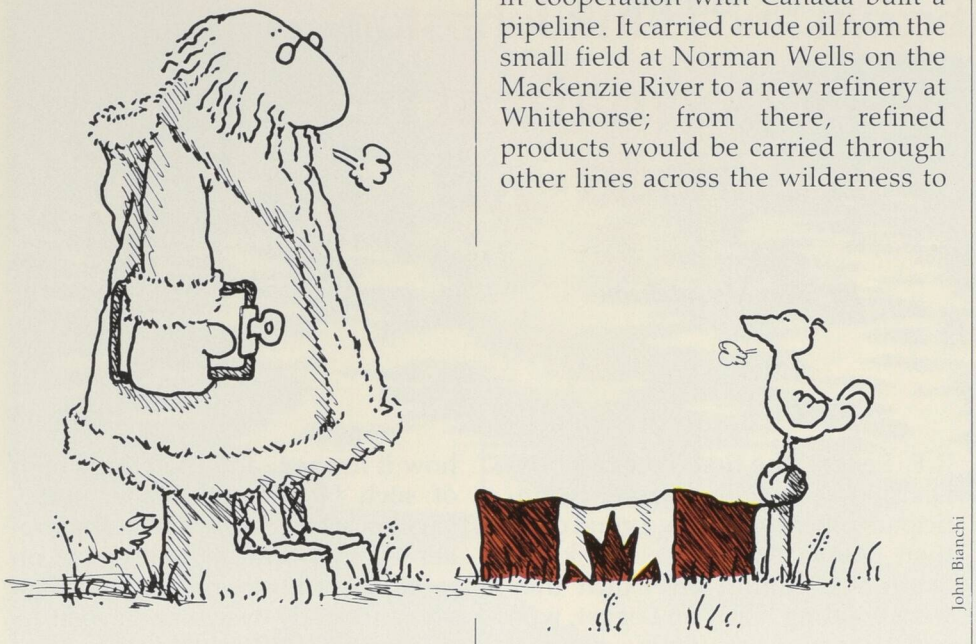
drain down through the underlying frozen ground. Trees that grow here cannot sink deep tap roots and so they lean and fall like drunkards, unsteadily supported by their shallow roots. Permafrost, in other words, gives northern lands their special character.

To the builder, permafrost is rife with potential catastrophe. Cemented by ice, even fine-grained earth materials such as sand or silt



John Bianchi

are stable and strong as rock. If the ice melts, however, they turn to muddy porridge, and *very* small disturbances can melt the ice.

When (as has happened) a bulldozer passes over tundra in summer, it crushes the thin cover of moss and lichen that insulates the ground. Heat from the sun can then penetrate and melt the top of the permafrost, causing the ground to settle and water to pond and run in the resulting depression. The track marks left by the bulldozer then widen to become a ditch, a gully, and finally a major scar on the landscape that can endure for centuries.

To place a building directly on the ground as we do in the south causes trouble in the north, for heat from within will pass to the earth below. If there is ice below, it may melt to form a watery slurry on which the building above totters and collapses.

For the indigenous nomads of the north, whose shelters were light and temporary, permafrost was never a problem. Miners and fur traders built structures that were more permanent, but still relatively light by Southern standards. If a log cabin at a Hudson Bay Company post slumped, it was an easy task to shim it level again. It wasn't until the Second World War, when industrial technology invaded the Canadian North, that serious permafrost problems arose.

To counter the Japanese threat of attack on Alaska, the American army in cooperation with Canada built a pipeline. It carried crude oil from the small field at Norman Wells on the Mackenzie River to a new refinery at Whitehorse; from there, refined products would be carried through other lines across the wilderness to bases in Alaska and on the west coast. It was built in a rush, and as might be expected, was not without problems. For example, at its Norman Wells terminus, houses, garages, warehouses, and other buildings began to settle as the permafrost below thawed. The pipeline operated for only a few months, since shortly after it was finished the war ended and its military justification vanished. A lot of work on building structures on frozen soil was carried out by the Americans during this early phase, however, and Legget credits this effort and later research by the United States Army in Alaska with providing the Canadian researchers with a valuable starting point for their own work.

Anticipating coming resource developments in the North after the war, the Canadian government decided to build a new town to become the administrative, education, medical, and transportation centre for the Northwest Arctic. The plan, at first, was to expand the lonely little community of Aklavik, a former fur trade post in the middle of the Mackenzie Delta. But, as a 1953 report by the Division of Building Research made clear, Aklavik was not the place to build. The mighty river that had dumped the silt on which the community sat tended to flood it every spring and erode the banks. The site's drainage was poor or nonexistent, there was little room for needed expansion and there was no gravel in the vicinity. And, underfoot there lay what civil engineers consider the worst possible kind of permafrost — ice-rich, silty soil in which the volume of ice was equal to the volume of soil.

That report marks the opening of a new, permafrost-conscious era in Northern Canada. Its co-author, on his first assignment with the Northern Research Group, was Hank Johnston.

Looking for Inuvik

In December 1953 the government decided to abandon the Aklavik project and form a team to search the Mackenzie Delta for a better townsite. The team of five engineers and three specialists in geography and geology included people from the Department of Transport to worry about where the airport would go, from Public Works to worry about the wharf and roads, from Health and Welfare to worry about the water supply — and two young men from the Division of Building Research to worry about the ground on which the new town would be founded.

Early in March 1954, after hasty preparations, after poring over air photos in Ottawa, assembling and shipping equipment and supplies, Roger Brown and Hank Johnston flew north. They met the other team members in Aklavik, and a few days later set up a tent camp in the Delta. It was still winter, the thermometer hovering around 40 below.

For the next eight months, through the spring breakup, the summer and early part of the following winter, a tent was home for