

geological sequence of formations are absolutely barren, we see that we must necessarily consider petroleum as secondary products of impregnation and replacement coming up along these structural channels from a source below the last formation in which it is found, namely the crystalline rocks. It must also necessarily be inferred that the latest incoming or emanations of these secondary petroleum products through all these strata are younger than the youngest impregnated formation.

The solid petroleum is also found in zones of great fracturing and of profound disturbance, in parallel vertical veins following the general direction of the orogenic uplifts of their particular district and cutting all the strata and in every way similar to mineral veins. This is well proven in California, Utah, Indian Territory, Galicia and other places, instances of which will be found in one of my other papers⁽³⁹⁾ on this subject. Arnold⁽⁴⁰⁾ and Ellis⁽⁴¹⁾ have both shown instances from California and from the Barbadoes Islands, respectively, in which the solid petroleum was replaced in depth in the same vein by liquid petroleum.

In some of the more recently formed oil- and gas-deposits as in Texas and Louisiana, where the oil and associated salt waters are often hot yet, the petroleum occurs in vertical chimneys of salt, gypsum, sulphur, calcite, dolomite and silica replacing and uplifting Quaternary, Tertiary and Cretaceous clays and sands, and forming peculiar qua-qua-versal domes called salines, mounds or salt islands. The local uplifts in some of the salines of Louisiana and Texas is extraordinary, as much as one to two thousand feet in an elliptical area but a mile or so across, and these salines, as Capt. Lucas pointed out long ago, are ranged along straight lines⁽⁴²⁾. Mr. G. D. Harris, in an article just published⁽⁴³⁾, gives us an interesting map of the structural lines of dislocation of this region, and shows that they belong to two systems more or less at right angle one to the other, and parallel to the great Balcones fault for the northeast system and to the Red River and Alabama Landings fault for the northwest system; he also shows that the salines are

39. Journ. Can. Min. Inst., Vol. VI, pp. 104-108.

40. Bulletin No. 309 and 317, U.S. Geol. Surv.

41. The Geology and Mineral Resources of Trinidad and Barbadoes Islands.

42. Trans. Am. Inst. Min. Eng., Vol. XXIX, p. 463.

43. Economic Geology, Vol. IV, No. 1, Jan. and Feb., 1909, p. 12.