

a belt of faulted and sharply folded rocks, known as the "Disturbed Belt"; east of this belt the rock folding has been less intense—it dies away in gentler undulations until the strata dip eastwards to form a long parallel syncline or trough, which underlies Calgary, Edmonton, and Dunvegan, on Peace River; still farther east the strata incline upwards toward the great plains and then flatten out.

It is on the two sides of this great syncline or trough that the most likely horizons for oil and gas occur, also the most favourable structure within reach of drilling operations, for the most hopeful Lower Cretaceous strata are too deeply buried beneath the syncline.

Deep boreholes put down along the eastern margin of the great syncline have met *gas* at Bow Island, Medicine Hat, east of Edmonton, on Athabaska River, and other places. Some thick *oil* and *tar* have been found in boreholes east of Edmonton and on Lower Athabaska and Lower Peace Rivers, but neither the quality nor quantity have so far been encouraging.

Passing over to the western margin of the great syncline and between it and the "Disturbed Belt" of the eastern face of the Rocky Mountains, a lighter, more valuable oil has been found at places northwards from the Montana boundary to Bow River. It is in this strip that the Black Diamond field occurs; its total daily output is small, not over 50 to 100 barrels a day.

It is possible that somewhere along this foot-hill zone oil in greater quantities may be met with; it is a high-priced oil and likely to occur in narrow fields which are not to be found without close work and many trials by rather deep holes.

Concerning the formations found in the foot-hill belt, it is believed that these were, when laid down as sediments, not far from the ancient western shore of the Cretaceous Sea; hence they are likely to consist of coarser material, such as sandstones and conglomerates; they are also likely to be thicker than their contemporaneous equivalents deposited as silt or mud farther eastwards on a marine floor. Thus the Bullhead sandstones of Hudson Hope are coarse material laid down in brackish water, while their probable equivalent, the Peace River sandstones and Loon River shales, are of much finer material and less thickness. So that, although the geological horizon is believed to be the same, the constituent material is quite different, and it may be that they differ widely in oil-bearing qualities.

We know very little of the origin of any oil so far found; broadly, it must be derived from the strata in which it occurs or from below them, for where water is present oil is unlikely to sink or descend, for water displaces it or forces it up against an impervious roof. If the origin of this oil is credited to buried organic material, it may have its source in any bed or stratum, such as limestones or shales, containing this material.

The Devonian limestones underlie Lower Peace River and Athabaska, and as they carry oil-seepages themselves may be the source of oil in these districts. In the foot-hills belt the underlying sediments are Jurassic and Triassic.

There is no certitude in the matter of oil origin. We can only look for suitable geology, structure, and depth. Conditions which favour it are a porous stratum, usually sandstones, but sometimes shale or limestone. This porous stratum should be arched up as an anticline or dome and sealed by overlying shales or mud. Sometimes the arch is not necessary, as the oil may be caught against a sealed fault or other capping.

The oil of Black Diamond field in Southern Alberta, the tar-sands of Athabaska, and the heavy oil of Lower Peace River occur in the lowest Cretaceous strata; these have different names in different localities, but are believed to be of much the same geological horizon, and they rest upon the rocks of an earlier period, Jurassic, Triassic, and Devonian, in these different localities.

The Kootenay formation, in which the Black Diamond oilfield probably occurs in Southern Alberta, has its counterpart in Upper Peace River in the Bullhead sandstones; both are coal-bearing in their upper portions, and both are brought up to the surface in violent folds along the line of the "Disturbed Belt," just east of the Limestone or Palaeozoic Mountains; they do not show much evidence of oil residues or leakage along this line of outcrop, but this may have no great significance, as such are often absent in known oil-bearing strata.

Above the Kootenay and Bullhead sandstones lie the impervious shales called Benton in Southern Alberta and St. John on Peace River.