Volcanic Origin of Natural Gas and Petroleum.

3rd. Petroleum, or semi-liquid or solid bitumens have often been noticed and cited by many observers as occurring in traps, basalts or other igneous rocks, as for instance, by Sir William Logan (1) in a greenstone dyke at Tar Point, Gaspe, Province of Quebec; by Mr. Rateau (2) in trachytes in Galicia, and by Professor Arthur Lakes (3) in injected volcanic dykes in Archeluta County, Colorado. Other occurrences of this kind have been recently described by Mr. Henry M. Cadell (4), in a paper on the Oil-shale Fields of the Lothians, as follows :-- "In 1890, a diamond bore-hole was made near Little Ochiltree, about onc mile north of Binny Craig, which, after passing through the Houston Marl, Houston coal and Fells shale, struck a thick sheet of intrusive dolerite situated near the position of the Broxburn shale. It was noticed that the whinstone core, brought up from a depth of over 600 feet, was cracked in places, and the fissures were full of a soft yellow substance like vaseline or wax which melted in the sun and spread in an oily film over the stone. . . . In the summer of 1900, an intrusive sheet of yellow trap about 3 or 4 feet thick was cut while driving through the shale at the mouth of the Albyn mine, on the eastern outcrop of the Broxburn shale anticline. The trap was full of cavities coated with calcite, filled in the heart with mineral wax, yellowish gray when fresh, and brown after exposure to the air. On analysing the hydrocarbon it was found by Mr. Steuart to consist of :---

Carbon, 84.35; Hydrogen, 12.83; Nitrogen, 1.68; with traces of sulphur in some specimens." The above composition is very close to the one of the ozoccrite of Boryslaw, Galicia, which is about 85.7 p.c. carbon, and 14.3 p.c. hydrogen. I will yet quote another instance given hy Mr. Cadell in the same paper(5):—In referring to a volcanic neck or pipe which was cut through in the underground Broxburn shale working, at Gallowscrook, near Philpstoun, he says: "The tuff itself varied greatly in character and structure. It was mostly fine grained and light colored, and

(2) Annales des Mines. 8ième série t. XI, pp. 150, 152.

(3) Mineral Resources of the U. S., 1901, p. 561.

5

⁽¹⁾ Geology of Canada, 1863, p. 402 and 789.

⁽⁴⁾ Trans. of the Institution of Min. Eng., Vol. XX11, pl. 3, pp. 347-353.

⁽⁵⁾ Loc. Cit., p. 351.