Imperial Oil

REVIEW

JUNE, 1947

Speaking of prices

General Wholesale Price Index
Wholesale Gasoline Price Index
Exclusive of Gasoline Taxes
Base: 1926 = 100
The REVIEW is published by Imperial Oil Limited in the interest of shareholders and employees. Unless otherwise indicated material published in the Imperial Oil Review may be reprinted without special permission. Credit lines will be appreciated. Correspondence should be addressed to The Imperial Oil Review, 56 Church St., Toronto, Ontario.

IN THIS ISSUE

- Speaking of Prices
- New Oil from Ontario
- The Service Business
- Gulf Year Service
- Highways to Hydrolysis
- Supplied for Canada's Skiesways
- Oil Boom Truce
- What of the North?
- Unca Maritime Refined
- Well-Tuned Oil
- The Chemist Pints the Way
- Report to Shareholders
- New Board Chairman
- Personalities in the News

ON THE FRONT COVER

The cover chart shows that over the past 20 years the wholesale price of gasoline, less taxes, has declined almost steadily compared with the trend of general wholesale prices. This is because the petroleum industry strives constantly to reduce costs and improve product quality although economic conditions sometimes cause unavoidable price increases. Charts in this issue explain the chief reasons for recent price rises.

Oil is where someone finds it. Conversely, if no one searched for oil there wouldn't be any oil produced.

There are reasons to believe that a great oil pool, or more than one, exists somewhere, in several places, far down below the soil of Alberta. Nothing is more important to the industrial and commercial future of this province than that this pool or these pools be found. It or they will never be found unless looked for.

It costs money to sink an oil well, a huge amount of money. Every well that is bored in an untapped locality is a wild-cat well. It may never yield a barrel, in which case the investment is a dead loss. Even in tested areas wells are drilled which produce no oil, or too little to count. In such cases also the investment is lost. A dry hole pays no dividends. A good many Albertans have trunks full of oil stocks to prove that point to their lasting regret.

For this reason the search for oil in this province or elsewhere can only be carried on in any thorough or comprehensive way by large corporations, with ample resources, corporations which can employ geologists, buy machinery, hire drilling crews—and drill wells where there is little or nothing at all to show that oil will be found. A small company, which goes broke sinking a few dry holes is "through" and the search stops there so far as it is concerned.

It is reasonable therefore that corporations wealthy enough to undertake to search for oil in a new section should be conceded the oil rights to a considerable area before they start operations. Otherwise they would not start.

This is the basis of the oil policy in Alberta. It is a practical policy, and is getting results. The developments in the Leduc area are part of the results. Whatever industrial and commercial expansion follows from the very encouraging quest that is being carried on there will come because companies who could afford to hunt for oil where nobody knew there was any were given encouragement to undertake the risk.

Once a "field" is located, smaller concerns can come into the picture, as they are and should be allowed to do. But it is the large corporations which have to do the pioneer work, and take the gamble that oil may be found where none ever has been found before. To encourage these to risk their money in a province-wide quest is sound public policy. The more oil they find, and the more places they find it in, the better for everyone who has a stake in Alberta.

SPEAKING OF PRICES

INCREASED COSTS OF CRUDE OIL AND OTHER MATERIALS AND EQUIPMENT RESULT IN HIGHER PRICES OF PETROLEUM PRODUCTS

A GLANCE at the charts on these pages will show why prices of gasoline, fuel oil and other petroleum products have advanced. Chief reason is the rising cost of raw materials. Canada's oil consumption is sufficient to meet only about 11 per cent. of her needs. The other 89 per cent. is imported from U.S. and South American fields, and rising production costs and heavy demand have combined to push the well prices of crude oil from these fields to the highest levels since 1920.

Transportation, construction costs, taxes and increased consumption are other factors affecting prices. The chart immediately above shows how crude oil has had to be moved ever-increasing distances. From 1939 to 1941 crude for Regina refinery was obtained from Turner Valley, a distance of 499 miles. By 1946 the supply of Turner Valley crude had declined to a point where there were practically no shipments of that crude available for Regina, and the Company was forced to go as far as 2,000 miles for its supply. The average distance of the Regina refinery from its crude oil sources grew from 483 miles in 1939 to 1,409 miles in 1946.

Consumption of petroleum products reached an all-time high in 1946. During the war refining facilities could not be greatly enlarged and so are not sufficient to meet this unprecedented demand. As a result the industry has had to import finished products as well as crude, thus adding further to costs.

Construction costs, indexed at 102 in 1939, stood at 136 in March of this year, and the trend continues up. Because of higher construction costs, the replacement cost of equipment per barrel of throughput is higher than before the war.

Taxes, both direct and indirect, play a big part in the price the consumer pays for his petroleum products. Out of his gasoline dollar, the Canadian motorist pays as much as 35 cents in direct taxes. 

JUNE • 1947
NEW OIL FROM ONTARIO

HISTORY is repeating itself in Southwestern Ontario. The area which produced Canada's first oil field some 90 years ago now has a new gas and oil discovery as the result of Imperial Oil's current exploratory program. The new field is named after the small village of Becher, a few miles north of Wallaceburg. At present it has eight gas wells and two oil producers, but two of the gasers now are showing oil.

Plans for a new large-scale search were prepared as long ago as 1941, when the geologists delved into records of old wells—hundreds of them—each of which might provide clues of value in the search. Leasing was started in February 1945 and drilling began the following July.

Since then the Company has leased 266,000 acres in 40 different areas and Ontario contractors working for Imperial have drilled 77 wells. Sixty of these were dry holes, eight were gas wells, two produced oil and seven had showings of gas or oil. The exploratory program cost $900,000 and this year the Company plans to spend $375,000 more on further exploration and $400,000 on development.

The intention is to drill 25 to 30 wells to develop the new-found field and 40 to 50 exploratory wells in previously untented areas. Sixteen rigs owned by Ontario contractors are currently drilling as the search continues.

"Wildcat" drilling—testing untried areas—is a costly business. Oilmen know that frequently many wells must be drilled before a producer is found. Yet Canada's increasing oil consumption and declining production in older fields led Imperial to seek out all possible oil sources.

Among the beneficiaries of this exploratory policy are the drilling crews and the owners of the mineral rights, most of them farmers. The Company tests the leased blocks as soon as possible and surrenders them if they prove unproductive. The owner is paid for the use of the land and for any damage done to crops in moving drilling equipment. If production is obtained, then the owner is paid a royalty on oil or gas. Last January one farmer received a $175 cheque for one month's oil royalty.

The story of the Becher field goes back to February 1946. The discovery well is now flowing 25 barrels of oil a day. Its start, however, was anything but promising. After oil was struck in February, the well was acidized but instead of opening up the oil-saturated formation the acid caused a water lock which stopped the oil flow.

Testing, coasing, patient skilful work and re-acidiing continued until August before the well started flowing. Since the discovery well was drilled, eight gas wells have come in with a total open flow production of more than 6,200,000 cubic feet of gas a day, and one oil well is giving 16 barrels a day. Two of the gas wells have started to produce oil and may yet be closed as oil rather than gas wells.

The exploration also disclosed possibilities of a field in the Wilsoncroft area between Petrolia and Oil Springs. The field proved to be a disappointment, however, for although the six wells had an initial production of five to 18 barrels a day it has since declined to about a barrel a day per well.

Most of Western Ontario's oil production has come from the Devonian ("Big Lime") formation at depths ranging from 350 to 600 feet. Forty-two of the wells Imperial drilled were Big Lime tests and the six at Wilsoncroft showed sufficient production on bailing tests to indicate they might be developed into commercial pumping wells. The deeper Stina and Guelph formations (900 to 2,100 feet) are the most prolific gas producers in the province and the Becher wells have been drilled to these formations.

Deeper still—3,500 to 4,000 feet—lies the Trenton formation. Seven wells were drilled to this depth, three of which were joint ventures with the Union Gas Company. One of the wells is a commercial gas producer and one had an initial oil production of eight barrels a day. The drilling is all done by cable tool rigs. At the end of 1946 these rigs had drilled a total of 89,189 feet.

The exploratory program is being carried out by Imperial Oil's Eastern Canada Exploration organization, which is headed by W. A. Rollif. In the field are Lyle W. Kidd, drilling superintendent; John McLean, district geologist; Hugh McDonald, assistant geologist; D. E. McCall, production superintendent and L. E. McMillan, district land man.

Some of the contractors and drillers are men who, like contractor George Rawlings, started in this area and followed the drills to Russia, Turkey, Egypt, Austria, Italy, Africa, the East Indian, South America and on into the Canadian Arctic.

Now they have returned to drill for oil, and to find it, in the land where in bygone they first saw a walking beam rod as the drill bit into rock. They have given Canada's oldest oil area a new lease of life.
THE SARNIA STORY

CANA D A'S LARGEST REFINERY, NOW OBSERVING ITS 50TH ANNIVERSARY, HAS HELPED TO DEVELOP THE DOMINION

Canada's largest refinery—Imperial's pioneer plant at Sarnia—is celebrating its Golden Anniversary this year. Simple ceremonies marked the celebration on April 26th.

President H. E. Heweton and members of the board of directors toured the big refinery before a mass meeting of employees in the mechanical shops. There Mr. Heweton spoke of the plant's historical part in helping to develop Canada and Mayor W. C. Neddo of Sarnia outlined the contribution made to the growth and prosperity of his city.

Thomas Montgomery, retired chief engineer, unveiled a replica of a plaque which will be cast to commemorate the Golden Anniversary. Interested spectators were some 200 pensioners of the Company.

Later they were housed guests at a luncheon which was attended by Company and civic officials.

In the afternoon the annual meeting of Imperial Oil Ltd., was held in the city hall, followed by a tour of the area south of the refinery to see the growth of new industries.

The original installations at Sarnia when acquired by Imperial in 1897, consisted of three crude stills, a re-run still, a tar still and a couple of other units. Over the intervening 50 years, the refinery has been developed and expanded until now it refines more petroleum than any other plant in the British Empire.

Sarnia refinery has grown with Canada since the days when railways were the fastest means of travel —where railways existed—and the horse was king of the none-too-good roads. Its story reflects the development of the entire petroleum industry.

As a pioneer of the oil business, Sarnia played a part in introducing the era of the automobile and aeroplane to the Dominion. It assisted in the development of the Canadian west and of the north. It carried its share of vital responsibility in two world wars. Today it is an efficient production centre ready for the future.

Fifty years ago kerosene was the refinery's single major product. Now crude oil is processed there into more than 600 different items, many of which have become household essentials and scores of which have contributed to the mechanization of transport, agriculture, and industry. Year after year the big plant has met the new demands for an increase in the quality and quantity of petroleum products.

The first plant at Sarnia was built in 1871 by the Dominion Oil Company. It later passed to the Alpha Hall Company and then to the Canadian Oil Company (no connection with the present firm of that name). It was rebuilt and operated by the Bushnell Oil Company and finally acquired by Imperial Oil in 1897. Additional equipment was brought to Sarnia when Imperial dismantled the refinery set up in Petrolia in 1885. The move to the St. Clair River location was made because the site offered water transport facilities important in a highly competitive industry.

In the early days much of the crude oil was brought in by teams over the "Old Plank Road" (now Petrolia). Later, a two-inch pipe line connected the refinery with "Lawyer's Station," then the receiving centre for the Raineberry field. Imperial added a three-inch line to bring the oil from Petrolia and Oil Springs and the "Twelfth Line" receiving and pumping station received this load.

At that time Sarnia, as rebuilt by Imperial, had a capacity of 800 barrels a day. In 1904 superintendent C. O. Skillman (later president of the Company) thought the refinery was "big enough" but that was when there were only about 500 homeless "contractions". By 1912 the demand for petroleum products had grown so great that the Lambton county fields could not supply enough crude oil to the refinery. To increase the supply Imperial built the first pipe line to cross the international boundary. About 154 miles of six-inch pipe were laid from Cynaght, Ohio, to.

Contrasting with the units of 50 years ago is this cracking unit which produces high octane gasoline and the giant which are manufactured into synthetic rubber and various plastics at a cost of about $1,000,000. Under the St. Clair River two eight-inch lines were laid to provide against a possible accident and stoppage of supply.

The original capacity of the line, with two pumping stations, was 3,000 barrels a day. Later two more pumping stations were added, increasing the flow to 10,000 barrels a day. Additional lines have been laid as the refinery called for more oil. Last fall another 80-mile pipe line was installed, bringing in an additional 12,500 barrels a day. The refinery now has a daily capacity average of 46,000 barrels supplied by tankers as well as pipe lines.

The internal combustion engine revolutionized the oil industry. Gasoline, once caused by refineries as a nuisance, became the most important product as motor cars used ever-increasing amounts of it along with oils and greases. The fledgling aviation industry—encouraged by Imperial when it pioneered northern flying—grew to the point where it consumed 100,000,000 gallons a year.

Sarnia refinery supplied the first settlers in the West with kerosene, axle grease and harness oil. As
the railway advanced over the broad plains, the box car started to rise, and Imperial Oil tank cars and tanks were often the first evidences of the young settlement. When power forging camps to the southwest and northwest were shifted to Moncton, Saskatchewan and Alberta until refineries were constructed at Regina, Calgary and Iroquois. In all, Sarnia is the "hub" of six refineries that supply Canada and Newfoundland.

Petroleum refining changed with the times. At first crude oil was distilled in batches, somewhat like maple sap in a sugar bush. This still usually was fired by wood. The different products were boiled off at excessive hot temperatures. It was pure rule-of-thumb refining and a good still operator was as secretive as a master brewer about his methods.

Then came the battery of continuous stills in which oil flowed from one to another, meeting higher and higher temperatures as it flowed. The lighter parts boiled off in the first still and the products of each succeeding still became heavier and heavier until only a heavy residue oil remained.

It was a paradox in an industry where the latest unit may become obsolete almost on completion that at Sarnia a battery of these old stills remain useful as auxiliary equipment for primary separation of crude oil into naphtha, gasoline, kerosene, gas oil and stock for processing into lubricating oils.

The products of the continuous stills found new uses: a paraffin department was added to the recovery to manufacture paraffin oils, Serlac, wax, and glycerine. A severe and compounded department was set up to supply lubricants. Serlacs were needed for shipping products and so a cooper shop began turning out barrels.

Growth of the Dominion demanded growth of the refinery. In 1914 No. 2 plant was started adjoining No. 1. New pressurized stills, forerunners of the modern cracking units, were added to produce more and better gasoline.

Other products improved when the refinery added various re-run stills, steam stills and chemical treating units. Cables were important and a new works, built which reached 2,000,000-pound production divided among some 55 varieties.

The 1920's brought "cracking" (heating oil to a high temperature under high pressure to increase the yield and quality of each product as gasoline). More and better lubricants were produced by a combination atmospheric and vacuum flash coil. In 1921 the refinery could process 10,000 barrels of crude a day and manufacture over 100 products.

In 1920 a large research and testing laboratory was built. Among the processes evolved at Sarnia which have gained world-wide acceptance in the oil industry, were the special treatment of oils to make high grade lubricants; clay treatment of cracked gasolines to improve storage stability; a method of solvent dewaxing of lubricating oils to remove wax and to oil flow at low temperatures; and the special catalytic cracking process which produces high octane gasoline and gases for synthetic rubber production and the manufacture of plastics.

During World War II, Sarnia's production was almost as important to the war effort as the manufacture of munitions. Nevertheless, the refinery was also able to assist the development of the Polymer Corporation synthetic rubber plant. The Company organized the St. Clair Processing Corporation Ltd., which operated many of the units at Polymer. St. Clair needed skilled operators and Imperial provided them, training hundreds of men in its own school. At war's end St. Clair Processing was dissolved and Polymer took over full operations.

Sarnia's GENERAL SUPERINTENDENTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. P. Chamberlin</td>
<td>1897-1899</td>
</tr>
<tr>
<td>C. O. Stillman</td>
<td>1899-1910</td>
</tr>
<tr>
<td>W. J. Gilchrist</td>
<td>1916-1922</td>
</tr>
<tr>
<td>C. B. Lever</td>
<td>1923-1921</td>
</tr>
<tr>
<td>G. L. Stewart</td>
<td>1921-1924</td>
</tr>
<tr>
<td>C. E. Carson</td>
<td>1924-1944</td>
</tr>
<tr>
<td>J. D. Bradley</td>
<td>1944-</td>
</tr>
</tbody>
</table>

Sarnia refinery has been the training ground for some of the Company's key personnel. C. O. Stillman became president of the Company. C. B. Lever was general manager of refineries before becoming the Company's New York representative. G. L. Stewart, after a term as general manager of refineries, became a director and vice-president and was recently elected chairman of the board of directors. C. E. Carson is a director and present general manager of refineries.

IMPERIAL OIL REVIEW

War brought a "muck-and-makes-do" program to the refinery seen after 1919 as new equipment became more and more scarce. Yet Sarnia plant produced reversing engines, gun shells and other war materials in the busy mechanical shops.

Other units were turned to new uses. Two old cracking units were converted to make a high octane blending agent for aviation fuel. Later these were changed into a catalytic polymerization unit making high octane gasoline from gases which formerly had little use.

In the half century of its career, the refinery has seen its gases turned into rubber, its asphalt into paving material for streets, highways and airports, its gasoline change in value from a waste to its most important product. The output has grown in these years, to include the following main product classes:

- gaseous, gasoline, aviation gasoline, motor gasoline, hydrotreating oils, candles, waxes, greases, lube treating materials, oils, fuel oils, asphaltic and coke. These main classes in turn include many specialized products which bring the total to more than 200 individual items.

Men and women of many and varied talents have contributed to the refinery's proud record and employee-employer relations have been good throughout its history. Through the cooperation of the Joint Council, Sarnia employees now have an eight-hour day, five-day week and vacations with pay. Group insurance, death benefits, theft plan, hospitalization and surgical benefits are also provided.

Sarnia has the manpower and equipment to make a still greater contribution to the national life of Canada in the future.

A small section of Sarnia refinery's No. 2 plant is shown here. To the left of the storage tanks can be seen the light ends plant.
Ten of the present employees of Sarnia refinery are entitled to the gold button with three diamonds which represents 40 years' employment with Imperial. Altogether their Company service totals 424 years.

Much of the refinery's half-century history is a living memory for them. Most of them have had a continuous connection with the plant and helped it grow.

Jim Fleet, who now has the longest service record, joined the refinery staff in 1900. His first job was in the cooper shop making the old-time wooden barrels to ship petroleum products. Later he became foreman of the stave shed and then of the cooper shop as well. Because steel drums took the place of wooden barrels, the cooper shop was demolished in the 1930's and Jim is now foreman of the wash plant.

T. Fred Manzer, with 45 1/2 years, has the second longest service. He started in 1901 as water boy, then went to the yard department and in 1905 to the loading rack at No. 1 plant where he became foreman. He has been refinery foreman since 1918.

Arthur R. Bullock, with almost 43 years' service, is a son of the late Robert Bullock who lit the first fire under the boilers at No. 1 boilerhouse. Arthur has worked in several sections of the refinery but has been carpenters' department foreman since 1938.

Loren L. Miller also comes from an oil family. He succeeded his father as superintendent of the Galena Signal Oil Company of Toronto. Imperial purchased Galena and Loren was transferred to Sarnia. Now he is employed in the compound plant and has had more than 42 1/2 years with Galena and Imperial;

George Willard Harris started in the barrel house almost 42 years ago and went to the yard department when the narrow-gauge electric railway was installed. Next he worked at the crude stills and then the sweetening stills, where he rose from fireman to head operator. He now is pumpman at Plant No. 3.

Other long-service men are Guy Dovers, J. Howard Percival, James McLaughlin, William J. Brims, and Otto Blase Glen, all of whom started with Imperial in 1904 or 1905.

Dovers' present job is to prepare steel drums for shipment, while Percival is in maintenance work at the boilerhouse, and McLaughlin is now an inspector in the boilmakers' department. McLaughlin travelled widely for the Company and helped build tankage at Westport, Ont., Montreal, Halifax, and Saint John, N.B.

Brims spent several years at Barranca, Peru, and served overseas in World War I. With these exceptions he has worked in the carpenters' department since 1907.

Glen began as stave joiner and later became a fireman on the first Imperial tanker named Impoco. He returned to Sarnia as a pipefitter and is an expert at handling 10 and 12-inch pipe at No. 1 plant.

Highways to Holidays

Canada is an invitation to travel

Canada's highways are again abounding with vacationists and tourists after the war years of restricted travel. And once again it is being proved that the Dominion has a diversified appeal for the holiday-bent motorist.

This is expected to be an important year of tourist traffic. It is estimated that more than 20,000,000 persons from the United States will cross the international border.

Canadians, too, will travel more. Last year there were over a million Canadian-owned passenger cars on the roads. There should be more cars this year because automobile manufacturers in the Dominion look forward to a 50 per cent. increase in production.

There will be new areas to visit because extensive road construction programs are being carried on in each of the nine provinces, adding to the more than 550,000 miles of highway that already exist.

The Trans-Canada highway has now been linked from coast to coast and while some sections in the extreme northwest of Ontario are not yet fully recommended for travel in certain seasons, other long stretches are a constant invitation to the motorist.

The Alcan highway is perhaps the most noteworthy of Canada's travel routes. This war-built 1,900-mile engineering feat through forest, muskeg, swamp and barren mountains runs from Dawson Creek, B.C. to Fairbanks, Alaska. It crosses some of the most picturesque, rugged wilderness on the continent and is attracting adventurous sportmen.

However, traffic on this fascinating highway will continue to be carefully restricted this year. Permission to travel on the Alcan must be obtained from the Traffic Control Board, 9037 - 100th St., Edmonton, Alberta. All travellers must have a qualified guide.

The Canadian government warns that on the Alcan route - 1,221 miles of which are in northwest Canada - facilities including gasoline stations, restaurants, overnight hotels and cabin camps are ex-
The Maritime provinces have a distinctive appeal. New Brunswick, for example, has more covered bridges than any other area on the continent. The Hartland bridge over the St. John River is the longest of its kind in the world—1,205 feet. The province is famous as a hunting and fishing playground.

More from Prince Edward Island have gone down in the six-year national park of coastal fishing vessels like those seen moored along the Murray River. Sailing in all Maritime's blend especially limited and in many places non-existent. Further warning is given that repair work on commercial or private boats cannot be conducted at government repair shops or maintenance camps.

As yet the Alcan is only for travellers who have the pioneer spirit. The average motorist will want more comfortable conditions. He has a wide choice for there are thousands of modern highways in the Dominion with all facilities for pleasant travel.

MOTORING IN THE MARITIMES IS PARTICULARLY REWARDING. CANADA'S ISLAND PROVINCE—PRINCE EDWARD—OFFERS PLENTY OF PASTORAL COUNTRYSIDE. ONE WAY TO REACH PRINCE EDWARD ISLAND IS TO START FROM CAPE TORMENTINE, N.B., WHERE A CAR FERRY RUNS ACROSS NORTHUMBERLAND STRAIT TO THE "GARDEN OF THE GULF." A leisurely drive through the island's quiet greenery will lead to Wood Islands, where another ferry returns to the mainland at Orincoo, near Pictou, N.S. From here there is the choice of many routes to Nova Scotia—perhaps east and north to Cape Breton.

Quaco City, capital of the New World, has much of that Old World atmosphere which helps make a vacation in French Canada unique. Along the shores of the St. Lawrence, "highway of the caravel," unusual delights are in store for the adventurous.

Island, or south to the Annapolis Valley and on, around the southern tip of the lobster-shaped province along roads that skirt the Atlantic seaboard.

Like the other provinces, Nova Scotia has undertaken an extensive highway improvement program. Her five year post-war plan calls for an additional 700 miles of paved road and reconstruction of important gravel-surfaced roads. The larger centres already are linked by paved highways and this network is being extended to many small towns, vacation resorts and scenic spots, among them the Cape Breton Highland National Park reached by the famous Cabot Trail.

New Brunswick's biggest drawing cards are her unsurpassed hunting and world-famous salmon angling. The St. John River, "North America's Rhine," presents the natural phenomena of the Reversing Falls and the tidal bore of the Petitcodiac River. A journey around New Brunswick's coastal perimeter leads on to the picturesque Gaspe Peninsula of Quebec, and the mouth of the St. Lawrence. The mighty river is also reached at Riviere du Loup after driving through Fredericton and Edmundston in New Brunswick.

Rural Quebec has its own fascinating Old World atmosphere of ox-carts, outdoor bakes-ovens and spinning wheels. Canada's biggest province has over 40,000 miles of highway and from Quebec City or Montreal there are scores of trips, among them those to the shrines of Ste. Anne de Beaupre or Cap de la Madeleine visited each year by more than 300,000 pilgrims. Many tourists combine motorizing with a cruise up the great St. Lawrence or they travel along the St. Lawrence on either north or south shore.

From Quebec, Ontario Highway No. 17 winds through the Ottawa Valley, past the nation's capital city, and on across to North Bay where it is an essential link with the Trans-Canada highway system for the Western Ontario area above Lake Superior.

Ontario's highways lead to innumerable holiday spots where vacationing, hiking and boating make for gay and happy days away from the strain and weekday worries of life in the city.

With over 70,000 miles of roads, Ontario has more highway travel than any other province. There are ideal vacation spots in a hundred or more places, from Niagara Falls to Quetico Park. Among the many playgrounds are Algonquin Park, the Muskoka district, the Kawartha Lakes and the Rainy River country. The Blue Water highway connects many lovely Georgian Bay towns and during the summer season with visitors to the Thirty Thousand Islands.

As the Trans-Canada highway improves, new sections of the north will be opened. Meanwhile the stretch from Port Arthur to Winnipeg brings thousands of vacationists to the Lake of the Woods area, high on the list of Canada's most beautiful districts. In 1946 Manitoba announced a 10-year program for the construction of a minimum of 2,000 miles of highway, a project that will run into several million

Handfuls of inquiries about scenic routes, road conditions, sports facilities and general travel information are being answered every day at Imperial Oil's Touring Service Bureau.

Giant elevators silhouetted against the sky are landmarks of the province from Manitoba to the foothills of the Rockies. They are "mileposts" in westbound driving to northern lakes...
Besides her mountain splendor, a principal attraction of the national parks in Alberta is fly-casting in fast, cool streams like the Bow, sparked trout and Dolly Varden are plentiful in rivers and streams along the scenic highway from Banff to Jasper.

The work will include 500 miles of "primary" highway and will pay special attention to the Trans-Canada, international connections, and access roads to national parks like Riding Mountain Park and Whiteshell Forest Reserve.

Saskatchewan has more than 8,000 miles of provincial highways. Last year about 1,000 miles were constructed, re-conditioned, or bituminous-surfaced, among them the Pearsall-Paqua section of asphalt through the wheat fields from Regina to Moose Jaw. The new roads are bringing visitors in large numbers to Prince Albert National Park in the northern part of the province, and to other popular resorts.

Alberta, too, is fortunate in her national parks among which are Waterton, Banff and Jasper. The Banff-Jasper highway is considered the most scenic drive of its kind in the world. It begins at an elevation of 4,000 feet and makes a gentle ascent up the beautiful Bow Valley to Lake Louise. The Big Bend highway is the last link in the western portion of the Trans-Canada, providing a shorter and quicker route between the prairies and the B.C. coast.

British Columbia and Alberta, of course, share the great Rocky Mountain scenery. The motor drive from Field to Revelstoke is inspiring, as are the many alternative routes such as that down the Fraser Valley to the Pacific shore. The B.C. parks like Kootenay, Mount Revelstoke, and Yoho all provide magnificent views, while a drive along the Cariboo Road gives a complete cross section of the provinces' attractions. Few visitors who have the time will fail to cross to Vancouver Island for a stay in the pleasant city of Victoria.

Thus Canada from coast to coast is a playground for the holiday-maker and the real problem is one of selection among so many choices. Imperial Oil's Touring Service Bureau at 64 King St. East, Toronto, gives assistance to motorists planning holiday trips anywhere in Canada or Newfoundland. Closed during the war, the bureau was reopened last year to meet the unprecedented demand for information about Canadian travel facts.

More than a million Imperial Oil road maps—new from cover to cover—came off the presses last year. Another million have been printed for 1947, and include maps of the Maritimes, Quebec, Ontario, Western Canada, and Newfoundland, and new maps for all Canada and for the Muskoka Lakes and Lake of the Bays area of Ontario. The all-Canada map has transport information on one side and pictorial treatment of the Dominion's resources and holiday areas on the other.

Motorists at a distance from Toronto who require information get special cards from their nearest Imperial service station operator and mail them to the Tourist Service bureau. Here all questions receive prompt attention.
Another specialist is J. R. Innes, who works as general assistant reviewing price structures, quotations, tenders, estimates, sales records and other statistical data. He came to the department after 13 years with the Quebec sales division.

With the growth of private flying and the development of Company-operated retail aviation outlets, the department feels that prompt, courteous and efficient service is of vital importance.

Horace J. Bell, who was with the Company's marine department for 12 years, is aviation representative at Gander, Newfoundland, where Imperial has a staff of 50 persons providing 24-hour service in refueling the Trans-Atlantic airplanes. His duties include assistance for airline personnel, foreign government representatives and the general travelling public at or passing through Gander.

In addition, Imperial has a personal list of 19 at Goose Bay, Labrador, fulfilling a contract with the United States Army Air Forces and also serving commercial aircraft which use those bases as alternates to Gander.

The Company also carries out Trans-Canada Airlines refueling operations on a 24-hour basis at Vancouver, Winnipeg, Toronto, London, Windsor, Quebec Junction, Ntl., Pembroke, N.S., and Halifax.

A four-engine plane is fueled by Imperial at Gander, Nfld. The big planes use about 2,000 gallons in making the Atlantic

Aviation information, when and where required, and is in charge of the purchase and operation of Company and subsidiary-owned aircraft.

T. M. "Pit" Reid, SFM, has been manager of the department since its inception. He is one of Canada's foremost aviation pioneers, veteran of the First World War and 1942-43 winner of the McIvor Trans-Canada trophy for the outstanding contribution to aviation in the Dominion. From 1931 to 1940 his department supervised the sale and delivery of over 500,000,000 gallons of gasoline and 7,560,000 gallons of aviation oil.

The department's assistant manager, Bruce Roos, is another World War I veteran. He was with the R.F.C. and R.A.F. in Belgium, France and Germany and after the Armistice joined Imperial at Farming. He made a thorough study of refueling and yard operations and has wide experience ranging from drilling operations to bulk tanks and consumer sales.

S. R. Plummers, chemical engineering graduate of the University of British Columbia, is technical specialist, concerned with the specifications, characteristics and proper application of the Company's aviation products. Product standards are in accord with international requirements which insure uniformity for aviation supplies in any part of the globe. Mr. Plummers served with the Princess Pats and R.A.F. in the First World War.

Another specialist is J. R. Innes, who works as general assistant reviewing price structures, quotations, tenders, estimates, sales records and other statistical data. He came to the department after 13 years with the Quebec sales division.

With the growth of private flying and the development of Company-operated retail aviation outlets, the department feels that prompt, courteous and efficient service is of vital importance.

Horace J. Bell, who was with the Company's marine department for 12 years, is aviation representative at Gander, Newfoundland, where Imperial has a staff of 50 persons providing 24-hour service in refueling the Trans-Atlantic airplanes. His duties include assistance for airline personnel, foreign government representatives and the general travelling public at or passing through Gander.

In addition, Imperial has a personal list of 19 at Goose Bay, Labrador, fulfilling a contract with the United States Army Air Forces and also serving commercial aircraft which use those bases as alternates to Gander.

The Company also carries out Trans-Canada Airlines refueling operations on a 24-hour basis at Vancouver, Winnipeg, Toronto, London, Windsor, Quebec Junction, Ntl., Pembroke, N.S., and Halifax.

A four-engine plane is fueled by Imperial at Gander, Nfld. The big planes use about 2,000 gallons in making the Atlantic
To further the direct approach to technical and service problems the Company has two field men who devote themselves exclusively to aviation sales. They are C. R. Jackson, Toronto, and Ian F. Rankin, Montreal, both of whom served with distinction in the R.C.A.F. during World War II. They are now attached to the Ontario and Quebec division offices respectively.

In its own operations, Imperial has been a pioneer among “air-minded” companies. In 1939-40 the Company used two single-motored machines in the exploration of the Mackenzie River basin which resulted in the Norman Wells field. This is generally recognized as the first attempt to employ aircraft in developing Canada’s natural resources in the North.

Today Imperial continues to operate from the air in many phases of its work and it maintains a twin-engined ‘plane for executive transportation. Flight captain for the latter is R. B. Millett, with D. J. Driscoll as co-pilot, and Robert Quinn, air engineer. Millett was a Wing Commander with the R.C.A.F. in World War II, and after his discharge he served with Cit Aerostar Aviation of Dorado in Barce Aires before joining Imperial last September. Driscoll formerly was associated with T.C.A. and Boeing Aircraft and later worked as a Seaman pilot on operations at Norman Wells. Quinn also served with the R.C.A.F. and was chief air engineer at Toronto Island Airport before his enlistment.

About a quarter of a century ago the aero-plane was an irregular means of transportation and livelihood for bush fliers and commercial operators. But much water has flowed down the Mackenzie River since the sound of Imperial aeroplanes first startled the Inzlane and outpost traders along its banks.

The intervening years have seen the growth of mining areas in the far north like Great Bear Lake, Yellowknife and Inuvik. Canada attained the record of handling more air freight than any other country in the world.

The war brought the establishment of the British Commonwealth Air Training Plan. Thousands of civilian workers in large factories across the nation built aircraft to be ferried overseas for operational use. Today the results of this effort are seen in the great development of Canada’s civil aviation.

The bombers of wartime, east-bound over the Atlantic from Canada’s shores, have been replaced by international airliners carrying hundreds of passengers daily to and from Europe on peaceful missions. At home Imperial Air Lines makes it possible for passengers in many major cities in Canada and Newfoundland to connect on at least three daily schedules with this global service. Other feeder lines link many of the provincial towns and outlying communities with the main line operations.

The aero-plane is used as an essential and economical means of transportation for Canada’s mineral exploration and development. It has become a necessity for the northern medical and police services; it is used by the seal and fishing industries; for forest fire detection and suppression; for free trade inspection and marketing; game and wildlife protection; in hydro electric construction, highway and railway location, crop dusting, and many other activities.

This tremendous growth in coverage has been possible only because of the production and distribution of aviation gasoline, lubricating oils and special products to adequate quantities and of correct specifications. The hundreds of thousands of hours flown in the Dominion could not otherwise have been achieved.

Imperial has played a leading part in this phase of Canada’s development. Since the earliest days of flying when aviation requirements of engines of the horsepower were met by “high test” motor gasoline and “extra heavy” tractor oil, the Company’s manufacturing department has kept ahead of engine development and has been able consistently to produce the special fuel and oil products necessary for wartime and post-war use.

These products include aviation gasoline of 115-140 performance numbers, (far exceeding the former octane number range) for engines developing up to 3,000 horsepower; aviation kerosene for jet and turbine-propelled planes; high viscosity index aviation oils; instrument oils; low temperature oil and grease; for sub-zero temperatures; compressor fluids; hydraulic and anti-corrosive oils; and other specialties.

The Company’s research laboratories are constantly at work and all these products are manufactured and tested to the most exacting government and manufacturers’ specifications. They are finally approved only after rigorous service tests.

The general sales department of which aviation sales is a part has the task of seeing that these products are available at all points throughout the country, whether for emergency Government or consumer loading in a farmer’s field, an air freighter arriving at one of Red Lake’s mines, or a plane taking off for overseas.

This is a big job. It involves setting up special storage facilities from coast to coast to service the regular airlines. It includes a bulk storage chain extending from Waterways down the Mackenzie River to Aklavik beyond the Arctic Circle from Edmonton to Abeka and a special marine storage depot co-operating with rail supply in Newfoundland.

The big four-engined trans-Atlantic planes use about 2,000 gallons in a one-way hop from Newfoundland to the British Isles. Thus at Gander it has been necessary to install and operate seven refuelling tenders manned by crews operating on eight-hour shifts to round out 24-hours a day, seven-days-a-week service. Storage facilities for aviation gasoline had to be provided at Lewisporte, Nfld., capable of receiving and handling complete tanker shipments.

At Gander a stationary aircraft refuelling system is being constructed now which will be coupled with large storage tanks and operated on a hydrant principle. This will permit simultaneous refuelling of several aircraft at the rate of approximately 200 gallons per minute per aircraft. The construction alone of this equipment will entail the investment of several hundreds of thousands of dollars.

Altogether apart from the production and distribution of petroleum products, Imperial has encouraged the development of Canadian aviation by the free installation and loan of refuelling equipment to the industry; the donation of aircraft to the Aviation League and the Royal Canadian Flying Club Association; and by contributions to the Air Cadet League, memberships in the Air Industries and Transport Association and the various flying clubs and aviation sections of the Boards of Trade throughout Canada.

The annual Canadian pre-war requirement of aviation gasoline of approximately 5,000,000 gallons increased during wartime to over 170,000,000 gallons. Today it is between 25 and 30 million gallons. A direct knowledge of aircraft operation and study of the many technical problems involved enables Imperial to supply the quantity and quality of aviation products needed to keep Canadian aircraft flying in peace time as they did in war.

To the left are members of Imperial’s Aviation Sales Department. Left to right are: Bruce Ross, assistant manager; S. B. Flannane, T. M. "Pat" Field, manager, and J. B. Jamison.
OIL BOOM TOWN

LEDOUC THRIVES AS WELLS ARE DRILLED TO PROVE WHETHER OR NOT A MAJOR FIELD EXISTS

LEDOUC, Alberta, is Canada's newest oil boom town. Since Imperial's Leduc No. 1 well came in last February 13, the butcher, baker and barber have benefited from the influx of oil men and their families. The discovery touched off an intensified interest in this district by other oil companies as well and all the varied activity has meant increased business for this small community 16 miles south of Edmonton.

The discovery well—the most promising in the West outside Turner Valley—continues its favorable oil production under careful control. It was shut down for more than three weeks because trucks could not reach it to haul away its oil. Frost coming out of the ground closed the roads for that period.

We had hoped to present a full report on Leduc No. 2 in this issue, but as the Review goes to press this well is coring at 5,392 feet—deeper than the 5,086-foot level at which No. 1 became a producer. No. 3 is coring at 4,885 feet—and No. 4 is coring at 4,571 feet. No. 5 is rigging up in preparation for the start of drilling, which is expected soon.

As the second and third wells near completion, Company officials are hopeful that both will become producers and so indicate a new field of considerable extent. The reports may be received as this appears in print.

LEDOUC No. 2 was drilled with this portable rig. These rigs are often used where drilling depths are relatively shallow. They can be set up in much less time than the standard rig.

The discovery of oil at Leduc meant increased business for the stores in this town as drilling crews and their families moved into the area. This is druggist A. P. Mouré of Leduc.
WHAT OF THE NORTH?

DEVELOPMENT OF CANADA'S ARCTIC AREAS IS
PROCEEDING THROUGH THE CO-OPERATION OF THE GOVERNMENT
INDUSTRY, AND THE ARCTIC INSTITUTE

VOLTAIRE once referred to Canada as a "few
acres of ice and snow." Today many Canadians,
remembering the fate of Hudson and Franklin, dis-
miss their country's vast northern regions with a
similar shrug of indifference. The legend of the Arctic
—a land of hardship and death—will not die easily.

Opinion about the Arctic is varied, ranging from
enthusiasm to scepticism. Some, like the noted Arctic
explorer and author, Dr. Vilhjalmur Stefansson, want
an immediate large-scale program of northern
expansion. Most government and business officials,
however, favour a gradual but systematic develop-
ment of the North.

Apart from strategic considerations, one of the
most important reasons for developing the Arctic
and sub-Arctic is the potential mineral wealth in
these regions. Up to date, the seemingly insurmount-
able obstacles of climate, transportation, distance
from markets and permafrost (permanently frozen
ground) have prevented more extensive operations.

Imperial Oil is co-operating with government and
scientific bodies in their efforts to open up the Cana-
dian North. In this connection, grants have been
made to the Arctic Institute of North America to
further research activities.

The Company's objective is to have a thorough
knowledge of the most promising oil-bearing regions
in the Arctic and sub-Arctic so that, as northern de-
velopment becomes a reality, Imperial will be able to
meet the increased demands for petroleum products.

Northern development requires information and
scientific knowledge which can be gained only
through a well-planned long-term program of re-
search and exploration. The Northwest Territories
and the Yukon comprise an area of approximately
1,516,682 square miles or more than one-third of the
total area of the Dominion. Many regions in these
districts are completely uncharted and others are
incorrectly mapped. So anxious is the Geological
Survey Division of the Bureau of Geology and Topo-
graphy, Department of Mines and Resources, to
push back this northern frontier, that its present
program calls for the mapping of the mainland to be
completed within the next two or three years. A
start has also been made on photographing and
mapping the Arctic islands.

Air bases and weather stations, which are now
being established, will help to open up the North.
The Canadian government is making preparations
to establish nine additional Arctic weather stations—
some within a few hundred miles of the North Pole—
which within the next five years will make possible
more accurate and longer range weather forecasting.

Explorers from many nations have contributed to
our knowledge of the Arctic. From the sunny lands of
Italy and Greece, from Norway, Holland, Ireland,
Denmark, Sweden, Germany and England, men
braved the unknown seeking to discover the North-
west Passage to the fabulous wealth of the Indies.
Later, when interest in the Northwest Passage waned,
there was the competition to reach the North Pole. The whaling industry and the interest of the
Canadian government in establishing sovereignty
over the Arctic islands also encouraged the explorer.

It is only within comparatively recent times, how-
ever, that the Arctic has been considered sufficiently
important in itself to warrant careful investigation.

Twentieth century explorers, chiefly Canadians,
British, Norwegians and Americans, have spent
years in the North studying the many and varied
problems which affect living conditions in the Cana-
dian Arctic and sub-Arctic.

The Naskapi oil field is 750 miles of Arctic Bay,
500 miles north of the Arctic Circle.

The Imperial Oil refinery at Norman Wells on the
Mackenzie River. Built originally in 1921, the
plant was shut down from 1922 to 1932. In 1939 it
was rebuilt to provide oil products for the growing
needs of the north.

The Imperial Oil products in the foreground have
just been landed at this bleak Hudson's Bay Company
post on Hudson Strait and are being checked before
transit to a warehouse. In the background the H.B. Co., supply ship, Nanuk, is seen riding at anchor.

22

IMPERIAL OIL REVIEW
URGES NORTHERN RAILROAD

Vilhjalmur Stefansson, noted Arctic explorer and author, believes the Dominion should speed up the construction of airports and railroads in the Canadian North. In an interview, he declared: "The need for an adequate transportation network in the Arctic is becoming critically urgent. The future of our northern regions depends on efficient transportation facilities." He emphasized the importance of developing these areas to improve communication and access.

The construction of a transcontinental railway would provide a stable and reliable mode of transport for goods and people, he argued. This would facilitate the development of resources and promote economic growth. Stefansson also emphasized the strategic importance of the North, warning against the neglect of the region.

Northern navigation last only a few short summer months, he noted. The Mackenzie River, for example, is navigable for only a short period each year.

When the Canadian Army's Operation Muskox expedition reached Cambridge Bay, curious Eskimos gathered to see the vehicles.

national in character and scope. It was organized in September 1944, with headquarters in Montreal, by a group of prominent Canadians and Americans. As the leader of the Arctic expedition, he carried out surveys in the Arctic, and his work helped to establish the importance of the Arctic region.

Dr. Vilhjalmur Stefansson, a prominent explorer, was a member of this organization. He contributed significantly to the exploration of the Arctic and the understanding of its natural resources and indigenous populations.

Through grants in support of specific projects, the Institute sends students to study Arctic conditions and problems. The success of the Arctic exploration and scientific work is the result of the Institute's efforts, which have been guided by the principles of research and collaboration.
the mining industry have been responsible for opening up large sections in the Northwest Territories. While production of minerals on a commercial basis in the Territories and the Yukon is a comparatively recent development and the value of annual output is not large when compared with that of the older mineral producing areas of the Dominion, it has not passed that of the furs trade, the only other important industry in the North.

Knowledge of the existence of minerals in the Canadian Arctic and sub-Arctic dates back to 1576 when Martin Frobisher brought back samples of pyrites from Baffin Island to England, under the delusion that the rocks contained gold ore. A century after the establishment of the Hudson's Bay Company, an employee of the Company, Samuel Hearne, set out in 1770 to investigate an Indian report that a northward flowing river had banks of copper. Although he found no copper mines, Samuel Hearne carried out one of the greatest feats of geographical exploration of his time and was the first European to see the Polar Sea by land. A few years later, in 1789, Alexander Mackenzie, exploring the river which now bears his name, noticed seepages of oil at the site of the present Norman Wells field.

Despite the discoveries of Mackenzie and Hearne, it was not until the advent of the aeroglen that development of the mineral wealth of the Territories became practical. Aerial transportation was first introduced into the Northwest during the winter and summer of 1921-22 by Imperial Oil and since then extensive aerial exploration has been conducted.

Even to this day, intensive prospecting by land parties has been confined to oil that is accessible from the Mackenzie and Yukon rivers and there have been only sporadic attempts at detailed exploration in other sections of the Canadian North. Many districts, including Baffin Island, Banks Island and Melville Island, are thought to contain valuable minerals but to date the cost of exploratory work in these regions has been prohibitive. Although the outlook for finding minerals is promising, any finds must be proportionately richer than those in more accessible areas so that the higher costs of transport and development may be offset.

In 1930, Imperial Oil completed the first well in the Norman Wells field on the Mackenzie River, about 85 miles south of the Arctic Circle. The following year a small refinery still was installed. Imperial hoped that the discovery of oil in the Mackenzie districts would stimulate other mining activities in the vicinity. This hope was not realized at the time and in 1952, because of the small market, the Company was forced to cap both wells and shut down the refinery.

In 1939 Gilbert LaBine's famous discovery of sodium-bearing and silver ore near Great Bear Lake focused attention once more on the mineral possibilities of the Northwest Territories and provided an impetus to develop the oil wells of the Mackenzie River basin. In 1953, the refinery at Norman Wells was improved and equipment installed to refine aviation gasoline.

The following year gold mining was started in the Yellowknife area on the north side of Great Slave Lake and created an increased demand for petroleum products. To meet this situation, two more producing wells were drilled in 1939 and a new refinery unit was installed at Norman Wells. At that time, the productive capacity of the four wells was about 400 barrels of oil per day.

In 1945, to provide an increased fuel supply for the U.S. Army in northwest Canada and Alaska, the Conoil project was undertaken. An agreement was signed between the governments of the United States and Canada and between the U.S. Government and Imperial Oil. Imperial's participation was necessary because its leases and oil wells were involved.

That year, the capacity of the refinery at Norman Wells was increased from 440 barrels to 1,100 barrels of crude oil per day. To date, over two million barrels have been taken out of the Norman field.

When the Conoil contract was signed, there were four producing wells in the Norman Wells field. At the termination of the contract, May 2, 1946, 64 producing wells had been drilled. For current requirements, only three or four of these wells are needed.

As a result of the development of the Norman Wells field, the price of gasoline at the refinery has been reduced from more than $2.00 a gallon to about 30 cents per gallon. Petroleum products are being supplied where they could otherwise have been shipped only under great difficulty and at high cost. In addition, a proved oil field of approximately 4,500 acres and estimated to contain 33,000,000 barrels of oil, has been defined.

From 1944 to 1946, Imperial Oil made an extensive and thorough exploration for Arctic petroleum in the project known as the Norman Wells Exploration. These operations covered 75,000 square miles of previously unexplored territory extending northwestward to the Alaskan boundary and northward across the bars and to the Arctic coast. The main object, to find oil in commercial quantities, was not attained, but there were compensating accomplishments. The geological information obtained by exploratory drilling and by widespread surveys has provided valuable scientific knowledge of vast tracts of otherwise unknown territory. Further geological surveys will be undertaken this summer.

Experience at Norman Wells has shown that problems of climate and agriculture can be overcome. Agriculture is possible in many parts of the sub-Arctic. Even in the far Arctic, studies show that it may be possible to grow green vegetables indoors for local consumption. Improved yields are believed possible by planting early-maturing varieties of seeds, more extensive use of fertilizers, and irrigation where soil lacks moisture or the rainfall is scanty. At Aklavik, more than 100 miles north of the Arctic Circle, gardens produce leaf vegetables, carrots, turnips, beets and potatoes.

The term Arctic climate have perhaps been exaggerated. Although the cold is of long duration and coupled with bitter winds, extreme minimum temperatures are not lower than those of some cities of southern Canada. It seems to be generally agreed that ultimately the size of the population in the North will depend on the economic development and climate alone will have little to do with it.

Life in the Arctic need hold no terror for the average Canadian. Modern science has been able to lessen the hardships of Arctic living conditions by providing well-insulated buildings, radio communication, air transportation and good food. Many problems must be solved, however, before settlement can be economically extended to all parts of the Arctic. Only by pushing back her northern frontier can Canada attain her full status as a nation.
Old-time oil gushers were dramatic but they wasted thousands of barrels of precious crude. Conservation is now the basic rule.

WELL-TAMED OIL

SCIENTIFIC PRODUCTION CONTROL IN THE FIELD CONSERVES THE NATIONAL OIL RESERVES

HOLLYWOOD movies about the oil business should find a new climax because the day of the uncontrolled oil gusher is over and petroleum conservation has taken its place.

The gusher was a new oil well that ran wild as it ceased experimentation for years by some writers. The sound machines could record the unrestrained roar of the well and the shouts of the drillers as they yodeled. "There she blows!" Cameras could picture roundabouts looking heavenward as they wiped their beaming faces in a shower of oil; and somewhere the villain could be shown, gnashing his teeth in defeat, as the derricks and countryside were blanched with the spectacular flow.

Gushers were exciting—but they were also wasteful on a grand scale. The Lucas well, which opened the Spindletop field on the Texas gulf coast in 1901, ran wild for nine days and poured an estimated 800,000 barrels of oil over the ground. This lake of oil not only started a great fire and was a total loss.

The waste of Lucas and other gushers was not deliberate and arose because the oil industry was in a pioneering stage and production methods were in their infancy. Drillers simply did not know how to control the new born wells. Since then the industry has grown to maturity; control and conservation are the rule; and wells seldom run wild.

The discovery of a new well, like Edzuc No. 1 near Edmonton, stirs in the petroleum industry, but an excitement more akin to a chartered accountant's elation at striking a trial balance first crack. The industry today is a very matter-of-fact business—a highly competitive one which cannot afford to dissipate its resources. The disappearance of

The old-time gusher is symbolic of the fact that oil is conserved in production, in refining, and in consumption by the development of new techniques through research and by knowledge acquired through experience.

Conservation in the field is essentially a matter of taking common sense steps to obtain the maximum production from an oil deposit. Geologists estimate that it takes a hundred million years or more to form an oil pool. But oil is a one-time crop—it can be harvested only once and cannot be replaced by man's effort or ingenuity.

The gusher era meant that every discovery was followed by a mad race by all lessees to get their wells down to production. More wells than necessary were drilled, resulting in needless work and excessive operating expense, because leases usually contained an offset drilling clause which compelled the lessee to drill or forfeit his options.

Gushers involved a much more serious loss than that of the oil that poured across the land. The uncontrolled flow of a new well meant the waste of the natural forces that bring oil to the surface after a deposit has been tapped. The most important conservation measures in the field are those concerned with pressure maintenance.

Nature has stored most crude oil in porous rock formations far below the surface of the earth. It is held in the saturated rock like honey in a honeycomb and might remain there deep in the earth and out of man's reach, then over the millions of years tremendous pressures have accumulated in the formations and the pressures can become carrying agents for the oil.

In producing oil the petroleum engineers make use of the principles of pressure energy which he applies in dissolving gas drive, gas cap drive, and water drive. Dissolved gas drive comes from the pressure of natural gas which is dissolved in the oil itself. Gas cap drive is the energy that comes from the cap of gas, that often exists trapped in the earth above an oil deposit. Water drive comes from water which lies

Proper wall-spacing as seen here has been practised in recent years to achieve the most economical production possible in a field. Spacing is determined on gas-oil ratios and acres.

JUNE • 1947
beneath the oil and which may be under sufficient pressure to push upwards as the gas and oil above it are taken out.

When a well pierces a formation containing gas, oil and water much the same action takes place as when the nozzle on a siphon is opened. The accumulated pressures seek to escape and in rushing up the well carry oil with them.

The old-time wells released all the pressures too quickly. The dissolved gas drive and the gas cap drive carried some oil to the surface but the carrying force was exhausted relatively soon. Moreover, the water pressure in its turn flooded the well with water and by-passed the oil pockets. In short, the old "wide-open" production left much of the oil locked in the ground never to be recovered because the carrying forces had been dissipated.

The importance of pressure maintenance is obvious because even under ideal conditions, seldom encountered, only about 80 per cent. of any oil deposit can be recovered from its earth-bound hiding place. Under modern methods of control the usual recovery range is between 25 and 75 per cent. Engineers' attempts to obtain some of the oil which still remains in the ground are known as "secondary recovery".

The birth of a new oil well today is attended as carefully as that of a child in the most modern hospital. Pressure maintenance is placed in effect as soon as possible to curb the immediate and to increase the ultimate flow of oil. These measures lead to scientific recovery that approaches the maximum possible under varying conditions.

Complicated pressure tests are conducted as soon as a well approaches the producing horizon. The mud which is a part of rotary drilling operations helps to act as a means of pressure control. Inoculating gas, oil or water under pressure have to compete with the weight of the column of mud fluid and if there is reason to expect abnormal pressure, the mud fluid is further weighted by the addition of a heavy mineral such as barium sulphate. By gradually withdrawing the column of mud, the gas and oil are allowed to rise to the hale more or less under control.

When tubing is run into a well, the flow of gas and oil is retarded by the use of chokes or ripples in the flow lines, giving the petroleum engineer an opportunity for further pressure control.

Dissolved gas drive by itself is a very inefficient carrying medium. In old fields that relied on this process alone, a mere 10 to 20 per cent. of the oil resource was recovered and thus in a field that produced 100,000,000 barrels, as much as 900,000,000 barrels of oil might be left unrecovered in the ground. In certain fields the dissolved gas is now separated from the oil at the surface and is returned to the underground formation by the use of compressors or pumps.

In fields where a great cap of free gas lies at the top of the deposit, it is possible to collect the gas as it escapes. The collected gas is re-compressed and forced back through an inlet well thousands of feet into the earth to reach the oil formation. Engineers call this the expanding gas cap drive.

Water drive, under proper control, is a much more efficient agent than either dissolved gas drive or gas cap drive. Under ideal conditions a controlled natural water drive will flush out the formation most of the oil and by the time the field is exhausted very little oil will be left below the surface.

Unlike coal and gold that remain in the earth until they are dug up, petroleum and its pressure carrying agents may be migratory. Consequently the oil and pressures stored beneath one lease's land may be drained to a well drilled on an adjoining property. Because of this fact regulations have been developed dealing with well-spacing and other measures such as gas-oil ratios and proration.

Gas-oil ratio simply means the amount of natural gas that comes to the surface with each barrel of crude oil. The ratio is carefully established in order to obtain a maximum recovery.

Proration aims at the systematic withdrawal of the ultimate amount of oil from a field by giving each well a carefully calculated daily rate of production. This is generally determined by legislative action, taking into consideration the capacity of each well and the peculiarities of the field. Alberta regulations are considered to be among the most advanced technically on this continent.

In Alberta the Petroleum and Natural Gas Conservation Board fixes a minimum sacrifices for which a well may be drilled. This is known as well-spacing. Although there has been much debate on the merits of well-spacing it is agreed that wells often have been drilled too close to each other. The forest of derricks along Oil Creek, Penn., nearly a century ago and the massed wooden sentinels on Signal Hill, California in more recent years are examples of excessive drilling that may result from a wild scramble for oil.

Of course, well-spacing suitable for one field may not be desirable for another. In some fields conditions may call for one well to 20 acres; in others, for one well to 40 acres; while occasionally the most economical and efficient production may require a close grouping of wells.

Imperial's operations in the Norman Wells field in the Canadian sub-Arctic are an example of controlled production. During army operations in the Aleutians, when Norman production was increased for the needs of war, pressure was maintained, gas-oil ratios were kept low, and the field was operated on an efficient production basis despite wartime conditions. Because of those conservation practices it is expected that the field can continue to meet the normal needs of the surrounding territory for at least another 25 years.

Under modern efficient methods, millions and even billions of barrels of oil that would have been lost will be recovered with benefit both to the oil producer and to the consumer of oil products.
THE CHEMIST POINTS THE WAY

THE PRODUCTION OF CHEMICALS FROM PETROLEUM IS DEVELOPING INTO AN ENTIRE NEW INDUSTRY WHICH WILL HAVE A WORLD-WIDE ECONOMIC SIGNIFICANCE

There is a story that, in the early days of petroleum refining, if a chemist showed his nose around the stills the stillmen would throw him in the boiling oil to be rid of him. The tale continues that they did throw a chemist in once and the operator, checking the product coming off, cried: "I knew chemists were no good—he lowered the gravity by 15 points!"

That was long ago, when oil was refined in pot stills. The operator judged the temperature of his still by spitting on the outlet pipe and his only tests of the quality of the product were to examine its color and to measure its specific gravity with a "gravity stick" or hydrometer.

Since then there has been a vast improvement in refining methods and with it has come a full appreciation of the importance of the chemist to the oil industry. Oil refining has practically become a chemical process in itself. In the oil field, too, the chemist has made a definite contribution to the methods of finding and producing crude oil.

However, it is in the actual production of chemicals from petroleum that the chemist's work has produced the most revolutionary change. Virtually a complete new industry—the petrochemical industry—has evolved from the refinery and it has an important economic significance.

Chemists knew that oil is a veritable treasure trove of chemicals but the petroleum industry as a whole did not make practical use of the fact until later years. This was because the industry was very new and grew rapidly in a comparatively short period in which refineries spent all their energy increasing the volume and improving the quality of petroleum products to supply the nation's growing demands.

As the products came in ever greater numbers from the stills, problems of a chemical nature arose. It became necessary to remove ill-smelling corrosive sulphur compounds from some crude oils; carbon forming gum depositing compounds had to be taken from others. These were chemical jobs so chemists were called in.

Chemists devised chemical treating processes and equipment that ended these problems, and laboratories began to have a recognized place on refinery sites. However, the chemist for the most part was kept busy with routine checks on the quality of products and only occasionally could experiment with new refining or treating techniques.

The full significance of petroleum as a source for chemicals was not appreciated until around 1899. Now, although petroleum is a comparative baby in the chemical field, it is a healthy baby. In 1945 our country produced one billion pounds of chemicals manufactured from oil and natural gas.

By comparison the chemical industry based upon derivatives of coal tar and other raw materials has had a long history. It is estimated that coal tar alone has served as a source of about 500,000 chemicals. However, one authority on petroleum chemistry, Dr. Gustav Egloff, has predicted that over 1,000,000 new organic chemicals may be produced from oil and natural gas.

Probably the most complicated mixtures of chemicals on earth today are found in coal, oil, and in living organisms like the human body. Both oil and coal tar are hydrocarbons—they are composed of carbon and hydrogen—but they are a difference in the chemical arrangement of the hydrocarbon molecules in oil which makes it potentially the source of a far greater number of chemicals.

Crude oil is a mixture of thousands of different hydrocarbons, each one a separate chemical in itself which can be subjected to chemical reactions to make many more chemicals each of which in turn can be processed to obtain still further variations. The original chemicals in crude oil may be pictured as the starting point of an inverted pyramid from which the figure grows larger and larger as the number of chemicals multiplies under processing.

Only in recent years did the refinery processes improve to the stage where the desired basic petroleum chemicals could be produced in quantity and of pure quality. As a result of continuing technological advances, the oil industry now is a supplier of raw or finished chemicals to other industries.

Catalytic cracking, hydrogenation, and dehydrogenation are among the processes devised to obtain the raw materials from crude oil. Selective solvent processes also have been developed to separate the various components of a mixture.

At present only a few of the pure basic petroleum chemicals are made in large quantities. But these few substances can serve as the starting point for the synthesis of literally hundreds of other chemicals. Recently published information lists at least 128 different chemical products from oil that range from acetic acid through alcohol, anesthetics, anilines, formic acid, glycerin, synthetic rubber, perfumes, fertilizers, resins and plastics to a synthetic butter.

Although it is a comparatively newcomer to the chemical industry, oil now supplies the raw materials for over four billion pounds of chemicals annually. The plastic articles seen here are made of polyethylene which a petroleum chemical helps to produce.
REPORT TO SHAREHOLDERS

THE CHARTS on these pages, taken from Imperial Oil's annual report for 1946, present the major facts about the Company's operations and earnings during the past year. Imperial recorded a greater volume of sales than in any preceding year and achieved substantial progress in its large program of necessary expansion and modernization of equipment, involving capital expenditures of $20,700,000. The gross value of sales was $155,972,239, up 12.5 per cent, from the 1945 level. The 1946 profit was equal to 94 1/10 of one cent per gallon on sales of 1,291,000,000 gallons of products as compared with 4 5/8 of one cent per gallon on 1945 sales of 1,289,000,000 gallons. The increased income from sales, combined with a better return per barrel processed, offset a reduction in income from investments.

The improved position resulted from an increased demand for the lighter and higher-value products of petroleum, including power fuels, lubricants and the like, and decreased demand for heavy fuels, which was at abnormally high levels during the war when maritime activities were at a peak.

Most notable additions to equipment were five modern ocean-going tankers, purchased at a cost of 88,420,486, and contracts were let for construction of three new lake tankers at Collingwood. Construction of the first fluid catalytic cracking unit to be built in Canada was begun at Montreal East refinery but shortages of steel and other building materials delayed progress.

Extensive geophysical and geological work and test drilling was done in unproven areas of Alberta and Saskatchewan and Imperial Leduc No. 1 well was completed as a satisfactory producer. In Ontario a gas field of importance was discovered near Wallaceburg and promising oil showings encountered.

The daily average throughput of crude oil in the Company's seven refineries was 119,700 barrels as compared with 104,700 barrels in 1945 @

AVERAGE YIELD FROM A BARREL OF RAW MATERIAL SUPPLIED

1946 42.4% 19.3 20.6 8.3 9.4
GASOLINES DISTILLATE FUELS HEAVY FUEL & GAS OTHER PRODUCTS INVESTMENT IN PROPERTY

1945 41.4% 16.3 25.6 9.4
GASOLINES DISTILLATE FUELS HEAVY FUEL & GAS OTHER PRODUCTS INVESTMENT IN PROPERTY

SALES RECEIPTS, COSTS AND PROFITS OF IMPERIAL OIL LIMITED FOR THE YEAR 1946

In 1946 Imperial Oil Limited made and sold in Canada and Newfoundland 1,280,000,000 gallons of products (Aviation and Motor Gasolines, Kerosene, Fuel Oils, Asphalt, Lubricants, Grease, Waxes, etc.). For these it received $193,872,230.

The cost of Crude Oil and other raw materials was $102,404,247.

The cost of manufacturing and packaging was $21,003,382.

The profit on freight was $22,444,312.

The cost of distributing and selling was $18,928,311.

The taxes paid (federal, property taxes, income tax, etc., but not including gasoline taxes which ranged from two to thirteen cents per gallon) were $17,544,610.

This makes a total cost of $182,935,563 leaving an operating profit after $12,947,157.

A PROFIT OF 94 1/10 OF ONE CENT PER GALLON.

COST OF CRUDE OIL AND OTHER RAW MATERIALS 57.6% MANUFACTURING 19.3% MERCHANDISING 18.5% FREIGHT 11.46% PROFIT 6.57% MARKETING 0.56%

CAPITAL EXPENDITURES AND DEPRECIATION PROVISIONS 1939 TO 1946

EXCLUDING PRODUCING DEPARTMENT

1939 $4,600,000
1940 $4,000,000
1941 $3,800,000
1942 $4,000,000
1943 $1,600,000
1944 $1,600,000
1945 $3,200,000
1946 $20,800,000

DEPRECIATION PROVISIONS

1939 $4,300,000
1940 $4,500,000
1941 $4,700,000
1942 $4,000,000
1943 $4,200,000
1944 $3,500,000
1945 $3,300,000
1946 $3,200,000

JUNE • 1947
NEW BOARD CHAIRMAN

GEORGE L. STEWART, vice-president and director was elected chairman of the board of directors on April 28. He succeeds Frank W. Pierce, who resigned due to pressure of other business activities.

Mr. Stewart joined the Company's engineering department at Sarnia in 1916 and two years later was transferred to Halifax. In 1919 he went to Toronto as an expert in mechanical matters for the manufacturing department. Later he became assistant superintendent of Regina refinery and then was given a similar position at Sarnia. He became Sarnia general superintendent in 1931 and three years later was named general manager in charge of all Company refineries. He was elected a vice-president and director in 1944.

Although Mr. Pierce has resigned as chairman, he will continue to serve as a Company director, a position to which he was elected in 1944. He had been chairman since 1945.

PERSONALITIES IN THE NEWS

L. E. Bury Receives 40-Year Service Button

L. E. Bury, purchasing agent for the Company, received his 40-year service button in April.

Mr. Bury was born in Springfield, N.Y., and his career in the oil business started in 1907 with Standard Oil Co. of New York in the Atlas works at Buffalo. He was employed in clerical and stenographic work until 1912 when he was given the job of running a "one-man purchasing department". He joined Imperial in 1915 as assistant purchasing agent at Sarnia. Next year the purchasing department was transferred to Toronto and in 1921 Mr. Bury was placed in charge.

William J. Brims Receives 40-Year Service Button

Born in Warwick Township, Ontario, and educated in Sarnia, W. J. Brims joined Imperial's Sarnia refinery in 1909 as a waterboy in the boiler makers' department. In 1907 he was transferred to the carpenters' department, and worked there until 1916 when he enlisted and went overseas with the 47th Battalion. Returning to Canada in 1919 he rejoined Sarnia refinery, and in 1921 went to South America for International Petroleum, where he worked until 1923. He returned to Sarnia and the carpenters' department in that year.

Mr. Brims represented the mechanical department on the joint industrial council at the refinery for 11 years.

Death of C. M. Rolston

C. M. Rolston, former manager of Imperial's British Columbia marketing division, died at Vancouver on February 27. He joined the Company at Winnipeg in 1889 and soon after went to British Columbia where he worked until his retirement in 1934.

In 1906 he built what is believed to have been the world's first automobile service station. The station used a water tank as the first gasoline "pump".

After retiring Mr. Rolston travelled extensively and was presented at Buckingham Palace in 1959. He was a director of the Exhibition Association and was active in the Vancouver Automobile Club.
Mr. Edith Cavell towers above this Western holiday highway