Almost everyone takes time at the year’s end to cast up the accounts of the preceding twelve months and to look ahead with some concern for what the future may hold. So it is with individuals, and so with any business enterprise, large or small.

The Imperial Oil Review has had more than the usual cause for such reflections in the last weeks of 1947. This has been a year of special anniversary for the magazine. The Review’s first issue appeared in May, 1917 and uninterrupted publication has continued since that date.

For thirty years this magazine has presented facts about Imperial Oil Ltd., and about the oil industry in general. Events of two world wars and of the interval between them have been reflected in our pages. The development of the Company has been described and an attempt has been made to report the human side of the business with invariable changes brought about by new conditions, new employment, promotions, and retirements. The Review has said about the petroleum services provided across Canada and in Newfoundland, about some of the problems we all have shared, and about carefully planned policies that provide security for employees.

None of the material we have published this year has had a greater significance than the articles about the Leduc oilfield. The Review has traced the development of Leduc from Imperial’s discovery well in February to the present certainty that a new major oilfield is in production at a time when Canada is critically short of crude oil. Leduc is an achievement of 1947 but the search for still further oil reserves in Canada must continue.

Other Review material this year has reported the heavy increase in the use of oil products in the Dominion, particularly of fuel oils, and that there have been unavoidable increases in costs. In other years the Review has been happy to report decreasing costs but this year the Company has been faced with increased costs of crude, of transportation, of labor and supplies and of the additional finished products it has had to buy in foreign countries.

Meeting increased product demand has presented one of the greatest challenges in Company history. Imperial is meeting that challenge with a major program of construction and development as described in the following pages.

When the Review began publication in 1917, Imperial was pioneering in Canada—in oil exploration, in scientific research, in the establishment of bulk stations and equipment to bring the advantages of petroleum products to every new community, no matter how small. Now in this year of the Review’s anniversary, the Company has undertaken a still larger program of development which will bring more and better goods and services to Canadians.
CONSTRUCTION
to meet the challenge of demand

IMPERIAL Oil Ltd. is in the midst of the largest construction program in the Company’s history with undertakings that involve investments of capital in many parts of Canada and Newfoundland.

This expansion has been made necessary by the ever-rising demand for petroleum products. Increased facilities for production transportation and manufacture are urgently required and Imperial is concerned with continued exploration for new oil fields and the development of its discovery at Leduc, Alberta.

While material shortages have hampered all building the Company already has completed some projects; others are underway; and others are in the preparatory stage ready for an early start.

The unprecedented increase in the demand for oil products has been a challenge to the petroleum industry. To the average Canadian the current heating oil situation is the most apparent sign of this demand. Because heating oils are in short supply, advertisements have warned customers not to buy new oil heating units except under special circumstances. Nevertheless, the Canadian oil industry as a whole is supplying about three times the amount of heating oils used in 1939. Still the demand exceeds the supply.

The consumption of other oil products has also risen rapidly and the tremendous increase in demand has come at a time when the oil industry, through no fault of its own, has not been ready to meet it in full.

This is because equipment in the oil industry requires frequent change, renewal and modernization; and during the war years all new construction had to be for war purposes. The industry needed, improvised, mended again and kept on turning out oil products which the mechanized struggle required for victory. Oil was a weapon and the huge wartime requirements were made.

As the war drew to an end, Imperial Oil was ready with plans for new construction and modernization at the earliest opportunity. The aim was to give Canadians better service and more top-quality peace-time products of wider variety.

The oil industry and business generally expected a slackening of war-taut demands after V-J Day that would permit an orderly expansion of facilities to meet larger requirements foreseen for the future.

Instead, the demand for oil products rose and has kept on rising and, when the industry tried to expand to meet public needs, material shortages were felt wherever building was contemplated. The pyramiding demand made increased capacity essential but lack of materials interfered with construction.

Anyone who has tried to build a house in the past couple of years knows the situation. Lumber was scarce, skilled labor was scarce, and—most important to the oil industry—steel was scarce.

"We are in a steel strait-jacket," one oil authority declared because steel is needed for exploration equipment, for ships, for pipe lines and tank cars, and for refining and marketing operations.

Imperial has had to adjust its building program to fit the shortage pattern. Essential jobs have been completed as quickly as supplies were available. Some equipment, due to be retired, has not only been retained, but is working harder than ever before because it cannot even now be replaced.

Desired but not absolutely essential construction has been deferred because the Company’s policy is to avoid, whenever possible, competition for building materials needed to ease the housing shortage. New executive offices in Toronto, new divisional offices and extensive service station construction all have been postponed.

It is anticipated the program will soon advance more rapidly. H. H. Hewitt, Imperial’s president, announced recently that arrangements have been made to obtain $24,000,000 which normally would be earned in the next few years but now will be available immediately for expansion.

"Imperial Oil is fully conscious of its responsibility to its customers for the supply of petroleum products and has had the matter of physical facilities constantly under review," he declared.

Some details of the construction projects are outlined on the following pages. They range from large undertakings like the "cat" cracker at Montreal East and the new refinery at Edmonton to much smaller but equally necessary developments. All will help to provide increased oil necessities and comforts for Canadians.
CONSTRUCTION
— to find
and produce more oil

The Fact that from her own territory Canada obtains barely 10 per cent of the oil she needs emphasizes the importance of exploration for new petroleum reserves in the Dominion. Accordingly, Imperial's discovery this year of a major oil field at Leduc, Alberta, has been a milestone in the progress of the Canadian petroleum industry. Present estimates are that Leduc has a reserve of at least 50,000,000 barrels and perhaps more. Some authorities predict that it will eventually exceed Turner Valley's production.

Leduc is an outcome of Imperial's progressive and systematic program of exploration in the Canadian west on which the Company and its subsidiaries have spent $23,700,000 between 1919 and the end of 1946. The new field is a substantial result from this investment but there were many disappointments and failures before it was found.

While Leduc has been passing through the proving stages, exploration has been continuing and will continue in other areas. Imperial plans to continue a major exploration program involving the expenditure of many additional millions of dollars in the search for new oil deposits.

Exploration calls for skilled man-power, rugged machinery and tractors, bulldozers, earth movers, trucks and their attendant gear. Geologists, seismographers and other specialists require delicate instruments. Bunkhouses, cookhouses and toolsheds are needed at each site.

Perhaps the largest single construction item involved in exploration is that for roads to distant drilling sites. The 70-mile road completed this year between Entrance and the drilling site at the Muskeg antline in the Alberta foothills cost approximately $250,000. If the million-dollar drilling venture in which five oil companies are associated proves a success, the road will remain leading nowhere except into mountainous wilderness. Many other "wildcat" wells involve similar if less extensive road building projects.

Exploration and production operations have felt the steel shortage. Steel is required for drill pipe, casing and tubing all of which have been in short supply, creating a situation that has been industry-wide in its effect upon the search for oil. When oil is found, new demands for steel for pipe lines, steel for gas separators and steel field storage tanks begin.

The discovery of a new field brings in its wake a whole chain of construction problems concerned with housing, transportation and production. For this reason an important part of Imperial's budget for expansion will be spent in the development of Leduc.

Leduc has already entailed the construction of a pipe line to the railway and the start of a new refinery at Edmonton. Arrangements have been made for construction of a housing in a model townsite near the field, so that oil field workers and others living in the area will be able to purchase suitable homes under advantageous terms. Twenty-five homes will be built this year and 175 next year. The townsite has been named Devon.

Meanwhile the small Becher field in southwestern Ontario is being developed and necessary construction is underway in other producing areas to help provide more Canadian oil for the Dominion.

A major part of Imperial's construction program is required by developments in the Leduc field. Leduc No. 4 well (left) helped to prove the importance of the discovery in Alberta.

CONSTRUCTION
— for transportation

Because Canada must import approximately 90 per cent of the crude oil she needs the Canadian oil industry is deeply concerned with transportation by pipe line, by ocean and lake tankers and by rail. Imperial's fleet lost four tankers through enemy action in World War II—the Candianita, Manitee, Calgarita and Victorial. Since the war ended, three other veteran ships, the Alberita, Transalta, and Vanacita have been retired.

To replace them and increase carrying capacity above pre-war levels the Company bought the Imperial Halifax in Britain and the Imperial Quebec, Imperial Toronto, Imperial Edmonton and Imperial Winnipeg, from the U.S. Maritime Commission. The Imperial Halifax, a 5,168-ton vessel, is being used on coast coast runs and the other four, all 16,600-ton "T-2" type tankers developed during the war run between Caribbean ports and Canada.

To give added service on the Great Lakes, Imperial will have three new tank ships in service next year. The Imperial Collingwood and Imperial London, already launched and now being outfitted, are 2,500-ton canal sized tankers and the 6,000-ton Imperial Sarnia, to be launched next June, will be the largest tanker on the Lakes under Canadian registry.

Ship construction has been materially affected by the ever-recurrent problem—the steel shortage—which also has seriously handicapped transportation of oil by railway tank car and by pipe line.

Large numbers of new tank cars are urgently needed by the oil industry both in Canada and the United States but the steel supply has fallen far short of car-builders' requirements. Imperial is using every tank car it can obtain and operates 2,700 more cars than in 1939. This increased number is still insufficient and the Company is courting every effort to obtain more cars. Meanwhile, the traffic department is busy night and day routing and tracing cars for the fastest possible schedules, making full use of available equipment.

Pipe line expansion has been along with complex construction developments. Last year the Company installed 83 miles of eight-inch pipe between Waterton...
ville, Ohio and Sarnia which gave Sarnia refinery 12,000 more barrels of crude a day. The pipe came from an old line originally laid in Ohio and Indiana in 1888. Imperial bought and restored the pipe as the only means by which the urgently needed enlarged movement to Sarnia could be provided.

The Company later used some of the left-over pipe from this project to lay two additional lines from the pipe line gatehouse on the Canadian side of the St. Clair River to the Sarnia refinery, four miles away. This increased the capacity of the pipe line installation at the low pressure end and led to a further increase in throughput. In all, Sarnia refinery receives 18,000 more barrels a day because of the use of the 58-year-old pipe.

Last winter the Montreal-Portland pipe line in which Imperial has a 40 per cent interest was taxed to capacity. Not only did it carry enormous quantities of crude oil to Montreal East but it also moved cargoes of stove oils and furnace fuel oils to meet increased requirements for those products.

The operators have, as one put it, "acquired the world" for pipe to increase the line's capacity, and found none, and so they have fitted the line pumps with larger plungers to force more oil through the 234 miles of pipe. This has raised the capacity from 60,000 to 70,000 barrels a day.

Now, workmen are installing an extra pumping unit in each of the eight pumping stations along the 12-inch line. This will raise the daily capacity to 80,000 barrels of light or medium crude, or 65,000 barrels of heavy crude.

Adding the larger plungers cost $74,000. The new pumps will require an additional $709,000. They are too large for the present pumphouses and will have to be housed in Quonset huts to protect them from the weather, because permanent building materials are not available. The plungers were installed last May and it is expected that the new pumps will be ready for work this month.

Looking to the future, the pipe line officials plan—when materials are available—to run a 20-inch line from Montreal to Portland. This would provide a total flow of 140,000 to 175,000 barrels a day for the four refineries in Montreal. The cost has been estimated at $10,000,000 to $11,000,000, but it is not expected that pipe and other necessities will be available before 1950 or 1951.

For the line from Sarnia to Cygnnet, Ohio, future plans call for a 16-inch line for the 152-mile stretch, with one pumping station at Cygnnet, instead of the four now in use along the line. This would provide more economical movement of crude into Imperial's Sarnia refinery than the eight-inch and two-six-inch lines now in use.

These developments are designed so that it will be possible to import more crude oil to Canada. Pipe lines have also been constructed for transportation from Canadian fields.

The new oil field at Leduc now has its own pipe line leading to the railway at Niisku, eight miles distant. The project is described in full elsewhere in this magazine. The cost of the line, gathering lines, loading racks and spur is about $375,000. It is expected the pipe line will be extended to Edmonton when Imperial's refinery is completed there.

Imperial's newest pipe line, completed last month, carries natural gas from the new Stotber field in Ontario. The gas is being piped into a metering station built by the Union Gas Company and from there into the gas company's line which runs to Sarnia. The initial volume when the line opened was between three and four million cubic feet per day and this new supply will help to ease the natural gas shortage in the southwestern Ontario area.

The Imperial Collingwood, a 2,500 deadweight-ton canal-sized tanker, slides smoothly into the water at Collingwood Shipyards.
CONSTRUCTION
—to make more oil products

REFINERIES, the factories of the oil industry, bore a heavy production burden during the war and there was a consequent strain upon equipment. Imperial’s post-war program for extension and modernization of refinery equipment has been slowed by the steel shortage but progress has been made on several major refinery projects.

Most important is Canada’s first fluid catalytic cracking unit, which is being built at the Montreal East refinery to provide improved gasoline fuels. This “cat cracker,” as high as a 15-storey building, is expected to be in operation early in 1948. Its capacity will be 11,000 barrels per day.

Montreal East will also have a new 6,000-barrel per day catalytic polymerization plant and a new crude pipe still while much existing equipment will be remodelled. The program calls for an increase in the refinery’s crude oil capacity from 25,000 to 35,000 barrels per day.

Twenty-three 100,000 barrel tanks are being built to provide storage for the increased production at Montreal East and for imported hasting oil. Most of the tanks are now in use.

The material shortages caused revision of construction plans at Sarnia refinery but by revamping old equipment crude running has been increased by 10,000 barrels per day. The refinery now handles an average of 50,000 barrels per day. No. 3 and No. 4 cracking coils, built in 1923 were revamped during the war to make cumene, a high octane blending agent for aircraft fighting grade gasoline. Now, with the addition of some old re-run skills, they have become a crude distillation unit.

Plans for a new catalytic polymerization plant, a new research laboratory and a plant for specialty waxes have all been deferred because of shortages.

The engineering and development department was to have had quarters in the proposed new laboratory. Instead, the Company bought a large hushhouse once used to house Polymer Corporation employees and moved it in three sections to a site near the refinery. The sections were rejoined, the hushhouse made into temporary offices and the department now is in its new quarters.

The increased demand for petroleum products brought an increasingly acute storage problem to Sarnia refinery, but this was partially solved by building six additional 100,000 barrel tanks for heating oils and three 15,000-barrel spheres for butane.

The Company has also approved the installation at Sarnia of increased laboratory facilities to test fuels and lubricating oils in engines and for testing heating oils in new types of furnace and stove oil burners.

Edmonton’s new refinery will be built on a 365-acre site on the Saskatchewan River, 1/2 miles east of the city. It will process crude oil from the Leduc field. The plant itself is being moved down from Whitehorse, Yukon Territory, where it was erected by the U.S. government as part of the war-born Canol development. The dismantled refinery is being moved over the Alaska highway to Dawson Creek, for trans-shipment to Edmonton by rail, a total distance of approximately 1,200 miles.

The price paid for the refinery as it stood at Whitehorse was $1,000,000, but by the time it is re-erected at Edmonton the cost will have risen to some seven times that amount. This probably would have been enough to build a new refinery, but purchase of the Whitehorse plant will afford a saving of 18 months’ time. The initial capacity will be 4,000 to 6,000 barrels a day.

The Imperial refinery at Ioco, B.C. will have new storage tanks with a capacity of 150,000 barrels early in 1948. These will store heating oils. In addition, dock facilities for tankers have been extended.

Three of these 15,000-barrel spheres have been built at Sarnia to hold butanes which gives gasoline quick-starting properties.

Imperial’s engineering department sees this renovated hushhouse as Sarnia office. The Company believes non-essential construction should be postponed during the housing shortage.

TANKAGE is being added and a new oxidizer will be built to increase production of paving grade asphalts.

Two large high-pressure boilers are being installed at Imperial’s Regina refinery to replace low-pressure boilers. They will provide a necessary increase in steam-generating capacity for the processing units.

At Imperial the Company has leased seven tanks, each of 100,000-barrel capacity, from the British Petroleum Board. Three of the tanks are believed to be unique in Canada for they were built of concrete to save steel during the war. They were used in the wartime “shuttle service” (trans-shipping oil).

New tankage to hold 180,000 barrels will be available at the Fort William lake terminal before the close of navigation on the Great Lakes. It will provide storage for oil products to help meet the increased western demand during the winter.

Norman Wells refinery will have improved housing facilities for employees and additional tankage. A new distillation tower will increase the manufacturing output to meet the rising demand for petroleum products in that far northern area.

Maintenance is just as important as new construction. Here workmen re-drill rivets in a mild ice drill, used in treating gasoline. The rivets must be renewed every three years.
CONSTRUCTION
— to help distribution

Because of the greatly increased demand for
petroleum, Imperial's marketing departments,
which handle distribution of the Company's prod-
ucts, need extensive new facilities across Canada
and in Newfoundland. However, construction pro-
jects have been governed by Imperial's policy that
only essential installations should be undertaken
because of the general mood of building materials
and labor to ease the housing situation.

The chief marketing construction in Canada dur-
ing 1946 and 1947 has been to provide marine ter-
minal tankage to hold heating oil. Other major
projects have been concerned with the new require-
ments of aviation and of the pioneering areas of
the Canadian north.

Last year, to supply trans-Atlantic aircraft, the
Company began developments in Newfoundland at
Gander airport and at Lewisporte. At Lewisporte, on
the Island's northeast coast, a dock to accommodate
150,000-barrel tankers was constructed and four
tanks with a combined capacity of 150,000 barrels
of products were erected. The cost was about $885,000.

At Gander a hydrosystem to speed up aircraft
refuelling was completed last summer. The only one
of its kind in the Island or in Canada, it consists of
15-inch pipe lines run under the airport's refuelling
area and connected with nine hydros.

In the usual refuelling of aircraft, trucks loaded
with gasoline drive out to the planes. At Gander the
trucks serve as connecting links between the hydrant
system and the aircraft. Gasoline flows from the pipe
lines through intake boxes into the transfer trucks
where it is filtered and measured. From the trucks
the gasoline continues on through discharging boxes
into the aircraft tanks. Loading speed is 149 gallons
per minute, compared to 30 to 40 gallons supplied
by ordinary refuelling. The new system cost approxi-
nately $110,000.

Housing for the marketing staff of 60 at Gander
was another problem. The Company converted three
two-story army barracks into 55 five-room apart-
ments for married quarters and 20 smaller apart-
ments for single personnel. All are fully equipped
with stoves, refrigerators and other conveniences.
The cost was approximately $210,000.

At Curling, Newfoundland, Imperial erected tank-
age for 35,000 barrels of diesel fuel for the United
States Navy. This permitted a cut in the haul from
Argentia, a distance of 500 miles, and reduced 20
tanker cars which the Company was able to use for
transport from Lewisporte to Gander.

The steel shortage hampered the program to build
increased tankage for storage of oil in Canada but
tanks have been erected at Toronto, Parry Sound,
Owen Sound, Welland, Cobourg, Brockville and
Belleville with a total capacity of 867,000 barrels
and at a cost of about $750,000.

This year Imperial is building eight fuel oil storage
tanks at Quebec points along the St. Lawrence River
and two in Ontario. Combined capacity of the Que-
bec tanks will be 325,000 barrels and of the Ontario
tanks 58,000 barrels. Other construction plans in-
clude two new tanks at Toronto to hold 35,000
barrels of aviation gasoline and tankage in the Que-
bec area for 110,000 barrels of motor gasoline. All
these undertakings will cost a total of approximately
660,000 and the program is expected to be com-
pleted in the late fall of 1948.

Imperial is also spending $2,090,000 to rehabilitate
its marketing motor fleet which had hard usage dur-
ing the war. Included in the new equipment are four
2,200 gallon airport service units as well as additional
-tank trucks for heating oils. The full replacements
needed for the motor fleet are not expected to be
available until 1948.

Increased storage for oil and its products must be provided
because of the sharp rise in Canadian demand. Imperial built
these 100,000-barrel tanks and others are being constructed

The Company also has provided new equipment
for the Northwest Territories. At Yellowknife, 34
new tanks were installed for the rapidly expanding
demands of the mining industry. These are small 50-
barrel tanks which were brought by barge to Yellow-
knife. Aviation gasoline blending plants costing
$15,000 each have been installed at Yellowknife and
at Hay River.

To serve growing pulpwood requirements the Com-
pany provided a complete new marine terminal at
Fort Smith, P.Q. and expanded the existing plant at
Bain Comox.

This year Imperial began limited distribution in
Ontario of bottled propane gas for use in homes that
have no municipal gas supply system. A propane
plant was built at Maple, and others are expected to
open at Caledon, Elliot and Strathford early in 1948.
Development of this service has been hampered by
material shortages.

Also because of the shortage of building materials
Imperial has decided on a general policy of not build-

ing new service stations. When other issues pressing
construction problems have been solved to meet the
challenge of the increasing demand for oil products,
the familiar Imperial Oval trademark will find new
locations.

Imperial's motor fleet was hard used during the war. Replacements are being made as quickly as new trucks are available.
SHOPPING for Christmas toys will be fun this year because, for the first time since 1940, they will be plentiful. Pre-war favorites are back and some entertaining new items have been introduced.

Manufacturers and retailers say toys are of better quality and in a wider variety at about the same all-over price range as last year. At Christmas there will be a limited number of British-made toys, some imports from the U.S. and Europe— even a few from Germany— but most playthings for Canadian children have been made right here in Canada.

Wooden substitutes of the war years will be fewer because some steel is available, though in limited quantities, for toy trucks and trains, and plush can be obtained for cuddly pandas and bunnies. Of course blocks and other wooden toys continue to be sold.

There is a marked interest in hobby items such as chemistry sets, telegraph keys with Morse code books for messages and equipment for making costume jewellery from colored sea shells. There are fully-operating small-scale gasoline motors and other accessories like gasoline tanks, filled by an eye-dropper, to keep the larger model aeroplanes flying. Archery and family group games are popular.

The plastic toys are related to the petroleum industry because all products help in the manufacture of some of the materials. Full plastic furnishings for a doll’s house, each piece with movable parts that “do” something; the “permanent” plastic bubbles or balloons; plastic scissors that cut paper but cannot hurt children; and Canadian-made plastic racing cars all are outstanding items.

John C. Risk, secretary of the Canadian Playthings Manufacturers Association, maintains the future of the industry lies in exports. In spite of wartime difficulties the Canadian industry achieved a 500 per cent export increase between 1938 and 1947. This cannot continue because Europe is returning to competition and Britain’s austerity program has been a heavy blow. One firm reports that its 1947

No country in the world makes lovelier dolls than Canada. Embroidery, cheeks and lips are carefully painted and rouged to give a life-like appearance.

Dolls of every size, shape and color are made to suit the tastes of young Canada but life-like baby dolls like this remain most popular.

Petroleum products are used in the manufacture of some plastics that make toys. The operator above is finishing work on a plastic automobile.
exports to Britain were only 20 per cent. of what they were in 1930. But South and Central America and the West Indies are buying increasing quantities of Canadian toys.

Toronto has what is believed to be the largest doll producing firm in the world — certainly the largest in the British Empire. The same firm makes a wider variety of plastic toys than any other company although some U.S. factories have a larger production of certain items. Another Toronto manufacturer, who started business 16 years ago in his mother's kitchen, now produces a million model aeroplane and boat kits a year.

Toy manufacture, however, is not a centralized industry and there is room for the small business or specialist. War veterans have started several small factories, notably one in Vancouver. Women earn money at home sewing doll's clothes. A man who invented a die for aluminum Christmas tree ornaments has orders for all he can supply.

Ideas are the industry's backbone and there is a full opportunity for personal enterprise and initiative. Canada has skilled workers, and designers and businessmen with imagination. She has the necessary materials. As she acquires a larger population her home market for toys will grow and she hopes to hold her own in the foreign market.
Pipeline to NISKU

Many construction problems were overcome to provide an 8-mile link between the Leduc oil field and the railroad.

Running the pipe into the valley bottom was ruled out because of the threat of deep winter snows. When a suspension bridge appeared to be the only solution, the problem was handed to Imperial engineer Robert Laird. His job was to design and build the bridge.

In addition to his engineering difficulties, Laird found himself without any of the materials generally used in this type of construction. The bridge had to support two lines of eight-inch pipe and a catwalk deck for pipe line inspection. (The second line is for a spare or to handle future production.) Those specifications were met in a structure made almost entirely of whatever material the engineers could find.

Old drill pipe lengths, cut and welded to Laird’s own design, form the towers which support the gracefully curving cables. Huge concrete blocks on both sides of the coulee anchor the towers. The catwalk deck was produced by use of metal airstrip matting secured from war surplus. Hangers and clips were fabricated in Company welding shops. The cables are the only new materials in the bridge.

These cables support hangers on which the pipe rests. The catwalk, placed above the pipe, permits the line walker to make inspections despite weather or deep snows in the coulee. Heavy hairfelt insulation covers the exposed portions of the line to offset frost and assure steady flow of the crude.

This handling of a tough assignment was characteristic of the planning of the entire pipe line project. Before the system was completed, pipe was used from Norman Wells, in the far north, and Turner Valley, in addition to the main line brought from Carolina.

Need for the pipe line became obvious early last summer as the Leduc field increased in potential. Even with a substantial road-improvement program truckers in the area could not cope with the situation. A pipe line seemed the only answer.

Leasing of right-of-way from farmers began as early as last July. Gathering lines from existing wells to field batteries were started. Farmers, generally, were co-operative when plotting of the main eight-mile course got underway. Where right-of-way was granted and where crop damage resulted from construction, the farmer received compensation.

New pipe was not available when the line first was proposed. A long search preceded discovery of the eight miles of suitable pipe then being unsold in sunny Carolina. It was far from sunny when the pipe reached Nisku and one of Alberta’s rainiest summer seasons at times complicated laying operations to the point of frustration.

Dampners, a hazard in electric welding, retarded stringing of sections. Prolonged periods of rain overtaxed even the improved roads, slowing transporta- tion. Mechanical ditch diggers became helpless in softened fields and even the flexible caterpillar tractors bogged down. Plough-like treads of the "caterpillar"
secured field allowances while the Company sought to keep construction damage to a minimum.

Consideration of farm property ranked high in the whole operation. Only a narrow strip of ground was required for the line. Fences that were removed to cross fields were replaced and repaired with new fencing. Earth replaced over the buried pipe was packed tightly, dragged and watered. Lane and roads were restricted. In some cases pick and shovel tunneling was ordered to protect proven trees, planned by farmers as windbreaks.

Most of the pipe is at least five feet underground at a safe limit below frost level. The line was laid by what workers term the “flying line” method. This involved racking of 40-foot lengths, which welders attached in groups to produce 200-foot strings. All joints were electrically welded with three “beads” or layers of metal and each joint was inspected and identified by the welder’s own mark.

These 200-foot lengths were distributed along the right of way by air-born caterpillar tractors, with welders following to produce a continuous string. The string was “painted” with pitch compound, wrapped in burlap and “painted” again to prepare it for its role below ground.

The string was rolled and gently eased into the bottom of a five-foot ditch prepared by a mechanical digger operated by one man. This giant machine turned out about one mile of smooth-walled ditch in a day.

At the eastern, or Niisku end of the line a new tank farm of three tanks provides 20,000 barrels of storage facilities. These units are tied in directly with the pipe line and the crude can be pumped from the tanks to tank cars on a new rail siding. The spur track is linked to the main rail connection between Edmonton and Calgary.

When Imperial Oil’s new refinery is completed at Edmonton it is expected that the Niisku pipe line will be extended in that direction to maintain a continuous flow of oil from the fields to the refinery.

The new line is owned and operated by the Imperial Pipe Line Company Limited, head office of which has been moved to Edmonton from Sarnia, Ontario. Directing operation is Whitney G. Sexton, formerly chief engineer of the Transit and Storage Company which operates pipe lines in the United States to bring American crude into Sarnia refinery. Mr. Sexton has had wide pipe line experience in the U.S. and British Columbia.

The new pipe line company is organized as an transportation company prepared to carry oil from all parts of the Leduc field for any producers or shippers who desire the service. The Niisku terminus of the pipe line began operations Nov. 3 when G. M. Blackstock, Chairman of the Board of Public Utilities Commissioners of Alberta, filled the first tank car.

Another phase of the project was the construction of flow stations at various points in the Leduc field. The stations consist of gas separators and field tanks. The separators are necessary because when crude oil comes up from producing zones often more than 2,000 feet underground it reaches the surface in a mist-like condition in which oil and gas are intermingled. The separators remove the gas and condense the oil droplets into liquid which flows into the field tanks and awaits its turn to move on into the pipe line.

The main purpose of the flow station or “production battery” is to permit centralized control of a group of wells. Flow lines come together at the battery where one man can handle efficiently the oil from several wells. Without the battery, each well would require a separator, tanks and attendant.

As additional wells are drilled and reach the production stage in a new field more batteries are required. Six stations are now in operation at Leduc and ten more are to be added.

After the oil has traveled through the pipe line to Niisku it is turned into storage tanks there and again awaits its turn until it can be run into the pipe of the leading rock and then into a tank car for the haul to one of the western refineries. Capacity of the pipe line is 30,000 barrels per day.

Engineers had to bridge a conical 930 feet wide and 165 feet deep with whatever materials they could find. This picture shows the early stages of the bridge-building activity

A machine with a voracious appetite, this ditch digger can produce one mile of smooth-walled trench a day. Where trees might be damaged, however, the ditch was dug with hand tools

Before the pipe went into the ground, it was carefully painted with pitch, wrapped in burlap and again coated with pitch to protect it against corrosion during its life underground
Manitoba's tractor trains plough steadily across the frozen lakes delivering important cargoes in all kinds of winter weather.

THROUGHOUT the long Manitoba winter, hundreds of tractor trains swing over the frozen lakes delivering supplies to trading posts and mining fields. Because the freight is carried on sleds pulled by caterpillar tractors, the operators are called "cats." And they talk about their sleds "cats." In central Manitoba tractor trains cross the ice-covered expanses of Lake Winnipeg, bringing in their harvests of freshly caught whitefish sheltered from frost in heated caissons, or frozen fish piled on sleighs. From points on the Hudson Bay Railway the trains carry in massive mining equipment, fuel and food. Often enough they come back empty. More often there's a pay-load of mining concentrates or pulpwood, frozen fish or furs for the return trip.

Some of these outfits are equipped with two-way radio sets in constant touch with head office and operate on a fixed schedule. Others function on a less formal basis along routes which are little known and which may involve round trips of nearly 1,000 lonesome miles.

Winter freighting is no new thing in Manitoba although its operations are less publicized than those of the far north. Time was when the freighting was done by horse and sleigh, and loads comprised equal parts of feed and freight. Many a driver in those days walked back from his journey because his horses had died of exposure.

Then came the gasoline-burning Lynn tractors and finally the Diesel tractors which have proved themselves veterans of the north.

Hiford, a tiny settlement at Mile 286 on the Hudson Bay Railway, is an important centre for tractor freighting. The 125 miles from the railway to God's Lake is practically a tractor highway, being used by four outfits. Sixty hours, standard time for making the trip one way, from God's Lake the tractors branch off to mining communities such as Lingmu Lake and Island Lake, or to trading posts of Red Stecker, or Bearskin and Seagull in Ontario.

Before actual freighting starts the road must be put into shape. Travelling by dog team, a small crew starts out over the route. The ice is tested and measured. At the margin of the lakes, snowdrifts may be shovelled away, so the ice may freeze to a satisfactory thickness.

When freighting is about ready to start in mid-December, a "breaking" crew goes on the road. These men put in bridges where necessary; haul a heavy drag over the portages to establish a firm foundation. They may clear away a steep lakeshore or a deep pitch-hole in the road to save breakage and strain on equipment.

The freightyurals at Hiford hum with idling engines. Once started for the winter, the engines are never turned off. During the long nights the headlights play over the piles of freight, easing the duties of the watchman. Night and day, the crews man-handle loads of fuel or dressed lumber, bags of flour and cartoons of dry goods and groceries onto the flat sleighs. Barrels of fuel oil for the trip as well as for delivery, drums of kerosene and gasoline are rolled and hoisted aboard.

The arrangement of the tractor train is carefully planned. Depending on individual hauling power, some tractors pull five sleighs and others only three. Each tractor and its sleighs become a unit in the lineup of the train. On portages the units remain close together but on lakes they are widely spaced, for the sake of safety. The trains average roughly three miles an hour, sometimes lunching along at the relatively breakneck speed of five miles. It is difficult to calculate mileage per gallon, due to the extreme variation of the roads.

Sleep-caboose and cook-caboose are incorporated in the train. In many cases the two are combined as
one and desperately crowded. The men sleep in bunks arranged like a honeycomb and called "muzzle-loaders." From the minute the train wheels out of the freightyard, the men go on shift. Usually two crews work opposite shifts of eight hours on, eight off. Some outfits drive steadily throughout the day, a 16-hour shift, and halt during the night.

Substantial meals are ready every eight hours, with light lunches in between for the men who are on shift. Meals are cooked and eaten "on the fly" for the most part, but usually during breakfasts the machines pause for refueling.

From time to time along the way, drums of fuel oil are removed from the sleighs and cached for the return trip. These are left out in the open and any oil in time of distress may borrow. Honesty is not only the best policy here, but the only one, since unnecessary tampering might lead to reprimands. Usually a mess is kept in a drift stick alongside the trail, a sort of "I.O.U."

Winter freighting has plenty of difficulties apart from the mechanical trouble which can and does develop far beyond the repair shop. Such mishaps as a machine "jumping its track," or a leaky fuel tank, or trouble with the final-drive bearing make the mechanic of the party literally worth his weight in gold. A rigging-sleigh carries extra parts, and the tool kit is guarded zealously.

The tractor route makes use of lakes where possible because greatest speed may be made across the flat frozen surfaces. While portaging between lakes, the machines must frequently double-up to haul loads over the grades. In some cases, to get them safely downhill, a tractor is hitched to the tail end of a string of sleighs to restrain them from rushing down upon one another and "jack-knifing."

When the ice snaps like pistol shots and the sleigh runners squeak over the snow, it is good freighting weather. In sub-zero temperatures continued driving strengthens the ice, forming a hard road which makes it all the safer for tractors in the rear.

Snow storms, on the other hand, not only make driving difficult and unpleasant, but they definitely weaken the ice. Under a thick layer of snow, the ice cannot freeze solidly, but forms frozen slush which is quickly vulnerable to the weight of early spring. Each tractor with its load of sleighs chews up the slush. The good ice underneath sinks with the continued weight and each on-coming machine finds more water and slush piled up ahead.

It may be necessary to plow out a fresh route for each tractor and load when crossing a lake of slushy ice. Where that is impossible, machines and loads are dragged across by cable, using a Hyster winch. Then, if the weather turns cold, the slush is frozen into rough bummocks, a further menace to equipment on the return trip. Air holes, too, are a danger. Sometimes the plowed road looks like a great dark snake weaving across the lake, in and out around the dangerous areas.

The route must be chosen with care. The "cut-skinner" out in front with the snowplow has a hazardous occupation. It is his duty to clear a safe path across the frozen icefields, to avoid air holes which may be invisible to the uninstructed. He must know enough to give insiders and reeds a wide berth, for there the ice is weak. He must be able to recognize signs of cracks in the good ice for below the surface of snow and slush.

Many a driver is not ashamed to stand up at the controls of his machine while on snowplowing duty, ready to leap. There is little margin for safety, and frequently drivers just haven't been fast enough in leaving their tractors. The lakes of the north still hold some bohdes. Because of this, and in spite of the added comfort, cabes are disliked by the cutskinner. If they must drive in them, it is always with the top folded back for a ready exit.

Dirty swamp-water or mud holes do not freeze well and are inescapes in midway. But if the shores are of sinking muskeg or rocky hills, it is impossible to skirt the mud holes. Sometimes muskeg may be traveled, but it's dangerous. The muskeg falls and rises to the passing machine. It may bear the weight of a few loads, but later loads drop through. Almost as swift as the plunge through the ice is the disappearance of a tractor into a muskeg.

When snowdrifts block the way, a snowplow breaks the road for the "cut train." This plow is operating on a lake, and may pack tight down to blue ice, or leave a few inches of snow

Once back in the freightyard, the round of work is resumed. Sleights are loaded; then out on the road once more. Time is all-important in winter freighting. The freight must go through before spring break-up arrives with its delays and dangers.

It is a hard life, concerned entirely with working, eating and sleeping. It calls for strength and endurance and courage. The men are matter-of-fact about it, but daily they face hardship and monotony, danger and not rarely the possibility of death.

Do the men like freighting? "It's a rotten life," they grumble throughout the season. But when break-up comes in April, they have usually started planning for next winter's freight. Not necessarily with the same lads, though. Many of these men are "boosters," shifting from one outfit to another year by year.

By its very nature the work is seasonal. The good crew of one year may not be available when next season rolls around. They may have taken entrance positions elsewhere. They may even have been stretched up by a rival outfit for a man's abilities are soon evaluated in the sparse population of the north. Anyone can drive a tractor, yes. But it takes much more than that to be a good cutskinner.
It is true that Canadian mills cannot compete in the production of the cheapest fabrics made in countries where textile workers have lower wage standards; nor can they produce some novelty and novelty goods that are profitable in the large markets of heavily populated areas. With these exceptions the industry can produce fabrics in sufficient amount and variety to meet the nation’s requirements in full. The manufacture of textiles has become an important factor in the national economy.

Canadian factories now supply stores across the Dominion with cotton goods that do not wrinkle, non-shrinkable woolens, glamorous fast-drying nylon, water-resistant materials for shower curtains and tablecloths and other modern textiles as well as all the standard cloths and fabrics.

The Basic Fibres

All these materials are processed from two types of fibres: the natural fibres, such as cotton and wool, most of which have to be imported; and the synthetic fibres from which science makes fabrics like rayon and nylon.

The plastics and synthetics are the newest members of the fabrics family and have had the most rapid development over the past 20 years. Certain synthetics like nylon, which is made from four elements, carbon, hydrogen, nitrogen and oxygen, are products of “pure science.” In others a raw material is combined with chemicals and then treated. An example is rayon, made from cellulose which may be obtained either from wood pulp or from cotton.

A number of products related to or made in part from petroleum have helped to revolutionize the use and characteristics of many familiar fabrics. One of these is called Polyvinyl Butyral, a plastic coating for textiles. It has a limitless color range and is used for coating tablecloths, upholstery, raincoats and umbrellas. Its special virtues are that it does not crack, is almost invisible and lets the texture and color of the fabric show through.

The New Formulae

Other remarkable and relatively new products are a stain-resistant treatment for silk, rayon and nylon hosey and a greaseproof treatment for curtains and draperies. The newly discovered formulae for treating, water-repellent and strengthening fabrics are the biggest new developments in the industry.

Plastics and other synthetics are the most glamorous branch of textile manufacture. However, wool, cotton, and combinations of wool and other fibres remain in more common use.

More than half the textile plants and mills in Canada are engaged in some operation concerned with woven and knit goods. The woolen goods have a history linked with almost the entire development of weaving and spinning.

The production of woven materials was begun by our covenan ancestors. Even before men learned the art of spinning yarn from fibres they wove baskets, mats and many other articles from weeds and grasses. Historians disagree as to which of the natural fibres was first used. The Egyptians made fabrics from flax or a flax-like fibre as early as 5,000 B.C. before the first of the Pharaohs. Wool may have been spun into yarn even earlier. A vegetable fibre obtained from the pod of the cotton plant was woven into cloth more than 3,000 years ago. Silk, produced by the silkworm in forming its cocoons, was woven in China more than 5,000 years ago.

The first looms of prehistoric times used a straight, horizontal branch of a tree. Over the branch the warp (lengthwise) fibres were tied. The lower ends were fastened to stones to hold them taut. Weft (crosswise) fibres were worked in and out by hand.

Spinning and weaving operations by the ancients in Perú, Mexico and other countries of the western world were accomplished with the same simple devices used by the early peoples of other continents. Some of the spun goods of the ancient Incas and Aztec periods have not been equalled to this day. Primitive yarn-making equipment consisted of two implements, a wooden distaff and a wooden spindle. These were not improved upon for centuries until the spinning wheel, introduced to Europe in the 14th century, was invented. It took some of the tedious handwork out of spinning and added speed but it came into general use slowly.

British Inventions

Towards the close of the 18th century, the problem of drawing out large masses of parallel fibres and twisting them into uniform strands was partly solved by the ingenious inventions of Lewis Paul, Richard Arkwright, James Hargreaves and Samuel Crompton. The inventions of these four men are the foundations of all modern systems of spinning and led to British dominance of textiles as the Industrial Revolution developed.

In Canada, in the days of the French regime and early English settlers, yarn was made in the home on the spinning wheel and cloth was woven on hand looms. A woman at a wheel could spin only up to two pounds of yarn a day and her hand loom was correspondingly slow. As a result, the choice of fabrics was limited although the handmade textiles were usually of good quality and remarkable quantities were produced.

A notable example of the French period was the Ceinture Flechee, or arrow sash, worn by hunters, trappers and explorers. The design often identified the trading company to which the wearer belonged.

With the introduction of the power loom and the development of highly complicated textile machinery during the 19th century, the factory gradually replaced the home as the centre of textile manufacture. The organised manufacture of textiles in Canada had its beginning about 1827. Wool was the first
How Your Woolens Are Made...

The woollen and knittgoods industry is the senior member of the primary textiles family in Canada. Over half the country's textile mills are engaged in the manufacture of wool. Because of the severity of Canadian winters, wool cloth will always be in demand.

Careful sorting of different grades of wool fibres, which calls for years of experience and expert knowledge, is the first step in the manufacture of woollens and worsteds. The industry claims that its employees, with their American co-workers, are the highest paid textile workers in the world. That wages are high is due to the use of the most modern methods and machinery and the consequent high rate of production.

Petroleum is necessary in processing textile fibres and helps in the creation of the amazing array of new synthetic yarns. It is also of infinite importance in servicing and lubricating the many and varied machines in textile plants. Some machines require extreme precision like those on which full-fashioned hosey are produced, and the machines vary in the type of lubrication they require. Imperial Oil devotes extensive research to ensure that the right lubricating product is available for each machine.

A typical example of this research occurred when a Toronto manufacturer had trouble recently with the lubricating oil used on machines that knit women's suits and sweaters. The operation requires an oil that is relatively colorless and odorless so that the yarn, often in delicate colors, will not be stained. Such oils are usually light in viscosity and in this case the machines had to be stopped as often as once a day for oiling with a consequent loss of money and time. Imperial research reduced oiling operations to once a week by developing an oil with a high viscosity but which also is almost without smell or color. Much valuable work has been done in the past 18 years in the textile department of the Ontario Research Foundation and in the chemistry division of the National Research Council. In these centres fundamental research on the properties of certain yarns as well as applied research on wearing or cleaning qualities of various textiles have been conducted.

Government Recognition

Recognizing the long-range importance of textiles, the Province of Quebec finances courses in textile manufacture at the St. Hycanthe Technical School while Ontario has opened the Provincial Institute of Textiles at Hamilton.

These modern, well-equipped schools provide specialized training for young men and women who will fill technical and supervisory positions. Member firms in the industry have made substantial contributions to both schools by supplying scholarships, textile machinery and technical advice.

The industry has increased its own program of basic and applied research and its leaders have shown a great interest in searching for new information from which entirely new techniques may develop. Such progressive development, research and training activities are equipping the industry for a bright future. In addition to the home market new export opportunities are opening.

An ancient art has become one of our most valued modern industries, supplying employment, producing useful goods, and importantly contributing to Canada's economic welfare.

Leaving the carding machine, the web is wound into a loose strand called a "sliver." After washing the sliver, drops of oil are added to compensate for loss of natural oil.

Gilling further combs out and straightens the fibres and draws them out into thinner slivers. Special petroleum lubricants are required for the complicated textile machines.
Lake Port Captain

Imperial's Capt. George Findlay is a veteran of many ships

BERNAMBUCO was exciting to the young Scottish sailor—new sounds, new sights, new languages, new foods and drinks in this new land so far from his native Dundee. It was his fifteenth birthday, Weeks before, he had signed "George Findlay" to the papers and had become one of the barque Neptune's crew. A Russo-Finnish ship she was, and for his hard work, long hours and not-so-good food the young sailor received 25 shillings a month.

George Findlay, who now is port captain at Sarnia, well remembers the voyage to Pernambuco for it was his first and last ocean crossing in a sailing ship. Steam had broken the ranks of the tall wind-driven ships and they were disappearing from the seas to give place to the more efficient steamers.

Findlay was soon to make the transfer from sail to steam. The next port of call for the Neptune was New York, and there he joined British steamer at an advance in pay—$15 a month was his wage as an ordinary seaman.

After a trip to the Far East, he joined a small schooner engaged in the coastal trade around Great Britain's shores. He was both able seaman and cook for the four-man crew.

Before he was 21, Canada lured him and he planned to farm in the west. His farming ambition did not last however, for he soon returned to Ontario and his first love—ships.

He joined Imperial in July 1907 and became a Company's ship master in 1916, with the Joolite as his first command, and later served in many Imperial tankers.

In 1929 Capt. Findlay was in charge of salvaging the Imperial tanker Minas Bras, which took fire off Canso, N.S. The blaze started in the ship's engine room and burned for four days. Her cargo was gasoline, and the salvage craft kept at a respectable distance, expecting the gasoline to go up in flames, but by some miracle the cargo did not take fire.

"The fire was so hot it melted her engines," Capt. Findlay said. "We found eight-inch piston rods bent over, all the brasses melted and just the stubs of the columns left. We towed her to Halifax but the engine and boiler rooms were in such bad shape that cost of reconditioning would be too high so she was sold for scrap."

When Capt. Findlay finally "swallowed the anchor" and came ashore in 1929, he was appointed Imperial's first port captain at Montreal. For some years thereafter he worked at Montreal in summer and in winter, after ice closed navigation on the St. Lawrence, at Halifax.

He interspersed his duties as port captain at Montreal, Halifax and Sarnia with occasional trips as master of various Company tankers.

The outbreak of World War II found him at Halifax, where he remained until July 1941. Since then he has been port captain at Sarnia, where he sees that Imperial tankers are kept in order, and looks after their supplies and any necessary repairs.

He says he has no special hobbies, but is a hockey and baseball fan. A son, John Matthew Findlay, is with the International Petroleum Co. Ltd. in Talara, Peru, and a steetop, Lawchlin MacLean Morrison, is teaching political science at the University of Toronto and at the same time working towards a degree of doctor of philosophy.

Captain Findlay is one of four Imperial port captains—the formal title is "marine department representative"—in Canada. The others are S. H. Phillips at Montreal, Capt. George Elliott at Halifax and Capt. Alex Goddard at Vancouver. Capt. J. C. Scott, at Talara, Peru, is the only Company port captain outside Canada. Their function, under supervision of the marine department in Toronto, is to attend to the needs of the tankers calling at their ports.

With their widespread knowledge of ships and men, these port captains expedite the movements of Company ships and charted vessels, and so aid the transportation of petroleum and its products to the consumer.
Personnel in the News

S. F. Heard New President of Royalite

S. F. Heard, new president of the Royalite Oil Company Ltd., was born in England. He joined the International Petroleum Co. Ltd., in 1929. Two years later he was transferred to Standard Oil of Argentina, and was in charge of wildcatting operations in the Comodoro River until 1925. He joined Imperial that year and was employed in the producing department at Toronto. In 1934 Mr. Heard was transferred to the producing organization in western Canada. In May 1946 he was appointed managing director of Royalite Oil and the firm of Alexander Hannah, K.C., as president, while retaining his position as managing director.

A. G. DeMont General Sales Manager

A. G. DeMont has been appointed Imperial Oil's general sales manager and chairman of the general marketing committee. He succeeds F. G. Hall, company director in charge of marketing who will now devote his entire time to Board matters. Mr. DeMont joined Imperial in 1918, on his return from overseas. His first job was warehouse agent at Sydney, N.S., and later he became a salesman at Amherst. Three years after, he was appointed assistant manager of the Halifax division and when S. S. Stansfield retired he became manager. In 1933 he became sales manager of Toronto division and three years later was named supervisor of branch manager. His next appointment was as regional sales manager for eastern Canada and Newfoundland. He became assistant general sales manager in 1945.

H. R. Knowles succeeds A. G. DeMont

H. R. Knowles was recently appointed assistant general sales manager of Imperial Oil. He joined the Company in 1909 as a salesman in Saskatoon and in 1915 moved to Toronto for special service station work. Later he became assistant manager of southern Saskatchewan division and then sales manager of eastern Ontario division. In 1927 he was appointed general superintendent of service stations. He was named co-ordinator of operations and assistant to the vice-president and two years later became regional sales manager for western Canada.

G. C. Bradley Western Sales Manager

George C. Bradley, now regional sales manager for western Canada, joined Imperial Oil in 1924 at Calgary refinery. In 1928 he was transferred to the Alberta marketing department and after holding various positions there became general manager of Maple Leaf Petroleum Ltd. in 1944. Two years later he returned to Imperial Oil and took a course in business administration at Harvard University. On his return to Canada he was appointed acting sales manager of Quebec division, and later was named assistant to the marketing director for Canada.

G. M. Thomas Retires After 40 Years' Service

G. M. "Mac" Thomas retired recently as resident manager at Hamilton, Ont., after receiving his 40-year service button. Ever since joining the Queen City Oil Company, which became part of Imperial Oil, he has been a member of the sales organization. During the first world war he served overseas with the 38th Battalion. His duties with Imperial Oil took him to a number of Ontario cities. In succession he has been district manager of the Ottawa district, resident manager at Sarnia and resident manager at Hamilton where he remained until his recent retirement.

J. Dean Bradley Becomes Manager of the Manufacturing Department's Operating Division

J. Dean Bradley, general superintendent of Sarnia refinery since 1944, has been appointed manager of the operating division of the manufacturing department at Toronto. He joined Imperial in 1913 and his first job was packing grease. Later he served with the accounting department and was successively gauge, time-keeper, load time-keeper and in the cost and yield department. In 1923 he was transferred to the manufacturing department as process foreman and in 1931 he became assistant to G. L. Stewart, then superintendent of Sarnia refinery. He became superintendent in 1934 and 10 years later succeeded C. B. Carson as general superintendent.

Dr. J. L. Hughlett New General Superintendent of Sarnia Refinery

Dr. J. L. Hughlett, who has succeeded J. Dean Bradley as general superintendent of Sarnia refinery, joined Imperial at Vancouver in 1914. He enlisted in 1917 and after overseas service he returned in 1919 and enrolled at the University of British Columbia. He graduated as a chemical engineer in 1925, with a scholarship for three years post-graduate research in Europe. He attended the University of Paris and graduated as a doctor of science. He rejoined Imperial and from 1929 to 1942 served in various capacities in refineries in Sarnia, Halifax and the west. He became manager of the St. Clair Processing Corp., Ltd., in 1942 and was appointed superintendent of Sarnia refinery in 1946.

N. W. McCrae Now Sarnia's Superintendent

N. W. McCrae has been appointed superintendent of the Sarnia refinery. Joining Imperial Oil in 1919, he worked on various processing operations including gauging, eddy blending, and mixing, to become foreman in charge of the lubricating department. During World War II, he was on loan to St. Clair Processing Corporation where he served as a process superintendent. On his return to Imperial, he became assistant superintendent in charge of No. 2 Plant, a position he held until his recent appointment.

B. D. Macpherson Appointed Co-ordinator Western Farm Sales Development

B. D. Macpherson has been appointed co-ordinator of farm sales development in western Canada. Mr. Macpherson has more than 23 years' service with the company, beginning his career as an office boy in the treasurer's department at Sarnia. He went to Calgary in 1927 where he became credit manager. He was appointed district supervisor at Lethbridge in 1928 and later became Edmonton city resident manager. He was appointed manager of farm trade sales for Alberta division early in 1945.

H. M. Powell Receives 40-Year Button

H. M. Powell, manager of Newfoundland division, recently received a 40-year button for Company service. He joined Imperial in 1907 at Halifax and was transferred to Montreal in 1912 where he became chief clerk in 1916. Next year he was appointed chief clerk of Toronto division and in 1921 went to Regina as assistant division manager. Later he filled a similar post at Hamilton. In 1930 he became assistant to the manager at Montreal and later was co-ordinator on plant equipment and construction and maintenance. During the war he was on special assignments in Ottawa and received his present appointment in 1945.
Seismologists are busy the year 'round and need special equipment. This winterized tank truck supplies water for the drills.

Mountainside Seismology

The science of searching for oil with "man-made earthquakes" helped in the discovery of the Leduc field.

PARTY Chief Frank Spragins was finding life exceptionally difficult for his mountain-front camp of 29 men and he quietly made up his mind to do something about it.

His camp was a seismograph unit, located in the Alberta foothills of the Rocky Mountains. The job of the unit was to range over a designated area, create "man-made earthquakes" with dynamite charges which had been tamped into holes they drilled into the bedrock, and record the resulting reflections from deeply-buried rock strata on a seismograph—the same instrument used to record actual earthquakes. From these operations they hoped they would find buried rock structures which might contain oil.

But the job was full of headaches. To begin with, powdery snow that never packed drifted two to six feet deep on their particular mountain front. Winter gripped their equipment with paralyzing frost. The men kept engines going 24 hours a day to avoid cold starts. They ran a 10-inch pipe through the water truck and burned small logs in it to keep the tank from freezing.

The party was working over the mountainside hills some five to six thousand feet above sea level. There were streams, rocky and swift. The forests were dense. Bulldozers had to slash roads ahead of the unit to make way for the prefabricated sleeping huts and delicate seismograph equipment.

Two things bothered Spragins—the lack of comforts for his men and the fact that his equipment had not been designed for use under severe Canadian winter conditions.

All this was in the winter of 1945-46. This year Party Chief Spragins took to the field with a completely redesigned seismograph unit—specially planned for the Canadian west.

Spragins supervised the adaptation and manufacture of the new unit and built many of the instruments himself—the first time such work has ever been done in Canada—but he would be the last to claim credit for the changes. He received guidance and technical aid from the Carter Oil Co. in the U.S., veterans in the art and development of seismographing for oil, who originally designed for other areas the equipment used by Imperial.

Imperial Oil's producing department in western Canada had realized the difficulties under which the seismograph units had been working and quickly approved expenditure of the money necessary for a proper job.

Other party chiefs, Frank Roberts and A. L. "Tobie" La Barge, with Spragins' chief operator, George Agnew, contributed their experience, suggestions and help. Spragins made use of his own special

After surveying an area under exploration, civil engineers mark the locations where shotholes are to be drilled. Here the location marker consists of a bit of cloth tied to a wire fence.

The equipment seismologists use is delicate and complicated. Party Chief Frank Spragins, above, is at work adapting it for most efficient use under Canada's varying weather conditions.

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knowledge acquired while working with the Carter Oil Co., whose basic designs he adapted with their full approval for Canadian use. F. L. Lawrence, maintenance engineer from Carter, was lent to Imperial and contributed to the instrument building.

Portable insulated trailers were also built—trailers which can be dragged along with the other equipment and kept close to operations in the bitter foothills weather. The whole camp is supplied with electricity from its own power unit. There are showers, a washing machine, radio and a recreation room. There is an office with modern lighting for the computers and others with desk duties.

Designing a trailer which would stand up under the punishment of the foothills country on newly bull-dozed roads—and sometimes over no roads at all—presented a difficult problem. Malcolm Reiss, then Spragins' immediate superior, consulted with the men who had used trailer sleds in seismograph work at Norman Wells in the Northwest Territories during the war. He also made a study of trailer construction and produced the design for the trailer chassis now in use. Calgary and Edmonton firms completed the fairly straightforward job of building to pattern.

The task of redesigning the equipment to Canadian requirements was a labor of love for Spragins.

Geophones, so sensitive they can pick up the sound of an ant's footsteps, are the instruments which "hear" the waves made by the dynamite explosion as they rebound from subsurface rocks

After the shot hole has been drilled down to bed rock—from 40 to 150 feet in depth—dynamite for the "minature earth-quake" is lowered to the bottom and carefully tamped down

The drill bites into the frozen earth as this portable drilling rig sinks a shot hole beside a snow-covered Alberta road.

(Continued on page 36)
Mountainside Seismology (Continued)

succees or teacups in shape. The man seismograph- ing for oil sets off an explosion at the surface. The shock waves travel down through the earth, strike the subsurface rock formations, and bounce back. With his instruments he is able to measure the time it takes for the shock to travel down and up again, and because he knows the speed at which the shock waves travel through the earth, he can measure the depth of the formations. By a series of spaced explosions he can discover the shape of the rock forma- tions far underground.

The advance man of a seismograph party in the field is probably a civil engineer. Within general limits set out by the party chief and his seniors, he decides where the holes for the dynamite are to be drilled and accurately surveys their locations.

Next come the portable drills. These are small- scale drilling rigs with a derrick which jackknifes down over the top of a truck. Sometimes they are powered by the truck's engine and sometimes by an engine mounted behind the cab. These rigs use a rotary drill and need a copious supply of water; the water often has to be hauled and a water truck is a standard part of the party's equipment. The "shotholes" as they are called, are drilled through the loose surface deposit to the solid shales or rock below, usually from 40 to 150 feet deep.

Then come the shooting and instrument trucks, responsible for the explosions and the records of their results. A dynamite charge, which may vary from five to 200 pounds is placed in the hole. Meanwhile the instrument truck is setting out its "geophone." The geophone, a coil in a magnetic field, is the instrument that picks up the shock waves as they travel through the earth after the dynamite explo- sion. It is very much the same as the microphone used in radio broadcasting. The geophones are set in the earth in a line which may vary from 100 to 1,300 feet in length. From six to 24 geophones may be used and they are connected by a 24-conductor cable to an input panel not unlike a telephone switchboard which is in the instrument truck. A circuit leads from the panel into amplifiers which can multiply the impulse from the geophones 10,000 times or more. The instruments used are so delicate they can record the footsteps of an ant!

The shock wave caused by the dynamite explo- sion is a mechanical motion that travels through the earth. As it strikes the geophone it is translated into electrical energy which is increased in force in the amplifiers. From the amplifiers it goes to the camera where it acts as tiny mirrors that cast beams of light on a moving strip of sensitized paper. These moving beams produce irregular lines on the paper and it is these lines that tell the skilled operator the story of the buried rock formation. The operators do not have to wait long for their information; the instru- ment truck is a tight-fitting darkroom and the strip of sensitized paper is developed on the spot.

There are other more technical and more intricate phases of the seismograph operation. For instance, the passage of time, measured in thousandths of a second, is recorded on the sensitized paper as it runs through the camera. When the dynamite is exploded, a series of relays is set in motion by the first surface wave which automatically controls the entire record- ing. Also, at the exact instant of the explosion "zero time" is automatically set by short wave radio from the shooting truck.

In redesigning the instruments for use in Canada they had to be made more sensitive. It was also necessary to "pack" the amplifiers so that they would discriminate more efficiently between the reflected waves from subsurface formations and surface waves which have relatively little or no value. Instrument and shooting trucks, which are usually about 1,000 feet apart during the explosion, are con- nected by short wave radio. The outfit is also in touch with the outside world by short wave, an im- portant communication channel because seismograph crews may be isolated in the foothills for periods of 10 weeks and more.

To an operator like Spragins, seismograph work is an exact science, permitting no room for error. However, there are plenty of variable factors, chief among which are the varying speeds at which sound travels through rock. This speed, or velocity, in- creases with depth and varies with the type of rock formation encountered. There are roughly three velocities to deal with: about 1,000 feet per second

These wary-lined records tell the trained seismologist what lies under the earth's surface. On the left is Party Chief Frank Roberts.
These findings, in turn, are passed on to Chief Geologist J. B. Webb, who, on the basis of all information at his disposal from all sources, will decide the best place to recommend for drilling.

Seismographing for oil requires the services of civil engineers, electrical engineers, experts in geophysics, skilled computer and technical personnel. None but the practical and physically energetic will brave the difficulties. In any season it is a robust outdoor existence. In winter it is a continual challenge.

Even on the plains, far from the foothills, the movement of equipment is a struggle with the westerner.

Crews always carry emergency rations, and often sleeping bags as well. Special tire chains have been developed to give a steady pull so that axles, transmission,universal and differentials will not be broken. Men become experts in handling trucks. A tent-like covering for the drilling truck has been developed in which a heater spreads warmth. Water tanks are insulated with felt and sometimes the exhaust pipe is coiled inside the water tank to help keep it from freezing.

The cost gives an indication of the effort. On the plains $15,000 to $16,000 a month is the price of operating a seismic party; but in the foothills, when roads have to be bulldozed through virgin territory, the cost will run as high as $25,000 a month.

Supplies are one of the biggest problems, and the greatest appetite of the seismic units is for petroleum products. The bulldozers, the "cats," the huge four and six-wheel-drive trucks have a constant hunger for oil. During one month in the foothills, one unit used 2,500 gallons of gasoline, 66 gallons of lubricating oil, 50 pounds of grease, 115 gallons of kerosene, 69 gallons of naphtha and 1,250 gallons of diesel fuel.

What is the compensation for this outlay of money and toil? There is a fair promise of return. Proof comes from the Leduc development where the overlying flat sand traps prevented detection of the oil-holding rock formations by the usual geological methods such as the study of outcropping rocks. Of course only the drills can determine whether the structure, once located, contains oil.

Seismograph men feel their future work in Canada will be increasingly accurate. Their equipment is becoming more efficient; their store of basic knowledge about what to expect under the western plains and foothills is constantly increasing; with increasing experience the men who operate the equipment are becoming more skilled.

Imperial was the first company to seismograph for oil in Canada, conducting operations in 1936. It was the first, in 1940, to undertake a comprehensive program of seismic exploration and it now has three complete parties of its own in action and employs others on a contract basis.

All of these things bring another compensation to Party Chief Frank Spragins and the others—he Frank Roberts and "Lobie" La Barre—the satisfaction of pioneering in the Canadian development of a science which will almost certainly play a major part in discovering sorely-needed reserves of oil at

Healthy appetites thrive on the keen air of the foothills and satisfying them keeps the expedition's cooks quite busy at the stove.

These prefabricated huts, ready-made, were especially built for seismograph parties operating under winter conditions.
PLowing Champions To Visit BRITAIN

FREE trips to Britain were won by Glen Mc-
Paddin, of Millbrook, Ont., and Russell Hare, Nanticoke, Ont., at the International Plowing Match at Kingston in October. They placed first and second in the Essy Champions tractor class, sponsored by Imperial Oil Ltd. The company also presented McPaddin with a gold medal and Hare, as runner-up, received a silver medal.

On the trip to Britain they will be accompanied by W. L. Clark, president of the Ontario Plowmen’s Association, as coach-manager, and by Alfred Brunton, and John Capton, winners of the Transatlantic class for horse-drawn plows, sponsored by the Sedaka Tea Company of Canada Ltd.

Glen Alexander McPaddin was born on the 250-acre farm where he now resides in Wellersley Township, Waterloo County. He has been plowing in competitions for several years and has placed in many local and provincial matches. He is unmarried.

Russell Beam Hare has also been a farmer all his life and now runs a 155-acre mixed farm, plus 50 rented acres, in Walpole Township, Haliburton County. He is married and has four sons. He has been competing in plowing matches since 1928 and has won prizes in all but three of the matches he entered. His best year before his present victory was in 1938, when he won three first prizes and the grand championship at Minesing, Ont.

William Lyman Clark, of R.R. 2, Gormley, has lived on his 50-acre dairy farm for 22 years and previously farmed at Agincourt. He is a veteran home plowman, who has a record of three wins and four seconds in provincial meets, as well as many successes at local matches.

Last year’s Basso Champions, Fred Timbers and Alex Black, went to Britain but the severe winter prevented competition. The 1947 winners hope to show British plowmen what Canadians can do.

SCHOLARSHIP WINNERS IN 1947

THE TEN young Canadians pictured here are hard at work in colleges from Halifax to Vancouver. They are the 1947 winners of Imperial Oil undergraduate scholarships offered to children or wards of Company employees and annullites to assist them in obtaining higher education. Each scholarship pays the recipient $500 a year and may be held for four years. Under Imperial’s scholarship plan, the winners may take any course they wish at any recognized university in Canada.

Helen Annie Fothetwip-
ham, Calgary, is at the University of Toronto
Robert Bruce Thompson, Barrie, is a student at Western University
M. W. Hindson, London, registered at Maranapolis College
D. D. Krutmann, Pte. Rupert, is a student at the University of B.C.
Stella M. Cvetkow, Be-
gina, is at the University of Saskatchewan
Marjorie J. Dee, Hal-
fax, is attending Mount Saint Vincent College
Arnold Joseph Reed, Toronto, is in engineering, Toronto University
Alissa McBean, Winnipeg, is attending the University of Manitoba
David Fawkner, Edmonton, is attending the University of Alberta
Kathleen Simms, Montr-
real, is studying arts at McGill University

Palm trees and water form an exotic setting for the oil derricks and equipment at Lake Maracaibo, Venezuela
Continuous service must be provided although the snow and ice of winter bring many added problems for the men who deliver oil products.