REGINA REFINERY INCREASES PRODUCTION OF AVIATION GASOLINE

Under program of plant expansion capacity is raised from 7,000 to 9,500 barrels of crude oil per day

AN EXTENSIVE building program, quietly underway since 1941 has increased the crude refining capacity of the Imperial Oil Refinery at Regina from 7,000 to 9,500 barrels per day and has made a large increase in the production of aviation gasoline, so vital to the war effort.

The extension program is complete for the moment but as a postwar measure it will be carried further when an additional crude tower and furnace will raise the capacity to 12,000 barrels per day.

The latest developments in petroleum technology are embodied in the design which makes the Regina Plant one of the most modern in the industry. All of this new equipment is designed to process Turner Valley crude.

Automatic operation of the units from the central control room insures manufacture of constant quality aviation gasoline, motor gasoline and fuel oil meeting required specifications. Another feature is the waste heat boiler which supplies steam to drive the large number of pumps and compressors. This makes for economy by recovering heat which would ordinarily be lost to the smoke stack, changing it into useful energy.

Aviation gasoline is a selected fraction of crude oil usually contained in motor gasoline. In the naphtha reforming section of the new equipment the remaining heavy gasoline fraction in itself unsuitable for motors, can be converted into high quality gasoline suitable either for certain grades of aviation gasoline or high octane motor gasoline through high temperature thermal cracking. By this process the heavier fraction is cracked in the furnace at high pressure and temperature of 1000° F, then distilled in the largest tower which is 10 feet in diameter and 100 feet high. The high yield of gasoline obtained is further stabilized to remove objectionable light ends and then refined before being marketed.

The absorption and stabilizing section recovers gasoline from refinery waste gas which would otherwise be used in firing the furnaces. This further increases the yield of gasoline from the crude than was obtained previously and will assist in the present critical shortage of gasoline brought about by the large increase in consumption of petroleum products for war purposes.

The third section of the new equipment is the Catalytic Polymerization Unit. This process is one of the more recent developments and establishes at Regina one of the first Catalytic conversion processes. While cracking converts heavier crude oil fractions into lighter gasoline and gas the Polymerization process converts the large part of the gas back to gasoline. The Polymer gasoline is obtained by passing the gas through reaction tubes containing solid catalyst at high pressure of about 1000 lbs. per square inch and a temperature of about 400° F under very closely controlled operating conditions. Gasoline obtained from this process, in addition to raising the amount obtainable from crude oil is of a higher octane value than gasoline obtained by distillation or cracking and is also suitable for certain grades of aviation gasoline or of a superior quality for high octane motor gasoline.

In promoting the war effort through increasing the available supply of aviation gasoline, motor gasoline and farm fuels with their program of plant expansion, Imperial Oil Limited has shown its confidence in the future of the West.
OIL FROM THE ARCTIC

By OLIVER S. HOPKINS, PH.D.,
Chief Geologist, Imperial Oil Limited.

LOCKED deep in the wilderness in the Canadian North West Territories, only a few miles from the Arctic Circle, four long oil wells for years gave mute testimony to man's intrepidity in his search for the world's mineral wealth. Near a settlement marked by a pinpoint on the map, and known as Fort Norman, these wells yielded a mere trickle of oil, by the standard of American oil fields. From the time the first well was drilled in 1929 until the summer of 1942 they did their work faithfully and unremarkably. Oil men the world over knew of their existence but regarded them largely as little more than an indication that oil existed in this very remote Arctic country.

Yet these four wells, operated for years merely to meet the small petroleum needs of Trappers, miners, an occasional airplane and river boats, were to become the nucleus of one of the world's most unusual oil fields; a field which was destined to grow in a matter of months not only in size and productivity, but to a position of international significance. These wells and their companion wells drilled since the late summer of 1942 are the source of crude oil for the now famous Canol Project, one of the most dramatic and interesting developments in the ever fascinating history of the oil industry.

"Canol" is a coined word, an abbreviated linking of "Canada" and "Oil." Born of military necessity, and pushed forward against almost insurmountable odds by the teamwork of military and civilian authorities, the Canol Project is today ready to produce oil which tomorrow will help fuel the planes, ships and military and naval equipment used in the increasingly important Alaskan theatre of war.

Back in July of 1919 a party of eight geologists and drillers of Imperial Oil Limited left Edmonton on the long trek to Fort Norman, reaching their destination in September. Here they prospected the region in which the hardy Root explorer, Alexander Mackenzie, had reported oil seepages a hundred years before. Five of the group held up

to materialize. Production was limited to a few thousand barrels of oil per year and by 1924 only six wells had been drilled, three of which were producers. A small refinery had also been constructed; but the market continued to be so restricted that in the same year the wells were capped and the refinery shut down.

By 1932 a new chapter in the history of Norman Wells opened. Rich mineral deposits had been discovered at nearby Great Bear Lake. River traffic mounted. River boats required gasoline and the mine machinery needed fuel oil. So the wells and refinery were re-sited and production resumed. The field lies in a muskeg-bleak hummocky country of tremendous distances and vast areas untouched by man. The "routine" of oil deliveries was anything but routine at first. Barrels were loaded on wagons and hauled to the river's edge by dog teams. Barge facilities were inadequate and had to be constructed. The Bear River rapids barred one delivery route and an eight and a half mile pipe line—one of the first product pipe lines in history—was built to circumvent them.

The following year the refinery was improved and a seventh well drilled. That year, too, equipment was installed to refine aviation gasoline. The airplane had begun to play an increasingly conspicuous and significant role in far north transportation—and Imperial's men made the first flight into the valley of the Mackenzie.

Geographically, the marketing area in this region

Drilling for oil in a bleak sub-arctic swamp. This is one of the many new wells being drilled in the Norman area.
To the military mind, trained to deal with realities as well as provide against contingencies, the answer was obvious—a road to Alaska and a source of fuel independent of the sea. The twin results were the Alaska Highway and Canol Project.

Virtually overnight Norman Wells, the only proved source of oil in the Great North West, became of vital military importance. To its one hundred odd customers there was added a new one, the United States Army.

Late in April, 1942, officials of Imperial Oil Limited were summoned to Washington. There the Army outlined a plan for building a pipe line from Norman Wells 600 miles across the Mackenzie-Yukon divide to White Horse on the Alaska Highway, where it was proposed to build a refinery for processing the oil into the needed products. Crucial questions were how much oil could be produced at Norman Wells and how soon. The Army might need a lot and in a hurry. As the only commercial producer of oil in this region and with years of experience behind it, the Army looked to Imperial Oil for the answer.

The answers which had to be given were not too encouraging. The actual potential of the Norman oil field was not known because peacetime markets had not justified the drilling that is needed to determine an oil field’s extent. Furthermore, the existing wells had been operated only during the short summer season and out of four potential producing wells only three were actually in operation. It remained to be seen how the oil pool would behave under conditions of year-around operation with a greatly increased number of wells. In the conservative judgment of Imperial’s experts, the chances of meeting the Army’s requirements could be considered only fair. In addition, still other difficulties loomed—namely, the problem of securing personnel and equipment under wartime conditions, plus the further problem of transportation over primitive and inadequate facilities within the prescribed time limit. About the only definitely known favorable fact was that Norman oil will flow at temperatures as low as 70 degrees below zero, which meant that there were no serious obstacles to all-year operation or pipe line distribution even under the rigors of the Arctic winter.

Having outlined the difficulties, Imperial Oil pledged its full cooperation, experience and facilities to the event that it was decided to go ahead. On May 1st, the U.S. Government executed a contract with Imperial Oil Limited in which details of Imperial’s participation in the Canol Project were set forth, including the drilling of new wells and production of oil within a few months at many times the rate ever experienced or anticipated in the past.
22 years of Norman Wells history. Under this contract the Army will obtain oil at prices comparable to those prevailing in the United States. Immediately Imperial began the task of recruiting men and supplies—draining some of its other Canadian operations for the former and aided in the latter by special priorities. There was no time to be lost because winter descended early on Fort Norman and the waterways which had to its southern Canada.

When househoders in Canada are beginning to think of flitting on the oil burner switch, the Mackenzie River is frozen and the initial blasts of winter have swept down from the bleak Arctic Circle. There was much to be done between that day in May and the day when the first icy winds would herald the onset of another trying season.

Work was begun simultaneously on various phases of the Canal Project by U.S. Army engineers, private contractors and Imperial Oil. By June a camp and loading facilities had been built at Waterways, the railroad 300 miles toward the polar regions from Edmonton. From that point it’s a 386-mile haul down the Athabasca and Slave Rivers to Fort Fitzgerald. Then comes a 16-mile portage necessitated by a series of rapids. The next leg of the journey from Fort Fitzgerald to Norman Wells calls for a 195-mile jaunt down the Slave River to Great Slave Lake, followed by a 125-mile trip across the lake to the head of the Mackenzie River. Final lap is a 550-mile trip down the river to Norman Wells.

That is transportation the hard way; no shiny rails of steel, no smooth concrete roads. River, portage, river, lake and river again!

The bare chronology of what happened in the fleeting months after May 1st is perhaps the most eloquent tribute to the amazing speed and efficiency with which the Army and Imperial working in close cooperation did an enormously difficult job.

By May a contract was signed in Washington. By the middle of June freight was flowing down the waterways bound for Norman Wells. On July 17th the first new well was brought in. By January, 1943, new producing wells had met the Army’s original oil requirements, although it had meant pushing drilling operations through the bitter cold, snow and storms of winter.

But the story doesn’t end here. As soon as it became apparent that oil could be produced in considerable quantities the Army raised its objectives many times the initial quota and Imperial today is hard at work to meet it.

The area of the Norman discovery has proved far larger and more productive than was anticipated. Instead of being limited to a few million barrels, it is on the order of a major oil field—no East Texas to be sure, but comparable to the average major field in the United States.

Since January of this year additional wells have been drilled, including a number of dry holes. In addition it has been found that a large portion of the oil structure lies beneath the river.

This fact, coupled with conditions peculiar to the area, has posed a new challenge to Imperial’s oil men, making the maximum recovery of the field’s potential a real problem.

Additional areas have been obtained from the Canadian Government and exploratory drilling is now being carried on intensively in the region surrounding the discovery well, where the pioneering geological work by Imperial in years past had located promising structures.

In the meantime, an important reservoir of oil lies beneath capped wells waiting for the completion of the pipe line to White Horse. Imperial took no part in construction of this line or its terminal refinery. Construction crews working ever since last summer and through the winter from White Horse at one end and from Norman Wells at the other have made considerable progress. In so doing, Army engineers and workmen employed by private contractors have wrought a truly heroic saga. Roads have been blasted through the wilderness, airfields have been built, winches and loading facilities constructed until today the Fort Norman area is no longer linked to civilization by water route alone.

When the Canal Project is completed, oil will flow to Alaska secure from any possibility of attack that might threaten the oil fields and the normal route of supply by seaway and tankers.

It is a question what the end of the war will mean to Norman oil. Expanded only to meet needs, the peacetime future of the field will probably depend on the peacetime development of the great Canadian Northwest.

On today’s cars there are as many as 34 different parts which require specialized lubrication. The choice of the modern automobile is one of the best examples of grease lubrication. To THE lubrication engineer “grease” means something quite different than to the rest of us. We recognize it as something necessary to prevent wheels from squeaking—and to keep oil out of our clothes. The expert knows it must be blended as carefully as a prescription.

Grease is essentially a mixture of soap in oil. Oil is incorporated with soap and, depending on the kind, the soap either disperses into such tiny particles that they cannot be seen under a microscope, or forms small but definite sized fibres. The purpose of the soap is to reduce or eliminate the tendency of oil to flow. The oil in grease does the lubricating, the soap holds the oil in place.

Greases may be semi-fluids or hard, rubbery stringy solids. A grease may be so transparent that it may be smeared on a piece of newspaper and the print read through it. It may be translucent or opaque. Some greases are black as pitch, others white, brilliant red, yellow or practically any color of the rainbow.

Some greases are made to repel water, others to mix with it. Some will melt at less than 100 degrees F; while others defy 450 degrees. They may contain natural or synthetic rubber, wool waste or wool yarn, horse hair, graphite, mica, asbestos or tallow. The soups dispersed in the oil may be made from various animal or vegetable fats and oils and such metallic alkali as sodium, calcium, aluminum, lead, barium etc.

The forms into which greases are made are as varied and interesting as their characteristics. "Cooling sticks," and "grease blocks" are examples. Cooling sticks are about eight inches long for easy handling. No train crew would think of starting out without a supply of them to keep a locomotive or car on the rails after it develops a "hot box"—an overheated journal. The stick acts as an ex-
different parts which require specialized lubrication. The bearing types range all the way from plain pins and bushings to precision anti-friction bearings functioning under various conditions. For instance, shackles and king pins are exposed to dirt and water, wheel bearings are subjected to high temperatures and the water pump requires a grease that can keep hot water in as well as lubricate the bearings.

HISTORY

The business of making greases has a long and interesting history. Not long ago a chemist in the Cairo Museum reported that deposits taken from the axle of a chariot used about 1400 B.C. proved to be a crude type of lime soap. In 1775 John Larder combined a mixture of white or red lead with "drying oil" to make a "grease for friction-preserving iron, steel and other purposes." Sixty years later, what was probably the start of cup grease manufacture came to light in the Partridge patent which covered "a composition paste . . . as an anti-friction, applicable to the bearings of wheels and machinery." It was made by mixing lime water with whale oil, olive oil or tallow. From 1850 to 1860 German railway wagon wheels rolled along on greases made of lead oxide, rape seed oil and water.

The first to make grease from a mineral oil was William Little of England who in 1849 distilled crude petroleum to make lamp oil and mixed the heavy residual oils with a soda soap of tallow and boiled the mixture to make a soda soap grease "suitable for lubricating machinery."

The first mention in England of lime-base mineral oil greases may be found in the patent application of Richard A. Brossman in 1857.

The year 1865 really marked the beginning of large scale grease manufacture in America. At this time Carl Daimler had just built his high-speed gas engine. Karl Benz was driving his three-wheeled horseless carriage, and some 3,000 oil wells had been drilled since Col. Drake's successful effort at Titusville.

Let's step back into a steel mill of that period. The machinery was equipped with plain bearings and simple, spur-type gears. It was slow moving and was lubricated with animal and vegetable fats—necessary but provoking, unsatisfactory and evil-smelling. Little or nothing was understood about the need for a continuous load-carrying oil film. Bearings burned out with disheartening frequency and there arose a cry: "Isn't there any lubricant that can take it?"

A young Scotch lad named Grant McCargo, a trained chemist from Cornell University, was working in a steel mill at the time. In his free hours he experimented with mineral oils and soaps and before long developed a mineral oil grease that proved far superior to the available fats. Demands for his new product grew so swiftly that McCargo quit the steel mill and formed the first company in America to engage exclusively in grease manufacture. The grease he developed for the steel mills was the first "cold set" grease and it offered protection against heat and water, the hug-bears of earlier lubricants.

TYPES OF GREASES

Greases may be classified as Lime Soap Greases, Soda Soap Greases, Aluminum Soap Greases, Mixed Soap Greases, Cold Sett Greases and Residue Greases.

Each of these types of greases is compounded with an eye to some particular use. Lime Soap Greases, for example, are smooth buttery products that repel water and can be used in wet locations such as water pumps, etc. at temperatures under about 160°F. Lime soap grease breaks down and separates into soap and oil at temperatures approaching 212 degrees and thus permits the oil content to flow out and be lost.

In contrast, the soda soap greases offer adequate lubrication at temperatures as high as 450 degrees F. and are particularly adapted to locomotive journals and steel mill service where high temperatures are encountered frequently. Soda soap greases also have wide application on exposed gears and high speed ball and roller bearings. Until recently soda soap greases were always fibrous in character, the fibres consisting of oil swollen terephrils of soap. Imperial Oil chemists have developed a method whereby the size of the fibres may be varied as best suits the application and use of the grease. Thus the smoothness of a lime soap grease may be combined when desired with the high melting property of a soda soap grease. Fortunately, most sofa base greases mix readily with water and cannot be used under wet conditions. In fact, many garage workers use a soda grease for a washing soap. Aluminum soap greases are clear, transparent greases very similar to lime soap greases in their properties. However, aluminum soaps permit the easier use of high viscosity oils in grease making. Consequently, aluminum soap greases are used where high viscosity oils are required in wet locations such as shackles of motor cars and under-water bearings on motor boats.

Mixed soda and lime base greases are intended for service where conditions prohibit the use of either a straight lime or soda product. High speed bearings operating in the presence of water, for example, need a lime base grease to resist the water, but the high rotational speed and temperature require a soda grease. The compromise grease solves this problem.
problem. Soda-lime soap block greases are commonly used to lubricate steam heated calender rolls in textile and paper mills where moisture and high temperature are always present.

In the manufacture of the above greases, the soap is made separately and then incorporated into the oil. Heat in varying proportions and temperatures is required in making the soap and during the mixing of the soap and oil. Some soda greases require temperatures at 460°F. in their manufacture which calls for "fired kettles"—kettles heated directly by means of gas burners.

Another class of greases are made at the relatively low temperature of about 130°F. This class also differs in its method of manufacture in that the soap particles are formed "in situ", that is in the grease itself. The fat, alkali and oil are mixed together. The fat and alkali react to form the soap right in the oil. Greases made by this method are called "cold set greases."

Any alkali or fat may be used in this method. Almost 95% of the cold set greases are made with lime as the alkali and rosin oil as the fat. These greases are sold to a large extent as axle greases. Comparatively inexpensive and water-resistant, cold set greases find wide use on agricultural equipment and rough, slow-speed bearings. They are also smeared along curved sections of railway tracks to reduce friction and wear of wheel flanges.

Residuum greases are heavy, tacky materials applied to exposed large gears, wire ropes, cables, etc. and are composed essentially of asphalt.

Many other greases are made at Sarnia for special purposes. For example, wool or horserail may be mixed with greases to hold the grease in place against spur gears. Graphite is added to some greases and mic to certain axle greases. Other greases may have addition agents added to them to give increased oiliness or extreme pressure properties.

MANUFACTURE OF GREASES

Until relatively few years ago grease making was an art. While the business of stirring hot soap into hot oil is very simple, to do it in such a manner as to form a grease is not simple. Long experience was needed by the early grease maker to learn the tricks and once learned they became his most precious secrets. Consequently, grease making re

A PICTURE STORY

These four pictures show steps in the manufacture of lime soap grease in the Grease Plant of Imperial Oil Limited at Sarnia. In the picture above the operator is dumping lime, one of the soap ingredients, into the pressure soap kettle. The other soap ingredients are fatty acid, and mineral oil.

1. Spontonification complete, the soap-oil mixture is dropped into a grease kettle below. Here oil of the desired kind is run into the kettle and stirred into the soap by large motor-driven paddles. The kettles have double walls between which water can be circulated to maintain any desired temperature.

2. Once an art shrouded in mystery, today grease making is a scientific operation. In the control panel above automatic instruments control the measuring of the liquid ingredients, such as soap and oil, the temperature in the kettle, etc. is controlled from this panel.

3. After the grease has been formed, it is run from the bottom of the kettle to be packed. Before entering the main device a powerful pump forces it through a strainer. Some greases are packed in large drums, as in the photo above, others in smaller containers.

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**THE FLOW DIAGRAM**

This diagram shows the essential steps in the manufacture of three of the several types of greases made in a modern grease plant. Each type of grease is compounded for some particular use. Lime Soap Grease, for example, uses water and can be used in wet locations such as water pumps. Soda Soap Greases withstand high temperatures, such as encountered in locomotive journals and steel mill service, while Cold Sett Grease find wide use on agricultural implements and rough, slow-speed bearings.

Grease is essentially a mixture of soap in oil. The ingredients are placed in a large kettle and mixed under precisely controlled conditions until the grease is formed. The batch of grease is then pumped from the bottom of the kettle into drums or other containers. After cleaning, the kettle is then used to make another batch of the same or another type of grease.

**LIME SOAP GREASE**

Lime Soap Grease of various consistencies are made by mixing quantities of lime soap with selected oils. The soap is made first. This is done by stirring and heating slaked lime and animal fat and a small amount of mineral oil in a pressure kettle. When the soap is formed, the pressure in the kettle blows the soap through an opened valve into a grease kettle on the floor below. Oil is run into the grease kettle and mixed into the soap. Automatically controlled steam in the double walls of the kettle maintains the desired temperature. The quantity of oil flowing into the kettle is also automatically controlled by instruments on the control panel. After the final batch is completed, cold water (instead of steam) circulated between the kettle walls cools the grease. When the temperature reaches about 200°F, a small but very necessary amount of water is added. This prevents the soap and oil from separating at room temperature. Once the water is incorporated, the grease is pumped from the bottom of the kettle through a strainer into drums or other containers.

**SODA SOAP GREASE**

Soda Soap Grease is made in essentially the same way as Lime Soap Grease with these exceptions: the soap is made directly in the grease kettle and is made with lye instead of slaked lime. No water is added in the final stages.

**COLD SETT GREASE**

Cold Sett Grease is a lime soap grease in which resin oil takes the place of fat. The grease will form at moderate temperatures by simply mixing a mixture of resin oil in mineral oil with salt. This salt is an emulsion of lime and a little mineral oil in water stabilized with a small amount of resin oil. The resin oil-mineral oil mixture and salt are simultaneously passed through a small mixer and then into the container in which the grease is packed. The grease is in liquid form at the time of being run into the container, but in a very few minutes becomes a solid.
The degree of stiffness of a grease, known as its "consistency," depends to a large extent on the kind and amount of soap present. It also depends on such factors as the temperature at which the grease is poured into the packages, the rate of cooling, storage temperature and the amount of subsequent handling of the grease. Since grease becomes softer or has a lower consistency when "worked" the consistency of a grease is frequently measured in the worked and unworked condition. The consistency is measured by means of a

made in the soap kettle is dropped into the grease kettle, oil of the desired kind is run into the kettle and stirred into the soap. As the oil is run into the grease kettle, the temperature falls from an original 300°F to about 180°F when mixing is complete.

If the mixture of soap and oil is cooled below 200°F the soap crystallizes from the oil in large masses. To prevent this a small quantity of water is stirred into the grease when its temperature has fallen to about 220°F. This causes a smooth satisfactory grease to form. The Grease is run from the kettle into packages.

Lime soap greases are smooth and buttery in appearance. They range in hardness from a semi fluid to a hard solid depending on the soap content. Since water is necessary to produce lime soap greases, these greases can be used in wet locations without harming the grease. In fact lime soap greases resist the entrance of water to a bearing. The temperature at which lime soap greases melt, known as the "dropping point," is dependent on the amount of soap present and is never higher than about 210°F.

The soap for Soda Soap Greases is made directly in the grease kettle instead of in a pressure soap kettle as is the case of Lime Soaps. The method of manufacture is essentially the same except pressure is not used and a lye solution (sodium hydroxide) is used in place of lime. After stirring for two hours at 280°F to 300°F, the saponification is complete. The grease is made by running the desired oil into the hot soap at such a rate that all the oil is added when the temperature has dropped to 280°F. Water is not added to soda soap greases.

Aluminium soaps are made by reacting aluminium sulphate with a sodiun (soda) soap. The aluminium replaces the soda in the soap. This process is carried out at Sarnia in the making of fluid aluminium soap greases which are perhaps more properly defined as soap thickened oils. These thickened oils are stringy, tacky substances used in the lubrication of relatively slow moving, low temperature gears such as may be encountered in lumber mills.

The harder grades of aluminium soap greases are made at Sarnia from aluminium stearate, a soap purchased outside the refinery. This is mixed with the desired oil in the usual manner and then run while still hot into shallow pans which permit rapid cooling. Slow cooling causes a soft product to result.

Cold set greases are lime soap greases in which resin oil is used rather than fats of fatty acids. Rosin oil is a product produced by distilling the resin obtained from crude terpentine of pine trees. The method of making set greases is quite different from the methods described above. Rosin oil is dissolved in the desired mineral oil in one tank. A mixture of lime and water to which a small

(Finished on page 21)
petroleum-powered farm families, the rugged tractor, the combine that can cut through a field of wheat in 8 hours, and the machinery that allows farmers to harvest crops more efficiently than ever before. More than any other factor, these machines have helped to transform farming from a slow, low-production, man-hour-consuming handcraft to a fast, efficient, high-yield industry.

The best example of the man-power conservation effort was the 1943 Goodfellow combine, an eight-man tractor. Instead of the enormous stock of grain, ten tons, eggs, butter and cheese that promised the Canadian 1943 baker, three men might be smaller and less frequent meals were planned and planned the work so that the cost of grain production has been cut approximately 60%.

One of Mr. Farmer's first chores is to start up the corn-burning "shochumine", stock tank heater — his cows and stock may drink properly sanita-
ed water and keep up their pace in milk production. To help Canada attain that quota of 320,000,000 lbs. of cheese, and 130,000,000 lbs. of evaporated milk. If it's early in the year, Mr. Farmer might next give his attention to kernelo-warmed incubators and brooders, with their occupants all eagerly wait-
ing their turn in the work of laying that astronomical quantity of eggs for 1943. Out in the barn, the farmer might have a gasoline-powered unit to operate a hammer mill, grinders, choppers, a hay mixer — all helping to keep the stock and poultry fed with meat, milk and eggs producing far more efficiently.

Later on in the day, after the milking, Mr. Farmer may start up his gasoline-powered separator which will skim the cream from 2,000 quarts of milk in an hour — an important cog in that bigger machine which has to churn 122,500,000 lbs. of butter a year. In addition to his separator, Mr. Farmer has a gasoline-powered pump which is a more likely to be the farmer's own particular depart-

Thousands of Canadian farmers rely on Imperial lubricants to keep their equipment operating longer and more efficiently.

The last word in farm-saving farm equipment, one-man well-propelled combine and thrash feed grains to one operation.

On his permit, he must prove he needs the machinery and cannot put existing equipment back into service.

Yielding this situation, the farmer must be on the quit now to keep his present machinery in top working order. Tractors and other gasoline or diesel power plants should be lubricated frequently and Imperial Oil service men and agents have been train-
ed to advise farmers in how to keep their motors functioning at peak efficiency as long as possible without replacement. All Imperial Oil field men have charts showing not only the correct types of oil for all makes of tractors and diesel-powered sources of motive power, but how, where and how often each type of machine should be used. They even supply petroleum products for home drawn equipment—each growers to keep wagons running smoothly, harass oil to help retain the flexibility and strength of leather and postpone the purchase of new harness. Then there are special oils — cream separator oils, suitable for high-speed machines, penetrating oils to remove rust and relearn another equipment for service. With proper lubrication and a little common sense care and atten-
tion, many farmers should be able to keep their machinery in the production line.

Imperial Oil agents also help the farmer get the most out of his implements and machines by provid-
ing him with a copy of the book "Farmer in Work" — a guide to the operation, adjustment and general care of the various items in the farm mechanical department.

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"I was on the Canadale"

By W. Williams, 2nd Engineer

Editor's Note—Bill Williams, 2nd Engineer on the Imperial Oil tanker the "Canadale", reached Canadian shores on 19th July and is expected to stay here for two or more years in a German prison camp. In this story he tells of the capture of his ship and of his life in the Camp.

We asked Bill what his plans were now that he was home. He said, "I'm going to have a lot of rest, then go to the Government school and try for my first engineer's papers—and then I'll catch the first Company boat and go back to sea."

I T WAS on the morning of our third day out of Freetown that it happened. We were plugging along and all hands were on the alert for any sign of enemy ships. We had an idea there might be trouble from reports we had heard in Freetown of enemy activity. The skipper had swung south—off the course of the regular run—to try to avoid any Nazi ships that might be looking for us. We were travelling alone, without convoy.

I was down in the engine room when I heard the gunfire. Down there I couldn't be sure whether or not it was one of our four-inch guns that was firing. I sure hoped it was! Then came the alarm—"abandon ship."

When I reached the deck I could see a ship about a mile or so away to starboard. She was a German raider, a converted cargo ship. I heard later she measured an eighty-inch gun and was equipped with torpedo tubes. She was capable of doing from 20 to 25 knots.

Taking to the boats, we pulled away from the Canadale. Everyone expected the reactor to finish off the tanker—and we were a pretty sick lot. But the German captain had other plans. Putting out launches, they picked up and put all the crew but the captain and three other officers back aboard. The four others they took aboard their own ship. Then, under armed guard, we got under way again.

We sailed north and finally docked at Bordeaux, where we were put aboard a train. It was a pretty tight squeeze—we had to sit three in each car designed for two. I had heard the jokes about the box cars of the last war which were labelled "40-bombers—8 chevrons." Well—they were still in operation. We had them on our train.

At first the guards were fairly lenient, and we sat in the shades and stretched out on the floor to ease our cramped muscles. Then, one of the staps, three or four chaps tried to escape. I'm sure they wanted to, but they couldn't get away, and on this we had to sit right on the seats so the guards could move up and down the aisle easily as they counted us.

We were four days on the train, and were beginning to wonder if the ride would ever end. Finally, we were taken off and marched to the camp. Captain Ferris and the others joined us some time later. They were on the tender for some time. We heard later that this same raider was the one that sank the R.M.S.A.S. Sydney. According to the German papers, both ships went down in the fight and only about half a dozen men from the two ships were saved.

Our camp was a seaman's camp about 14 miles from Bremen. Taking all in all, we weren't too badly off. We slept in bunkers lined with straw—16 officers or 18 ratings to a room. There was a full sized playing field where the English boys played soccer and cricket, and where we played softball when some balls and bats reached us from the Y.M.C.A. in Toronto. We actually got up a softball league with eleven teams.

I can't say too much in praise of the Red Cross and what they did for us. Under the Geneva Convention we were supposed to be fed the same rations as our guards. In reality we ate better than the guards, due to the Red Cross parcels which arrived regularly. The Red Cross parcels were sent to us with food and medicine and later with clothing.

When people ask me how we were treated, I usually reply by saying that we weren't treated at all. Outside of the regular roll calls, and the irregular calls when some of the boys managed to slip away, the guards left us pretty much to ourselves. At first we had younger soldiers as guards, and they were pretty tough. We soon learned to keep out of their way. But during my last year in camp all the young guards were moved away—I guess for service in Russia—and veterans of the last war took their place. They weren't nearly so tough. Their attitude was, "Just behave yourselves and we'll leave you alone."

I mentioned that some of the boys used to try to escape. They'd get away all right, but only for a while. They were always picked up and brought back. Some of them got as far as some of the occupied countries, but the people there were too scared to hide them.

Being only 14 miles from Bremen, we could see the night raids which the R.A.F. stage. From this camp we'd hear the hark of anti-aircraft fire and the heavy "crump" of bombs. The searchlights used to look like a row of picket fences against the sky. While I was at the camp I saw one daylight raid—l think it was by the Flying Fortresses. They were so high they looked like stars in the sky.

At first we had only two ship's doctors to look after our health and they did a swell job. Later we got more doctors and surgeons, as they took more ships. The Red Cross furnished the medical supplies and apparatus for the operating room.

There is no lack of medical care.

There are several Catholic priests captured on a South African ship, a Church of England padre and a Salvation Army chaplain. There is a Catholic church erected on the camp.

The big interest in the camp is the arrival of the private parcels and the Red Cross boxes—and the letters from home. We are always worried about home and the folks there.

On June 15, this year, one hundred and four of us were instructed to have our belongings packed and to be ready to go at 10.30. None of us knew where we were going. There were rumours that we were going to be exchanged, but the Germans would give us no explanation. For eight days we were held in a detention camp.

The waiting and suspense was terrible. Then one day we were sent to Bremen, and four and a half days later we reached Lisbon. I was lucky enough to get a seat in a Yenise to London, where I had to wait almost a week for a ship. Three other chaps came with me to England, Milton Holmes, 3rd engineer, and Vincent Totty, junior engineer, both of Trenton. The fourth ship was an English lad who is going to live in Sydney.

My ship docked on July 28th. Nothing ever looked sweeter to me than the white rocks off Halifax Harbor. Even the fog looked good!
SARNIA AND TORONTO WAR SERVICES GROUP ACTIVE

Inaugurated in September of 1941, the Imperial Oil War Services Group in Toronto has had a busy two years. The group is composed of members of the Toronto and Leaside offices, who devote considerable part of their spare time to turning out garments which the Royal Canadian Red Cross sends overseas, knitting woolen goods and gathering donations for the needs of the crews of ships of the Royal Canadian Navy and the Royal Navy, and sending parcels to enlisted employees. In addition, the ladies of the Group have arranged to send cigarettes for prisoners of war, and have supplied a radio for Chorley Park military hospital in Toronto.

As reported in the Summer 1942 issue of the Imperial Oil Review, the War Services Group arranged a concert in which the featured artist was the President of the Group, Miss Vera Wilkinson. The proceeds of this concert went to purchase an operating room lamp for the military hospital at Chorley Park.

Statistics, say the makers of dry reading. But the tremendous amount of work which the ladies have produced since September of 1941 is evidence of the great work of the Red Cross headquarters in Toronto, can best be brought out by the following list:

- 25 complete outfits for boys, size 4
- 20 complete outfits for boys, size 6
- 10 complete outfits for girls, size 5
- 30 complete outfits for girls, size 3
- 200 pairs of socks
- 300 pair of shoes
- 200 pair of gloves
- 100 pair of mittens
- 5000 yards of thread
- 5000 yards of yarn

In presenting this cigarette box to the commander of the H.M.S. "Smilax", Lieut. A. Brunson, this box was simply inscribed "H.M.S. Smilax, from staff, Imperial Oil Limited, Toronto, Canada, Aug. 1941." The box was received with great appreciation by Lieut. Brunson.

SARNIA GROUP INAUGURATED

In January of this year the ladies of the Sarnia office were approached by the Assistant Naval Oicer Commanding, Contract Bridge, and Great Lakes area, Naval Service, who asked if they would take the responsibility of supplying the crews of naval vessels building at Sarnia with a library, woolen garments, and other comforts. The reply was prompt and enthusiastic. While the girls had worked for the local Red Cross and other organizations, either individually or in groups, this was to be one work for which they would be solely responsible.

A War Services Group was formed and, with the financial assistance of Miss Helen Smith, Wool and Knitting Covenant, the pile of woolen garments grew. Many of the girls had never knitted before but were willing to try and some in a short time were able to make perfect garments, while others had to be taught along, but each garment passed a rapid examination before being put away in the locker.

Finally a representative of the local shipyard called up to say that the first "Fairmile" of the season was being commissioned and the Officer Commanding would be down to see the articles to be supplied to his crew. He looked over the list of articles, made some changes, examined the samples shown him and answered innumerable questions. He looked wistfully at all the magazines, books and games which had been accumulated, but explained that the space on board his boat was so limited that it was possible only to take one-third of the magazines offered. On being asked if there was any one thing which he could suggest should be added to the list, the Officer Commanding advised that an electric toaster would be a real luxury aboard his craft.

(Continued on page 24)
In Recognition of Service

Imperial Oil Employees Decorated For Service to Their Country

Flt/Lt Harry Turnbull, D.F.C.
Formerly in the laboratory at Sarria refinery. Flt/Lt. Harry Turnbull, R.C.A.F., was awarded the Distinguished Flying Cross in May. The citation reads in part: "This officer has completed a large number of operational sorties during which his navigation has invariably been of a high standard ..."

Flt/Lt. Turnbull was born in Sarria, March 13th, 1917, and entered the Sarria laboratory in March, 1937. He enlisted in the R.C.A.F. in August, 1940, and upon completion of his training course was sent to England. After a short stay in England he was transferred to Egypt and served 11½ months in the Mediterranean war zone.

Pilot Officer Daniel B. King, D.F.M.
Formerly a billing typist at the Manitoba Divisional Office at Winnipeg, P.O. Daniel B. King was awarded the Distinguished Flying Cross for outstanding work as a bomb aimer in attacks over Germany and Italy.

P.O. King enlisted in the R.C.A.F. on February 15, 1941. He has recently been promoted to Pilot Officer.

C.E.R.A. William Sponer, D.S.M.
Formerly an engineer in the Sarria refinery boiler house, Chief Engineer Room Artificer Wm. Sponer (R.C.V.M.), on board the Corvettie, successfully won the Distinguished Service Medal when he dropped depth charges from the ship and forced a German submarine to the surface.

C. E. R. A. William Sponer was born in Ayr, Scotland, November 4, 1914, and entered the Company’s employ in December, 1931. He enlisted in the R.C.V.M. on January 2, 1940, and almost immediately went overseas.

Cal. Robert D. King, D.S.O.
Formerly Assistant Superintendent at Hafifin refinery, Cal. Robert D. King, Princess Louise Fusiliers, 2nd Canadian Division, Overseas, was awarded the Distinguished Service Order for bravery in two of the enemy during the Dieppe raid.

A Lieutenant Colonel at the time of Dieppe, Cal. King’s citation reads in part: "Lt.-Col. King showed great courage and devotion to duty during the operations at Dieppe, August 19, 1942. He took charge of an L.C.T. after Brig. Leitch was wounded. In addition to supervising the repair of the engine and steering gear which had been damaged by enemy fire, Lt.-Col. King organized the personnel on the return journey to England."

Cal. King had been with the Company 28 years at the time of his enlistment.

Wing Commanders of the R.C.A.F.

Wing Commander J. St. Pierre, D.F.C. (U.S.)
Formerly in charge of the Navigation and Service Department in Montreal, Wing Commander J. M. W. St. Pierre, R.C.A.F., was awarded the United States Distinguished Flying Cross for outstanding work in the Tunisian and Sicilian campaigns. The decoration was conferred on him by Lt.-Gov. Carl Spaatz, United States commander of the Northwest Africa Air Forces, during a visit to the squadron’s Tunisian base late in August.

Wing Commander St. Pierre joined the Company in 1934 as a service station attendant, rising rapidly to the position he held at the time of his enlisting in the R.C.A.F.

N. S. Jeanne d’Oodt d’Ossencron, Mentioned in King’s Honor List

Formerly in the Montreal Divisional Office, Nursing Sister Jeanne d’Oodt d’Ossencron, No. 14, Canadian General Hospital, Canadian Army Overseas, was mentioned in His Majesty’s 1943 Birthday Honor List (Royaal Red Cross secondary grade) and is to receive her award at Buckingham Palace at the next investiture.

C.E.R.A. James P. McGee, Mentioned in King’s Honor List

Formerly for seven years a shift engineer in the main boiler house of the Montreal Refinery, Chief Engineer Room Artificer, Royal Canadian Navy, has been mentioned in His Majesty’s 1943 Birthday Honor List for outstanding service and efficiency in (Continued on Next Page)

Imperial Oil Review
FALL 1943
WAR SERVICES GROUP ACTIVE
(Continued from Page 21)
One of the girls who, strange to say, never indulges in toast, kindly donated her toaster to the cause and this was delivered with the other articles.
About a month later another boat was commissioned and supplied with knitted articles, books, games, cards, magazines, etc., and it is expected that by the end of this season about 300 garments will have been supplied.
It has been reported that larger craft may be launched in the Barrie Harbour next year, and consequently knitting needles will be ticking this winter so that the Group may have on hand sufficient knitted garments to supply a boat's crew at a moment's notice.

DEATH OF THOMAS D. GARVEY
It was with deep regret that his many friends throughout the organization learned of the passing of Thomas D. Garvey, a popular member of the staff at Barrie Refinery.
Mr. Garvey was educated at Trinity College, Port Hope, and Upper Canada College, Toronto. He was an active member of the Barrie Yacht Club and at various times owned sailing boats which were usually manned by boys in whose sailing careers he was deeply interested. He was also a member of the Barrie Golf Club for many years, and keenly interested in the game.
Mr. Garvey began his career with Imperial Oil Limited on September 12, 1910, and served in the capacity of Head Stocktaker at Barrie Refinery for thirty years, which position he held at the time of his death. During his years of service with the Company he acquired a great many friends and was a well known figure at the Barrie Plant to both young and old. Possessed of a very keen sense of humor and an ardent sports enthusiast, he never lost his youthful outlook on life.
Mr. Garvey's widow resides in Barrie, and an only son, Sergeant-Navigator Thomas G. Garvey, is overseas with the R.C.A.F.

AMING a gun to nail a Nazi bomber in full flight, there is a special Imperial lubricant to help do the job. Specially-developed lubricants from Imperial Oil Laboratories now serve on many fighting fronts.
On the home front where the aim is higher production, there are oils and greases for every operation, developed by Imperial Oil Limited to help keep plants going at top speed. Machines must not fail Canada in this critical hour of our war effort.
Imperial Oil's research facilities, steadily built up through peace-time years, have swung to problems of war production — working to produce lubricants for Canada's fighting machines.
Roll Out the Barrel—INVASION STYLE

Invasion depends on gasoline and oil as well as on men and machines. In the official war photograph above, a detachment of the Royal Canadian Army Service Corps, working from a petroleum dump in Sicily, prepares a shipment of fuel for tanks and fighting equipment at the front.

To assure adequate supplies of gasoline and oil fuel on the fighting fronts, help conserve petroleum products on the home front—in car, home, farm and factory.

OIL IS AMMUNITION—USE IT WISELY