possible to explain, in some instances, some of the visible phenomena on mechanical principles? May there not be, in the case of many volcanoes, rude natural channels and reservoirs within the stratified parts of the earth's crust, into or through which the fiery fluid may pass, on its rising towards the surface—channels which, having a certain amount of inclination, may cause liquid lava to act as water in the hydraulic ram, producing earthquake-shocks when the throes are ineffectual—and ejections of matter high into the air, when a passage has at last been cleared?—reservoirs, in the shape of huge natural caverns, which, gradually becoming filled with the rising fluid, produce, by atmospheric compression over its surface, a continuous stream for a time—like the air-box in the fire-engine?

I conclude with the remark that in Canada—in western Canada, at least—we appear to be happily situated outside the circle of dangerous volcanic influence. It is true we now and then hear of vague rumblings at St. Catherines and Dundas; of a sort of volcanic tide-wave in the Lake near Cobourg; of detonations on the north shore of Lake Huron. We are assured, also, that an undulation of the earthquake at Lisbon in 1755 was felt on Lake Ontario. We know that in 1663, in the lower portions of the Province, there was an earthquake with volcanic ashes, which lasted for six months; that in 1785, and again in 1814, at Quebec, there was pitchy darkness at noon-day, with black rain and volcanic ashes—due, it has been supposed, to a crater in the terra incognita af Labrador. We can see, moreover, that the basin of Lake Superior, in the far dim foretime of this continent, was a focus of volcanic action. We notice trap in the river Ste. Marie, and Gros Cap is porphyritic. Col. Fremont describes an extinct crater in the neighbourhood of the Great Salt Lake, and an active volcano, 70 miles to the north-east of San Francisco. Mount Elias, in the Russian territory, is an open volcanic vent. And Commander McClure, of the *Investigator*, reports lava along the American coast of the Polar Sea. But in Canada, on the whole, it is a matter of congratulation that we have thus far been permitted to acquire a strong confidence in the ground on which we tread, and that we are spared the presence amongst us of any of those points of communication between the upper and nether worlds—which in other lands are exceedingly interesting,—but also sometimes very inconvenient.

On the Chemical Composition of Recent and Fossil Linguloe and some other Shells.*

By W. E. Logan, F.R.S., and T. S. Hunt.

In the Report of Progress of the Geological Survey of Canada for 1851-52, we have mentioned the existence of small masses, containing phosphate of lime, and having the characters of coprolites, which occur in several parts of the Lower Silurian rocks. In a bed of silicious conglomerate towards the top of the calciferous sandstone, at the Lac des Allumettes, on the Ottawa, they are abundant in cylindrical and imitative shapes, sometimes an inch in diameter. The same material forms casts of the interior of a species of Holopea or Pleurotomaria, and often fills or completely incases the separated valves of a large species of Lingula, which Salter has referred to *L. parallela* of Phillips. The phosphatic matter is porous, friable, and of a chocolate brown color; it contains intermixed a large quantity of sand; and small pebbles of quartz are sometimes partly imbedded in it. The analysis of one specimen gave 36 per cent of phosphate of lime, with 55 per cent. of carbonate and fluorid, besides some magnesia and oxyd of iron, and 50 per cent. of silicious sand.

Similar masses occur in the same formation at Grenville, and in the lower part of the Chazy limestone at Hawkesbury, in both cases containing fragments of Lingula. Those from the latter place are rounded in shape, and from one-fourth to one-half of an inch in diameter, blackish without, but yellowish-brown within, and having an earthy fracture; the analysis of one of them gave:

Phosphate of lime, (PO_5, 3Ca O), -	44·70
Carbonate of lime, - - - -	6·60
Carbonate of magnesia, - - -	4·76
Peroxyd of iron, and a trace of alumina,	8·60
Insoluble silicious residue, - - -	27·90
Volatile matter, - - - -	5·00
	97·56

From the color it is probable that the iron exists as a carbonate. When heated in a tube, a strong odor like burning horn is perceived, accompanied by ammonia, which reddens tumeric paper, and gives white fumes with acetic acid, showing that a part at least of the volatile matter is of an animal nature. The specimens from Lac des Allumettes lose 1·7 per cent. by gentle ignition, with a like production of ammonia, and an odor of animal matter; the same thing was observed with those from Grenville.

The existence in Lower Silurian rocks of these masses, whose characters leave no doubt that they are coprolites, and whose chemical composition is like that of the excrements of creatures feeding upon vertebrate animals, led us to examine the shells of the Lingulæ always associated with these phosphatic bodies. The result has been that all the specimens yet examined consist chiefly of phosphate of lime; they dissolve readily with slight effervescence in hydrochloric acid, and the solution gives with ammonia a copious precipitate readily soluble in acetic acid, from which oxalic acid throws down lime. With a solution of molybdate of ammonia there is obtained a quantity of the characteristic yellow molydo-phosphate, many times greater than the bulk of the shell.

We have thus examined *Lingula prima* and *L. antiqua*, from the Potsdam sandstone, *L. parallela* from the calciferous, and a species somewhat resembling *L. quadrata* from the Trenton limestone. It was desirable to compare with these the shell of a recent species, and for this purpose fine specimens of the *Lingula ovalis* of Reeve, from the Sandwich Islands, were furnished us by J. H. Redfield, Esq of New York. The shell of this species had the same composition as the fossil ones, and the thick green epidermis, which swelled up like horn when heated, gave a bulky white ash of phosphate of lime.

For a further analysis the shell was boiled in water to remove all soluble matters, the soft parts still adherent were carefully detached, and the shell, with its epidermis weighing ·186 grammes, was calcined over a spirit lamp. The brownish residue, weighing ·114 grammes, readily dissolved with slight effervescence, in dilute hydrochloric acid, leaving but a few light flakes of carbonaceous matter. Acetate of soda and perchloride of iron were added to the solution, which was boiled, and the precipitated basic salt separated by filtration, and decomposed by hydrosulphuret of ammonia. The filtrate from the sulphuret of iron having been concentrated, the phosphoric acid was thrown down by ammonia with a magnesian salt; there was obtained ·070 grms. of pyro-

* See page 195 for a previous notice of this discovery