THE EDITORS SAY:

THE cover is from a night photograph of the Tropical Oil Company's gasoline plant at El Carmen, Colombia. Where once there was only a jungle, there is now a modern community affording all the advantages of modern-day standards of living. Constructive national policy, economic stability, and the experience of decades in the oil industry has made possible the successful development of Colombia's oil resources with a resultant substantial contribution to the national revenues of the Republic.

SHIPS decoy our inside covers. Aviation manager Pat Reid's speedy Stinson which played its part in creating Imperial service for the Hughes round-the-world flight is on the inside from cover and on the inside back is a view of a new Imperial Oil Inland Waterways tanker taking form at Saint John, New Brunswick. If you are interested in the operations of an inland fleet of oil carriers you can learn a lot about them from the article beginning on page 19.

OIL has always had its problems—and will always have them. A current reminder of this fact is the development in the Turner Valley oil field in Alberta which has been a spectacular development in many respects. However, it may be that more sensational if the field had experienced the difficulties and disappointments encountered in the development of many major fields in the past few years. Co-operation among the different branches of the industry has been a bright chapter of success for the Turner Valley and if we might carry the metaphor further, we might say that prosperity was the hand that guided the pot. What have been oil's problems for years? You can learn something about them from the article beginning on page 10. What is prosperity? It is described in its simplest aspects on pages 8 and 9.

THE most dreaded of all hazards encountered in the production of oil is fire. Although every conceivable precaution is taken by experienced operators, mishaps occur from time to time. How a major fire in an oil field was conquered is told in words and pictures beginning on page 24.

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A PICTURE STORY
OF A TURNER VALLEY
OIL WELL...

Counting the expense of moving hundreds of tons of heavy machinery, sinking concrete foundations for the drilling and pumping rigs, and pushing the drill down through 3,000 to 9,000 feet of sand and rock, a well in the Valley may represent an expenditure of from $100,000 to $250,000.

After geologists and engineers have discussed the matter from the angle of knowledge of the structure on the one part and the actual physical problems of drilling on the other, the location for the new well is chosen. The actual drilling usually takes from 130 to 170 days if no mishaps occur.

As in this case drilling is to begin in winter, the first steps taken are to thaw out the ground by means of gas lines as shown above.

With the ground thawed a labor gang goes to work excavating for the derrick foundations.

Foundations for the derrick are the next order of business. The forms have been completed and the concrete is being poured.

Ideal section showing formations and producing horizons in the Turner Valley field. The disturbed nature of the strata causes great variation in the depths to the "top of the line"—the driller's ultimate objective—let alone the famous "West flank" the average is more than 6,000 feet.

IMPERIAL OIL REVIEW

ERECTING THE DERRICK:

The derrick gets under way. The base is 30 feet square. The cost of such a derrick, unassembled, in the Turner Valley is approximately $7,800.

Unsteady nerves and vertigo have no place in this work. The completed derrick towers 136 feet above the ground. The next job will be to put the crown block in place at the top of the derrick. The crown block, which is really a huge pulley, weighs more than four tons and costs approximately $3,000.

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Meanwhile a sump is excavated as a reservoir for the mud, which will be circulated by the rotary drilling rig. (See Picture No. 13.)

An upward view of the derrick shows the crown block in place at the top and suspended from it the travelling block with a capacity of 350 tons. The travelling block itself weighs more than five tons and costs about $2,500.

**BOILERS AND PUMPS:**

Boilers and water tanks are now moved in and will be used to generate steam for the drilling operations. These tanks and boilers will cost more than $10,000.

Here are some of the pumps and other equipment which will be used in drilling the well. Order will soon develop from the seeming confusion.

DRILLING BEGINS:

A mechanical marvel which has greatly increased drilling efficiency. The derrick keep the derrick advised at all times as to the pressure being applied by the bit and the progress being made. As the drill cuts away the formation it is automatically lowered to maintain a constant pressure. The derrick works beside which the driller is standing weigh some 23 tons and represent an investment of about $16,000.

Drilling is about to start. The "mumph necks," so the workers on the derrick floor are known, are coupling up the drill stem. The drill is rotated by the turntable on the floor.

As the drill goes down lengths of drill stem have to be added. Here the crew are breaking a joint in the drill pipe. The two huge wrenches are operated by a steam winch. The 10,000 feet of drill pipe required for an average well in the Turner Valley weighs about 85 tons and costs approximately $43,200. Some 250 (chrome-nickel) steel joints will be needed and these will cost even more than the drill pipe because of the very special quality of the steel and the exacting needs governing their manufacture.

At all times when the drill is turning, mud is pumped down the hollow drill stem to flow out around the bit and make its way back to the surface keeping up with it the drilling debris and consolidating the walls of the hole so as to prevent caving. The mud is pumped through the hose which is seen at the left leading to the rotary swivel at the top of the drill stem. The swivel must be able to support as much as 150,000 lbs. of drill pipe and withstand 400 lbs. to the square inch of mud pressure and at the same time permit the drill pipe to rotate at speeds up to 200 r.p.m. The swivel weighs more than two tons and costs about $2,500.
**DRILLING PROGRESSES:**

14 This is the drilling mud. Flowing from a storage tank, it is added to the well as a "killing mud." It is very carefully checked for viscosity, weight and other qualities.

15 This is the mud shaker over which the mud flows after it returns to the surface. The shaker acts like a sieve and sorts out the larger particles of drilling debris and by microscopic examination of these the geologist can tell how the well is "killing" or performing.

**CEMENTING THE CASING:**

16 After the drill has reached the producing zone it is withdrawn and the casing is run. The casing is steel pipe usually 9 inches in diameter and 6 inches in diameter and makes a wall for the well. Cement is then pumped down the casing and flows up towards the surface between the outer wall of the casing and the sides of the well. As much as 1,000 bags of cement are used in cementing a well.

17 At right you see the casing and on the top of it a casing joint to which the cement is being forced down to hold the casing in place. After sufficient time has been allowed for the cement to set and harden, the casing is ran and the bit goes into the productive zone. (It is hoped!)

**ACIDIZING:**

18 By良心 the mud out of the hole the driller determines whether he has struck a flow of oil. If so, the next job is turning the Turner Valley gas into acid. The acid is 10 to 10,000 gallons of acid brought to the well in tank trucks. The acid penetrates the oil-bearing rock and increases the flow.

19 After the acid is spent it is pumped out of the well and burned, as shown on the right. The last step is to put the production test to determine its potentialities.

**PRODUCTION BRINGS NEW PROBLEMS:**

20 A producing well: The derrick has been skidded to another location and this is all that marks an investment of approximately $200,000 to $280,000. The casing runs to the surface level and the smaller pipe protruding above it is the tubing through which the oil flows. The intricate arrangement of valves permits regulation of flow to the district quantity.

21 The oil has to go to market and in a new field this means provision of transport facilities. Here, a section of pipe line is being laid to carry Turner Valley production from the field to Calgary. The steel pipe is first welded together and then lowered into a ditch.
WHAT IS THIS THING CALLED... "PRORATION"?

In this article Proration is discussed in its simplest aspect, as it is now in effect in the Turner Valley. Its elaborations to solve problems arising out of well spacing, conservation of pressure, maximum ultimate recovery, etc., are not discussed because at this writing they are not being applied in the Valley.

From each, this means that the wells will share the market as follows:

<table>
<thead>
<tr>
<th>Field</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well A</td>
<td>270 barrels daily</td>
</tr>
<tr>
<td>Well B</td>
<td>110 barrels daily</td>
</tr>
<tr>
<td>Well C</td>
<td>140 barrels daily</td>
</tr>
<tr>
<td>Well D</td>
<td>190 barrels daily</td>
</tr>
</tbody>
</table>

Total: 700 barrels daily

That is how proration works in the Turner Valley. The Alberta Government establishes the potential output of each well by having its own engineers make the tests at the wells. The capacity of the market to consume oil is known and to by a simple bit of arithmetic the allowable production from each well is arrived at.

There is nothing sinister, mysterious or novel about it. It is the same principle that would apply in the event of famine. The available food would be prorated to the people in need of it, only in that case we would be dealing with a problem arising out of scarcity, while in the oil business, proration is enforced to solve a problem arising out of surplus.

As production in the Turner Valley has increased and as market requirements have fluctuated, the proration figure has, of necessity, been revised from time to time, but the fact remains that every producer who has been agreeable to equitable treatment for other producers has been in a position to get his fair share of whatever market could be developed.

Criticism of proration in the Turner Valley has been current from time to time but it is accurate to say that it has not been circulated by those who are conversant with the situation nor has it been instigated by anyone who are agreeable to recognizing the practice of equity in connection with their operations.

When the Tariff Board sat in Calgary in January last to study the Turner Valley situation, one producer complained that he had a large quantity of oil in storage and that he could not arrange with the Royalite Oil Company to take it. When he was questioned it transpired that this oil had been produced at a rate of 2.5 times the rate at which he would have produced if he had conformed with the proration schedule then in effect. Accordingly, if his oil had been accepted for movement through the pipe line he would not have been in an equitable position with regard to other producers. To move this oil would have penalized others who had been willing to flow their wells at a rate which would give everyone a just share of the market.

To sum up, proration is an equitable method of sharing whatever market is available. It has nothing to do with extension of markets, which is an entirely different problem and which can be solved only by continued co-operation over a period sufficiently long to permit of the enormous and complicated readjustment which has to be made every time a new major oil field has to be fitted into the world's oil picture.

A review of developments in the Valley where progress has been orderly and where the producer has continuously received a price adequate to finance further effort in order to delimit the field, while at the same time the benefit of reduced prices for products has been extended over the Prairie area, contrasts most pleasingly with the chaotic conditions which have arisen time and time again in the United States and which, by driving the price of oil down to distress levels, have resulted in heavy financial losses for all interests involved, and in ruin for many. These chaotic conditions were corrected by proration and it is proration which has in the past few years prevented their recurrence.

Page Right

IMPERIAL OIL REVIEW

SUMMER NUMBER, 1936
Oil has always had its problems

Ingenuity and persistence have solved them as they arise

By J. W. Doherty, Imperial Oil Limited

Mother Nature, when she gave petroleum to man, must have said, "This is one of my most valuable gifts. I am giving it to you at a price. The price you must pay is continual ingenuity to make it useful. You must never be discouraged, and you must never be satisfied."

The history of the oil business would seem to prove that man has kept part of the bargain. For nearly 80 years now he has been puzzling, fuming and fuming about oil and its problems. Mother Nature will probably excuse the very few times he has been discouraged in view of his undoubted refusal to be satisfied.

At first, oil was a source of involuntary worry. No one wanted to worry about it because no one thought this dark, evil-smelling liquid found in seepages here and there was worth a grey hair. But early in the nineteenth century Mother Nature apparently decided that it was time the race of man began to appreciate her gift. So she mixed it with the brine of many salt wells that were drilled at that time in various parts of the American continent. At first the salt well operators did not take the brine. They were drilling for salt, and oil was a nuisance, a "jinx" which caused the abandonment of many a good salt property. "Devil's Tar" it was called by Martin Bratty when he struck a "gooseie" at Tilghman's Creek in Virginia. Both the oil and the creek were well named. Allowed to flow into the nearby Cumberland River until it covered its surface for a distance of thirty-five miles, the unwanted petroleum caught fire and burned down the salt works.

However, it was a salt merchant, Samuel M. Knir, who was among the first to recognize the value of oil as an illuminant and as a medicinal ingredient, and who unwittingly initiated the train of events which led to the drilling (this time intentional) of the first oil well in 1859 and the dawn of the oil industry.

From that time on, oil itself ceased to be a problem. The problem thereafter was to be one of a different and more complex character—how to find uses for all the many fractions of the crude oil, how to juggle them to meet market demands, how to effect economies in refining practices. The story of the oil industry's continued ingenuity in meeting these problems constitutes a record of which any industry might be proud.

The first problem faced by oil men in the early days of the industry was the necessity of extracting as much kerosene as possible from a barrel of crude. Because kerosene was the chief saleable product, there was a small market for lubricating oil and for certain petroleum ingredients used in medicines, but this was supplemented by the oil lamp, and kerosine because of its burning qualities and abundant supply was replacing whale oil as the popular illuminant. Oil men turned themselves back on when they managed to recover more than half a barrel of kerosene from a barrel of crude oil, and deplored the incontrovertible fact that there was always a stubborn ten per cent of the barrel's contents which persisted in becoming gasoline and nothing else, for gasoline was a drug on the existing market. In order to create a market for the unwanted gasoline, naphtha, stoves were developed and the sale of these devices was actively promoted by the oil refiners. "Deodorized stove gasoline" was the alluring brand name for the Imperial Oil product sold in those early days.

Just when the industry was becoming happy about the constantly increasing appetite for kerosene of the oil lamps of the world, a young experimenter by the name of Edison inconsiderately invented an electric lamp which was characterized by an entire lack of appetite for kerosene in any way, shape or form. It was a contumacious which might have placed definite limits upon expansion of the oil business had not other young experimenters been at work inventing the internal combustion engine whose appetite for the despised gasoline was as healthy as it was unforeseen.

From the turn of the last century motor cars appeared on the world's highways in steadily increasing numbers, but the gasoline era of the oil industry really began just before the War when the number of registrations first
commenced to climb in earnest and create a demand for gasoline that threatened to be greater than the industry, with its then limited oil reserves, could satisfy. Another problem had been placed in the oil man's lap. This time it was made more complex and more urgent by the exigencies of war. Something had to be done, and done quickly. There were three possible solutions. Either to find more oil, to extract more gasoline from the available oil, or to restrict the non-combustible use of gasoline. The third method was employed while the other two means of action were being more fully explored, and so "gasless Sundays" became the vogue.

This was only a "stop-gap," an improvisation until the brains of the industry could think of the correct answer to the question that had been posed. Finding more oil would have been a good answer, except for two reasons. More gasoline could be obtained in this way but more kerosene, fuel oil and other products of petroleum would have to be refined, too, and unfortunately Mr. John Public did not want more of these products—or at least not nearly as much more as would inevitably be produced. There was an even more cogent reason for judging this to be the wrong answer. It did not appear possible to find more oil in sufficient quantities with the then available scientific knowledge and equipment. In fact, talk of an oil famine was rife.

So it became a question of producing more gasoline from the same amount of crude oil. Up to this time the oil refiner had been taking out as much gasoline and other products as Nature put there by heating the crude and collecting the various fractions as they boiled off at different temperatures. This was simple distillation. Now, with the genius that so often attends pressing need, he invented a radical new process by which, under great heat and pressure, heavier fractions of the crude could be "cracked" into the lighter gasoline fractions. At once the possible output of gasoline was more than doubled. The discovery could not have been more timely. Again by his ingenuity the oil man had proved his title to Mother Nature's gift.

The invention of the "cracking process" was, and still is, the greatest achievement in the roll of honour of the petroleum industry. Great not so much in its immediate solution of a nasty problem as in the cumulative benefits it has since conferred upon the consumer. These benefits result from the tremendous saving which "cracking" has made possible in oil resources. By distillation the gasoline yield from a barrel of crude had averaged 18 per cent. "Cracking" immediately started this average climbing and, as further improvements in the process were made and more and more refineries installed "cracking" equipment, the average yield crept gradually upwards until today it approximates 48 per cent. In other words it took 3½ barrels of crude oil to make a barrel of gasoline before "cracking," only a little more than 2 barrels are now required with "cracking." More than 12 billion barrels of oil have been consumed as a result. The full meaning of this saving grows clearer when it is realized that the proven underground oil reserves on the North American continent at present total little more than this amount. If it were not for "cracking" then it is safe to say that the outlook for the oil industry would not be encouraging.

The price of gasoline and allied products would certainly have been considerably higher. So high in fact that the motor car industry might never have reached its present key position as a leading creator of employment and bulwark of our industrial economy.

The years following the War brought a swing of the pendulum. Now, more scientific methods of exploration for oil and better drilling technique resulted in a tremendous increase in petroleum production which could not be absorbed, now that the industry had learned how to make a barrel of oil go farther. The spectre of an oil famine was laid, and was soon replaced by the reality of overproduction. From the pangs of famine to the pains of indigestion! For a time it threatened to be an acute attack, but ingenuity and common sense were brought to bear on the problem and two new words were added to the petroleum dictionary—proportion and utilization. Briefly, proportion is the adjustment of the rate of production of oil upon a "pro rata" basis, determined by current demand. Utilization signifies the orderly, economically sound development of an oil field as a unit by avoiding excessive drilling through spacing the wells so as to ensure a maximum recovery at a minimum of cost.

Standing in the way of both reforms was the "law of capture" shibboleth, dating from an antiquated decision of the courts based upon the early idea that oil flows in underground channels and that consequently the legal position of the producer is analogous to that of the hunter in the forest who goes by the "finders keepers" principle. Petitioning "a bird in the hand is worth two in the bush," the owner of an oil property argued that a barrel of oil in his possession above ground was worth two barrels not in his possession below ground, especially as there was nothing to prevent the two barrels being possessed by someone else. Later, legal pronouncements and, better still, actual proved that proportion and utilization in the long run meant considerably more money in the producer's pocket, helped to clear the way for the solution of this problem. Of course, the tremendous increase in demand for all products of petroleum was also an important constructive factor.

The oil industry of today has its own question marks. For instance, to what extent is fuel oil going to rival gasoline in demand? The growth of the fuel oil market during the past two decades has been steady and sure. The advantages of oil as a fuel for ocean-going ships were first recognized during the War, and since that time the tonnage of oil-burning vessels has increased eighteen hundred per cent. A similar trend (Continued on Page 32)
Cleopatra's Legacy

By W. G. CHARLTON

Imperial Oil Limited.

Cleonpatra, historians tell us, was the first woman to use scented oils in her bath. And even before Cleopatra, as far back as 4000 B.C., the women of the Orient were delightfully accenting their beauty. So the women of to-day are the heiresses of a beauty technique which has been 5000 years or more in the making.

Tutankhamen's tomb revealed that the ancient Egyptians were familiar with cosmetics. The women carried rouge and lip-stick with them always, and eyebrow pencil was an essential part of the make-up kit. Malachite, a green ore of copper, was the forerunner of the present eye-shadow.

By 1700 B.C. the Greeks were experts in the art of cosmetics. On rare old vases treasured in museums are painted pictures which show that the Grecian women knew the secrets of finger-nail dyes and skin foods.

The men, as well as the women used hair-blaeking lotion, so it is quite probable, though regrettable, that the famous golden locks of the Greek heroines had their origin in a bottle. The first sign of men rebelling against their wives wearing too much "war paint" (a revolting which has not altogether abated with the passing of the years) was recorded by Xenophon, who tells of a young Greek imploring his wife to improve her beauty by doing more house-work, and not by applying cosmetics. This prescription is interesting! Is the recent great development in household labour-saving devices accountable for the increased use of cosmetics during the past few years?

The Bible, by reference to perfumed oils and ointments, reveals that the women of that period used cosmetics. Josueb is described as "painting her face" when she heard of the arrival of Jehu. The three wise men brought with them gifts of myrrh, and 1779 years before this there was an extensive and profitable trade in the transportation of myrrh from Gilead to Egypt.

Other civilizations used cosmetics extensively. The Chinese have long been skilled in the art of coating and camouflaging nature, and in the Sung and Ming Dynasties they reached a high degree of perfection in this line. The Koran, in its description of the large and beautiful eyes of the houris, indicates that the Mohammedans knew the use of eye-paint. History tells us that the women of Carthage used rouge, henna and eye-shadow.

The Romans learned the use of cosmetics from the Greeks, and, much to the disgust of the older-fashioned inhabitants of the Imperial City, the custom spread rapidly. The Roman women, in their search for artificial beauty, made up some weird concoctions. One face lotion consisted of blood, gall, and liver of sea fishes, leeches and frogs mixed with oil or vinegar. (Here was the perfume's opportunity). Cosmetics were used extensively by the men as well as the women of Nero's court. This was about the last straw to the old-fashioned Romans, who went about sadly wondering what sort of creatures these men were who indulged in the use of scented oils and had their hair waved like women's.

In the 16th century cosmetics were introduced to England by the Crusaders. Despite exorbitant prices they rapidly became popular, and in the 17th century were used to such an extent that a bill was presented to parliament which proposed to render null and void the marriage of any of His Majesty's subjects who were lured into matrimony by the use of cosmetics and subtile perfumes.

To-day, France is the leader of the world in perfumery, while in the cosmetic line branches from this continent are recognized everywhere as superior. Cosmetic manufacturers in the United States, aided by petroleum engineers, have developed the business to the point where it now ranks as one of the major industries of the country. Every year women spend hundreds of millions of dollars on cosmetics, with the result that the cosmetic industry is one of the few that have shown a steady gain since 1929. Nearly $50,000,000 is spent every year on beauty creams alone.

Just what expenditure is made in Canada for similar products is difficult to determine but the total value at the week of all toilet preparations made in Canada during 1936 was $7,415,522. Naturally by the time these products are distributed and placed in the consumers' hands they would represent a much larger figure. In addition to this sum, $861,000 worth of perfumery, cosmetics and toilet preparations are imported.

As far as can be determined, the value of face creams produced by Canadian manufacturers in 1936 was $816,000. Apparently some $223,000 worth of essential oils, 134,000 pounds of petrolatum and 89,700 pounds of wax were consumed by the Canadian cosmetic manufacturer in 1936.

Petroleum plays a major part in this huge industry, and it may well be said that modern woman's search for beauty finds point all the way to the refinery. Formerly face creams and similar commodities were made with a lard base. Lord, however, had a tendency to become rancid, and consequently heavy perfuming had to be resorted to. When fashion demanded more delicate perfumes a substitute for lard was sought, and here petroleum research came to the aid of the cosmetic manufacturer by supplying the base for modern cosmetics. To-day most perfumes, hair dressings, nail lacquers, pomades, facial creams, lipsticks and other beauty preparations are made with solvents, essences, oils, greases and other petroleum products.

It is a fact to-day from the fat of oil face lotions of the ancient Romans and the exorbitant prices for cosmetic of 15th century England. To-day, with the aid of science, specialized machinery and petroleum products, the manufacturers in America are able to put fine quality cosmetics on the market so that the fairer sex can purchase its beauty aids at a price most people can afford.
COST OF WHEAT PRODUCTION REDUCED

With hope running high for a good crop in nearly all areas of the Prairies, wheat prices and production costs are items of wide interest. So far as production costs are concerned there are naturally influenced to an important degree by yield, and promises are good in this respect. Very important also in determining the cost of a crop are the costs of equipment and supplies used by the farmer in his operations.

The accompanying chart is based on data from the Seattle Grain Company's "Index of Things Farmers Buy", with the exception of wheat prices which are from the Dominion Bureau of Statistics. It will be noted that all groups of commodities which the Western farmer purchases are selling at prices substantially lower than the 1926 prices which are the base used by the Dominion Bureau of Statistics in revealing price trends. Approximately 78c now will buy groceries which cost $1 in 1926; clothing is selling at about 87c of the 1926 dollar; household equipment at 87c; farm equipment at 88c; farm machinery at 94c; and municipal and school taxes are about 76c of what they were in 1926. On the other hand wheat is at about 90c of the 1926 level.

The most drastic reduction in cost of any commodity entering into the farmer's operations is in the cost of fuel for his tractors, trucks and other power equipment. Regular grade gasoline is at all time low and results in the farmer being able to purchase for approximately 63c the same quantity of gasoline which cost him $1 in 1926, and the quality is greatly improved! But this does not fully reflect the advantage in regard to power fuel costs because since 1926 there has been developed a third grade gasoline which is entirely suitable for farm operations. The result is that with $1 the farmer can buy almost twice as much power as he could in 1926.

In the case of farmers using diesel oil a still greater advantage is enjoyed. It will be noted from the accompanying chart that the trend of gasoline prices has been consistently downward for more than ten years and that no other group of commodities shows a comparable reduction.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PRICE OF WHEAT</th>
<th>CLOTHING</th>
<th>HOUSEHOLD EQUIPMENT</th>
<th>FARM EQUIPMENT</th>
<th>FARM MACHINERY</th>
<th>TAXES</th>
<th>GASOLINE REGULAR</th>
<th>GASOLINE THIRD GRADE</th>
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<td>1936</td>
<td>62!¢</td>
<td>80.5¢</td>
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<td>1937</td>
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World Oil Production In 1937

THE demand for petroleum and petroleum products last year was the largest in history and world production of crude petroleum reached the staggering total of 2,045 million barrels. This represented an increase of 15% over the 1,810 million barrels produced in the previous year.

Oil is produced in about 36 countries, of which 12 are important, contributing 98% of the world's annual supply. From the pie chart reproduced above it will be seen that the United States is by far the leading petroleum producing country, accounting for over 62% of the world total. Next in importance is the Soviet Union which has produced 17% of the world's crude each year for the past several years. Venezuela occupied third place among producing countries, supplying about 9% of the annual production, and accounting for most of the oil exported from South America. In 1937 these three nations produced roughly 81% of the total output of the world.

It is interesting to note that almost 78% of the world's oil supply is produced in the Western hemisphere. The United States, as already mentioned, accounted for 62.61% of all the oil produced last year. The South American countries together produced 12.60%, with Canada and Mexico accounting for a further 2.41%. Europe, including the Soviet Union, produced 12.80%, with Asia and the Far East supplying the remaining 9.45%.

Floating Tanks

Ploughing the Waters of the Great Lakes, Squeezing Through Narrow Locks, go the Imperial Oil Lake Tankers, Part of the Company's Distributing System.

By ANDREW MERRILEES

On the dark banks of the Sorelges Canal at Coteau Landing, Ontario, a steamer is creeping slowly into the lock. It is moving cautiously; its lights gleaming colorfully against those on the gates. A man is standing on the bow, peering into the abyss below. He seems tense.

"Seven!"
The steamer moves slower.

"Three!"
The steamer grinds pitifully in the lock. A winch clatters.

"Hold her!"
Ropes come taut with a grinding wrench. The ship takes a heave forward and settles back easily. It is very close to the gate. Only three inches away. Some navigating!

A few minutes stillness; then the hum of the machinery opening the gates. A hoarse bark of the whistle, and away. The steamer moves up the canal. If that boat had been five inches longer, two inches wider, or two feet deeper, it would not have been able to navigate the St. Lawrence canals. That was an Imperial Oil tanker.
Ploughing the waters of the Great Lakes, scurrying, scuffling through narrow locks which will scarcely allow them passage, navigating snarl-filled rivers, buoy-marked channels, breaking through thick ice, go the Imperial Oil fleet of lake tankers, an integral part of the company’s Canadian distributing system.

In each one is sufficient gasoline to keep your automobile running for a lifetime; yes, many lifetimes. They are handled carefully by skilled men trained for service. Generally speaking, they are bright, fine lake steamers. Technically, they are nothing more nor less than floating tanks.

Their job it is to keep well supplied the storage tanks of the company’s depots along the two thousand miles of Canada’s inland waterways. Directed from the executive offices in Toronto, they carry gasoline and fuel oil from the refineries at Sarnia, Montreal East and Halifax to depots located from Fort William to the maritimes.

They are ever busy, stopping only when ice wals up the harbors, forcing them into inactivity. On the Great Lakes, the open navigation season extends roughly from April to November, but this does not stop the Imperial Oil tankers; they are not working at the first crack of the ice to replenish the depleted petroleum supplies at the company’s depots. They have been known to start as early as March 25th and in time of emergency keep working until late in November.

In the early days of sailing schooners when everyone wore silk toppers, the mayors of many lake cities presented the captain of the first ship to enter port with a silk hat. This practice is still continued, although no self-respecting captain would now wish to be seen in this mode of headgear. Nevertheless, some Imperial Oil skippers have as many as five of these “stovepipes.”

When oil was used for illuminating purposes only, it was carried in barrels and tins, and this condition continued until its commercial use demanded another means of transport.

In 1885 about 200,000,000 gallons of petroleum were exported from the United States in barrels and tins.
and less than 2,000,000 in bulk. Within ten years the shipment of oil in barrels had fallen to less than 2,000,000 gallons, and the transport of oil in bulk had risen to nearly 500,000,000 gallons. Needless to say, the former method of transport resulted in many breakages and much loss. The barrels were made of wood, as were the ships, and in storms the barrels were thrown about and smashed and not a few were washed overboard. Shipowners were also hard put to keep their ships in the oil trade, as a few months in this service rendered them unsaleable for any other kind of carriage.

Oil companies were then faced with the problem of owning their own ships. Many firms bought old freighters for conversion into oil carriers. This consisted of the installation of tanks in the ship's hold, and was from all angles, very unsatisfactory. The utilization of every cubic foot of space is now a stringent feature of modern tank ship design, and all vessels are now built with this end in view.

Many interesting technical features exist in oil tanker design without which such a vessel would be impossible. The interior of the ship is not a huge tank as one might assume. It is divided up into many individual portions to take care of collision, leakage, expansion, safety and convenience. Each tank is equipped with an expansion trunk, to which height the vessel is loaded. This takes care of expansion in the cargo without an excess of fuel oil. The interior of the ship is not a huge tank as one might assume. It is divided up into many individual portions to take care of collision, leakage, expansion, safety and convenience. Each tank is equipped with an expansion trunk, to which height the vessel is loaded. This takes care of expansion in the cargo without an excess of fuel oil. The interior of the ship is not a huge tank as one might assume. It is divided up into many individual portions to take care of collision, leakage, expansion, safety and convenience. Each tank is equipped with an expansion trunk, to which height the vessel is loaded. This takes care of expansion in the cargo without an excess of fuel oil.

The loading or unloading of an oil-tanker is carried out with practically no noise other than the subdued thrum of the pumping machinery. Connections between the ship and the dock are effected by flexible pipe lines bound in rope. The distance between the dock and the storage tanks is sometimes considerable, the longest in the Great Lakes being at Hamilton, where the line is more than half a mile in length.

All the Company's tankers on the Great Lakes are managed by the Imperial Oil Shipping Company, recently formed subsidiary, which directs the movements of both lake and ocean vessels.

The lake fleet consists of eleven vessels, the largest fleet of tank ships on the Great Lakes, and they range in size from the 2631-ton "Talaradite" to the little 715-ton river steamers "Otawaite" and "Rideadite.

As far as is known, Imperial Oil Limited were the first Canadian operators of bulk tank steamers on the Great Lakes. Their first steamer, the "Imperial," is still in service in Vancouver harbor. Built in 1898, the "Imperial" is the oldest unit in the company's fleet, and left the Great Lakes for the Pacific coast many years ago.

The first large steamer was built to the order of the company in 1912. Launched at Dundie, Scotland, the standard lake vessel "Tocoma," of 1669 tons, entered service in that year. Some years ago the vessel was sold to the International Petroleum Company for service along the Persian coast. She has lately made appearances in Halifax and Montreal, having been purchased for the bunkering service.

The fleet was increased to four the following year, when the "Impperial" and "Imperial" were launched at Grangemouth, Great Britain. These sister ships were almost twice as large as the "Tocoma," being of 2255 gross tons, and were subsequently commissioned for war service in the Mediterranean. Both vessels had many escapes from submarines while carrying petroleum to the allies at Marseilles, Florence, and Genoa and were returned to the company after the Armistice, re-entering service on the lakes. The "Impco" has since been lost.

To replace the vessels commandeered for war service, and to supply the increasing demand for gasoline in Canada, three vessels were built to the order of the company at Collingwood Shipyards during 1916, and were the only large vessels to be launched in Canada during that year. These were the "Royoite," named after one of the western subdivisions of the company; the "Jooite," a coadvertising the Canadian National and the "Santoria," named after the city of Sarnia. These vessels are of standard lake size, being 250 feet in length, and 45 feet in tonnage of beam and grossly approximate 1600 tons gross.

The somewhat larger steamers, "Talaradite" and "Reginaite," were built in 1918 at Collingwood, and were the first vessels to be provided with electric lights. On account of their extreme depth of draft they were found unsuitable for naviga- (Continued on Page 32)

SARNIA, known to Canadians for its championship football teams and its vast Imperial Oil refinery, is to have another claim to fame. A great steel link between Canada and the United States is here being forged—a link long sought by Sarnians who saw their sister city of Windsor to the south benefited by a similar tie.

It is to be called the Blue Water Bridge, an appropriate title because the Blue Water Highway which skirts Lake Huron for more than 100 picturesque miles stems properly from here. Begun on June 24th, 1937, it will be completed and ready for official opening on Labor Day, September 4th of this year, if present plans materialize. On that day President Roosevelt and either Lord Tweedsmuir or Prime Minister W. L. Mackenzie King will officiate at the opening ceremonies. The date coincides auspiciously with the time of the Blue Water Carnival held annually in Port Huron across the river. The carnival is attended by many Sarnians who no doubt will seize this opportunity to make their first crossing via "The Bridge."

A road map of the Great Lakes district reveals the strategic importance of the new span. The combined population of Sarnia and Port Huron is hardly large enough to feed it with traffic but a steady flow of cars may be expected from the middle West seeking a direct route to Eastern Canada and the Eastern States, immediately upon its completion the ferries, heretofore sole (Continued on Page 32)
FIGHTING FIRE
IN AN OIL FIELD

One of the most perilous and certainly one of the most dramatic of all occupations is that of extinguishing fires in oil and gas wells.

The M. M. Kinley Company of Houston, Texas, specialize in work of this nature and to them The Review is indebted for the photographs published here which are taken from the first complete set of photographs revealing the difficulties of extinguishing a major oil well fire. Two days after M. M. Kinley's crews arrived at the scene of this fire, which was in southwest Texas, they had succeeded in extinguishing the flames and 14 days later the well was capped.

1 (Upper left) This is the way the burning well looked shortly after it caught fire on January 8, last. At the time it was estimated to be making 500,000,000 cubic feet of gas and the result was one of the worst oil well fires in history. An initial attempt to extinguish the flames had failed after six weeks of disheartening effort.

2 The first job was to remove steel debris from the crater, left, which was more than 70 feet deep. Until this was done there was no use extinguishing the fire because the heat of the metal in the vicinity would immediately re-ignite it.

3 A large metal container was then filled with solidified nito-glycerine and carried in a wheelbarrow as close to the flames as the workers could approach.

4 Note the water which is being played on the workers from the left in order that they may tolerate the intense heat at the mouth of the well.

5 Cut goes the fire! The charge of nitro-glycerine is detonated and smothers the flames, the last of which can be seen disappearing in the upper right hand corner.

6 And that's that! The flame has been extinguished but the well is still blowing great quantities of gas and oil into the air at the rate of 100,000,000 cubic feet of gas daily with a pressure of 2,200 lbs.

7 Oil fires are snuffed out by this method by the concussion separating the flame and fuel long enough for the fire to burn out.

This picture gives an idea of the depth of the crater blown out by the wild well. The arrow points to the surface of the earth.
CAPPING THE WELL: Extinguishing the flames is only the first step in fighting a burning oil well. With the fire out, the escaping gas and oil must next be brought under control. How this is done is shown on these pages.

A “mud-hog” had to be lowered into the crater to pump out accumulated mud and water before the workers could attack the job of capping the well.

In the earlier attempt the flames were smothered by flooding the crater with water, but the fire broke out again and the “mud-hog” was needed to pump out the mud from around the casing.

Here is the end of the casing through which the well is discharging 100,000,000 cubic feet of gas. As the end of the casing is damaged, the workmen have to cut a section off. A tedious job, because one spark from the cutting machine would re-ignite the well.

Here comes a valve control arrangement known in the oil business as a “Christmas tree.” This is swung out over the crater so that it can be spotted carefully over the casing. All that need be done now is to fit it over the end of the casing.

Difficult working conditions! The “Christmas tree” is being lowered into position. The men are working in a cloud of gas that might explode at any moment.

The “Christmas tree” has been fitted over the casing. Later, flow lines will be installed to carry the gas up the side of the crater to a series of large separators. Meanwhile, to relieve the pressure, the wild flow is being permitted to continue.

After the “Christmas tree” was fitted, cement was poured in and the whole works securely anchored to hold it down. The main control valve is now ready to be closed. Leading off to the left are the flow lines through which the gas and oil will be brought to the surface.

Victory! When the cement had set the “Christmas tree” valves were closed and the rampaging well was under control. Note the smile of victory on the face of the workman at the left.
And Now... A PATENTED GASOLINE

- All gasoline contain gum, and this is about the amount of gum contained in the quantity of gasoline used by the average motorist in one year.

- New Esso and 3-Star Possess Unique Qualities Protected by Canadian Patent.

EVER SINCE Esso and 3-Star gasoline were first introduced to the motoring public it has been the aim of Imperial Oil Limited to maintain their leadership by periodic refinements and improvements whenever scientific development offered a suitable opportunity. Lately in this direction is the addition to both Esso and 3-Star of an exclusive solvent oil which dissolves gum and checks carbon formation, thereby assuring smoother, more powerful engine performance and fewer repair bills.

In recognition of the practical value of this improvement in gasoline quality, the Canadian government has issued Patent No. 357956 to cover the new formulae of Esso and 3-Star.

Lately, unfamiliar with the secrets of efficient motor operation, may wonder how the addition of a few drops of solvent oil to a tankful of gasoline can improve engine performance. To understand the reason it is necessary to review what happens in the average motor using ordinary gasoline.

The modern motor car engine is composed of smooth, close-fitting parts, designed by the manufacturer to move at tremendous speeds. Anything which interferes with the delicate co-ordination of these parts directly affects engine efficiency. In every car two materials are continually coming into contact with engine surfaces. These materials are gasoline and motor oil. All gasolines contain a certain amount of sticky gum, and all motor oils contain a certain amount of hard, black carbon. Both gum and carbon tend to be deposited in the engine. If there were no sticky gum present, the carbon would be so flaky most of it would blow out the exhaust. But the gum unites with the carbon and makes it a solid mass to valves, rings and pistons. Over a period of time these deposits may grow to such an extent that they cause the valves and rings to stick and to seat imperfectly.

The purpose of valves and piston rings is to seal power within the engine so that every ounce of energy will be transmitted to the car wheels. When valves and combat engine deposits. That an oil of good lubricating qualities cannot perform such a function is easily proved by a simple experiment. If two cupsfuls of the same gasoline are evaporated, an identical deposit of gum will remain adhering to the bottom of each. When lubricating oil is poured in the one cup, there is no change in the deposit; the gummy mixture sticks just as firmly to the cup as before. But when the same amount of solvent oil is poured in the other cup the deposit is soon dissolved.

The claim is not made for the new patented Esso and 3-Star fuels that they will remove carbon from a badly deposited engine. They will tend to do so over a period of time, and they will certainly combat further accumulation, but they are most useful in keeping new engines, or engines from which the gum and carbon have been removed, in peak condition.

In the photo on the right, different gasolines are being tested for their carbon-forming properties. Below is a view of the laboratory in which the new Esso and 3-Star gum-dissolving solvent was developed.
THE LATE

CHARLES McNAIR

- A Kindly Spirit and Loyal Servant, For Many Years Head of Fuel Oil and Railway Sales.

ONE OF the Executive Office maintenance staff and of Charles McNaig, "I always feel better after I see him." In these words he pictured the character of the late head of Imperial Oil's Fuel Oil and Railway Sales Department. Charles McNaig was noted and loved for a kindly geniality which came from his heart and when he died at Kingston, Jamaica, on April 24th, many people in the organization and many more outside of it lost a steadfast and always helpful friend. The company lost a loyal and able servant.

The late Mr. McNaig was born at Milton, Ontario. His first employment was in a store but like many youths he succumbed to the romance of railroad and obtained employment as a fireman on the old Grand Trunk out of Sarnia. After some years he qualified as a locomotive engineer and after four years in that capacity was promoted to the position of instructor of transportation rules on what then was known as the Middle Division of the Grand Trunk. His unrivalled knowledge of his work and his unfailing ability to make and hold friends attracted the attention of the Galena Signal Oil Company, specialists in railway lubrication, when they required a service engineer. Accordingly, in September 1915, Mr. McNaig was employed by that company. In 1926 the Galena Signal Oil Company of Canada Limited was incorporated and Mr. McNaig was elected a director. Subsequently he was appointed to the office of vice-president.

In 1927 the Galena Signal Oil Company of Canada was acquired by Imperial Oil Limited and the head office moved from Montreal to Toronto. Mr. McNaig continued on the directorate of the reorganized company. In October, 1931, he was appointed to the position which he held until his death.

He was an energetic and enterprising worker who always found time to take a keen interest in the affairs of those about him. He was business manager of the Imperial Oil Hockey Club during the time that it had an entry in the Toronto Mercantile League. From the time he came to Toronto he was active in the affairs of the 56 Church Street Club, an organization of Imperial Oil and International Petroleum employees and was president of the Club in 1934-5. Three years ago when the Imperial Players' Guild was organized, Mr. McNaig accepted the presidency of that group and deserves much of the credit for its continued development.

The funeral service in Toronto was very largely attended by all ranks in the company's service and by an almost equally large representation of his friends in all parts of Canada.

REGINALD H. SPURR

Reginald H. Spurr, for 21 years in the employ of Imperial Oil Limited and until his retirement in 1957, Manager for the Company in Newfoundland, died at Toronto on May 14th. Mr. Spurr was engaged in the oil industry from his boyhood and was first in the service of the Vacuum Oil Company. In 1917 he joined Imperial Oil Limited and after serving in various capacities he became Assistant Manager of the divisional office at Brandon. In 1932 he was appointed Manager at Newfoundland.

JOHN J. HICKEY

John J. Hickey, for nearly 20 years an efficient employee in the traffic department, died suddenly at Toronto on June 17. Mr. Hickey had an extensive experience in railroad and industrial traffic affairs, and was highly esteemed for his ability and judgment, and for his unfailing consideration and kindness to all with whom he came in contact.

AN EXHIBITION IN THE MAKING

THE CRAFTSMAN above is not making toys, he is working on a model of the Imperial Oil Display which will be a feature of the Canadian National Exhibition at Toronto, August 26 to September 10. Imperial Oil has been able this year to arrange for a display which will be unique in many respects. It will deal with the exploration, production and distribution of crude petroleum. The Museum of Science and Industry, Chicago, is co-operating wholeheartedly by lending many unusual and very valuable exhibits. These include accurate replicas of oil bearing structures, geological samples arranged for microscopic examinations, rotary and percussion drilling rigs, pipe line systems, etc., etc. Among the many interesting features of the exhibit will be a diorama of the Turner Valley in which the geological structure is exposed and the drilling operations reproduced in a life-like way.

The various exhibits which will be arranged in this display will have a value of more than $50,000, and visitors passing through the exhibit will be able to acquire in a short time a general knowledge of the methods employed in finding, producing and transporting crude petroleum, a subject of particular interest to Canadians at this time in view of the developments in the Turner Valley.
OIL HAS ALWAYS HAD ITS PROBLEMS

(Continued from Page 13)
towards the use of oil heat for domestic and industrial purposes has been apparent. Diesel installations in all phases of industry have further stimulated the demand for fuel oil. So important has the market for this product become that many refineries are kept just about as busy refining fuel oil during the winter months as they are during the summer refining gasoline. This is a happy state of affairs, except for the fact that the problem of juggling the barrel of crude oil to give the required amounts of gasoline, fuel oil and other products at the right season, is becoming a bit complex again. As more fuel oil is produced, more gasoline tends also to be produced—and this during the season when less gasoline is needed.

But this problem should not bother the modern oil man, after his half century's experience in reaching a barrel of oil to deliver. Witness the following changes in yield which he has contrived without undue fuss. In 1880, 75.2 per cent. of the barrel was made into kerosene, 2.1 per cent. into lubricating oils and 10.3 per cent. unavoidably became gasoline; no fuel oil or gas oil was produced, as such. By 1917 the proportion of kerosene had dropped to 13.1 per cent.; gasoline had increased to 21.5 per cent., and the fuel oil-gas oil and lubricating oil yields had risen to 49.2 and 5.7 per cent. respectively. In 1929 the kerosene fraction had fallen to 5.7 per cent.; the gasoline fraction (through further improvements in the "cracking" process) stood at 39.3 per cent.; fuel oil and gas oil 43.3 per cent.; lubricating oil 3.5 per cent. In 1936 gasoline showed a further gain to 44.1 per cent.; fuel oil and gas oil, after a temporary drop to 44.0 per cent. in 1932 had risen to 48.6 per cent.; kerosene 5.3 per cent.; lubricating oil 2.9 per cent. From these figures it might appear that fuel oil was becoming less important. Actually, the smaller percentage of fuel oil and gas oil today comprises far more in total gallonage than the larger percentage during the earlier years of the century, because the total gallonage of refinery runs has continually increased as a result of the growth in the gasoline market. The recent rise in the fuel oil-gas oil percentage from 44 to 48.6 per cent. is more truly indicative of the greater importance of this fraction.

The vista facing the industry is an intriguing one. A barrel of oil does not grow any larger but the number of different products obtainable from it, already in the hundreds, is steadily increasing. New processes forecast an even greater emphasis upon chemistry and indicate the probability that a multitude of household and industrial articles may be manufactured synthetically from petroleum gases. The future promises to offer a greater scope than ever for the oilman's ingenuity.

FLOATING TANKS

(Continued from Page 22)

Noon on the St. Lawrence river and the "Regina" was subsequently sold, while the "Talarific" is now engaged in ocean service.

All recent additions to the fleet have been British-built ships. Canadian designed, the first of which was the "Windfis," launched in 1927 at the yard of the Furness Shipbuilding Company, Haverton Hill-on-Tees, England. This tanker grazed 1930 tons and has been the prototype for the designing of many lake tankers since built.

The "Windfis" was followed in 1930 by the "Acadiana" and "Sirocata," of 1919 tons apace. These vessels were also built at Haverton Hill-on-Tees and express the latest trends in lake tanker design. They are specially built for navigation on the St. Lawrence canals and lake service.

Also during 1930, the company's small but efficient units, "Otterville" and "Ridnaute," were completed. Also built in the Furness yard, these vessels were designed for navigating the Ottawa River between Montreal and Ottawa and Hull. They are 175 feet in length, 43 feet of beam and only 11 feet in draft. This is necessary in order to navigate the shallow river and the Carillon and Grenville canals, in which the depth of water is nine feet. Both vessels have proved extremely capable in reaching the smaller harbors on Lake Ontario and the St. Lawrence River.

The latest addition to the fleet was the small Pacific Coast tanker, "Beccale," which will operate out of the Vancouver refinery. Other additions are contemplated for the fleet and two are expected to be launched this year. These vessels will have the most modern development of propulsion plants under the Canadian flag.

BLUE WATER BRIDGE

(Continued from Page 23)

means of travel between either shore, will cease to carry automobiles so that all motor traffic will take to the bridge.

The Blue Water Bridge will cost $2,750,000, shared five ways among the Dominion, the Province of Ontario, the United States Government, the State of Michigan and the State Bridge Commission of Michigan. Canada's total share of the cost will be $835,000. Imperial Oil products are being used exclusively in the work of construction.

A SHIP TAKES SHAPE

Two new Imperial Oil tankers, each with a capacity of 420,000 gallons of cargo, are now under construction at Sorel, Quebec, and at Collingwood, Ontario. Loadings will take place towards the end of August.