulphate lime	1.58	—	—	7.95
	99.91	100.00	100.00	100.00

I. Thorold, by Delesse.
II. Napanee Mills, by W. M. Smith, Syracuse, N. Y.
III. Hull, by Delesse.
IV. Quebec, by Delesse.

As to the relative qualities and tensile strength of the various Canadian cements, it has been thought best to say nothing. as "comparisons are odious." Much information and many schedules of testing operations may, however, be found in recent reports of the City Engineers of Toronto and Montreal. In these reports the various Canadian brands are shown in comparison with most of the prominent European and American natural and artificial cements.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Prehistoric Remains in America.

THERE is one fact in regard to the prehistoric and protohistoric remains of North America which does not appear to have received the attention it deserves.

If we examine carefully the descriptions and figures of these remains so far as published and attempt to classify them, we soon find ourselves forced to admit that there are two well-marked, general classes of types, the one belonging to the Pacific and the other to the Atlantic slope. The characteristics which distinguish these two classes are both numerous and well-marked. Geographically, the Rocky-mountain range appears to be the dividing line as far south as the Rio Grande, Mexico, and Central America, belonging to the Pacific slope section.

Although the remains of the Pacific division present many types, varying in the different sections, yet there is such a strong general resemblance, on the one hand, of those found from Southern Alaska south to the Isthmus (excepting a gap in California), and, on the other hand, such a strong contrast with those of the Atlantic slope as to justify the conclusion that this arises from ethnic distinctions and indicates different races. Mr. Swan has long been calling attention to the resemblance between the types of the region inhabited by the Haida Indians and the remains of Mexico and Central America, and no one who will make the comparison will fail to be convinced. Professor Dall, who has studied the manners, customs, and remains of the Northwest Coast, reaches the same conclusion. I cannot enter into details in this brief article, but ask any one who doubts the correctness of this conclusion to compare the figures given by Ensign A. P. Niblack, in his work on "The Coast Indians of South Alaska and Northern British Columbia," with those found on the monuments of Mexico and Central America, and then with the types of the Atlantic slope. It is true that the former are modern, yet the resemblance both in general character and combination to those of Mexico and Central America is too marked to be overlooked, while no such resemblance to those of the Atlantic slope is observable.

Do not these resemblances on the one hand and differences on the other have an important bearing on the question, "From whence did America (or rather North America) derive its original immigrants?" That the works of the two slopes present two distinct classes of types cannot be denied. That there is in California a break in the continuity of the types of the Pacific slope, which seems to indicate an overflow from the Atlantic side, only serves to emphasize the above conclusion. The marked similarity between the types of the Pacific slope and the Pacific Islands has been referred to by Professor Dall (3d Ann. Rep. Bur. Eth., pp. 147–151), who finds that they have prevailed "from Melanesia to Peru and from Mexico to the Arctic." In summing up, he remarks that "the mathematical probability of such an interwoven chain of custom and belief being sporadic and fortuitous is so nearly infinitesimal as to lay the burden of proof upon the upholders of the latter proposition." Professor Dall does not argue from this a common origin of the people possessing these characteristics; but believes they have been "impressed" upon the inhabitants of the western coast from the Pacific side. Notwithstanding this disclaimer, does not the evidence indicate two streams of original immigration, one to the Atlantic and the other to the Pacific coast? Ensign Niblack, although disclaiming any inference to be drawn therefrom as to relationship, gives a list of resemblances between the customs and works of the New Zealanders and Haida Indians that is certainly remarkable.

The idea that America was peopled by way of Behring Straits is somewhat losing its hold on the minds of students, and, as a usual result, there is a tendency to swing to the opposite extreme. Drs. Brinton and Hale are inclined to believe, chiefly from linguistic evidence, that the first settlers came from Europe to the North Atlantic coast. The former says in his "Races and Peoples," pp. 247–248, "Its first settlers probably came from Europe by way of a land connection which once existed over the North Atlantic, and that their long and isolated residence in this continent has moulded them into a singularly homogeneous race, which varies but slightly anywhere on the continent and has maintained its type unimpaired for countless generations. Never at any time before Columbus was it influenced in blood, language, or culture by any other race."

Now it may be that settlers came from Europe to the North Atlantic coast, but the evidence is decidedly against the remainder of the above quoted paragraph, which is, in fact, somewhat self-contradictory. For, if the settlement was at one point, by one race, and this race was never influenced by another, it is difficult to imagine in what respect the moulding process acted. However, the chief objection is to the theory of a single original element, and the assumption that it was never influenced in pre-Columbian times by any other race or element. The facts set forth by Professor Dall and confirmed by Ensign Niblack are too apparent to be set aside by any theory or mere declaration. Even without the evidence presented by these parties, the differences between the archæologic types of the Pacific and Atlantic slope are sufficient to outweigh any argument that has been presented against intrusive elements. CYRUS THOMAS.

Washington, D.C.

Some More Infinitesimal Logic.

PROFESSOR BOWSER, in his reply to me in *Science*, Mar. 10, does not recognize the logic of his calculus in the example in question. The only reasons given in his calculus that would permit the use of $\cos dx = 1$ are, the axiom (?), page 12: —

"An infinitesimal can have no value when added to a finite quantity and must be dropped."

And, page 37: —

"Because the *arc dx* is infinitely small, . . . its *cosine* equals 1."

If, for these reasons, $\cos dx = 1$, then, for the same reasons, $\sqrt{2}\cos\left(\frac{\pi}{4} + dx\right) = 1$.

Four out of the five axioms on page 12 are misleading, not to say incorrect. The orders of infinitesimals or infinites to be retained in an expression do not depend upon the expression, but upon the use that is to be made of it. Sometimes we must use $\cos dx = 1 - \frac{dx^2}{2}$ or $= 1 - \frac{dx^2}{2} + \frac{dx^4}{24}$, etc. Quite prominent mathematicians have failed to do this properly in instances where they would naturally use great care. Reasoning on infinitesimals is at best of a slippery character. I have referred in my former article to an example (Ex. 3, p. 325) where Professor Bowser obtains a result that is easily verified to be incorrect; yet the logic of his work seems correct, not only to the average, but to the best students; and it must have seemed right to Professor Bowser, or he would not have inserted it.

The second proof of the differential of the logarithm, pp. 29–31, is another example of false logic. The same proof is found in Olney, p. 25; Taylor, p. 24; Hardy, p. 31; and is the only proof relied upon by some of these authors. This is quite a list of mathematicians who have indulged in infinitesimal reasoning of the value zero, and who will probably learn of it for the first time through this article. It is easily seen that the logic is false by