OIL IS AMMUNITION

...use it wisely!

"Tankers have always been the chief means of oil transportation for Canada... little information about tanker losses has been made public. I regret to say that these losses have been colossal."

(From a radio address by Hon. C. O. Howe, Minister of Munitions and Supply)

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THE TANKER'S SERVICE... An Apology

Oil is being fought, speedly movement means a lot.
Where forces change position day to day,
If any one's plans went foul, we must have reserves of oil.
For motorized equipment won't eat hay!
So each tanker has a place in the war's diary. 250.

When troops must travel swiftly and far,
And there's not a bit of talk, if the General had to walk,
So we bring him oil, to run his motor car.

All year 'round, we're on the go: heat or cold, or rain, or snow,
Storm or calm, we keep on just the same;
In the Tropic's heat, we roost. Freeze, when off a northern coast.
And we do not look for glory, or for fame.
That's for Services reserved, and will surely be deserved!
They'll have won it, with their unwavering toil,
And to help the boys to earn all the glory
That they yearn.
We'll do our bit, by bringing them the oil.

-L. Murphy

Editor's Note: Shortly after the above poem reached the "Imperial Oil Review" the tanker of which Leo Murphy was a member of the crew was torpedoed. He went down with the ship. Leo Murphy called his poem "An Apology." As such, it is misnamed. Rather, proudly, he should have called it "A Creed"—the creed of the men of the tankers flae who daily risk their lives to supply the vital oil that powers the fight against the Axis.
Workmen of the "Petroleum Wartime Shops" make final assembly of two reversing engines for Corvettes.

PETROLEUM SHOPS MAKE TOOLS OF WAR

As well as producing the petroleum products vital to our war machines, the Canadian Petroleum Industry is now helping to produce the actual machines of war.

In 1941 the Industry and Sub-Contracting Coordination Branch of the Department of Munitions and Supply was formed. Its job was to make sure that every plant of every kind in Canada worked on war production for as many hours a day as possible. Cooperating in this programme, the Canadian Petroleum Industry in 1941 volunteered the spare capacity of its lathes, shapers, mills, planers, drills, etc., in eight major maintenance shops, to produce the tools of war.

The "Petroleum Wartime Shops" was established as a result of this offer. This organization, which operates on a non-profit basis, is under the direction of a committee appointed by the oil companies participating. In filling their orders, the shops of the petroleum industry make their machines do feats never contemplated in peace time. To turn out parts for our war machines and at the same time to keep up vital maintenance work took a good deal of skill and ingenuity and planning. But the job was done.

As a result, war parts have been flowing by the thousands from the shops of Canadian oil refineries ever since the scheme was inaugurated.

Typical of the work done by the Petroleum Wartime Shops is the steam-activated engine required to reverse the main engines on corvettes. Pattern makers, moulders, machinists, blacksmiths — all work together to produce those engines. Other material being turned out includes parts for control meters, gun shields for tanks and Pacific-type boilers.

In the woodworking shops pattern makers turn out patterns of the work for the iron mongers to follow.

Typical of the work turned out by the "Petroleum Wartime Shops" are these reversing engines for Corvettes.

Boilmakers, machinists, welders—all cooperate in producing gun shields for tanks. Welding is the last step in production.

A pile of gun shields produced by the "Petroleum Wartime Shops".
Hockey Night in Canada

Your Imperial Oil Hockey Broadcast Has Become a National Institution.

Through six years of broadcasting under Imperial Oil direction and sponsorship, Hockey Night in Canada has not only maintained the listening public inherited from the former sponsor of these broadcasts, but has built a slowly but steadily increasing listenership throughout the Dominion. From a multitude of fan letters, and from a variety of other sources, the Company has received innumerable word-pictures of the extent to which the broadcast has affected the life and habits of hundreds of thousands—perhaps even millions—of Canadians.

One letter will tell of a crowded Saturday night lobby in a small-town hotel with home-towners and the travelling public all equally intent upon the game. The next pictures the scene in a little prairie homestead, with the entire family (and even perhaps some of the neighbours as well) neighbours from as far as fifteen miles away gathered around the radio set to hear the broadcast they've been waiting for all week. The next is from the owner of a radio theatre in a Rocky Mountain town, who found it impossible to get an audience for his 7 o'clock show on Saturdays until he had hooked up a radio set to bring his patrons the last period of play; and then, after the final bell—with the show. The next from a social club in the Maritimes which had re-designed its Saturday evening gatherings to provide bridge and dancing until 10; hockey until 11:00 (Atlantic time); and then supper. The next from a storekeeper far up in the Yukon, whose Saturday night customers—mainly half-breeds—just about wreck the place each time a goal is scored. At last, that's the way he tells it. It does sound a little drastic.

After a season or two of broadcasting, we began to be impressed by the apparent fact that our audience, both in rural sections and in remote outposts of Canada, and in fishing and mining and lumbering districts, must be relatively more numerous and more enthusiastic than the urban audience. But all existing audience-surveys had been confined to the cities alone, where large numbers of citizens could be reached by telephone during the course of a game and asked for information as to what broadcast if any they were listening to. So Imperial Oil decided on another type of survey—one which would contact rural as well as urban residents, to discover whether or not they were hockey broadcast fans. As it was a totally different type of survey from the others—being held during the week instead of during the game—the results of the two types could not be directly compared. But the results appeared to indicate that the mixed rural-and-urban audience was perhaps substantially larger, as a proportion of population, than the urban audience alone; also that rural and small-town listeners were generally more appreciative of the broadcast than residents of cities where other entertainment is more accessible and more varied.

But above all, the fact which stood out in this survey was that 74% of all people asked identified

(Continued on page 8)

NEW LIFE
FOR OLD BARRELS

Every Steel Barrel Must Now Work Overtime to Supply Canada’s Petroleum Needs.

You take a barrel that has been so badly dented it looks as though it had been dropped over a cliff. First you test it for the presence of explosive vapour and steam it to remove the gas if necessary. Then you clamp it in a denting machine, fill it with water, pump in compressed air, beat it with hammers—and the dents magically disappear. You weld any spots where there are leaks, and put it back in the denting machine if necessary. Then you test to make sure there are no more leaks, treat and wash it inside and out, dry it, paint it—and you have a barrel that is ready to go back into service.

That is what is happening in the barrel reclamation programme which Imperial Oil Limited is carrying on in plants throughout the country.

Before the war, badly damaged barrels were sent to scrap. It just wasn't economical to repair them. But now—it's a different story. Before the war there was plenty of steel available for new barrels—now there is an acute shortage of steel. All available barrels have to work overtime to supply the country's petroleum requirements. As the barrels are returned to the plants, experts sort them out and decide what needs to be done to put them back into service. Some need no repairs, and are sent immediately to be cleaned and painted. Some are damaged, and have to be dented and welded.

Watching a barrel-denting machine at work is like watching sleight-of-hand. One moment the barrel is a very tired-looking specimen, battered and dented. The next moment it seems to take a new lease on life. It straightens itself up and the dents disappear.

Water and compressed air do the trick. At first glance it would appear that compressed air alone would be sufficient to "blow out" a barrel. It is. But by itself compressed air is a dangerous medium with which to work. If there is a weak spot, compressed air may shatter a barrel and send razor-sharp pieces of steel flying in all directions. It has been known to do so. That is why water is used. It is a safety measure. The barrel is first filled with water to approximately a half an inch from the top, and then the air is pumped in. If the barrel should
break, all that would happen is that the operator would get wet.

While the water and air force out the dents, they do not actually straighten the barrel. The operator takes a hammer and plays a ball on the sides to do this. He then marks any spots where there are leaks.

From the deforming machine the barrel goes to the welders who weld the leaks. If necessary, the barrel is then put again on the deforming machine for further straightening. Then it is taken by the tester, who tests for any leaks that might have been missed. The barrel is now ready for cleaning.

Generally, the caustic is used. With the caustic still inside, the drum is put through the washer. In the washer spins on rollers while jets of water scrub it on all sides. The caustic is then emptied out and the barrel rinsed out with boiling water. The water is wrapped out, and then the barrel goes to the air dryer. Operating at 50 pounds of pressure, this air dryer removes any foreign matter which may have been left inside. The next step is the driers, where air at approximately 250 degrees is blown into it.

When dry, the barrel is examined by a vapour proof inspecting globe. If it is found that the barrel is rusty, or is not absolutely clean, it is returned for further washing, until it can pass inspection. Then it goes to the paint machine, and is painted with its identifying color. The stencilling is put on, and the barrel is ready for filling and shipping.

Barrels which have been dented on the "chime" are a bit more difficult to repair than those which have been dented on the sides. It's the chime reinforcing ring around the edge of the barrel. A special chime straightener has to be used to round the chime out to its original shape.

Steel barrels suffer damage in a variety of ways. A great deal of the damage is caused by careless handling in transport, mostly when unloading. It doesn't do a barrel any good to be dropped from the deck of a boat onto a concrete dock, or from a truck onto a railroad track. On some coasts it is the practice at lumber camps where there are no docking facilities to float barrels ashore from a ship. The rocks they encounter enroute have a decided shortening effect on the life of the barrels so handled. Sometimes in lumber and mining camps the barrels are piled on the edge of a hill. One topples over, and in its race down the hillside it encounters rocks and trees. In some lumbering and mining camps the crews have what they must consider a particularly enjoyable way of opening barrels. They sink a hole in the end with an axe!

All these add up to a real headache for the manufacturer who relies on these barrels to supply the country's oil needs. But an even bigger headache than damaged drums are drums which are not returned at all. After all, even a damaged drum can be repaired and put back into service—provided of course it isn't too badly damaged; but a drum which isn't returned at all is completely out of service. In these days, when steel barrels are so vitally needed, every steel barrel that is kept out of circulation is doing its part to help the Axis.

One reason why steel barrels are not returned is that they are put to other uses. In the North-West Territories trappers found that steel barrels made excellent snowshoes. Other uses to which steel barrels have been put include rafts and mooring floats, incinexors, rain barrels, sand and fire equipment, hose reels, cultivator pipe, tables and chairs, camps, scaffolding, and even automatic pig feeders!

Before the war, diversions of steel barrels to such uses was a problem for the oil companies alone. But now it is a problem that bears on the war effort. Everyone who purchases petroleum products in steel barrels should see that the containers are returned promptly. Every steel barrel and drum must work overtime to keep supplies of oils and fuels flowing to air fields, army camps, manufacturing plants, and the like. The importance of returning barrels is emphasized in the following order: "Every person in possession of any empty steel drum shall promptly return the same to the normal channels of trade so long as the same is fit for further use." In the United States, the War Production Board has ruled that no barrel is to be used for any other purposes than that for which it was made.

Canada depends on steel barrels to transport its petroleum products. That is why Imperial Oil Limited has appealed to everyone who receives petroleum products in steel barrels to return them promptly to the oil company from which the supplies were purchased. On the hockey broadcast, in magazines and newspapers, the appeal has gone out to...

**KEEP THEM BOTTLEING!**
Refining

The Power Fractions—Second in a Series of Articles on How a Modern Oil Refinery Transforms Crude Oil into Finished Petroleum Products.

EDITORS NOTE: This is the second article in the series on "Refining" prepared by Dr. G. A. Purdy of Imperial Oil's Technical and Research Department. In the first article we saw how a refinery separates crude oil into various fractions by fractional distillation. In this issue the story of Motor Gasoline is told. Sections on Aviation Gasolines and Diesel Fuels will follow later.

Motor Gasoline

The power fraction of petroleum which puts the world on wheels in Motor Gasoline. Modern motor gasoline is a tailored-to-measure product. When Mr. Motorist asks for Extra or 9-3 Oil Gasoline, the product which flows into his tank is a scientific blending of three different petroleum products and two non-petroleum substances. The petroleum products are "straight-run" gasolines, "cracked" gasoline and "light ends"; to these are added small amounts of "octolite" and "ethyl fluid.

"STRAIGHT-RUN" GASOLINE

"Straight-run" gasoline is gasoline that has been distilled by ordinary methods, as described in Part I of this series. It is the gasoline which Refiners have always had to use in the crude oil, as distinct from gasoline which is made artificially from other fractions, such as gas oil, by "cracking" their large molecules into small ones. As the distillation process by which straight-run gasoline is made has been fully described in Part I there is no need to discuss it further here. Instead, a little history of straight-run gasoline will show us why the blended product of today became necessary.

Whatever a batch of crude oil is distilled, a certain percentage of gasoline, kerosene, gas oil, etc., results. The first product of petroleum for which a use was found was kerosene to light the lamps as widely used before the turn of the century. The gasoline which had to be distilled off ahead of the kerosene was regarded as a great nuisance and often was poured into the arroyo creeks. The chief refining problem regarding gasoline was how to get rid of it.

Then some bright and developed a stove which would burn the bothersome gasoline and the unwanted product was named "20 Gravity Shelf Oil" and became quite respectable. Soon the "hobble and carriage" began to appear, changing slowly along streets and highways with power supplied by the same product now renamed "gasoline." As more and more automobiles came into use, more and more straight-run gasoline had to be made to satisfy their appetites for speed. The Refiners had to add more and more of the kerosene fraction to the gasoline fraction in order to increase their supply of motor fuel, but this resulted in poorer quality. In 1906 about 20% of the crude was separated as gasoline. In 1934 gasoline took over 20% of the crude—and motorist looked for the automobile engines, motor knockers, chilled motor oil and low power output. To increase power, motor car designers increased engines with more and bigger pistons.

This is one of a battery of modern steel tanks. On the left in the horizon the gasolines are being separated by distillation and the gases and residual oil. On the right in the foreground are the gas stations where, in a non-alcoholic atmosphere, the goodly product is distributed. Nearby is the separation where the cracked gasolines and the kerosene are separated in a continuous recycle. On the right are the filter towers which separate the Dangerous impurities and filter the product. On the left are the towering distillation towers which separate the various fractions and the equipment for the separation of kerosene, gas oil, and cracked gas oil. Beneath these towers is a condenser box, the control room and the pump room.

selves as either "regular," or "extra," or occasional." So we called it that—first to ourselves—and then in these pages—and then on the broadcast itself for all the world to hear. And not one solitary listener apparently even thought of disputing the claim.

That was before the war—and it now appears that we were only half right. Today, Hockey Night in Canada has really become a "national institution" almost in an official sense. And here's how it came about.

Many of you may have seen an announcement which was published by Imperial Oil in most of the larger newspapers just after the final playoff game last season. In that announcement, Imperial Oil promised to return to the air this Fall, providing, of course, that the N.H.L. found it possible to continue in operation. But during the weeks that followed, sports writers appeared to be growing increasingly skeptical as to whether there would be any National Hockey League when the Fall season rolled along.

Around mid-summer—when it was found out what the prospect really was—two officials of the National Hockey League made a special pilgrimage to the national capital to enquire whether professional hockey would be permitted to continue. They went to Ottawa with no very great hope. They had prepared themselves to hear the worst—and were prepared, too, if the national welfare demanded a complete sacrifice of professional hockey. They walked out after the interview with slightly dazzled expressions. Instead of a gloomy concession the N.H.L. might be allowed to continue as a very special favour, and only for a time; they had actually received a renewal for the N.H.L. to carry on to the best of its ability.

And the following day, an official of the department concerned was quoted as follows in a newspaper interview: "It may be necessary to give some consideration to these matters. The N.H.L. is not, or need not be, or else we would face the problem of repeating what it is at present means to hundreds of thousands of Canadians in entertainment and amusement of morale."

The only possible explanation was—Hockey Night in Canada.

It didn't take any very high degree of science to figure that one out. N.H.L. officials in Canada themselves as either "regular," or "extra," or occasional." So we called it that—first to ourselves—and then in these pages—and then on the broadcast itself for all the world to hear. And not one solitary listener apparently even thought of disputing the claim.

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which knocked and carbonized as usual. To top it off, it seemed apparent that there wasn’t enough crude oil in sight to produce even this not-so-good gasoline in sufficient quantities to meet the demand of the ever-growing swarm of cars.

"CRACKED" GASOLINE

More and better gasoline had to be made. Ever since the day in 1862 when a "still runner," absent at a too handy saloon, accidentally overbarreled his still, it was known that excess heat would break down heavy oils into lighter ones. The large molecules in the heavy oils were "cracked" into smaller ones, many of which would be used as motor fuel. Cracking was the key to more gasoline and petroleum. Chemists and engineers soon developed refineries that used this principle to meet the demand for motor fuel. Today refineries by means of cracking can make an extra gallon or more of gasoline for every gallon naturally in the crude. Cracking solves the problem of quantity—and improved quality, too, as we shall see.

Gasoline quality depends on the kind of molecules in the gasoline. Straight-run gasoline molecules are of three types, depending on the structure of the molecule. The types which add quality are ring-shaped (aromatics and naphthenes) or branched (isoparaffins). These, when exploded in a cylinder, give the piston a smooth powerhouse push. Straight chain shaped molecules (saturated paraffins) explode so abruptly that the piston bounces down on the rings without doing much useful work. These molecules cause "motor knock" and are thus very unwelcome in gasoline. Straight-run gasoline has a large percentage of these knocking molecules.

On the other hand, cracked gasoline has a relatively large percentage of ring and branched form molecules. Furthermore, the greater part of the straight chain molecules present have excellent anti-knock properties. It is because these particular straight chain molecules have new chemical properties added by the cracking operation. These new properties make them "unsaturated paraffins" (olefins)—quite different from the "saturated paraffins" which are "knockers."

Thus, cracked gasoline is rich in those molecules which behave best in the cylinders of a motor, are of good quality as far as anti-knock value or "octane number" is concerned.

THERMAL CRACKING

Cracking is a complicated business in which heat (up to 1190°F) and pressure (up to 1000 lbs. per square inch) are the clubs that break up the heavy oil molecules. More than half the fragments resulting from cracking are of gasoline size. The cracking process begins in the cracking coil furnace which is much the same as the pipe still furnace described in the previous article in this series. Into the half-mile of tubing in this furnace goes the "cracking coil stock" which consists of any or all fractions of the crude not needed for fuel oil, lubricating oil, wax, asphalt, etc. requirements. Here it undergoes the cracking reactions that produce an array of hydrocarbons ranging from light gasolines to heavy tar. In the thermal (non-catalytic) process the cracking reactions continue in the "soaker" into which the cracking coil discharges. The soaker is a single piece of steel forged and machined into a tower thirty-five feet high and six feet in diameter, with six-inch thick walls. From the soaker the "cracked products" enter a "separator" where the tar drops to the bottom and is withdrawn to be used as a heavy fuel oil (marine bunker fuel) while the vapors which constitute the rest of the cracked products leave the top to enter a series of bubble towers. By the same distillation process as described in the previous article the bubble towers separate the vaporized components into pressure distillate (gas, light ends and cracked gasoline) furnace fuel oil, industrial fuel oil and diesel fuel.

CATALYTIC CRACKING

Since some of the hydrocarbons created in the cracking coil are more desirable than others, the chemists decided to direct the chemical reactions to produce as many as possible of these desirable substances. This was quite a task since the molecules in a cracking coil are like a capital of wildcats at their wildest. Only in recent years has the chemist found means of directing the reactions from inside the coil. He doesn’t go in himself of course. Instead he sends in a "catalyst" which is

HOW THE CRACKING PROCESS HAS INCREASED THE AMOUNT OF GASOLINE PRODUCED FROM CRUDE

1910

REFINING BY ORDINARY DISTILLATION

1914

REFINING BY ORDINARY DISTILLATION

1914-1920 CRACKING PROCESS DEVELOPED

1920

ORDINARY DISTILLATION PLUS CRACKING

1940

ORDINARY DISTILLATION PLUS CRACKING

GASOLINE

1 BARREL

GASOLINE

2 BARRELS

GASOLINE

2 BARRELS

GASOLINE

2 BARRELS

GASOLINE

2 BARRELS

GASOLINE

2% BARRELS

GASOLINE

2 BARRELS

DOE: 1940 CRACKING PROCESS

Maximum %

Note: All the above figures would vary, of course, depending on the type of crude used.
Some Simple Definitions
Continued from previous page

fraction is redistilled in a "Reun Tower". Sulphur containing compounds but the "acid treat" is usually used only on an ester ketone and

The accredited manufacturer in the form of but

A recent method of removing sulphur compounds is by the process known as "the Hall process". Beeswax is a non-polar bed of the mixture

process for the purification of changing sulphur compounds (mercaptans, mercaptoe, etc.) into hydrocarbons. The hydrogen sulphide is then removed by a subsequent lye treat.

Cracking
Cracking is a process in which fractions unsuitable or unsuitable for commercial use can be converted into valuable gases, gasoline and oil fuel (diesel, furnace and marine). At the high temperatures created in the Cracking Coke the hydrocarbon molecules of the Cracking Coke Feed Stock are broken or cracked into various sized fragments. Many vapors from the coke un-

The coke molecules leaving the cracking coil are separated one from another in the Condenser and Cracking Coke Boiler Tower. The gas, light end and cracked gasoline leave the Cracking Coke Boiler Towers together as Pressure Distillate.

D. S. & A. Plant

The Pressure Distillate is separated into its component parts in the Gas Absorption Plant and Gas Absorption Plant (D.S. & A. Plant). From the bottom

The oil coming from the Gas Absorption Plant flows to storage, picking up a trap of "Inhibitor" on the way to prevent any oils remaining from forming gum. The light ends and gases leave the top of the tower to enter receiving drums and part of the gases separate to go to the Gas Absorption Plant. The gases are treated and the rest is sent on to the Stabilization Bubble Tower where the light ends are separated and sent to refrigeration. The gases go to the Gas Absorption Plant. More gas goes from all over the field to the Stabilization and from there, sent out, to the gas makers with it. More recently a method has been developed whereby the olefins are prevented from forming gum without removing them from the gasoline. In this way their anti-

Alkylation

Alkylation is a synthetic process in which gases are converted into light fuels with the high octane number necessary for modern high horsepower, high performance engines. The feed stocks to the process, "Isobutane" and "Butylenes" (or in general "Ole-

The isobutane and butylene feeds used in the process are contained in the light ends available in the Stabilization Bubble Tower. Extra quantities of isobutane, normally required and may be obtained from natural gas wells or from synthetic feed stocks, "normal butane".

Hydrocarbons contained in the light ends are separated in the condenser and are then fed into the Isobutane Stabilizer. The Isobutane is then treated with olefins and the mixture of gases is sent to the tank car or further processing. Alkylation is a complex process in which the feed stocks are combined in a sequence that produces a product with a high octane number. The process is designed to produce a gasoline which is a mixture of alkanes and alkenes with a high octane number.

The gasoline produced by alkylation is a complex mixture of hydrocarbons that are used as an additive to gasoline to improve its octane rating. The octane rating of a gasoline is a measure of its resistance to knock, or the tendency of fuel and air mixtures to ignite spontaneously in an internal combustion engine. A higher octane rating indicates a greater resistance to knock, which is desirable for high-performance engines. The octane rating is determined by a laboratory test that measures the resistance of a fuel to knock.

Inhibitors

The olefins molecules, unsaturated paraffins, as well as unsaturated naphthenes and isoparaffins, created in cracking operations are a mixed blessing. Although excellent as far as octane number is concerned, some of the olefins have the unfortunate property of changing into "gum" on the way to the cylinder of a motor. The olefins all too readily join one to another (poly-

HOW ATOMS GET TOGETHER TO MAKE OR MAR GASOLINE

Hydrocarbons and carbon atoms get together to form a molecule. The number and arrangement of the atoms in the molecule make it a desirable or undesirable constituent of gasoline. The following shows the arrangement of the atoms in a molecule of straight-crun gasoline, the chemical family to which the molecule belongs, and the octane rating or anti-knock value of the family.

Cracked gasoline has members of the above families in it, as well as new families created in the cracking coil. Those new families have the same structural formulas as the Naphthenes, Isoparaffins and Paraffins above, except that two or more hydrogens atoms are being from each—since they are called "cracked" or "cracked" paraffin. The octane rating is improved by this loss of hydrogen atoms but the chemical stability is lowered causing a strong tendency to form gums. This undesirable characteristic is corrected by the addition of an "inhibitor".
Stabilization Tower where a final distillation rids the light ends of the last trace of gas. The gas leaving the top of the Stabilization Tower and the receivers as well as gas produced anywhere else (crude distillation) contain traces of light ends which must be recovered. This is done in the Gas Absorption Plant where a light oil ("lean" oil) scrubs out the gas it contains of light ends. The lean oil, enriched with light ends, becomes "fat" oil which passes into a neighboring bubbling tower. Here the light ends are stripped from the "fat" oil and returned to the Stabilization Tower to join the mainstream of light ends. The fat oil, now made lean, re-enters the absorption tower to absorb more light ends from more gas.

The light ends are really a third gasoline. This is blended with cracked and straight run gasolines to give volatility to the finished product. Volatility means the tendency of a liquid to change into vapor. It is volatility which gives a motor an easy cold start and quick acceleration. About 1/5 of the finished motor gasoline blend consists of light ends. The amount added depends on the season—more in winter, less in summer. That is why we say that Eso Extra and 3-Star are "tailored to the season."

**ETHYL FLUID**

One more very important substance is added to Eso Extra and 3-Star gasolines to bring their quality up to the level expected of Imperial gasolines. This substance is ethyl fluid whose chief ingredient is tetrachloro lead. Strong enough, although tetrachloro lead is itself an explosive, it is added in very small amounts to the blend of the gasolines to slow down the rate of explosion of the gasoline vapours in the cylinders and prevent "knock."

"Octane number" is a technical measure of the smoothness and power of an explosion of gasoline vapour—of the absence of "knock." Octane numbers range from 0 to 100. The smoother and more powerful the explosion and the less tendency to knock, the higher the octane number of the fuel. Octane numbers are obtained by comparing the fuel under test with standard reference fuels in a precisely controlled special one-cylinder engine. The standard reference fuels are "heptane" and "iso-octane." Heptane is a hydrocarbon occurring in crude oil which is all that is bad as far as knocking in an engine is concerned and thus has an octane number of "0." Iso-octane is a man-made hydrocarbon which is all that is good so far as the test engine is concerned and thus has an octane number of "100." These reference fuels are mixed in various proportions and tried out in the test engine just as the fuel under test. If, for example, a mixture of 75 parts iso-octane and 25 parts of heptane exactly matches the performance of the fuel under test, this fuel is said to have an octane number of 75.

Straight-run gasoline will have an octane number of a little less than 60, cracked gasoline about 70, and light ends about 80. A blend of these will have a resultant octane number of about 65. The addition of ethyl fluid to this blend will raise the octane number as much as 20 points. The actual octane number increase obtained will depend on the amount of ethyl fluid added and what hydrocarbons make up the gasoline blend. Ethyl fluid lifts the piston pushing powers of those hydrocarbons normally "poor" and "light" to the head of the class.

**FINISHED MOTOR GASOLINE**

When straight-run gasoline, cracked gasoline, light ends, inhibitors and ethyl fluid are mixed in just the right proportions—finished motor gasoline results. To this a trace of dye is added for identification purposes. The process sounds comparatively simple but it requires a great deal of experience and knowledge, plus millions of dollars' worth of modern refining equipment, to achieve a product of the highest quality like Eso Extra or 3-Star gasoline. Rigid tests guard every stage of the process to ensure the uniformity and reliability for which Imperial Oil products are famous. When the motorist steps on the "gas" a perfectly balanced fuel springs into action—giving a quick start, fast pick-up, long mileage, maximum power without motor knock, carbon or gum formation, smoke or dilution of motor oil. Yes, motor gasoline has come a long way since the days of "70 Gravity Stove Oil."

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**IMPERIAL OIL EMPLOYEE LEADS FRENCH-CANADIAN BOMBER SQUADRON**

On October 6th, Canadian newspapers carried the news that the French-Canadian bomber squadron of the R.C.A.F. made its first operational flight into enemy territory. The squadron's first operation was described as "successful" in an R.C.A.F. communiqué.

The airmen were led by Wing Commander Joe St. Pierre, who circled one of the targets for twenty minutes to make a special low-level reconnaissance after dropping his bombs.

Before enlisting in the R.C.A.F., Mr. St. Pierre was in charge of the Aviation Sales and Service Department of Imperial Oil Limited in Montreal. He joined the Company as a service station attendant in 1934. In 1936 he was transferred to the Sales and Service Department in charge of automotive tune-up and testing equipment. In 1937 he was appointed a fuel oil salesman, and in 1939 was placed in charge of Aviation Sales and Service.

Mr. St. Pierre enlisted in the R.C.A.F. in October of 1939.
Montreal Office Is Prepared

One way in which civilians in wartime can help their country is by being prepared to meet any emergency which may arise. To this end, employees of Imperial Oil Limited in Montreal have inaugurated an extensive A.R.P. and first aid programme. The response to the call for volunteers was so great that the difficulty was not in finding members, but in finding positions for all who volunteered.

On these pages are shown pictures of the A.R.P. drill at Montreal offices and plant, and of the first aid activities there. In the A.R.P., drills everything is carried out exactly as though actual warning of a raid had been received.

1. On receipt of a general alarm, the aero-planes spotters man the roof to warn of the approach of hostile aircraft.
2. Receiving the warning from the spotters, Chief Warden N. E. Woolley rings the bell which relays the alarm to the offices.
3. Under the direction of deputy wardens, the staff leaves the building.
4. To keep open telephone communications, one of the men on the staff relieves the girls on the switchboard.
5. Auxiliary buckets are filled from the barrels of sand and water which are located throughout the offices.
7. The roof fire-fighting crew man the equipment. Here they practice combating an incendiary bomb, using a stirrup pump.
8. Meanwhile, the men in the yard go into action. Valves are closed to isolate units to prevent spread of fire.
9. The yard fire-fighting crew brings up the portable foamite fire-fighting equipment.
10. Others bring up the smaller foamite extinguishers.
11. Men of the First Aid group bring a 'casualty' in on a stretcher.
12. The Ladies' first-aid group have spent long hours practicing their first-aid work.
13. Two members of the men's first-aid squad demonstrate artificial respiration.
ADAM W. SIME LOST ABOARD S.S. "CARIBOU"

EN ROUTE to Newfoundland to study lubrication problems connected with the war effort, Adam W. Sime, Lubrication Sales Manager of Imperial Oil Limited in Toronto, lost his life when the R.S. "Caribou" was sunk by enemy action.

The news of his passing was received with the deepest sorrow by his many friends in the company. Known and loved by his kindly, cheerful spirit, all who knew "Adam" Sime felt in his loss the loss of a good friend.

Born in Edinburgh, Scotland, Mr. Sime attended Edinburgh Academy. He came to Canada in 1906 with his parents to live in Toronto. He attended Upper Canada College and later the University of Toronto where he graduated in chemical engineering in 1914.

Enlisting as a machine-gun officer with the 35th Battalion in the Great War, he went overseas with this unit, transferring later to the 4th Mounted Rifles as a captain. He was badly wounded and taken prisoner in 1916.

Returning from overseas at the close of the war, Mr. Sime went to Saskatchewan in 1921 to teach school. In 1925 he joined the Spanish River Pulp and Paper Company as a chemical engineer. In 1929 he joined the Toronto Division of Imperial Oil Limited as a lubrication engineer.

In October of 1930 he was appointed to General Sales as manager of the Automotive Equipment and Aviation Department, and in 1931 was appointed assistant manager of the Lubrication Sales Department. In 1933 he was appointed manager of this department.

S. B. BLACKHALL PASSES ON ... WAS COMPANY'S OLDEST ANNUNIAT

S. B. Blackhall, pioneer of the Canadian oil industry, passed away on October 21st at his home in Edmonton.

Mr. Blackhall was born in London, England, in 1857. In 1870 he came to Canada and settled in London, Ontario. Three years later he began his career in the oil industry, when at the age of 16 he went to work for Sharpe Brothers, oil dealers in London. For the next nine years he was in contact with the east's pioneer oil firms, particularly six small ones who merged their interests to form the London Oil Refining Company. In 1886 the Imperial Oil Company Limited was formed and Mr. Blackhall entered its service shortly after.

In 1903 Mr. Blackhall went West to join H. E. Sharpe as vice president of Imperial Oil Limited in Winnipeg. For five years Mr. Blackhall and Mr. Sharpe comprised the entire office staff there, handling the company's affairs throughout the West.

In 1918 Mr. Blackhall retired under the company's pension plan. He was the company's oldest annuitant.

DEATH OF T. A. WICKETT

For twenty-three years with Imperial Oil's Traffic Department in Toronto, Thomas A. Wickett passed on suddenly in October.

Mr. Wickett was born in Warwick Village, Ontario. When a boy, he moved to the Huntsville District, where he helped his father in opening up roads and building bridges in that area. In 1900 he joined the Grand Trunk Railway and served as Agent at Wyevale, Sondridge and Forawas Station.

In 1919 Mr. Wickett joined the Traffic Department of Imperial Oil Limited. His railroad experience made him very valuable in his work with the Company, of arranging tank car movements.
A 30-SECOND SKID TO WAR!

- The champagne splashes. The tape is sliced. A ship slides down the ways. Its 30-second skid is smooth, safe, serene because another industrial lubrication problem has been solved.

- Among the hundreds of oils and greases manufactured by Imperial Oil to help with Canada’s gigantic war production program are special greases with sufficient strength to support the entire weight of a vessel, yet with enough “greasiness” to prevent wood-to-wood contact and perhaps a fire on the ways.

- Imperial Oil’s research laboratories and refineries are working night and day to produce the lubricants for the machinery of Canada’s industrial front.
In accordance with Government orders, Imperial Oil offices and plants throughout the country have converted their oil-burning furnaces to coal. The photograph was taken in the boiler room at the Executive Building in Toronto. FRONT COVER: Employees of Imperial Oil Limited at Sarnia on their way home from work.