LEARNING NATURE'S SECRETS . . .

With a casing device the modern oil driller brings to the surface cross sections of the rock formations from thousands of feet below. By examining these cores in the laboratory the geologist is able to determine the porosity and oil content of formations through which the drill is passing. When drilling a new field the data thus acquired are especially valuable as a guide for future operations.

EDITOR'S COLUMN

THE PHOTOGRAPH from which our cover has been reproduced is an aerial view of the International Petroleum Company's operations at Talara, Peru. The front cover shows, in the upper left, the Talara refinery and crude oil storage, with the Pacific Ocean in the right foreground. On the back cover we see more of the huge silvered storage tanks with the oil field in the distance. Immediately in front of and to the left of the tanks is the town of Talara, with the Company's loading dock and warehouses in the foreground.

* * *

THERE is more to opening up an oil field than drilling a few holes and collecting the oil as it comes to the surface. Especially if your field is in a sparsely settled part of the country. Then you will have to build roads, erect tool and machine shops, build homes and schools for your workmen and their families, dig sewers, construct pipelines, erect storage tanks and build docks for tankers. You will have to get the pictures to "Before Oil Goes to Market", starting on page 4.

* * *

A COUPLE OF issues ago (Fall-Winter Number, 1939) we told how prospectors went "shooting for oil" with dynamite and the seismograph. On page 5 of this issue there is another article dealing with the use of explosives in the recovery of oil. The title this time is "Gunning for Oil".

* * *

RECENT DEVELOPMENTS of trans-Atlantic air services with bases in Newfoundland are drawing world attention to our nearest British neighbour and oldest of Britain's colonies. Expansion of transport facilities within the island will in time greatly accelerate development of its rich natural resources — see page 25.

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Venezuela...

Rapid Progress Is Being Made in the Development of Important Newly-Discovered Structures.

TWENTY-TWO years ago Venezuela for the first time was listed in world statistics of oil-producing nations. The newcomer to these statistical summaries was not then of any great consequence for in the year of her debut she contributed to a total world production of 1/2 billion barrels, only about 130 thousand barrels. That was just about as much as Canada had produced away back in 1865. However, in 1938, to a total world production of nearly two billion barrels, Venezuela's contribution was about 190 million barrels, or approximately 1/5 of the total. As a producer she had risen until second only to the United States of America and the Union of Soviet Socialist Republics. To the latter country she was a close second, being only about 23 million barrels behind. At her present rate of progress, and particularly in view of the developments during the past two years in those fields in which International Petroleum Company Limited is interested, the oil industry's statisticians will not be surprised to see Venezuela soon established as the world's second largest producer of petroleum.

Until lately Venezuela's oil production has been confined principally to the western section of the country, notably in the immediate vicinity of La Vela Marazalito, a large inland sea on the north-western tip of the Republic. Sand bars partially block the short straits which separate Lake Maracaibo from the Gulf of Venezuela on the Caribbean Sea, and shallow-draught tankers are employed to convey most of the oil produced in this area to deep sea terminals on the Gulf of Venezuela. Consequently the development of this area has not involved any considerable transport problems.

Substantially all the oil produced in western Venezuela is of low gravity but a large fuel oil content and a small yield of the light fractions which make gasoline. In eastern Venezuela after long and costly exploration work, production was secured from fields in the western section of the Orinoco Basin adjacent to the Gulf of Paria which lies between Trinidad and the Venezuelan coast. Here again the oil was principally of low gravity but the wells struck their attention further inland to the great plain stretching between the Andes on the coast and the broad Orinoco River which flows from west to east through the central part of the country. The result of extensive geological and geophysical surveys there was such that two years ago International Petroleum Limited decided to invest in the oil possibilities of this area. The large proven and prospective structures now known to exist contain oil largely of high gravity with proportionately high gasoline content. Incidental to its investment in this area, International also acquired an interest in other producing areas both in the Maracaibo Basin in western Venezuela and in the eastern part of the Orinoco Basin in eastern Venezuela. A 30-mile ten-inch pipe line was built to move oil from the Tumbalobreda field in the eastern part of the Orinoco Basin to Boca de Uramu, whence the oil is barged down a branch of the Orinoco to tidewater.

Most interest, however, attaches to the important oil-bearng areas in the State of Anzoategui which are now being brought to large production. The centre of this area is Oficina which lies approximately 100 miles due south of the coast. In order to bring oil from this area to market a pipe line had to be built. Contract for its construction was let in March last and the job was completed in July. One hundred miles long, the line is 16-inch diameter. It is one of the longest lines in South America and is the only long line of such large diameter ever constructed for crude oil service. It is expected that it will be carrying oil before the end of August. Its capacity with the one pumping station now provided is 100 thousand barrels daily but by increasing the pumping equipment this can be increased to 200 thousand barrels daily.

Striking approximately due north from Oficina where there is already an available production of 25,000 barrels daily, the line crosses a wide area of table land, reaches across a stretch of lowland swampland and in its last 25 miles traverses a spur of mountain which at two points carries it to elevations of nearly 500 feet. But the superficial character of the country which the line crosses is of only passing interest; the important fact is that very large proven and prospective oil structures in which International Petroleum has invested are adjacent to the line along its right of way. Among these are the Santa Rosa, Santa Ana, Santa Joaquin, El Roble and Algarrobo. As development of these structures progresses they will have an immediate access to world markets.

The coastal terminal of the pipe line is at Guanta, not far from Barcelona. It is an ideal site for a deep water terminal and is being laid out so that its facilities can readily be extended to permit handling of enormous quantities of oil each day.

" Fortune" magazine recently said that on the balance sheet Venezuela looks like the answer to a political economist's prayer. There is no foreign or internal debt to speak of and the country has the least per capita government income in South America—all because of oil. It is estimated that during the past 20 years since exploitation for petroleum was undertaken in Venezuela on a large scale more than $500,000,000 of outside capital has poured into the country. The development in which International Petroleum Company Limited is interested in the State of Anzoategui and facilities to transport the oil to the coast involved an expenditure of $25,000,000 before one barrel of petroleum could be moved from this important area to market. In the succeeding pages some of the work involved in this development is photographically illustrated.
Before Oil Goes to Market

Discovery of a new oil field is only the first in a series of many steps that must be taken before the oil can go to market. The nature and extent of developments necessary to afford commercial value for the production varies under the influence of many factors such as climatic and geographical conditions, availability of labour and of supplies and equipment, available communication, proximity to market, etc., etc. Recent developments in which International Petroleum Company is interested and which have resulted in successful explorations over a large area in the State of Anzoategui in Venezuela, have called for an expenditure of approximately $25,000,000 before a barrel of oil from this area can make its way to the seashore for sale in world markets. These developments entailed the construction of modern producing camps, erection of huge storage facilities, the building of a road approximately 100 miles long and the construction of a pipe line of equal length, transport of enormous amounts of equipment and supplies, the creation of a deep sea terminal, provision of medical and sanitary services, and so on. In the accompanying photographs some of these activities are illustrated.

1. A road had to be built 100 miles from the field to the coast.
2. Below—A hill is removed to provide fill for a dock.
3. Below—Hauling the fill to the shore.
4. Below—Dumping the fill for the terminal dock.
5. Below—Forms are laid for the concrete dock.
6. Above—Laying concrete slabs on the dock.
7. Above—The road cuts its way over the hills.
8. Above—For miles it stretches across vast plains.
9. Above—A concrete bridge along the road.
10. Above—A stretch of the new road near Cauaza.
11. Above—the road builders’ camp at Cauaza.

Continued on next page
12. Building one of four 96,000 barrel steel tanks.  
13. Ditching along the right of way for the pipe line.  
14. The line crosses the brow of a hill.  
15. Preparing grades for loading tanks at Guanta.  
16. Houses are built of steel to resist termites.  
17. Sewers are laid.  
18. The oil camp mess hall in course of erection.  
19. Workshops in erection.  
20. Warehouse for drillers' tools and equipment.  
21. An air harbour is established at Guanta.  
22. A nearly completed airplane hangar at San Tomé.  
23. Main street in the oil field camp.
"Gunning" for Oil

Drilling for oil" is a phrase that was born in derivation back in 1859 when Colonel Drake began the world's first oil well. "Gunning for oil" is a phrase of more recent origin but like the other it too, for awhile, was thought to be "just a crazy idea".

However, today, in oil fields the world over it is the practice under certain conditions actually to "gun" for the oil by firing special bullets through casings at various depths below the earth. It is just another of those scientific developments which inventive ingenuity has been consistently applying to the operations of the petroleum industry with a view to maintaining a continued supply of petroleum at low costs.

The instrument used in gunning for oil bears little resemblance to any ordinary firearm although the gunners’ term for a revolver, which is "rod", might be applied to it for its appearance is that of a metal rod about nine feet in length and from 4 to 7 inches in diameter. Into this rod are set the percussion chambers and the bullets which project at the will of the operator after the device has been lowered to the desired depth in the casing of the oil well.

In drilling an oil well to a depth of, say, six thousand feet, it is probable that as many as a half dozen different oil sands will be found between the top and the bottoms of the hole. Previous practice was to drill to the first producing sand, set a length of perforated pipe in the producing horizon and operate the well until lack of production forced the operator to withdraw the casing, drill the well to the second producing sand and again set perforated pipe. This operation might be continued until the lowest producing sand had been tapped, but the cost of time and equipment in following this method can be appreciated. Today, oil companies, aware that many productive sands exist from the top to the bottom of a six-thousand-foot well, utilize the following procedure: they drill and case straight down to the lowest producing sand. They gun perforate casing and cement at this point, exhaust the production of the sand, run in a bridging plug, perforate the sand directly above and continue to produce the well. Wells that were formerly abandoned as non-productive have been gun perforated and have been brought in as profitable producers.

As recently as 1932 the idea of gun perforating through casing to develop new production or to increase old production was not a new one, but no one had been able to successfully put the idea into practical operation. Experimental work had been undertaken years previous, and in 1929 Sid Mims, an experienced oilman, was granted a United States patent, but some of the "bugs" in the process still existed. It remained for two former employees of the nation's two largest electric companies to devise ways and means of gun perforating an oil well safely, positively and economically. W. G. Lane and Walter T. Wells secured the rights to the Mims patent shortly after 1930, made numerous improvements in the methods covered by it, and applied for additional patents which were ultimately granted.

The early inception and development of the Lane-Wells gun perforator is a story of hardships, disappointments and reverses usually attendant wherever a product new and revolutionary in character is born. Handicapped by lack of funds, Lane and Wells refused to give up hope that they had undertaken something which would be of inestimable value to the oil industry and of monetary advantage to themselves. It was not an easy thing to arrange demonstrations, for oil executives were naturally hesitant to authorize experiments which might jeopardize a well that cost $100,000 or $150,000 to drill.

Finally, however, tests were arranged. The mingled emotions, hopes and fears which filled the two men on December 12, 1931, the day set for the first test, may well be appreciated. Every cent that they had been able to scrape together had gone into their work, and their very future depended upon their success. And success it was, for at the completion of operations the well selected for the test run yielded a production of 32 barrels per day after having been abandoned in 1929 and after standing idle for nearly three years.

Prior to the development of this gun perforator the established practice for placing oil wells on production was by setting screened or perforated pipe. This method was nothing more than placing a string of casing, or pipe, with slottings or perforations made before insertion in the well, at a depth where oil sands were expected to be encountered. Since the perfection of gun perforator methods, and in sands where the character of the producing zones permit, the present practice is to run solid casing, without slottings or perforations, and cement it into place. Then a gun perforator is run into the well and holes are perforated through both cas-
To "gun" a well may take anywhere from two or three hours to six hours, depending on well conditions and the number of shots required to complete the operation. The equipment consists of a service truck carrying a winch and cable drum with eight to twelve thousand feet of special conductor core cable. For lowering, firing and raising the gun, electrical generators and safety controls, weight and depth indicators tell the operator the exact position of the gun when several thousand feet below the surface; three sizes of guns with extra loads; a two-way load-speaker system, together with a crew of two men, consisting of a shooter and a derrick man. The well operator furnishes the assistance of two men on the derrick.

A perforating gun carries from ten to fifteen chambers which are shot one at a time in sequence at the will of the shooter who presses a switch on his control panel. Accuracy of shooting and absolute safety are essential and the accidental discharge of a load is prevented by an elaborate safety system and by the use of non-atomizing powder.

The first step in "gunning" a well is to prepare a firing chart which will show the shooter at what depths the curing is to be penetrated. The gun is then lowered into the well by means of a stranded steel cable which carries down its center the electrical current to fire each firing chamber of the gun. When the gun has reached the desired depth, the shooter, following his firing chart and depth indicator, presses the switch at proper intervals to cause each steel projectile in succession to pierce through casing, cement and deep into the rock. As many as one hundred shots may be required to complete the operation.

The drawings in the right hand column show three of the uses of the gun perforator.

PERFORATING FOR ACID TREATMENT. When wells in limestone formations are to be treated with acid to increase the flow of oil, holes are fired through the casing and into the limestone to permit the acid to work.

RESTORING OLD WELLS TO PRODUCTION. When the oil at "Z" zone out, the hole is plugged with cement and new holes are "shot" at a point opposite the exact producing formation "T".

SHUTTING OFF WATER is another important application. The casing is run down through the water zone, and the gun is used to penetrate the casing opposite the producing zone.
PITY THE POOR TAXPAYER!

LAST FALL a certain Canadian city elected a new Mayor. The retiring Mayor, an amiable and courteous gentleman, invited members of the City Council and heads of the civic departments to foregather with him a few days before he turned over his office to his successor. The idea was for a nice friendly little farewell party. The Mayor would say complimentary words about the Councillors and Department Heads, thank them for their co-operation during his term of office, wish them well in the future. Councillors and Department Heads would express similar laudatory sentiments regarding the Mayor.

This sort of valedictory love feast is popular with our elected representatives everywhere. It spreads healing balm over political bruises and abrasions, smooths mental scar tissues left by bickerings and squabbles, offering up with everybody singing "He's a Jolly Good Fellow", and meaning it—at any rate until next time.

The particular festival under observation here turned out to be a remarkable one, indeed; because, right in the middle of the doings the retiring Mayor announced that at the close of the year the city would have a surplus of something like $400,000 cash in the bank. Now the city where this happened is a growing city, a truly progressive community, but it is not one of the first half dozen Canadian cities. A surplus of $400,000 is a matter for self-congratulation in the largest city of any Canadian municipalities these days. The Mayor and the Councillors and the Department Heads in meeting assembled felt that way about it, and rightly so. They beamed at one another. They shook each other by the hand, warmly. The more boisterous spirits smacked each other across the shoulders. A few shouted "Hurray!" Ah, that must have been a sight worth seeing. A score of faithful servants of a prosperous Canadian city, prosperous even in depression times, congratulating themselves and their community on a surplus of $400,000 cash in the bank. A grand spectacle. A glorious feeling.

So far, there can be nothing to cavil at in so notable an achievement. No room here for carping critics. Out with him who would seek to belittle such efficiency in the public service. But wait.

After some minutes the excitement faded a little. Immediately the busy administrative minds of the people's representatives began to function at high speed. They had $400,000 surplus funds. What could they do with it? Silly to think of leaving it where it was to draw bank interest. Ridiculous, in fact to imagine anything except ways to spend it.

A gentleman who holds the well-being of a sanitarium close to his heart, rose to his feet and began to speak eloquent words about the sanitarium, which was, he said a noble institution, doing magnificent work in the community. "Hear, Hear," said the meeting. But—that sanitarium needed funds. It was hard up. He proposed therefore, that from the $400,000 the sum of $17,500 should be given at once to the sanitarium. "Agreed!" cried the meeting, and it was so ordered.

Other gentlemen who had adopted other enterprises as objects of their special protection followed in quick succession with proposals for gifts of various sums, amounting altogether to $20,000. "Hear, Hear," cried the meeting again. Finally, one councillor, fairly bursting with civic pride, pointed out that the community was desperately in need of a new City Hall, a City Hall fitted to serve a community with a $400,000 surplus. He moved that the sum of $50,000 be set aside to establish a City Hall building fund. "Approved!" shouted the assembled administrators. In practically no time at all, $337,500 of that $400,000 surplus had been voted away.

It was at this point that an unhappy, even a disa

The meeting broke up shortly afterward, in a somewhat subdued mood, having revoked the resolutions previously adopted with so much gay enthusiasm.

Much of the people we have told this true story to seem to think it funny. In a way it is funny; but it is tragic, too. Here were public servants in office, administrators of the affairs of a populous Canadian community, sworn to protect the interests of the tax-payers who had elected them, who were paying salaries for that protection. Yet, the minute these trustees of the public funds thought they had their hands on a goodly sum of public money, their first thought was: what now? They could spend it as rapidly as possible.

In all that gathering of public officials, elected and appointed, no single voice was raised to suggest that the $400,000 surplus might be employed to reduce the tax rate. When it was pointed out that the bondholders had a prior claim the fact was accepted grudgingly, swallowed with a sour face.

From their actions, you'd think these progressive gentlemen had just won the Irish Sweepstakes. Interviews with sweepstakes winners chant similar lyrics, set to the same tune: "We're going to get a new car."

"First off, I'm going to take a trip around the world."

"Now I can get that fancy coat I've always wanted."

Those councillors and administrators hadn't won a sweepstakes. They hadn't even won a bingo game. The money they hastened to spend so lavishly wasn't their money to spend. It belonged to the bondholders in redemption of solemn pledges made years before. Doubtless the sanitarium and the other institutions are worthy causes, deserving of support. It might even be that the community would like to have a swanky new City Hall. The point is that no distribution of taxpayers' money should ever be made without the taxpayers themselves first receiving proper consideration.

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Man-made Rubber

Into the mixing vats go ethylene dichloride, derived from petroleum, and sodium polysulphide, and out comes a substitute for rubber that is in many ways superior to the natural product.

FROM THE far-off Orient comes 95 per cent of the world's supply of rubber—necessary in peace and even more necessary in time of war, and so the nations of the world have learned to grow their own rubber—in laboratories; Stalin gets rubber from Vodka; Hitler makes rubber from coal and lime at three times the cost of the natural product, and Mussolini tries another way: in Canada and the United States ethylene dichloride, derived from petroleum, and sodium polysulphide go into the test tubes and vats separately and come bouncing out together as man-made rubber.

For several generations school children and adults have been told how a falling apple prompted Isaac Newton's theory of gravity, and how a tea kettle gave James Watt his idea for the steam engine. Possibly future historians will record how Dr. J. C. Patrick, of Kansas City, mixed ethylene dichloride and sodium polysulphide to make a new and cheaper anti-freeze, but instead the result was a gummy mass that looked and felt like rubber. It was thus that in the early nineteen twenties, the first commercial synthetic rubber was produced on this continent.

So man-made rubber, because of ethylene dichloride and sodium polysulphide, can be added to the long list of products in everyday use that result from petroleum and its derivatives. Without petroleum and the products it helps to produce, this world would soon revert to the unenlightened and comfortless feudal ages. Machinery would stop through lack of lubrication, transportation would be brought almost to a standstill, cosmetics would be of the simplest forms, colour dyes would fail to retain their brightness and illumination would be by the tallow candle. Now, as a result of petroleum, man-made rubber adds to the comforts of mankind.

Three hundred and fifty years ago Columbus came upon South American Indians playing with a heavy ball of vegetable gum, and as a result the civilized world became interested in what was thought to be something to erase with—hence the name: rubber. It was not until 190 years ago, however, that this interest became more than a passing fad. In 1839 Goodyear dropped India-rubber mixed with sulphur on a hot stove—and discovered the principle of vulcanizing.

(Continued on page 32)
THERE ARE certain indispensables of human existence—fire, iron, the wheel, etc.—whose earliest use by mankind is so lost in the mists of antiquity as to remain forever a matter for conjecture.

Wheat is like that. No one knows who first plucked the bearded head of a wild wheat plant and made food from the kernels. It really does not matter, of course, because the important thing is that somehow, somewhere, the peculiar advantages of wheat as a food were recognized and the precious seed was saved from year to year to plant crops in ever-increasing quantity.

Wheat's right to the title "staff of life" is based on solid premises. Of all cereals, it makes the best bread. It is easily cultivated, resistant to heat and cold, as convenient almost as a liquid to handle and store, not perishable, and, considering the amount of production labor required, exceptionally high in food value.

More than any other country, Canada has a stake in wheat. Not that this country produces more of the golden crop than any other—it is normally surpassed in this respect by the United States and India. But Canada, with her relatively small needs for home consumption, is the largest exporter of wheat, supplying 40% of the world's trade in this key commodity.

How, why and when did Canada go into the wheat business? The train of events began in 1920 when Rupert's Land, comprising the three prairie provinces, was transferred from the Hudson's Bay Company to the Dominion. The government was faced with the problem of developing this vast new empire with its pitifully meagre population of 12,200 whites and half-breeds. Obviously, a railroad was needed to stimulate immigration. Clearly, too, grain was the ideal crop for such a country, not only because it would produce wealth with a minimum of cultivation and delay but because the product so provided would ensure freight for the railroad when it was completed.

Attracted by the promise of a railroad and free homestead land grants, settlers began to pour into Manitoba. The first wheat shipment, made in 1876, was 857 bushels for seed to be used in Ontario. By 1883, when the CPR was completed between Winnipeg and Port Arthur, the movement of wheat had grown to one and one-half million bushels. In 1885 the last spike was driven in the transcontinental line and immigration flowed westward, farming out on either side of the new steel rails which held this great sprawling land together.

By J. W. DOHERTY,
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Imperial Oil Limited.

There was plenty of romance in those days of "the wheat rush"—just as much as in the more exciting "gold rush." Winnipeg boomed wide open and fortunes were made—and lost—in a day. A historian describes the excitement in 1881-1882 in this way: "Nothing to equal it had ever before occurred on Canadian or British soil... Real estate agents became as numerous as the sand on the seashore... Men, old and young, hung around with anxious looks, and as a rule, a roll of plans under the arm or a notebook in the hand may be detected... In the evening after the stores and other places of business are closed, the hotels and real-estate auction rooms are the centres around which the great mass of the people congregate. The excitement then is even more intense than during the day... In this great turmoil of business, men of all nationalities meet—for what country or clime is not represented in this grand gathering or the nations in this new country?"

The growing of wheat in this Great Lone Land was not accomplished without the usual pioneering tribulations. It was a country of bewildering contrasts. Searing heat, Arctic cold, drought, hail and frost presented a combination of natural hazards to be found nowhere else, and yet—perhaps on this very account—it grew the best wheat in the world.

The hazard of drought on the semi-arid plains was ever-present and the story of how one of the early settlers discovered, through the merest chance, the value of the summer fallow as a means of combating this danger reads like fiction. A Scotch settler by the name of Mackay has only half his fields sown when the Red River rebellion breaks out. His tenants and hired men are commandeered so the rest of his land performer lies fallow. Next year, the rebellion over, he sows every available square foot of ground. It is a year of drought; and as the harvest continues with no let-up Mackay observes an oasis of luxuriant wheat growing amid the rest of his dried-out fields. He remembers that this is the area which lay prostrate but unsown the year before—and the meaning of the phenomenon becomes clear to him. It is a discovery of the greatest importance to the prairie wheat lands.

Canadians are familiar with the equally romantic story of the birth of Marquis wheat, which until recently formed eighty percent of the Western wheat crop. Marquis wheat has the same advantage in respect to early frost, fall storms, etc., as the summer fallow has in respect to drought. It gives the farmer a better chance against these other arch-enemies because it ripens somewhat earlier than other hard spring
THE HARVEST GOES TO MARKET

wheat—this few days advantage is often sufficient insurance against the hazards of fall weather. Marquis has put many extra dollars into the pockets of Canadian wheat growers, not only because of its early ripening characteristics but as a result of its larger yield.

The transition was rapid from those early days of expectation to Canada's present position as a major producer of wheat of premium quality. It was made possible primarily by two factors. The increase in world wheat utilization at the rate of two million bushels annually for the 20 years previous to the war invited growth in Canada's wheat acreage. So did the boom period of the war itself when the Western acreage was almost doubled.

Two industries played an important part in this development—oil and farm machinery. Each, depending on the other, in combination they made possible a more extensive and thorough cultivation of the limitless prairie lands.

The oil industry made its first contact with Western in 1911, when the Imperial Oil Company Limited, as it was then known, opened an office and bulk plant at Winnipeg. This was before the era of farm machinery, and oil was needed primarily for illumination and wagon lubrication. As the pioneer pushed farther and farther West, Imperial Oil went along too, opening service depots and transporting the keynuine and lubricating oils to outlying points hundreds of miles distant in ox- or horse-drawn vehicles.

Then, after the turn of the century, power machinery magically lightened the task of breaking new land. Convenient and dependable supplies of fuels and lubricants were essential, and Imperial Oil again pioneered by developing a distribution system that kept pace with the needs of each area. In 1929, there were 40 Imperial Oil distributing stations serving the Prairies and by 1933 this number had grown to 509.

As the branch railway lines reached out new communities would spring up. A box car station, a grain elevator, and the Imperial Oil depot were their dominant features.

Keeping the West supplied with petroleum products had its own peculiar problems. Most of these arose from the unpredictability of crop conditions and the resulting impossibility of estimating accurately the size and the time of peak demand. In other markets demand may be fairly consistent throughout the year, a chart of the rise and fall of consumption of petroleum products on the Prairies resembles a valley flanked by two lofty pinacles which represent the peak demands of Spring and Fall.

To cope with the situation and assure an uninterrupted flow of fuels and lubricants when they were most needed, the Company found it necessary to purchase hundreds of tank cars which were kept busy for the few weeks of peak activity and then lay idle for the rest of the year. Later it became necessary to build refineries at Regina (1916) and at Calgary (1923) and this made it possible for the Company to produce the oil to meet the needs of the farmers in the off-seasons carrying crude to these points.

Along with a adequate service for the Western wheat lands, Imperial Oil endeavored continually to raise the quality of its products and at the same time to keep prices at a level that would be fair alike to the buyer and the seller. In this connection it is interesting to note that the fuels and lubricants marketed among wheat farmers today are of infinitely higher quality than those sold in 1913, yet the price is considerably less. The wholesale price of gasoline, for instance, is only 66.2 per cent of its 1953 level, a reduction greater than that of any other major commodity during the same period.

The switch to power machinery, which necessitated this expansion in the oil industry, was carried out with unusual rapidity. The era of mechanization really began during the latter part of the War and the post-War years. Prairie farmers owned 36,500 tractors in 1921, some 21,000 of which had been purchased in the two preceding years. By the year 1928 no less than 72,000 tractors were bought, and by 1936 tractors in the Prairies totalled 83,000.

TO THE LAYMAN, perhaps the most striking indication of the increase in mechanization is the absence of the harvester "specials" which used to pull out of the farm every fall. To the wheat farmer himself, the most striking fact about mechanization is that he can produce his wheat now for less money than ever before. Continuous progress has been made by the farm implements industry, not only in providing machines of greater and greater utility but in reducing prices at the same time. For instance, if the "Sears" grain company's index is adjusted to include the latest wheat producing machine it is apparent that equipment which costs $1,000 in 1927 would cost only $712 today.

The progress made in this regard can be better appreciated, when it is understood that by the use of the modern equipment available during the last few years, the cost of plowing, seeding, harvesting and threshing has been cut by about 60 per cent. Many farmers report that they can make more money at today's low prices than they could in the pre-War days of higher wheat prices, due to the lower operating cost of modern farm machinery.

Wheat is grown on 245,000 square miles of land in the West, comprising 250,000 farms, ranging in size from four acres to thousands of acres. The average farm is of some 568 acres, with about 140 acres under cultivation, of which 95 acres are in wheat. When the wheat is threshed and ready to start on its long

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journey to market, the farmer transports it by motor truck or wagon to a country elevator located on the 20,000 miles of railway which have been built up and down and across the prairie provinces.

There are more than 5,000 country elevators with an average capacity of 45,000 bushels, in the three prairie provinces. The farmer drives his load of wheat onto the elevator scales, then dumps it into the pit, and has his empty conveyance weighed again, the difference being the weight of his grain. The reason for the term "elevator" becomes apparent when the wheat thus delivered is transferred from the pit to the storage bins by means of a series of buckets attached to an endless rubber belt driven by a gasoline engine. The wheat in this way "elevated" into the bins, and when it is time to transfer it to a railway boxcar it is elevated by the same means still higher into the shipping bin whence it falls through a spout into the car below.

The transport of wheat is by far the greatest single freighting job undertaken by Canadian railways and the size of the wheat crop therefore has a very direct influence upon their earnings. Last year's crop for instance, meant about $55,000,000 in railway revenue. 50,000 freight cars are used at the peak of the grain movement, each car holding 2,000 bushels of wheat. As soon as the crop is in, great trainloads of wheat begin to wind their way west to the Pacific and east to the head of the Lakes. Three quarters of the crop moves east through Winnipeg to Port Arthur and Port William.

THE WORLD'S LARGEST TERMINAL ELEVATORS ARE LOCATED AT PORT ARTHUR AND PORT WILLIAM TO HANDLE THE FLOOD TIDE OF GRAIN WHICH FLOWS YEARLY THROUGH THESE PORTS FOR SHIPMENT VIA THE GREAT LAKES. VIEWING THESE TOWERING CONCRETE STRUCTURES WITH THEIR CYLINDRICAL MOTIF THE LAZYMAN IS INCLINED TO WONDER AND ASK QUESTIONS. AND TO THE MOST OBVIOUS QUESTION OF ALL HE RECEIVES THE REPLY THAT THE STORAGE BINS ARE MADE OF CONCRETE BECAUSE IT COMBINES STRENGTH WITH NON-INFLAMMABILITY, AND THAT THE CYLINDRICAL SHAPE IS EMPLOYED BECAUSE IT RESISTS BEST THE PRESSURE OF THE GRAIN WITHIN AND THEREFORE MAKES LESS CONCRETE. THE TALLER, RECTANGULAR PART OF THE STRUCTURE IS KNOWN AS THE "WORKING HOUSE." ONCE THE WHEAT IS ELEVATED TO THIS POINT IT CAN BE TRANSFERRED BY GRAVITY TO ANY PART OF THE BUILDING. THE SHIPPING BINS ARE LOCATED IN THE LOWER HALF OF THE "WORKING HOUSE" AND FROM THESE THE WHEAT CAN BE "SPOUTED" INTO THE HOLD OF THE LAKE FREIGHTER. BECAUSE THE TERMINAL ELEVATOR PUTS GRAIN TO WORK TO THE FULLEST EXTENT IT IS THE CHEAPEST AND SPEEDIEST WAY OF TRANSFERRING WHEAT FROM BOX CARS TO BOW AND PERFORMING SUCH NECESSARY OPERATIONS AS WEIGHING, CLEANING, ETC., AT THE SAME TIME.

There are normally 600 lake freighters engaged in the carriage of grain on the Great Lakes. Each of these vessels is nothing more than a vast, elongated shell, designed to employ every available cubic inch for storage purposes and with a minimum of space reserved for living quarters and machinery. Perhaps it is because much of their bulk is below the water line that it is difficult to appreciate the tremendous capacity of these boats. The larger vessels will carry over 500,000 bushels of wheat which is equivalent to seven trainloads of 40 cars each, and the capacious holds of the largest boat on the Lakes swallow up, without points of indigestion, nine train loads. Loading speed varies from 75,000 to 100,000 bushels per hour and unloading is accomplished at a rate of from 20,000 to 40,000 bushels per hour.

WHERE DO ALL THESE HUNDREDS OF MILLIONS OF BUSHELS OF WHEAT GO? THAT IS A QUESTION WHICH NOT EVEN THE DOMINION BUREAU OF STATISTICS CAN ANSWER EXACTLY BECAUSE CANADIAN WHEAT GOES TO MARKET VIA SO MANY DIFFERENT ROUTES AND PASSAGES THROUGH SO MANY DIFFERENT AGENCIES, WHICH ARE NEVER AT THE SAME TIME—THAT EVEN A PINKERTON DETECTIVE WOULD LOSE THE TRAIL. IN NORMAL YEARS OF WORLD TRADE IT WOULD BE SAFE TO SAY THAT A PERCENTAGE OF THE BREAD EATEN IN PRACTICALLY EVERY CIVILIZED COUNTRY CONTAINED SOME CANADIAN WHEAT, BLENDING WITH THE HOME-PRODUCED PRODUCT OR ANOTHER IMPORTED VARIETY TO RAISE ITS QUALITY.

Last year's Western wheat crop of 524,000,000 bushels was the largest in the past six years but unhappily a war-fearing world is apparently reluctant to depend on outside sources for its foodstuffs to a degree that would afford Canadian wheat the price and markets which its unexcelled quality merit. Not a really large crop like the four of five hundred million bushel harvests of the 1920's, it was nevertheless twice as big as the 1937 yield and a considerable encouragement to Westerners after the unprecedented series of crop failures since 1932. Encouragement they certainly needed after the unprecedented conditions faced for the past decade. Wheat prices declined precipitously with the onset of the depression in 1930 so that until 1932 while crops were relatively good prices were unduly depressed. By the time prices began to turn upwards in 1933 the first of the cycle of drought years had arrived and Western wheat farmers were largely deprived of the benefit of a rising market. Imperial Oil endeavoured to provide some encouragement in 1933, when conditions were serious, by announcing a debt adjustment and interest reduction plan on the mortgages owed by Western farmers for products supplied on a credit basis in 1929 and 1930. This gesture was appreciated greatly, as the thousands of letters received from grateful farmers attested, but the encouragement most needed is that of wider markets. The present situation is complex, but despite the problematic world outlook a good crop such as is presently indicated for this year would be a great boon for Canada's Western wheat lands.

"Yankee Clipper" MAKES AIR HISTORY

— Pan-American's "Yankee Clipper" recently completed the first scheduled round trip flight over the North Atlantic via the Great Circle route. In her flight the giant ship was serviced twice by Imperial Oil, once at Shediac, N.B., and again at Botwood, Nfld. The "Yankee Clipper" is driven by four 1500 horse-power motors and has a cruising speed of 165 miles per hour. It has daytime accommodation for 74 passengers and sleeping accommodation for 40. There are 10 in the crew and there is a large cargo capacity. The length of the ship is 169 feet and its wing spread 152 feet. Fully loaded, it weighs 82,500 pounds.

HOW THE ATLANTIC WILL BE FLOWN

There are two practical trans-Atlantic flying routes: the 3,418 mile northern route via Shediac, Botwood, Foyes and Southampton and the longer, 3,840 mile southern route via Bermuda, the Azores, Lisbon, Marb
Even then discovery of the ore was by accident. For years the fishermen of Bell Island had been using the red rock as ballast in their boats. Its weight made it particularly suitable for this use. A visiting engineer noted this peculiarity of the stone. Analysis and further investigation disclosed the richness of what had hitherto been regarded as worthless rock.

Newfoundland and Nova Scotia are naturally associated in one's mind with the fishing industry. Men who go "down to the sea in ships" have given glamour to these places; but another industry is of primary importance even though it lacks the color and romance of the fishing fleets. For, also, men go down under the sea to mine the iron ore of Bell Island, and the rich coal of the Sydney field in Nova Scotia, which in association have made the Maritime's great steel industry.

Until the discovery of the iron ore, Bell Island's only inhabitants were a few fishermen who resided in a hazardous harvest from the sea. Today, there is a town of 3,000 inhabitants and the island has become the seat of a great industry employing 1,800 workmen. Mining, originally confined to the land areas, is carried on under the bed of the ocean for a distance of several miles beyond the shore line.

The enormous coal deposits of the Sydney field in Nova Scotia are 1,500 miles by water from Bell Island. Here subterranean mining produces 95% of the field's output, and the Sydney field in its turn produces 70% of the coal mined in Nova Scotia. At present the subterranean workings extend from two to three miles seaward from the shore, and working limits have been tentatively placed at four miles. It is estimated that great reserves of coal lie beyond these limits.

Controlling the iron mines of Bell Island and the coal mines of the Sydney field, the Dominion Steel and Coal Corporation at Sydney operates one of the largest and most efficient steel mills in the world. Steel products from Sydney go into the world markets and successfully compete with the output of the largest mills in the industry. "Dosco" is a Canadian industry in every respect. One of Canada's biggest users of Imperial lubricants, the rest of its purchases are also mainly Canadian. Its employees are skilled native workmen.

In common with all great steel mills, coal is the governing factor in the location of the Dosco Mines. Practically all important iron and steel centres are located near the ore mines, which one would naturally associate with the mining of ore, but at or near coal fields. The Pittsburgh district in the United States and the Lake Superior iron mines, which are the source of iron ore for essentially all steel production, are the closest points of steel production in the United States.

Sydney is the eastern terminus of the Canadian National Railway system and is situated upon a safe, natural harbour. It is a coincidence that two Sydney—New South Wales—are renowned not only for their magnificent harbours, but also for the fact that these are both underlain by valuable seams of coal which outcrop on the surrounding land areas.

Fifty miles of railway connect the departments of the steel plant at Sydney, which together with the coke plant covers an area of 160 acres. The traffic is so great upon this system that the rolling stock equipment, locomotives, etc., would be sufficient to operate 500 miles of track line. The system is divided between the Canadian National and the Sydney and Louisburgh railways.

Thousands of tons of raw materials are used every year to produce Dosco iron and steel. A perspective of the plant at the close of navigation would reveal, besides an array of buildings and towering smokestacks, about 800,000 tons of ore and limestone in great stacks behind the blast furnaces. If another pile of 600,000 tons of coal could be visualized adjacent to this, then one would have a rough idea of the amount of the raw materials required to feed the giant furnaces for one year.

The unique natural advantages of the location of the Dosco Mills with respect to raw materials, the excellent shipping facilities available both for home and export trade, and a "Bloomer" determination to maintain highest possible standards in modern equipment and producing facilities have made this Canadian industry known wherever iron and steel are essential commodities.

Although the shafthead of the mine shown below is on land, the workings extend 2 to 3 miles under the sea.

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In 1939 a clerk in St. John's went on a holiday to Bell Island, on the coast of Newfoundland. While there he found some samples of a curious red rock, which he forwarded to Ottawa for analysis. A few weeks later he received a telegram which read: "Please send 250 pounds for further analysis." He thought the message was a request for money to the amount of more than $1,000, which he could not afford to raise. He did not understand that what was required was a larger sample of the rock for more extensive analysis and so he let the matter drop.

Had he interpreted telegram correctly the obscure clerk would have become known as discoverer of one of the richest iron ore deposits in the world; instead, his name was lost to fame and the world's largest reserve of iron ore—an estimated two billion tons valued at hundreds of millions of dollars—remained unknown in Bell Island until 1939.
By W. G. Charlton
Imperial Oil Limited

NEWFOUNDLAND

On May 2nd, 1927, a one-time citizen of Venice by the name of Giovanni Cabot set sail from Bristol in his 50-ton ship Matthew. Fifty-three days later, Cabot sighted the shores of what is now Newfoundland.

If John Cabot, as Giovanni Cabot is more commonly known, could make the same trip in one of the huge flying boats that soon will be travelling regularly between England and Newfoundland, and could see his Newfoundland from the air, he would note a similarity in his native city of Venice. For, like Venice, a large part of Newfoundland is covered with water. Rivers and bays cut far inland from the rugged coast; these, with numerous lakes combine with the temperate climate and beautiful scenery to make Newfoundland a tourist's and sportsman's paradise.

Back in the last century, Rudyard Kipling wrote a poem about Canada called "Our Lady of The Snows". It was typical of the ideas people in the old country had about Canada. To them this country was a frozen wilderness inhabited by Indians. Fortunately, Canada has been able to live down both Mr. Kipling's poem and those ideas. But Newfoundland still suffers from mistaken ideas.

It is amazing, in these days of modern travel and education, how little is known of Newfoundland's oldest colony. To most people, the word Newfoundland conjures up a picture of a foggy, rocky island, somewhere near the Arctic circle, covered with snow and ice. People do realize that St. John's, the capital of the island, is in the same latitude as Paris, France, that zero temperature is a rare occurrence, and that the summers are ideal, with warm days and cool nights. The fog that one always associates with Newfoundland is 200 miles away on the Grand Banks. Stormers on their way to England pass through the fog of the Grand Banks, and to the passengers the Grand Banks mean Newfoundland, and therefore Newfoundland must be foggy. It must be very discouraging at times to the Newfoundlanders, this association of ideas.

Strategically, Newfoundland is to North America what Gibraltar is to the Mediterranean. A glance at a map of the Western Hemisphere will readily show the importance of its location with regard to the St. Lawrence River, 1,640 miles from Ireland. Newfoundland offers the shortest crossing of the Atlantic, and as a result is the key to transatlantic telegraph communications. In 1902 the western end of the first telegraph cable was laid at Heart's Content in Newfoundland, and it was at Signal Hill, St. John's, that Marconi received the first transatlantic wireless signals from Poldius in Cornwall.

This 'shortest crossing' of the Atlantic has made Newfoundland the base for many of the transatlantic aeroplane flights. Alock and Brown led the way in 1919 when they took off from Signal Hill, and in their war-time bomber made the first successful direct flight across the Atlantic. Early this summer the huge flying boat, the "Yankee Clipper", made the first flight of a regular air mail service between New York and London, by way of the fine new flying base at Botwood, Newfoundland.

(Continued on next page.)
Newfoundland has been passing through trying times. Throughout its history fishing has been the main industry of the island. More recently, pulp and paper have grown in importance, but fishing continues to be of great importance. With the disappearance of foreign markets, the fishing and pulp and paper industries collapsed, dragging the government with them. In 1932 Newfoundland lost its status as a self-governing dominion, and a Commission was sent from England to try to straighten things out.

The situation is slowly getting better. Your Newfoundland is a great step, and with the Commission putting forth every effort, the future doesn’t look so white. Newfoundland itself offers natural resources that will go far to bring about recovery. At Bell Island it has the largest known deposits of iron ore in the world. Other minerals abound in the hills and only await exploitation. The soil, although thin in places, has been proven good for agricultural purposes. Indeed, as was reported in the IMPERIAL OIL REVIEW in 1922, the value of farm products in 1921 exceeded by ten percent the value of the fisheries.

With proper development, Newfoundland might be one of the world’s tourist attractions of the western hemisphere. With 40,000 square miles of practically wild, unpeopled country, covered with forests and mountains, lakes and rivers, it offers the tourist one of the few remaining unspoiled vacation lands in North America. As a sportman’s paradise it is already well known. The rivers and streams teem with trout, and the salmon fishing is second to none. Experiments have been carried on with deep-sea fishing, and Newfoundland may soon rank with Florida and Bermuda in that sport. For the hunter, caribou, moose and bear roam through the forest areas.

Newfoundlanders agree that transportation is the key to the solution of their difficulties. The great vacation lands must be opened up. The traditional isolation of the inhabitants must be ended, and easy transportation with resultant interchange of ideas would bring to the people of Newfoundland a newer and brighter outlook.

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John F. Marrett
APPOINTED ASSISTANT TRAFFIC MANAGER

John F. Marrett has been appointed Assistant Manager of the Imperial Oil Traffic Department succeeding the late L. R. Van Wart. A native of Cork, Ireland, Mr. Marrett began his transportation experience in the Old Country and came to Canada in 1913. He was employed in the Sarnia freight offices of the Grand Trunk Railway at various capacities and in 1935 joined the Imperial Oil organization.

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W. E. Kleinsteiber
APPOINTED TRAFFIC MANAGER

W. E. Kleinsteiber has been appointed Traffic Manager for Imperial Oil Limited, succeeding the late Walter H. Dickie. Mr. Kleinsteiber is a native of Hamilton and after public and business college education, entered the employ of the Grand Trunk Railway as chief junior clerk in the Hamilton division freight offices. He advanced to the position of collecting freight agent in Hamilton and in Toronto and was then transferred to the general freight department in Montreal. He resigned from the Grand Trunk Railway in 1912 to join the staff of the Imperial Oil Limited Traffic Department.

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Lee R. Van Wart Passes

Well known in railroad circles in Canada and the United States. Lee R. Van Wart, assistant traffic manager of Imperial Oil Limited, died in Toronto on May 28, following a brief illness.

A native of Detroit, N.Y., Mr. Van Wart was a veteran of the Spanish-American War. After four years with the Standard Oil Company (New Jersey) he came to Sarnia and Imperial Oil Limited in 1911. He moved to Toronto in 1918 and in 1930 was appointed assistant traffic manager. Successor in 1935 to Walter H. Dickie, Mr. Van Wart was to have received official confirmation of his appointment as traffic manager when death came.

The Imperial Oil Review joins with the great number of Company employees who admired and esteemed the late Mr. Van Wart in extending sincere sympathy to Mrs. Van Wart and family.

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GETTING AWAY FROM BUSINESS

A. E. Halverson, Director of Imperial Oil Limited, went down to Gray Rocks Inn in the Laurentian mountains for a brief holiday recently and the day after found himself flanked with familiar signs when a party of the Sportsmen Pilots Association from Pennsylvania and Michigan arrived on their annual air tour. Mr. Halverson, with his back to the Imperial truck, is chatting with one of the organizers of the tour.
SIR HUBERT WILKINS' Search for the Lost Russian Fliers

Photograph by Raymond E. Booth.

SOMEWHERE in the barren wastes of the Arctic Ocean the wreckage of an aeroplane lies buried, and with it the fate of six Russians led by Sigismund Levanevsky. A sequel to two successful flights from Moscow to the United States with single-engined planes, the experts believed Levanevsky's flight in a four-engined plane had an assured chance of success and would secure valuable data on flying conditions in the Arctic.

The expedition left Moscow on August 12th, 1937, to fly across the North Pole to Fairbanks, Alaska. The plane had made a successful passage over the Pole and was 300 miles beyond when a crackling code message suddenly told the listening radio stations on both sides of the Arctic Ocean that the plane was encountering trouble. It said quite briefly, that the plane was flying heavily against a 100-kilometer wind and was losing altitude. Then in a jumble of signals which followed, the last message said, "We are going to land..." No further message was ever received, and no conclusion could be reached as to where or under what conditions the big plane had sighted in the summer ice floes of the Arctic.

The story of the search for the Russian flyers has been graphically related by Sir Hubert Wilkins in "The National Geographic Magazine" by whose courtesy this material is reproduced here. As the world knows, the entire aviation and radio resources in the Yukon, Alaska, the North-West Territory, Greenland and the U.S.S.R. were made available in an effort to establish immediate contact with the flyers and to aid in their rescue. For the first time in aviation history, a rescue party was organized to conduct a search by air in the polar regions.

The failure of Levanevsky's tragic expedition to complete this important flight to Fairbanks ironically enough accomplished many of the things they had set out to do. Many important discoveries were made by those who went in search of the missing flyers—discoveries which years of spasmodic trans-Arctic test flights might never have revealed about the perils and problems to be encountered in the Arctic.

Sir Hubert Wilkins' search extended more than 44,000 miles, most of the flying being done over the Arctic Ocean. Using a flying boat at first and then a land plane equipped with skis, his series of flights in
the Arctic proved beyond any doubt that standard aircraft could handle the rigours of Arctic conditions. The performance of the radio equipment and the accuracy of the meteorological services also confirmed that the conquest in the Arctic is 48 years nearer achievement than was anticipated before the Russian flyers began their experiments in the summer of 1937.

When the Russian flyers were first reported missing, the Mackenzie Air Service sent a plane along the Alaska Coast to check a story from Eskimos who told of having heard a plane on the day Levanevsky disappeared. On August 15th the Soviet Embassy at Washington cabled Sir Hubert Wilkins, noted Arctic explorer, to head a search party. Convinced of the dangers of flying a land plane in the Arctic in mid-summer, due to the melt ice and treacherous landing conditions, he chose a long-range flying boat. He secured a twin-motor flying boat in New York which he felt was most suitable, and agreed to have his party be on route to Edmonton and the North-West, leaving on the 17th. In the crew were Air Commander Herbert Hollrick-Kenyon of Toronto and S. A. Chesniece of Port Arthur, both of whom had accompanied Sir Hubert Wilkins as pilots on an Antarctic expedition. The other two members of the crew were Gerald D. Brown, Engineer, and Raymond E. Booth, Radio Operator. Sir Hubert Wilkins acted as navigator.

Four days after leaving New York the search party had established its first base at Coppermine, 90 miles north of the Arctic Circle and immediately began operations. The fuel tanks of the flying boat carried 1,760 gallons of gasoline which was sufficient for a flight of 3,000 miles. In addition to this supply ten extra drums of fuel were carried in the cabin of the plane to allow an additional flying range of 500 miles. As the plane was taxied out for the first search flight, a leaking oil line was discovered. The sudden change in temperature, which in August was a few degrees above freezing, had loosened some connections and a complete check-up was necessary before the flight could get underway.

On the first flight the flyers learned to their surprise that at high altitudes the temperature was warmer than nearer the ground. This was due to air currents, which are heated in the Tropics and blown toward the Poles. Falling towards the earth's surface in the Arctic, the air cools and drifts back towards the equator. This weather phenomenon made air travel in the Arctic considerably more comfortable than anticipated.

In the midst of one of the flights at an altitude of 10,000 feet, an overflow of gasoline from the drums flowed over the cabin floor. The Eskimo ground crew had filled the drums to capacity, and the reduced air pressure at this altitude caused the gasoline to expand and reach a depth of about two inches. Locking himself in the cabin compartment, Sir Hubert Wilkins worked for two hours sopping up the fuel with old rags until it had been all evaporated. "It was really miraculous," says Sir Hubert Wilkins, "that it had not already caused an explosion." Three flights in all were made from the base, the total mileage being about 5,000 miles.

During their flights which were pointed directly into the region in the Soviet district, radio calls were sent out every thirty minutes in the hope of contacting Levanevsky. Although cloud and fog banks made it difficult to see wide areas of ice fields, the visibility, even at night during August and September in 1937, was generally good. Sir Hubert Wilkins spent most of his time in the air seated in the navigator's cockpit in the nose of the flying boat, wearing four-powered spectacles binoculars. When he spotted a dark object or anything even remotely suggestive of a plane or a tent on the ice below, he used high powered glasses for a closer inspection. With him the entire crew kept a lookout covering their vast network of flights.

On their return to Coppermine after the first series of flights, they decided to move their base to Aklavik, 600 miles West. This change was due in the first place to the fact that the Royal Canadian Air Forces' emergency supply of gasoline had been rapidly depleted by the plane which burned about 77 gallons per hour; and secondly because the new location was better suited for shorter approach flights into the area they wished to search. At Aklavik they also had the advantage of direct air communications with Edmonton.

When they reached Aklavik a representative of the Ethyl Corporation with an emergency supply of Ethyl fluid provided by Imperial Oil Limited was on hand to service the flying boat with the proper gasoline mixture and to formulate the necessary octane rating for the equipment in use. Rigged out in a gas mask, rubber clothes and gloves, his appearance was unusual even for the stances of the Arctic Ocean where styles seem strange to the visitor.

On September 2nd the search party moved over into Alaska to visit Barter Island and re-check the rumours that Levanevsky's plane had been heard in that vicinity. After a short delay the weather report indicated good weather, and a new series of flights commenced. Zigzagging back and forth between 82° and 85° north latitude and 135° to 150° west, they continued the search. A week or so later the ice began to encroach on the surface of the flying boat and it was decided to discontinue the search with the flying boat. During the thirty-day search they flew 13,000 miles over the Arctic.

On his return to New York, the Soviet Government asked Sir Hubert Wilkins to continue his search in a plane equipped with skis. Dick Merrill's trans-Atlantic plane was purchased and flown to Edmonton where it was fitted out with skis. Although considerably smaller than the flying boat, since it only carried two men, this ship had a long cruising range. Sir Hubert Wilkins and Hollick-Kenyon returned to Aklavik on November 25th, taking Allan Dyno, engineer from Canadian Airways and W. R. Wilson as radio operator in place of Booth and Brown. The two-engined monoplane was equipped with skis—on the propeller hubs and also had a radio direction-finder which was used extensively with two long-wave radio direction-finding sets which were put in operation at Aklavik and Point Barrow, Alaska.

The winter expedition did not have favorable flying conditions until well into the New Year. Grounded at Point Barrow, just prior to Christmas, they celebrated a real Arctic Christmas by visiting all the white families for Christmas dinners. On January 12th they were forced to return to Aklavik due to the heavy drifts at Port Barrow which would not allow a take-off with a full load. The plane had also begun to accumulate salty hoar frost which formed a solid coating of ice both on the outside and outside of the plane. This could be removed only by tapping the ice with hammers. To overcome this condition on the windows it was found necessary to fly with them open. Otherwise, the fliers could not see.

On January 16th Sir Hubert Wilkins and Hollick-Kenyon prepared for another cruise into the Arctic. They took off at night into the clear semi-gloom of the full moon in a temperature that registered 61° below and continued their search over another wide area. On their return, engine trouble developed from an accident to one of the propellers and another lay-off was necessary until a new motor could be flown up from Edmonton. It was about the first of March before the engine was installed and ready to try. To test the new engine a complete inland search was made out across the Richardson and Brooks Mountains in Alaska—an area into which the Russian plane might have flown if there was any accuracy in the stories told by the Eskimos of Barter Island. Bad weather delayed further flights until March 10th when an eleven-hour flight was made and this one was followed up by another flight on March 14th which proved to be the least and most informative of the entire search. They were in the air for nineteen and a half hours and covered 2,500 miles in a search which carried them to within 200 miles of the North Pole. Two more flights were anticipated but before suitable flying weather was obtained the Soviet Government had decided to give up the search and asked them to return to New York.

During the six months' search the Wilkins' flights covered 44,400 miles without any mishap or failure on the part of his equipment. In giving up the search Sir Hubert Wilkins stated that he and his companions "sincerely regretted" that the search did not succeed in locating Levanevsky and his companions. "Their efforts—perhaps more than those of any others," said Sir Hubert Wilkins, "will inspire the development which will eventually open the shortest routes for aerial transportation between the big cities of the Northern Hemisphere."

INTERNATIONAL DAY ON THE PRAIRIES

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International Day in Swift Current, Sask., sponsored by the Kinetic Club, is an annual event when crowds throng the city streets with thousands of visitors. These photographs supplied by the courtesy of the Swift Current Sun show (above) a part of the crowd watching the parade: an African kabib (left) which marked a merchant's stand and a desert scene making a bank building.

SUMMER, 1939
MAN-MADE RUBBER... (Continued from page Fifteen)

But production of natural rubber is a slow and
prodigious feat for the white man. In Ceylon and
Sumatra, in the valley of the Amazon, he has cleared
jungles, set out plantations, and educated natives to
cultivate the rubber-bearing Hevea Brasiliensis tree.
Then, he waits five to seven years while the large
grainful tree matures and he can harvest the sticky
milky fluid that comes from the latex vessels fused
between the inner wood and the outer bark of the
trunk. This fluid is mixed with a fungid and pure
rubber rises to the top to be scooped from a vat and
hung out to dry for a week or ten days before being
shipped.

This slow process was satisfactory as long as rubber
had little commercial value, but with Goodyear's dis-
covery, science interested itself in solving the problem
of making it artificially. First to discover the basic
hydrocarbon of rubber was a Frenchman, Bouchardat.
Through the destructive distillation of natural rubber,
he obtained isoprene which he in turn polymerized.
This action converted the isoprene into a rubber-like
material, thus establishing as a fundamental in the
manufacture of synthetic rubber the polymerization
of the isoprene.

Work based on Bouchardat's discovery, however,
was slow until Germany succeeded in producing a
small amount of synthetic rubber at a very high unit
—during the World War.

This product had an unpleasant odor and other
defects which made it a poor substitute. Following
the war, other European nations jumped into the im-
provement of artificial rubber with varying successes.
Of the "made at home" efforts, Edison's Florida
Golderd (in which Henry Ford is now interested)
has been highly publicized and moderately successful.
But with Dr. Patrick's discovery, scientists on this side
of the Atlantic began producing artificial rubber at a
rate now reaching thousands of tons annually. Prices
of cradle natural rubber are at low levels, and synthetic
rubber at the present time costs a few cents more a
pound to produce. However, the product does not
always enter into competition with natural rubber, for
certain physical characteristics make it superior for
many special uses.

Chief among the merits of man-made rubber—
aside from the fact it can be made in five hours—are:
(1) It does not swell and deteriorate when used with
gasoline and oil, and, (2) It resists the corrosive action
of electric corruents. Man-made rubber has proved so
satisfactory that fuel lines in some modern automobiles
are made from the new substance. When automobile
manufacturers streamlined the rear of cars, the use
of synthetic rubber permitted the filler neck of the gasoline
tank to be transferred to the left rear fender. The in-
flammability of natural rubber has always been an
undesirable property in the manufacture of electric
cable shielding because short circuits may set it afire.
Because man-made rubber will not burn, it has been
welcomed by the electrical industry.

Soft rubber washers and gaskets require consider-
able time to fabricate, and great care must be taken
to avoid porosity and puck-marking during processing.
And, of course, they rapidly deteriorate in universally
used solvents. Only three minutes are needed to mold
a glossy, smooth oil-proof man-made rubber product.
This artificial product is also playing an important role
in the air for it is now a U.S. Army Air Corps specifi-
cation for all fuel hose. The U.S. Navy uses man-made
rubber fabric for lighter-than-air craft gas cells be-
cause it is 25 times better than the finest rubber for
preventing the escape of helium.

The manufacture of synthetic rubber is equally as
interesting as the story of its discovery. From large
storage tanks several hundred gallons of ethylene
dichloride and sodium polysulphide are separately fed,
by gravity feed, into mixing vats. Four four hours
the two chemicals are thoroughly mixed in the pres-
ence of a catalyst, both by their own interaction and
by constant internal agitation. A gummy mass forms
which is water-washed free of the excess polysulphide
and the sodium chloride which is formed during the
process. Acid is then introduced into the washed
deposit, causing it to coagulate into a rubber mass.
A layer of the man-made rubber 18 inches in depth
and 8 feet in diameter is obtained from a single vat.

A cracker mill removes moisture and breaks the
material while a second mill further refines and forms
it into sheets similar in appearance to crude natural
rubber. In producing different materials of individual
characteristics a variety of compounding agents is used.

At present synthetic rubber is but an infant in swaddling
clothes. Some day, perhaps sooner than many of us suspect, it will emerge to play a much more
important part in our everyday life.

PETROLEUM AIDS CHEMICAL INDUSTRIES

Year by year the chemical substances processed from
refinery gases have increased until the list includes
hundreds of compounds. These are used chiefly as
basic materials for organic synthesis by the chemical
industries. Besides the varied substances that are in com-
mmercial production, petroleum chemists have created
many other products in the laboratory which will be
produced commercially when and if research chemists
can utilize them. Samples of these compounds are
made available for experimental work in other in-
dustries.

SAFETY BEGINS HERE...

As trains roar through the night the safety of
hundreds of passengers is dependent on the steady, continuous burning of thousands of
railway signal lamps. Imperial L.T.B. oil (Long Time Burning) is refined specifically for
this purpose and every batch is carefully tested in Imperial Oil laboratories before delivery
to the Canadian railroads.