PETROLEUM *in* CANADA

Victor Ross

THE WORLD'S LARGEST OIL WELL, MEXICO.
ESTIMATED FLOW 170,000 BARRELS PER DAY.

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THE preparation of this volume has been as much a matter of editing as of original research, so many and so varied have been the sources of information drawn upon. Indeed, it would be difficult to apportion the responsibility, but in passing on the result to the reader one is glad of the opportunity to extend grateful thanks to all of those who have so generously and so ably assisted, and in doing so to say that while this assistance has come from authoritative sources the book pretends to be nothing more than a somewhat casual and deliberately non-technical commercial story.

VICTOR ROSS
Toronto, 1917

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Chapter 1.

INTRODUCTORY

THE beginnings of all industries are gilded by legend and shadowed by mystery and the petroleum industry is no exception. It is at once one of the oldest sources of commercial gain, and one of the youngest developments of vast productive trade. Today it is a basic industry in the sense that many other industries depend upon it; fifty or sixty years ago it was regarded in no such light. Today the known possession of large deposits of petroleum, which in its Latin derivatives means literally "rock-oil," gives to any nation or territory economic importance; a half a century ago statisticians seldom thought of it as adding materially to any community's wealth and power. Its development as a factor in the industrial progress of mankind has been almost coincident with electricity, and it may be safely said that,—in the arts of peace and war,—it is a hardly less important factor. The oil deposits of the earth are the objectives not merely of commercial conflict, but of military enterprise.

In the greatest of wars, which at the time of writing is in progress, we read of armies striking at or tenaciously defending territories, for the main reason that petroleum abounds therein. Its rapid production has revolutionized transport on sea and land. It, in common with electricity and steam,

has relegated the horse to a secondary place in the solution of the problems of transport. It has made submarine and aerial warfare possible, and has revolutionized naval construction. Yet its possibilities were undreamed of by the grandfathers of boys still at school.

Nevertheless petroleum was collected for the use of mankind, and for the service of religion before the dawn of recorded history. It plays its part in the earliest annals of the human race. It is one of the bitumens that were in familiar use by the ancients; the fluid relative of the pitch with which Noah was directed to tighten the seams of his ark.

The "oil out of the flinty rock" alluded to in Deuteronomy and other books of the Old Testament is the veritable fluid from which so many sudden fortunes have been made in these latter days. Biblical allusions indicate that the priests not only of the Hebrews but of the other tribes of the East used natural oils for their altars. Like many gifts of nature it was regarded as miraculous by the ancient peoples who knew nothing of scientific theory. The burning wells of Baku were an objective of religious pilgrimage among prehistoric peoples, and despite the waste that went on in ages past, they still flow, though the output is now devoted to practical uses, and no longer plays its part in religious mysteries. The Zoroastrians, or fireworshippers of Persia and India, saw in these wells the manifestation of a great spirit imprisoned deep in the earth, who was supposed to breathe an inflammable vapor

from his nostrils. Zoroaster had his fire temple at Baku, and it is probable that these inflammable wells did much to confirm the literal idea of Hell, common to many religions of Semitic origin. Alexander the Great, the conqueror of Asia, saw the burning lake of Ectabana centuries before the birth of Christ, and Marco Polo, the mediaeval explorer, with all his romancing, revealed the truth about the oil resources of Baku in later centuries and discerned their commercial value. Before his time the Roman conquerors had realized the value of the mineral oils of the near East and used them as illuminants. Nor were the ancients ignorant of the value of petroleum in its various forms as a cure for natural ills, and used it both externally and internally. The fact that it had, in their eyes, a magic origin, heightened its curative value for them.

The ancient peoples of the regions of the Black Sea and the Persian Gulf were not alone in appreciating the practical uses of this gift of bounteous nature. The oldest records of China and Japan contain allusions to the use of natural oil and gas for heating and lighting, while Europe in the middle ages was aware of the medicinal value of the oil deposits of Galicia, Northern Italy and Bavaria. Since the middle of the nineteenth century the most prolific source of oil in the world has been the continent of North America, but the knowledge of its resources in this respect are not entirely a modern discovery. As early as 1632 Joseph de la Roche d'Allion gave an account of oil springs he had seen in what is now the State of New York,

and his record was published in Sagard's "Histoire du Canada."

Modern investigation and modern invention, going hand in hand, have swept away the old legends which gave a magical glamor to petroleum and have made it the vehicle of vast commercial expansion. Strangely enough, oil production as a commercial enterprise, in the present-day acceptation of the term, began not in the United States, as many suppose, but in the little land of Roumania, where the industry was started in 1857 and has steadily increased ever since, though production has never reached anything like the volume it has attained in States like California and Pennsylvania. The United States entered the field in 1859 and Italy, where the industry has never assumed serious proportions, a year later. Other countries have become producers in the following order: Canada, Russia, Austria (Galicia), Japan, Germany, India (Burma), Dutch East Indies, Peru and Mexico. The Mexican industry dates only from 1907 and experts are unable to say what country may become a new producer tomorrow, for no territory of considerable extent is free from indications that may bear fruit in the future. Prospecting has been carried on in almost every part of the habitable globe; much of it has been misdirected, but much of it has also brought petroleum to light in unsuspected places.

Petroleum and its sister, natural gas, rank today among the great natural resources of the world, sought as eagerly as gold. Fortunate indeed is the

country which possesses stores of petroleum, for, like gold, it brings other industries with it, and a healthy prosperity which helps to weave the ever-growing fabric of international trade.

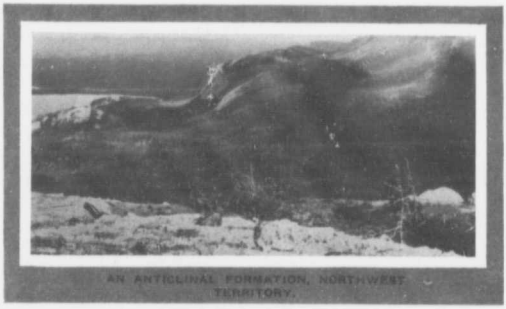
CHAPTER 2.

THEORIES OF THE ORIGIN OF PETROLEUM

SCIENTISTS have long been in dispute as to the origin of petroleum. At one time the oil was generally ascribed to inorganic sources, and distinguished chemists expounded the various chemical reactions by which petroleum could be formed from various substances which might be present deep beneath the earth's crust. The inorganic theories, however, were not founded on observations in the field, but were constructed in laboratories by chemists who were not geologists. The deeper the exploration into the earth the less carbon and hydrogen is found, when the primary crystalline rocks are composed of minerals which are practically free of these elements. Thus the carbides and other substances on which the theory "inorganic origin" depends have not yet been found, and this means of accounting for the sources of petroleum remains purely hypothetical.

In recent years geological study of the world's oil fields has led to the general conclusion that petroleum is derived from organic material originally imprisoned in the sediments which now compose the sedimentary rocks. These sedimentary rocks are formed mainly as the result of the erosion of the primary rocks, but they contain in addition the remains of the organic life, both animal and vegetable, which invested

the earth through many age-long geological periods. A part of this organic matter was preserved in the form of coal, other parts doubtless decayed away and were not preserved, but a mere fraction of the vast amount of organic matter which must have originally accompanied the sediments would be ample to yield incalculable quantities of oil and gas.



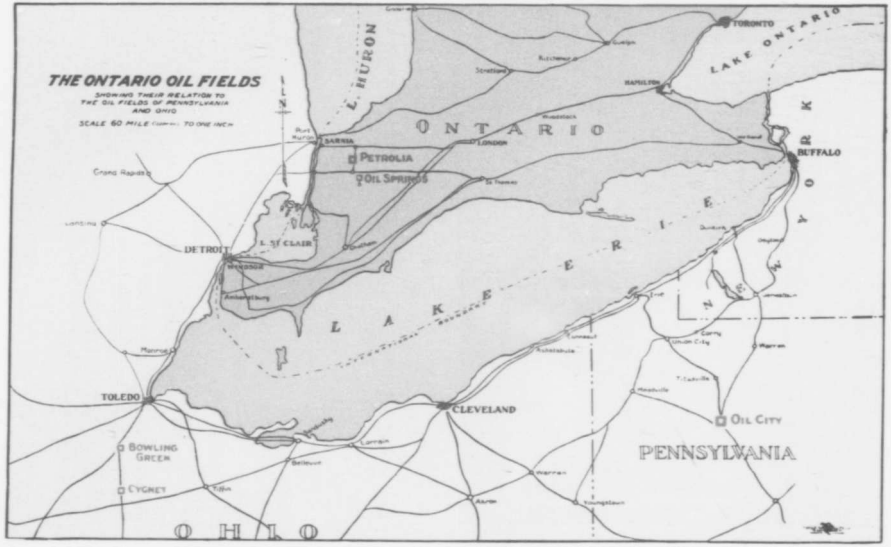
AN ANTICLINAL FORMATION, NORTHWEST TERRITORY.

There is much difference of opinion now as to the particular kinds of animal or vegetable matter that gave birth to petroleum; as to the particular mode of decomposition by which it was generated; as to the conditions favorable to the process; and as to stage in the history of oil-bearing rock at which the chemical transformation took place. One of the important features, however, in the occurrence of petroleum which is not yet satisfactorily explained, even in the organic theories, is the general association of salt with oil. Not

only is strongly saline water commonly present in the vicinity of petroliferous rocks, but in a number of fields the oil is closely connected with large masses of rock-salt, gypsum and dolomite. It seems likely that eventually some more satisfactory modification of the organic theories will be evolved in which these circumstances will have a place.

The term "coal-oil" applied to the form of petroleum, at one time most generally in use, was born of a misapprehension. It is said that in 1790 miners in the Shropshire coal mines in England observed oil trickling from the fissures in the veins and naturally believed that it came from the coal. Many years later this circumstance was quoted to sustain the theory that soft coal beds were the source of supply. When the first large deposits of petroleum in the United States were discovered, bitumen coal was also found in immense quantities in the same regions: thus the belief that the two were of common origin was fixed more firmly and the term "coal-oil" came into general use. This belief was common among operators until oil was found at points far removed from any coal, as for example in the Petrolia and Oil Springs fields of Ontario.

Natural gas is a usual and extremely useful accompaniment of oil. With the "gushers" it is the gas that sends the oil spouting into the air. From the tremendous volume of oil that bursts from a flowing well (170,000 barrels a day has been recorded) comes the familiar and not unnatural belief in the existence of huge subterranean pools or lakes of oil. But in reality,



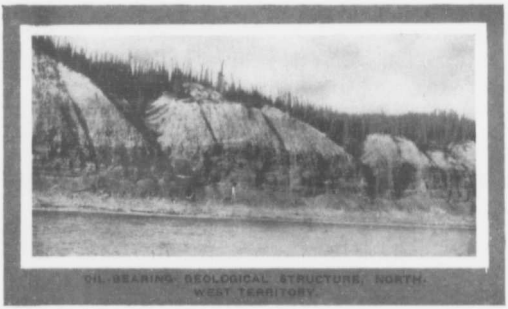
THE ONLY PRESENT CANADIAN OIL FIELD—SHOWING ALSO PROMINENT OIL FIELDS IN THE UNITED STATES

A GUSHER.

it is the solid rock itself which is the reservoir for the oil. When a piece of oil rock is examined under a powerful glass, millions of tiny interstices appear between the different sand grains. This porous, oil-bearing sand stone may very readily contain one-tenth or one-eighth of its bulk in petroleum. Indeed, some of the oil sands of the Russian fields have been estimated to contain not less than one-fifth of their bulk in petroleum.

The accumulation of oil in the earth, therefore, would seem to call for the presence of a coarse grained porous rock which may be roughly described as a reservoir divided into infinitesimal compartments. The usual reservoir rocks are sandstone, which explains the common term "oil sands," although certain limestones and occasionally conglomerates serve the same purpose, but whatever the character of the reservoir rock, it must be covered over by some non-porous layer whose impervious nature holds the oil until the drill penetrates the strata, releasing the pent-up gas, oil, or water, so that the liquid comes to the surface, either by the natural pressure, or by pumping.

There is no fixed rule governing oil-well production, nor can the period of complete exhaustion be accurately calculated. The yield may continue years before the final cessation. If the well is then abandoned for a period, it will not renew its full former activity, but generally will yield some oil, and this is taken to prove that the liquid mineral is migratory.



OIL-BEARING GEOLOGICAL STRUCTURE, NORTH-WEST TERRITORY.

Chapter 3.

THE PETROLEUM INDUSTRY IN WESTERN ONTARIO

In the introduction to this volume allusion has been made to the ancient recognition of the uses of petroleum. In Canada the discovery of such deposits and the subsequent growth of a great industry therefrom belong wholly to the modern and scientific era, and constitutes a very interesting chapter in the history of the industrial development of this country. The industry is but little more than half a century old and, until recent discoveries in the West, was wholly centred in Lambton County, Ontario, on the shores of Lake Huron. The peninsula which extends between Lake Huron and Lake Erie is rich in natural gas, which is usually associated with petroleum, while the shores of Lake Huron, to the north of it, are marked by salt deposits, which are also a frequent accompaniment of oil deposits in various parts of the world.

The discoveries on Black and Bear Creeks, in Lambton County, from which the flourishing industries of Petrolia and Oil Springs have grown, were due to the excitement which attended the Pennsylvania discoveries, and set geologists and prospectors scouring the whole Lake Erie region for similar finds.

The Province of Ontario has an area equal to that of Germany and France combined. Southern, or Old Ontario, is the oil and natural gas region of the Province, nine-tenths of whose population is concentrated within this territory, covering an area greater than England.

Reference to the occurrence of oil, asphalt and natural gas dates back to the earliest history of Canada. In 1830 the settlers in the vicinity of Enniskillen, in Lambton County—the extreme western part of Old Ontario—noticed the presence of oil in the swamps of that region. It was called "gum oil" and was present in such quantities as to be regarded as a nuisance because it killed vegetation and so detracted from the value of the land.

This is the district that was destined to figure as the centre of oil production in British North America. The two fields in Lambton County—Petrolia and Oil Springs—became the most important in the Dominion. To all intents they are one in community of interest, although there is a slight difference in the grade of oil that comes from each.

The paying wells in this territory are confined to a belt running northwest and southeast for about twenty miles with a width varying from one to four miles. The centre of the belt is situate about sixteen miles southeast of Sarnia. The area of the Petrolia field is twenty-six square miles, and of the Oil Springs pool, two square miles. In

structure the formation is scientifically described as anticlinal, that is to say, the strata are folded in the form of an arch.

Oil has been found in the various parts of the Devonian and Silurian formations, but the production has been derived mainly from the Corniferous Limestone, which is a member of the Devonian. Oil was discovered in the adjoining county of Kent, south of Lambton, soon after the first drilling in the Petrolia district, and at one time its average production exceeded the pioneer producer.

Commercial petroleum was brought into existence in Canada in 1858 by J. H. Williams, of Hamilton, who was attracted by what was known as the "gum beds" of Oil Springs. Because he was familiar with the discovery of petroleum in the Old World, Mr. Williams set about extracting what he believed to be the same sort of naphtha as that produced by the wells in Baku. His first effort took the form of a retort and the gum was boiled. This primitive attempt at distillation produced a comparatively light, irridescent liquid. In the hope that he might obtain greater quantities by digging beneath the surface of the gum beds, he excavated a well, and found that the deeper he penetrated the earth, the greater the yield. This was really the first oil well in America and was dug a year before Drake's well in Pennsylvania, 1859, although it did not pierce the limestone.

The experiment attracted many persons to the field, and ten or twelve shallow wells were opened at Black Creek, in the vicinity of Oil Springs. It

was not until February, 1862, however, that what may be termed the first real oil well was drilled. This was the achievement of James Shaw, a poor photographer, who had lived in the vicinity for many years, and had been a close observer of the methods of the prospectors. With the old-fashioned spring pole worked by foot-power Shaw punched the cap of the upper vein of oil rock at a depth of 165 feet at Oil Springs. The result was a well that gushed thousands of gallons an hour and flowed for a comparatively long period.

Shaw received no permanent benefit from his discovery and is said to have died in poverty. He was offered $25,000 in gold for his property when the well began to flow, but declined all proposals and lived to see the day when it dwindled down to a "pumper" of a few barrels a day.

The excitement in the oil regions of Pennsylvania was keen when Shaw made his strike and this was communicated to Oil Springs and to Petrolia, the tremendous yield leading to the belief that the region was richer than that of Oil Creek, Venango County, Pennsylvania. Speculators were pouring in by hundreds and land values experienced a sudden appreciation. The prediction was made (although it was not based on scientific knowledge) that the field would continue long after the Pennsylvania field had become exhausted. Many of the wells produced as high as 2,000 barrels a day. Three yielded 6,000 and the Black and Mathieson had a record of 7,000 barrels a day for more than two months.

PETROLIA IN 1874.

Another prolific oil deposit was struck at Bothwell, in Kent County, and the story goes that the first well was sold for a wheel-barrow filled with gold coin. Investors and promoters came from the United States and many crossed from England to make their fortunes in the new Oil Eldorado. Operators were working independently without any idea of concentrating their energy, and there was a great deal of confusion and loss in the marketing of the product.

The first oil refinery in Canada was established at Oil Springs. Its nearby neighbor, Petrolia, came into existence later.

Petrolia, or Petrolea, as it formerly was spelled, is the hub from which the oil industry of British North America has radiated to the thirty-two points of the compass. It is to the Dominion of Canada what Oil Creek, Pennsylvania, is to the United States—the genesis of the development of

one of the mightiest factors in modern industry, and, like its contemporary across the border, is an inconspicuous dot on the map of the North American continent. The bustle and feverish energy of the early days of oil discovery have departed, and Petrolia has in their stead the wholesome repose of a quiet, well-ordered society in possession of all of the social and educational advantages enjoyed by larger communities.

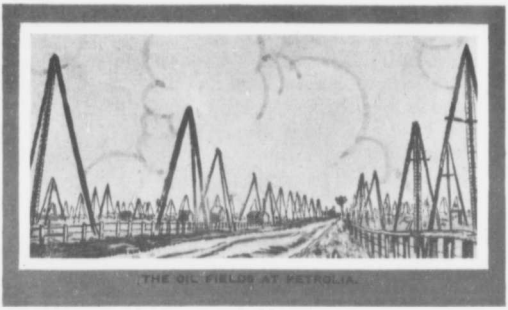
From an inconspicuous, unknown hamlet it quickly rose to prominence. An oil exchange was established and the operators met daily to fix prices and to discuss ways and means for the promotion of the industry.

The co-operation of the oil men on the ground, which provided large quantities of crude at reduced prices, opened an export market that kept the field clear until 1873, when the suddenly increased output

from the McKean County field of Pennsylvania paralyzed the Canadian trade. For a considerable period the home market could not take even one-half of the output, but in time the consumption increased as new products created new uses. The development of the vast agricultural resources of the Dominion had then scarcely begun. Settlements in the West were still small and scattered, and the situation demanded that the energy and resources of the oil producer and oil refiner should be directed towards the expansion of the export trade.

From 1870 to 1873 sixty per cent. of the refined product—the burning oil—was sent to the United Kingdom, the Continent and Mediterranean ports. Gasoline was then unknown. Benzine was the nearest approach to it, but it was regarded with a good deal of disfavor. Little was known of the process by which lubricating oil could be manufactured, and the demand for lubricants was limited.

From Petrolia to Oil Springs is eight miles as the crow flies. Between these points that mark the first and greatest productions of petroleum in British North America, the land is totally barren of oil or natural gas. Oil Springs is the older, but as the oil region was developed, the interests of the two communities ran parallel. Both sought oil in the territory that lay between them, but without success, as the scores of dry holes testify. The spectacle is presented today of a forest of three-legged derricks that stand over producing wells on either side of a tract that, as far as oil is concerned, is a desert as dry as Sahara.



THE OIL FIELDS AT PETROLIA.

The first newspaper devoted to the oil interests to be published in the Dominion of Canada appeared April 23, 1862, under the title of the "Oil Springs Chronicle." To the first issue was contributed a remarkable prediction as to the future uses of petroleum, and although practically nothing was known of the value of the residuals of petroleum fifty-four years ago this look into the future revealed with marvellous clearness the picture now familiar to all. It was written by Professor J. Y. Hind, of Toronto, who, after discussing the chemical constituents of the fluid as they were known in his day, made the following prophecy:

> "From its cheapness, petroleum will necessarily supersede alcohol, which is commonly used for fuel for cooking purposes during the summer months, and we may look for its adoption as fuel for the generation of steam in our ocean steamers where economy in bulk and weight

is so great a desideratum; petroleum is, as it were, the essence of coal, and the question of its adoption as a steam generator is dependent on the abundance of the supply, to which a satisfactory answer recently has been given by the flowing wells of Enniskillen.

"Even crude oil is sought for with eagerness in many workshops in England for the purpose of lubrication where swift motion is employed. When mixed with fat or resin, it acquired greater consistence, and is more generally applicable to ordinary purposes, but it is the lubricating oil which is one of the results of the destructive distillation of the crude product that is and will be most extensively used.

"Even should the heavy lubricating oil be not used for the purpose its name implies, the paraffine can be extracted by cold and pressure and candles made from it, so that under all circumstances there is no waste or loss.

"Enough has been said to show that the Enniskillen petroleum is admirably suited for many purposes—as an illuminator, as a fuel, as a material for the manufacturing of gas, as a lubricator and as an antiseptic,—and to these may be added its use in the practice of medicine."

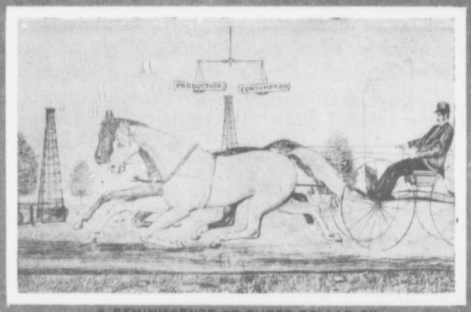
Up to that time the only known value of petroleum as a medicinal remedy was in its employment as a liniment. It may be assumed, therefore, that Professor Hind, who had such remarkable prevision

as to other things, foresaw the utilization of one of the products of petroleum in the internal human organism. This actually came to pass nearly forty years afterwards, when the virtue of white mineral oil as an intestinal lubricant was recognized.

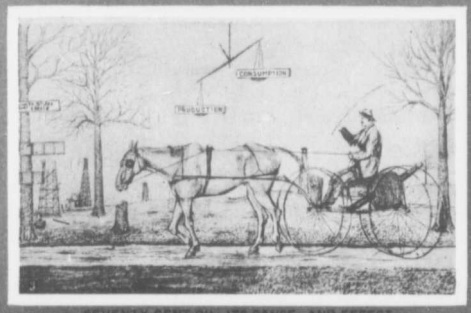
Petrolia did not have a newspaper to represent it until some time after the "Chronicle" started at Oil Springs. The title was "The Valuator and Petrolia Reporter." It had only a brief existence. When in August, 1863, crude oil was quoted at five dollars a barrel and refined oil forty cents a gallon, the Reporter's comment on the situation was :

> "With crude oil at five dollars the refined may be sold at forty cents a gallon without loss, but with very little gain, if indeed any, taking into consideration the great wear and tear on the machinery employed. But aside from this, the risk is greater than in most other kinds of business, and it is our opinion that no one is warranted in investing in a refinery here or in sinking wells without a pretty fair prospect of two hundred per cent. dividend every season."

But before this—before the floods of oil had swamped the demand, demoralized the market and sent prices tumbling—the whole Canadian oil region was joyous. Ten dollars gold a barrel was the price for oil, and there were many large transactions at that level. Nine dollars was maintained for months, and the prediction that there would be a drop to six or even lower was regarded



A REMINISCENCE OF THREE-DOLLAR OIL.



SEVENTY-CENT OIL: ITS CAUSE—AND EFFECT.

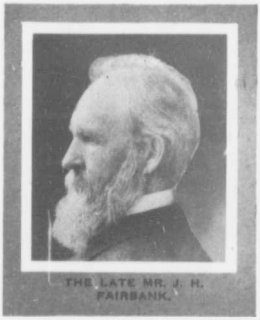
PICTURES FROM TWO OLD PRINTS MADE EARLY IN 1870, BY H. L. McCANCE.

as unduly pessimistic. Then came the gushers, and the higher the oil spouted the lower prices dropped, until finally from ten dollars the price went to ten cents. The oil was coming too fast to be stored, and there was too much to be profitably marketed. Operators paid scant attention in those days to a five-barrel well. Not infrequently these would be plugged, as the output scarcely met the expense of operation. It was not until the producers, acting in concert and for the mutual welfare, forced an expansion of the export market that the situation was relieved. The five-barrel wells held in such contempt then are now giving oil that is measured in gallons. One barrel a day from the hole that used to give a hundred is now regarded in high favor.

The best results for six or seven years after the first oil was struck, came from a depth of less than 350 feet.

Chapter 4.

EARLY HISTORY OF THE WESTERN ONTARIO OIL FIELDS



THE LATE MR. J. H. FAIRBANK.

The most successful of the operators in Petrolia between 1863 and 1865 were Messrs. J. H. Fairbank, Dow Elwood, Judge Avery, H. W. Lancey and Dr. Underwood. John D. Noble came to Petrolia about 1866, as did Edwin D. Kerby. In 1868 the Crude Oil Association was formed with Dow Elwood as President and J. H. Fairbank as manager. In the spring of 1869 came Charles Jenkins, and in the following year J. L. Englehart, who continues to be an active figure in the oil industry, took his first survey of Petrolia. Mr. Fairbank was one of the most prominent men in the Ontario field. It was due largely to his practical methods and sound business principles, that the Petrolia development was so rapid and so helpful an influence in commerce generally and became the important factor that it did in the Canadian oil industry.

No other oil centre on the American Continent has contributed so many expert drillers and oil operators to foreign countries for the production and development of the industry as Petrolia. They have gone from there to the United States, Mexico, Central and South America, the West Indies, Austria, Germany, Russia, Egypt, Sinai, East Africa, Madagascar, Persia, India, Burma, the Orient, Sumatra, Borneo, Java, New Guinea, Australia and New Zealand and have been foremost in locating oil territory, in mechanical inventions, in their methods of production and in the marketing of the product.

One of the most noteworthy of these was the development of the Canadian system of drilling of the great oilfields in Galicia by William H. McGarvey, of Petrolia. He became interested, as others, in oil development and made a study of the most effective methods of drilling. He was part owner of the once famous "Deluge" well, one of the large flowing wells which brought wealth to its owners. He took a corps of expert drillers and with his family went to Germany, where he remained a short time in Hanover, thence to Vienna and formed the partnership of Bergheim & McGarvey, who were largely instrumental in the development of the Galician oilfields.

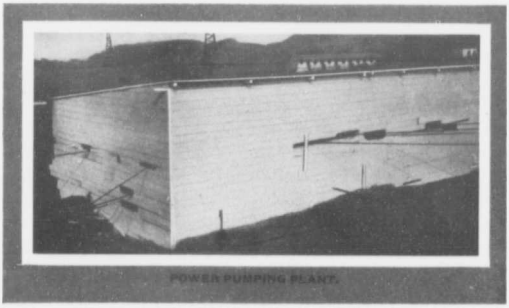
William Swan, one of the old-time characters in Petrolia, is remembered as having possessed what seemed to be an uncanny faculty for finding oil sands. His first prospecting resulted in tapping a flowing well that yielded 1,000 barrels a day.

The start had been made without the necessary preparations and there were no means of controlling the tremendous rush of oil that came from the depths, so that Swan saw thousands upon thousands of gallons escape without being able to hold but an infinitesimal proportion. Black Creek, during the summer of Swan's chance strike, had the appearance of a solid river of oil. The water was not visible, buried as it was beneath a film of from two to four inches thick. Scores of flowing wells added to the volume, and in six months it is estimated that more than a million barrels of petroleum were carried off on the creek to the St. Clair River.

Scientific exploration of the Petrolia district continued from month to month and from year to year. Geologists made exhaustive tests in the hope, and many with the expectation, that the field was simply the starting point, and the guide to other and more prolific territory. F. J. Carman, a scientific operator, undertook drilling to determine the character of the lowest strata of rock formation that had been investigated up to that time. He drilled the deepest well that had ever been attempted in Canada, going to a depth of 3,770 feet. The trenton limestone was reached, but no oil or gas was discovered. The Carman well, although it did not strike oil, has been a valuable aid to scientific knowledge, and the record of the character of the successive formations, preserved in the geologic records, has been and will continue to be valuable for future guidance.

It was in Petrolia that the radical change in the method of pumping oil wells was made, and this method subsequently was adopted in oilfields of similar depth in all parts of the world. In the five years following the first forcing of oil to the surface, it was the practice to have each individual well equipped with a boiler and engine to work the pump, so that if twenty wells were being operated, twenty men would be required to take care of as many different rigs.

A plan gradually developed for correcting this waste of energy, practically revolutionizing the whole existing plan, by doing away entirely with an engine for each well and transmitting power from just one engine to as many wells as it was necessary to pump. This is accomplished by a system of shafts or rods laid horizontally a few inches above the surface of the ground and connecting one well with another through the entire group.



POWER PUMPING PLANT.

These shafts are called "Jerker Rods," and are coupled to the periphery of a vertical half-wheel (or cam) corresponding with a similar cam in the power-house that is rocked back and forth by the main shaft of the engine. This motion is communicated to each of the walking beams over each well and gives the stroke to the plunger in the pump cylinder. The length of the stroke is regulated to conform to the quantity of oil required to be pumped. When a long stroke is required the plunger is placed at the extreme end of the beam, and for a shorter stroke it comes up nearer the axis.

The introduction of this system reduced the cost of pumping very materially and the example set by Petrolia was quickly followed all over the United States. One of the earliest operators to do away with the engine-to-a-well plan was J. L. Englehart & Company, on whose tract 225 wells were operated by two engines of forty horse-power each.

From the beginning of the oil industry in Old Ontario, Petrolia and Oil Springs were the Mecca for geologists and also for pretenders who followed in their trail and who offered their services in locating oil deposits for a consideration. While the practical operators paid little or no attention to the claims of "oil smellers," as these unorthodox professors and diviners are called, it is reasonably certain that many thousands of dollars were spent by intelligent men in attempts to make a strike through the affinity supposed to exist between hazelwood and subterranean liquids. The forked

hazel stick is familiar throughout Canada to farmers as well as to oil operators, and even now it is frequently employed in the effort to locate water. Instances are numerous of water having been actually found at the spot where the finder stood with the stick, which seemingly turned without apparent effort on his part.

THE DIVINING ROD.

There is no doubt that chance was responsible for the discovery of a good deal of oil in the Petrolia field, and it is equally certain that the prospector who put down a drill at random had about the same hope of success as the diviner with the forked stick. No record of the failures has been preserved. Only the successes are remembered. The procedure was about the same in all cases. The first requisite was payment in advance to the "smeller" for his services, for he did not believe in a contingent fee. He claimed that the best results were obtained from a forked branch cut in the dark of the moon, with

a knife, never before used, and that the sap must flow—otherwise the twig would not respond.

The genuine scientists were of real aid to the prospectors, although the majority of the oil men depended more on the drill than they did on information which they believed to be based principally on theory. The pretenders for a time were a numerous class and they prospered. They were finally exposed and after several attempts to revive confidence, disappeared from the field.

Chapter 5.

THE DRILLING AND SHOOTING OF OIL WELLS

TYPICAL OIL WELL.

The system of drilling for oil now in use in the Canadian wells, was devised to meet the special conditions of the field. Since the infancy of the industry Canadian oil operators have been foremost in promoting improved practices, although in the beginning the appliances were extremely primitive and, in fact, represented but a small advance on the methods devised in China centuries before the Christian era. The Chinese used an auger attached to a pole that was held in a vertical position from a cross pole supported on a post. The end of the cross pole was fastened under a springboard while a driller guided the vertical pole, or sometimes a cable, to which an auger or boring tool was attached. One coolie after another jumped from a platform and jarred the board so that the

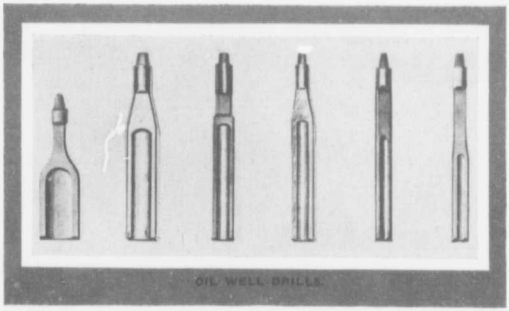
tool would plunge down and deepen the hole with each stroke. The deeper the hole became, the heavier the coolie required for the "kicking down."

THE SPRING POLE DRILL.

Jumping men were not a part of the early Petrolia drilling equipment, but foot-power was employed for the same purpose—the driving of the drilling tools into the ground. The excavation to the surface of the rock was curbed with timber and the slow and tedious task of drilling to the oil vein was begun. This was called the spring pole method and was succeeded by the pole tool drilling rig which has been extensively adopted in different parts of the world. In Canada, of late years, it has been almost entirely superseded by what is known as the Canadian Wire Line System.

In one of the older systems, known as the cable or standard system, a drill with a face in the

shape of a blunt wedge is raised and dropped through a space of about six feet. In the other, the hydraulic rotary system, there is employed a rigid stem of heavy pipe that rotates a fishtail bit at the bottom of the hole, cutting and stirring up the formation to be drilled. The drillings are continuously washed out by a stream of water reaching the bottom through the drill. If necessary mud is pumped instead of water through the drill, and by thus plastering the walls of the hole, caving is prevented when drilling through quicksand or other formations.



The standard or cable drilling system is used in hard rock, and the rotary in softer formation, while frequently both are combined.

Sometimes the oil is struck suddenly and is driven to the surface by the imprisoned gas. But when the well does not flow a pump is inserted.

The early days of the oil industry were not unattended with serious hazards to life, but modern invention has in a considerable degree minimized these dangers. Moreover, with growing scientific knowledge of petroleum, many fears once entertained have been dissipated. In 1860 the people of Western Pennsylvania were thrown into a panic by the proposal of a stranger, claiming to be an European scientist, to shoot a white-hot bolt into the bowels of the earth through an iron pipe driven to a great depth for the purpose. By the ignition of inflammable gases, thought to exist in the great cavities beneath the earth's crust, the promoter expected to produce a sufficient explosion to lay bare the subterranean reservoirs of oil. The Pennsylvanian populace, instead of viewing this proposal with the distrust and apathy traditionally accorded the first efforts of inventive minds, possessed sufficient imagination to picture the possible results, and were so convinced that the scientist minimized rather than exaggerated the feasibility of his undertaking, that they selected a small but representative committee to hang him on the spot. Because he had conspired to disturb not only the peace but the actual foundations of society in Pennsylvania he was taken into custody and solemnly warned to desist.

Less than a year afterward nitro-glycerine was being exploded in large quantities deep down in the earth to shatter the rock and give an outlet to the oil without disturbance to the landscape.

A large proportion of the wells in this country are

WELL SHOOTER LOWERING THE TORPEDO

"shot" wells, and to create them required men of steady nerve, for well-shooting is one of the most hazardous of occupations. The high explosives utilized are kept in specially constructed magazines, the maximum amount of nitro-glycerine stored being rarely over 300 quarts. A "shot" is sometimes as little as eight quarts and in certain instances as much as 160 quarts have been used. The explosion of a charge of this size is followed by an earth tremor for a radius of a thousand yards even when the charge is placed from one to two thousand feet below the surface. It sometimes occurs that the resultant flow is so great as to be temporarily beyond control, but ordinarily the flowing well is giving its regulated yield within forty-eight hours. In the early days when the explosive was conveyed to the oil districts over rough roads in jolting wagons, accidents were common.

When ready for use the nitro-glycerine is contained in tin tubes or shells five feet long, and two inches or more in diameter, pointed at the lower end and having bail handles at the top. From five to fifteen shells are lowered with extreme delicacy to the bottom

THE WELL SHOOTER'S WAGON.

of the well and then the "go-devil"—a five-pound shell, pointed, from ten to twelve inches long—is released point downward. The "shooter" dashes for safety and the explosion follows. As an example of the mental alertness and quick judgment of the well-shooters it is recorded that upon one occasion the first tin of explosive was being lowered when the rope suddenly slackened. This could only mean that the well had unexpectedly begun to flow. The shooter realized that in a matter of seconds six quarts of nitro-glycerine would be hurled out of the well carrying death to himself and his comrades. There was no time to run; there was just one thing to do and he did it with extraordinary nerve. Standing directly over the well he grasped the shell by the bail handles as it came shooting up on the breast of the flowing oil, and although the impetus which it had gained threw him across the derrick and dislocated his shoulder, he held on and saved the crew.

WELL SHOOTER FILLING THE TORPEDO.

Fatal and even minor accidents resulting from wells are rare in these days. Experience has suggested many precautions, chiefly in preventing premature explosions, which was the commonest danger in the early days. In the modern method the nitro-glycerine "jack squib" is used. This is a tin tube three-quarters of an inch in diameter and two feet in length. A three-minute fuse with a fulminate cap attached to the lower end is wound around the tube to the top and extends three or four inches above. This with the fuse is placed inside of a tin about two inches in diameter and slightly longer than the inner tube. Dry sand tamping fills the space between the two tubes. The top of the larger or outside tube is folded in and pressed down on top of the same, retaining it in place. The inner tube is then filled with nitro-glycerine and corked. The fuse is lighted and the "jack" is dropped into the hole. The explosion follows.

Sometimes it is necessary to case a well near the top of the pay sand. When that is done an electric torpedo is used to prevent damage to the casing. The torpedo is placed in proper position in the

hole; a squib containing two or three quarts of nitroglycerine and attached to an insulated wire is then lowered to the top of the torpedo. The casing is pulled out of the hole over the wire and the squib is exploded by a battery and it in turn explodes the torpedo. The casing is again put into the well and the hole cleaned out. This is the safest plan of all, but it is only used in developed territory where there is good rock pressure. The most dangerous "shooting" is the torpedoing of a flowing well or "gusher" to improve the yield. This operation requires the greatest care. Flowing wells have a maximum and a minimum flow and close watch must be kept for the exact minute when the torpedo can be lowered into the hole. If the flow should start while it is being lowered the torpedo will be hurled out, perhaps with disastrous result.

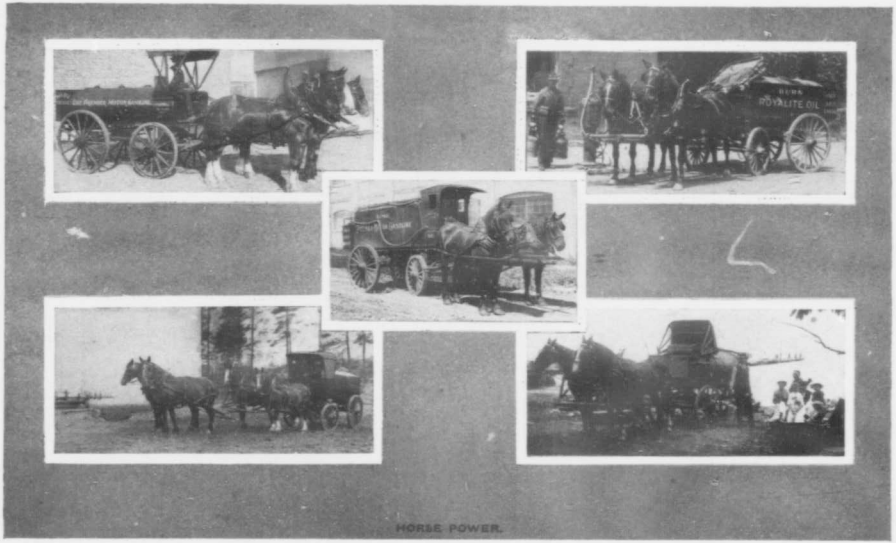
A FLOWING WELL UNDER CONTROL.

Chapter 6.

METHODS OF STORING AND REFINING

The problems of the oil industry only begin with tapping the subterranean stores of petroleum and increasing its flow to the surface. Collecting the flow and preventing wastage present further difficulties. In the centuries that preceded the scientific organization of oil production the wastage was incalculable. The old legends of flaming wells and rivers of oil, used to promote religious superstition, represent sheer loss. It is gratifying to remember that Canadian producers have led the world in grappling with this question of the conservation of petroleum. One of the chief difficulties encountered by the early operators in the Petrolia field was that of storing the immense volume of oil that was coming to the surface. The suggestion of dams was abandoned as impracticable and carpenters were set to work to building immense wooden reservoirs which became larger and larger as the demand for storage increased. Some of them were 24 feet in diameter and 20 feet in height. Although bound with iron hoops they proved unsatisfactory and there was considerable leakage as well as danger from fire. Large iron tanks followed the wooden ones, but they were both cumbersome and costly.

Then came the discovery of the clay tank. Some genius realized that the Erie clay, which is a



HORSE POWER.

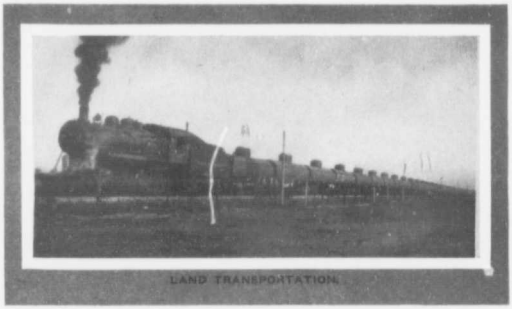
characteristic of the geological formation, was of such an impermeable texture that it would make an absolutely oil-proof reservoir.

Being of a solid, tenacious quality, and easily moulded, the clay underground tank proved cool and absolutely free from fire peril or from leakage or evaporation. Lying close at hand it was nature's first aid in the problem of conservation.

The clay tanks first built were formed by excavating a circular hole some thirty feet in diameter to a depth of fifteen feet through the porous top soil found all through the Petrolia and Oil Springs district. A wooden crib was set in, formed of double inch rings, five inches wide, outside of which boards were nailed and clay from the strata below packed solidly between the curbing and the wall, making a firm "puddling" about five inches thick. With all the improvements in the refining and distribution of oil, nothing yet has been devised to improve upon the clay storage tank in localities where clay strata are found.

Following the problem of storing at the well-mouth comes that of transporting the crude product to the refineries and from thence to the distributing centres. When the wells of Oil Springs and Petrolia were first opened, the oil was stored in barrels and conveyed in wagons to Wyoming, at that time the nearest railroad point in Lambton county, lying five miles north of Petrolia. Those were the days of corduroy road, and much no doubt was spilled in transit. Subsequently, specially constructed tank

wagons were brought into use to convey the petroleum from the wells to the refineries that began to grow up, and to the warehousing company's receiving stations. Later a system of pipe lines were constructed to convey the oil from the wells to refineries.

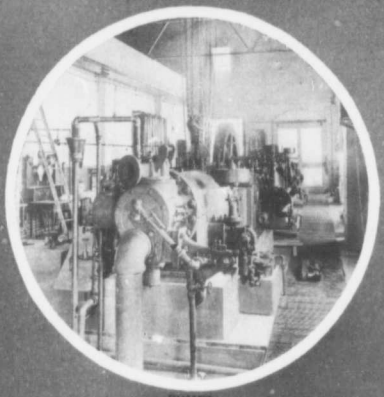


LAND TRANSPORTATION

After transportation comes the process that prepares the raw material for the market—the distillation or refining of the crude oil—a business that has grown to enormous proportions in all the countries of the civilized world, since the discovery of the uses of the many by-products of petroleum.

Until clay storage was devised, it was the practice to bring the crude oil to the refineries in wooden containers that were carried on wagons and emptied into underground tanks built of wood or iron. From these tanks the crude oil was pumped to the still and the heating was started with wood fuel. This consisted largely of walnut and oak, of which there

POWER PLANT.



PUMPS.

THE GREAT INTERNATIONAL PIPE LINE
FROM CYGNET, OHIO, TO SARNIA, ONT.

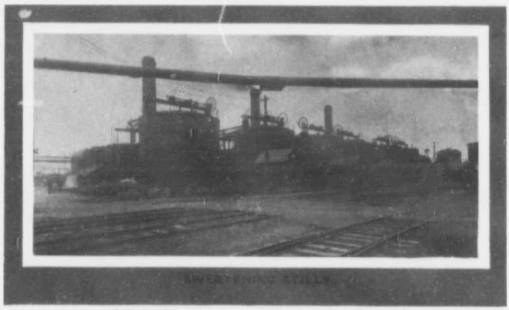
were extensive forests in the vicinity of the refineries. Sometimes the residual matter from the stills was used under the boilers but wood was preferred. This was later succeeded by coal because of the higher temperature and steadier heat secured. At that time no method for the utilization of natural gas as fuel had been invented. Millions of cubic feet went to waste. Gas wells were plugged up or sometimes set on fire. Nowadays, wherever natural gas is obtainable, it is used not only in the distilling processes, but in pumping the wells either by gas engines or as fuel under the boilers.

The first stills in Canada were what was known as the cheese-box still. They were of small capacity and were succeeded by the horizontal cylindrical stills of 500 to a 1,000 barrel capacity.

The problem of purification of crude petroleum produced at Petrolia and Oil Springs was most

important. The petroleum as it came from the wells was laden with sour-smelling sulphur compounds that persisted in the naphtha and burning oil distillates.

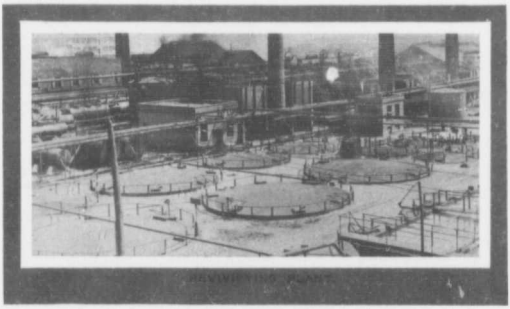
These sulphur compounds could not be removed from the distillates by any of the then existing methods of refining, to the extent which would admit of the finished products competing in burning quality with the high-grade product obtained from the Pennsylvania crude which was free from these objectionable sulphur compounds. After many trials, a method and apparatus was devised which enabled the refiners to make naphtha and burning oils sweet, free from sulphur and almost equal in burning quality to the best oils obtainable elsewhere.



Oils are here freed of sulphur by copper oxide.

The process which was discovered by Herman Frasch while employed as a chemist in one of the Canadian

refineries, begins by introducing finely divided copper oxide into a still equipped with a stirring apparatus. The mechanical stirrer keeps the copper-oxide in intimate contact with the distillates being treated, and as fire is applied to the still, the distillates pass over free of sulphur. The sulphur enters into combination with the copper oxide and remains behind in the still. The copper sulphide formed is removed from the still, its sulphur contents roasted out and the resulting oxide finely powdered and used again. The method is still used in the leading refineries of Canada and the United States.



Copper Sulphide is here purified so that it may be used again.

At first, in making burning oil, the refineries did not free it of the necessary proportion of the naphtha content to make it safe. So much naphtha remained, and the burning oils were therefore so inflammable, that the government

undertook to reduce the danger by a regulation called the flash test. This means the momentary ignition or flash caused by applying a light or spark to the vapor arising from the fluid through the application of heat. The smaller the naphtha content the higher the temperature the oil will reach before the vapor from it takes fire. The government fixed this temperature at 85 degrees Fahrenheit and inspectors were assigned to all refineries

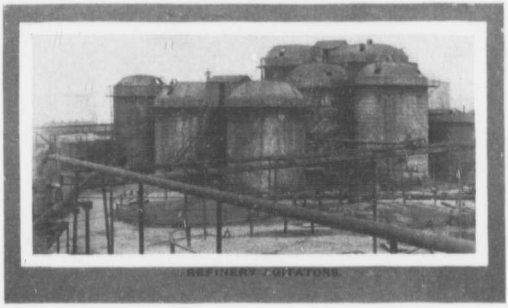
Separation of wax from oil by refrigeration.

to make the necessary tests, using a device called the pyrometer or flash test apparatus.

While present-day methods of distillation differ to some extent, the general methods and results are practically the same in all oil refineries. Crude petroleum is composed of a large number of distinct hydro-carbons, each of which is transformed into vapor at a specific boiling point. When the oil is placed in the still and subjected to heat,

vapors are given off as the temperature reaches the boiling point of the most volatile hydro-carbon present. The action is very similar to the generation of steam from water in a steam boiler. As the fire beneath the still is increased in intensity, the temperature of the oil rises steadily. As it reaches each successive boiling point, the hydro-carbon corresponding in boiling point is vaporized and passes from the still through the coil of pipe which is cooled by contact with cold water. The resulting condensation which reconverts the vapor into liquid flows into receiving tanks. The sediment left behind is a very heavy tar. Sometimes this tar is further distilled until the product remaining in the still is a dry, hard coke.

As each hydro-carbon has a definite specific gravity as well as a definite boiling point, the refiners are able to separate the different hydro-carbons, as

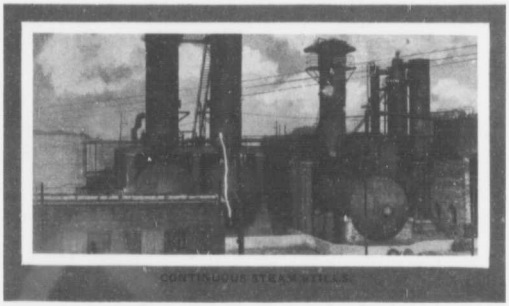


Where Paraffine Oil is purified with acid.

they flow from the condenser, by means of the specific gravity of the liquid.

The first distillate that passes is crude naphtha. This is followed successively by refined oil distillate, fuel and gas oil, lubricating oil distillate and wax distillate. These are finished by treating with chemicals, by redistillation, by pressing, or by filtering, as the demands of the consumers require.

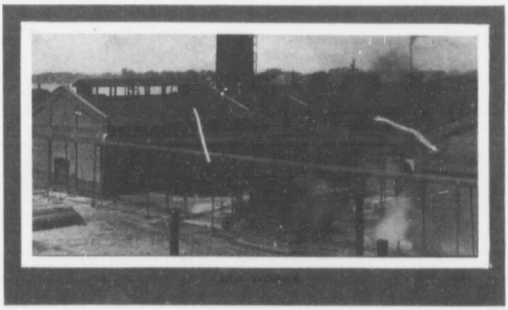
In some refineries crude oil is distilled continuously —that is to say, a series of from three to ten stills, depending upon the grade of crude oil and the products to be made therefrom, are used and so arranged that as the first still is heated to a certain temperature the light products are distilled off and as more crude is pumped into the still the residual oil overflows into the second still which is heated to a higher temperature than the first still and



For separation of Naphthas and Refined Oil.

distills off a heavier product. The residual oil then overflows into the third still and so on until the oil in the last still consists of a more or less heavy oil or tar, the crude oil being pumped into the first still continuously and tar being pumped from the last still continuously. The tar may be removed and marketed as such, or is placed in other stills and run until all that remains in the still is the coke. The distillates so obtained are treated in the same way as those from the single stills.

Sometimes the residual oil in the stills after the naphtha, kerosene, and other light oils have been

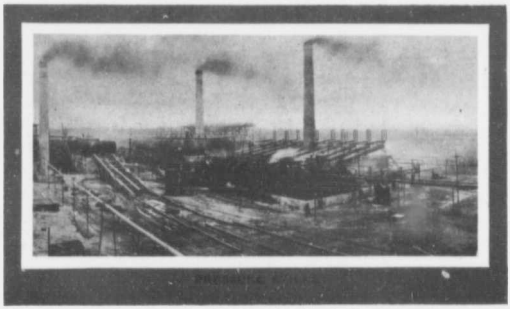


Here acids are freed of impurities for re-use.

taken off is treated with chemicals or filtered, and the resulting product constitutes steam cylinder lubricating oil. When occasion demands, the crude that contains large amounts of asphalt, and the residual oils in the still after the removal of

naphtha, kerosene and other light products are used for road-making purposes, and by still further carrying on a distillation the resulting products are solid asphaltic pitches.

Many of the crude oils yield only small percentages of gasoline under the ordinary distillation processes, so that their utilization in this way has been uneconomical and wasteful. The Burton pressure process, is a method of re-distillation effected by closing the outlet from the still, increasing the temperature to a high degree, and at the same time exerting an atmosphere pressure that changes the heavy oil into the light products of the gasoline series. Thus, a large part of what would eventually become a less valuable residium, is recovered. This is the highest type of conservation, and the gasoline so produced is equal, in all respects, to that yielded by the ordinary process of distillation.



For obtaining additional yield of Gasoline by Burton process.

Chapter 7.

BOOM DAYS IN ALBERTA

The story of the part played by the City of Calgary in uncovering to the world a new supply of oil is one of psychological rather than economic interest. Time may yet give some importance to the Southern Alberta field from the oil-seeker's point of view, but thus far a great deal of money has been spent in the search for oil in that part of the country and hardly any has been taken out of it. But the discovery of oil in the foothills of Alberta, forty miles southwest of Calgary, will be long remembered as an illuminating incident in the history of Western Canadian development.

Long before the spontaneous outburst of excitement in Calgary, in May of 1914, rumors of oil had gone the rounds of Alberta and had stirred the imaginations of the earliest settlers and traders in that far Western section of the prairies. An old servant of the Hudson's Bay Company, who is still living in the West, likes to tell of the time, in the early eighties, when an Indian arrived at the Company's post at Edmonton bearing in his pack a bottle partially filled with petroleum. When questioned, the Indian said that he had found this strange liquid oozing out of the ground at a spot somewhere east of Edmonton along the banks of the Saskatchewan River. Two traders immediately set forth

A SECTION OF THE CITY OF CALGARY

with the Indian to find the source of the oil, but unfortunately they took with them a two-gallon keg of whiskey to act as an incentive to their guide. The Indian drank himself crazy and finally died before he was able to reveal the location of his find of oil.

In the south country where the ranchers held undisputed sway for many years before the homesteader and the wheat farmer began to invade the land, the story is told of certain wells in the foothills where the cattle and horses refused to drink on account of the oily scum that formed on the surface of the water. Another oldtimer's yarn tells about one of the Mormon settlers in the late eighties finding a little lake up in the hills whose surface was completely covered with an oily scum. The settler hit upon the ingenious scheme of sopping up the oil from the top of the water by the use of woollen blankets. After wringing the blankets dry and collecting the liquid extracted therefrom, he was able to sell considerable quantities of oil amongst the people of his community. On account of these tales, therefore, it has been claimed for a long time by the most enthusiastic and hopeful of Southern Alberta's residents that a great oilfield certainly must lie somewhere in the foothill region skirting the eastern slope of the Rockies.

Possibly it was due to the rampant speculation in real estate during the years immediately prior to 1914 that the oil boom did not occur at an earlier time. When it did come, however, it found a community of receptive minds in Calgary, where real

estate for some time had been rather inactive, and a new form of speculative amusement was most acceptable.

First, however, it is of interest to record certain events leading up to the boom days of two and a half years ago. In 1911 a Mr. W. S. Herron, after spending eight years as a miner in the Cobalt district of Northern Ontario, took up farming near Okotoks, Alberta. Mr. Herron was not long in Southern Alberta before he became interested in the possibilities of finding oil in that part of the Province.

He first attempted to interest the Calgary Council Board in oil, but to no purpose. Then he went to Toronto, where he succeeded in interesting in the project of drilling for oil, Mr. A.W. Dingman and Mr. Eugene Coste, who later became the manager of the Calgary Light, Heat and Power Company. Both Messrs. Dingman and Coste went to Alberta to investigate Mr. Herron's proposition for themselves, and on August 30th, 1912, the Calgary Petroleum Products Company was formed. The capitalization of the company was fixed at $150,000, representing the value of 15,000 shares of stock at a par value of $10 per share. The assets of the new company were mainly 7,000 acres of petroleum and natural gas rights, and 1,200 acres of surface rights, all of which had been secured by lease from the Dominion Government by Mr. W. S. Herron. Mr. A. W. Dingman became manager of the Calgary Petroleum Products Company, and in January 1913 he began to drill for oil at a point situated

THE DINGMAN WELL NEAR CALGARY

about three miles west of the village of Black Diamond, or, more exactly, in Section 6, Township 20, Range 2, west of the fifth meridian. From Calgary the scene of Mr. Dingman's operations lay forty miles directly southwest. The town of Okotoks, eighteen miles east, was the nearest point at which a railway line approached the Dingman wells.

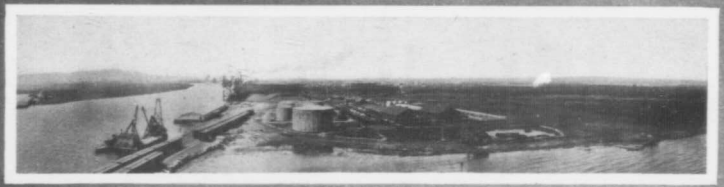
The Calgary Petroleum Products Company, which began life in a very modest and unassuming way, was soon to become the centre of great excitement. At a depth of 180 feet Mr. Dingman struck a powerful flow of natural gas which was controlled and made the source of power for the operation of the drilling machinery. On October 7th, 1913, the beginning of the boom which obsessed the people of Calgary for the greater part of the following twelve months was marked. On that date, the first discovery of oil was made in the Dingman well. It proved to be only a "pocket," but was sufficient to set the wheels of speculation rapidly in motion.

A rush was made upon the government land office, and within two months leases covering an area of more than sixty miles square, surrounding the section on which the Dingman well was located, were taken up. Possessed of leaseholds of various sizes which were secured from the Dominion Government at the rate of twenty-five cents per acre, groups of individual speculators banded themselves together and organized companies.

It was found when the "pocket" in the Dingman well was tapped that it contained an oil which tested ninety per cent. pure gasoline. This was regarded by some as promising evidence of the presence close at hand of a body of crude petroleum from which the gasoline was merely a form of seepage. Everything conspired to whet the public appetite to the point of predatory keenness on the subject of oil. All Calgary was ripe for the boom which came six months later.

As soon as the first pocket of oil in the Dingman well had been exhausted, drilling was recommenced. All winter long the drill was kept in operation, and when spring came it brought encouraging news from the Dingman property. Sand saturated with oil had been constantly appearing in the excavated material at the well mouth and it was felt that in a very short time the oil would be reached. The only danger was that it might prove to be such a powerful "gusher" that it would be impossible to control the flow.

By this time "eminent" geologists had begun to appear in the field—the field being very often a



FORT WILLIAM.

WESTFORT.

STORAGE PLANTS AT FORT WILLIAM AND WESTFORT.

suite of rooms at the best hotel in Calgary. They played a prominent part in fostering the boom which followed. Some few of these men had genuine scientific qualifications, but either they erred greatly in judgment, or else they misled the public for their own gain.

It is fair to add that there were one or two well known geologists who emphatically refused to lend their names to the promotions. And finally, on the evening of May 14th, the magic word was spoken—"The Dingman has struck oil at a depth of 2,700 feet."

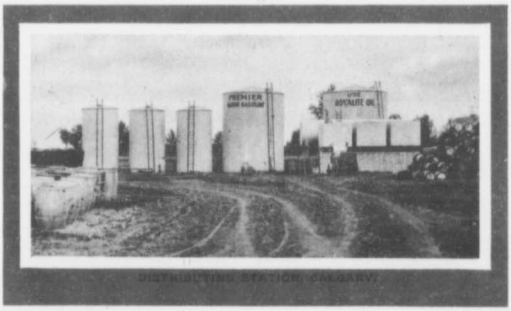
It was on a Thursday night that the news of the big strike was reported. On Friday every available motor vehicle in Calgary was forced into service in

carrying hundreds of men down the Macleod trail to Okotoks and west through the foothills to the Dingman well. There the inquisitive crowd of

embryo oil magnates amused itself by filling bottles with the gasoline-like liquid which had been taken from the well, and in surmising what Dingman Well No. 2 (located a thousand feet from No. 1) might bring forth.

At any rate, enough was seen to enable the pilgrims from Calgary to return home with the most optimistic reports of the discovery and stimulated with a determination to make their city the greatest industrial centre on the map.

Then came the wild scramble after shares of stock. New companies were organized every day, and



DISTRIBUTING STATION, CALGARY

every spare bit of space in the stores and offices fronting the main business streets in Calgary was hired by the selling end of some new oil company. More than 500 companies were formed. The whole down-town district was literally swathed in great cotton streamers bearing the names and the prices

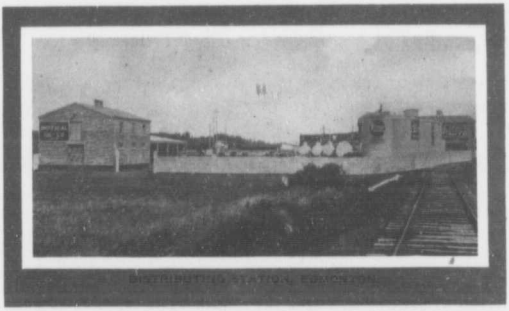
of new issues of stock. For the first five or six days following the report from the Dingman well, Calgary's legitimate business activities were paralyzed completely. The main streets where the oil companies had established themselves were the scene of the wildest and most irresponsible kind of delirium. All day long men, women and children crowded and jostled each other in an attempt to gain entrance to the counter of the oil broker's offices where shares might be purchased. Shares were sold during the first days all the way from ten cents to a dollar and a quarter each.

In the ticket office of one of the railway companies an oil company had succeeded in renting a small space

DISTRIBUTING STATION, LETHBRIDGE.

for stock-selling purposes. It was a good stand and the people were lined up for yards outside the door trying to get in to spend their money. One of the railway company office inspectors from Winnipeg

happened to arrive in Calgary just at the height of the excitement, and he found it impossible to approach his company's property by the ordinary entrance, so he managed to get in by a rear door opening on a lane. What he saw inside was the busiest scene that particular office had ever afforded. The selling of railway tickets had been side-tracked entirely. Waste paper baskets stood about the floor, conspicuously filled to overflowing with checks and



paper money. The entire staff was busy receiving money from a crazy mob which merely demanded shares and a receipt for its money. The inspector soon found himself engaged in the same popular business, and afterward he told of one old lady who had finally succeeded in getting close to the sales counter eagerly demanding "some oil stock." She had one hundred dollars to invest. The inspector said that he didn't know anything about the stock that was being sold—didn't even know the name

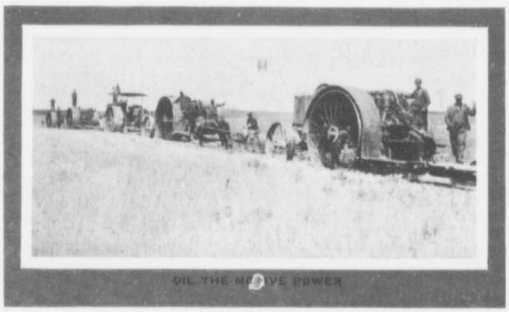
of it. "Oh, that doesn't matter," she exclaimed, "anything will do as long as I get some stock."

That was simply a typical instance of the condition which prevailed without abating in the slightest degree for a whole week. Over a million dollars were withdrawn from the savings accounts of the Calgary banks, and this represented the small deposits of clerks, laborers, domestic servants, and the general class of people in the community which is usually styled "the public."

It was inevitable under such circumstances that wild-catting should have flourished like the proverbial green bay tree. Calgary soon became the Mecca of stock gamblers, and every train from the East and South brought its delegation of promoters. Exchanges sprang up over night and within a month or six weeks some half-dozen of these centres were established for the benefit of those who wished to deal in oil shares. Printers made small fortunes producing prospectuses and the "eminent" geologists made larger fortunes issuing reports upon the physical character of leaseholds. By the end of July, 1914, the greater part of the foothill country extending from the international boundary northward as far as Rocky Mountain House, immediately west of Red Deer, had been leased from the Dominion Government by oil prospectors and speculators. The total capitalization of the companies amounted to something over four hundred million dollars, which simply represented the value of an unlimited area of leaseholds, as set by the hopeful gentlemen composing the directorates of the various companies. Out of that array of five

hundred companies only about fifty actually undertook to erect derricks in the Southern Alberta field and drill for oil.

The gathering of the war clouds at the beginning of August, and the final outbreak of hostilities in Europe soon checked the oil boom in Calgary, and the crowd of speculators and promoters melted away. Those who had sunk their savings deposits at the rate of ten cents and a dollar per share alone remained.



Other discoveries followed that made at the Dingman well, but they failed to attract the attention or arouse the excitement which characterized the period of two months of June and July 1914. The aftermath of that memorable time came in the form of a judicial inquiry into the affairs of numerous companies which were organized ostensibly for purposes of development. The Alberta Government too has since appointed a high-salaried

Utilities Commission whose business in future it will be to prevent such reckless exploitation as occurred during the late spring and summer of 1914. Much litigation has developed as the result of the Calgary boom, and one magnate who had charge of the famous Black Diamond Company is now serving a sentence in the penitentiary. All one hears of the Southern Alberta field today is an echo of the boom of two years ago. Interest in oil prospecting has been transferred in the meantime to the more northerly districts of that Province, around the Peace and Athabasca Rivers.

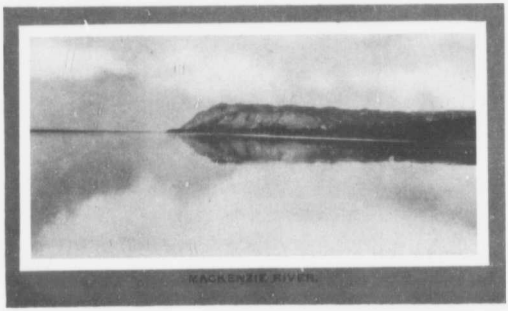
DRILLING RIG ON PEACE RIVER.

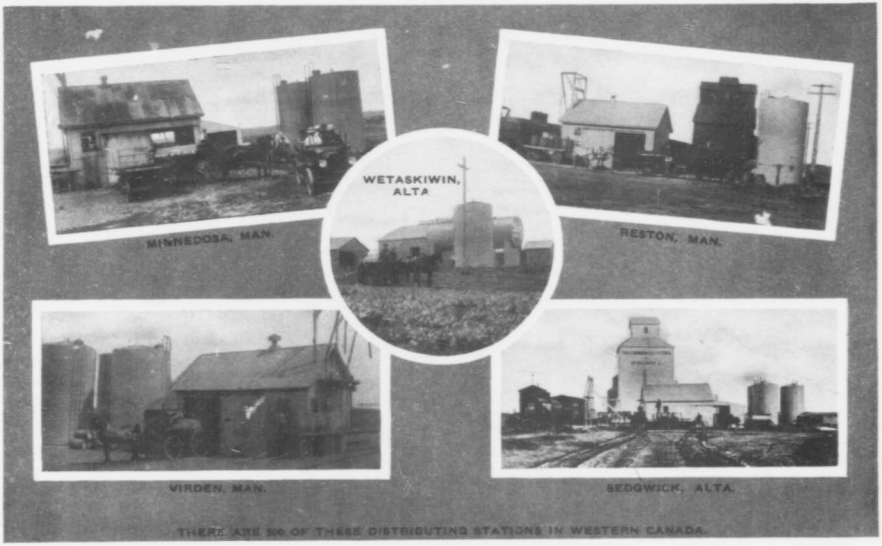
CHAPTER 8.

PETROLEUM IN WESTERN CANADA

In the great Northwest territory—most of it beyond the reach of economic development at present—occur some of the most promising indications of oil fields in Canada. As yet but little scientific study of the region has been made, though reference to the occurrence of oil and natural gas dates back to the earliest history of the country. In his work entitled "Voyages from North America to the Frozen and Pacific Oceans" (which is a record of experiences from 1789 to 1793), Sir Alexander McKenzie describes seepages which he refers to as "tar springs."

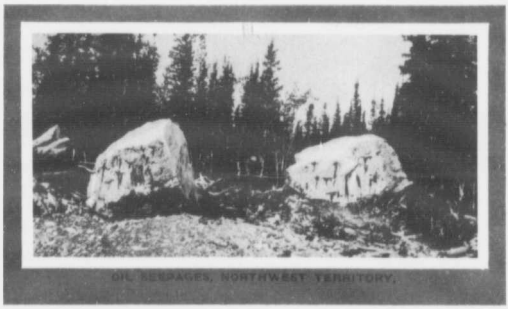
Subsequently a geological report on the Yukon and McKenzie basins was made by Mr. R. G. McConnell,




WETASKIWIN, ALTA
MINNEDOSA, MAN.
RESTON, MAN.
VIRDEN, MAN.
SEDGWICK, ALTA.
THERE ARE 500 OF THESE DISTRIBUTING STATIONS IN WESTERN CANADA.

of the Canadian Geological Survey, 1888 to 1889. In this report Mr. McConnell calls attention to the presence of shales saturated with petroleum which are seen in the Devonian formation along the banks of the MacKenzie River in various localities, and also especially to pools of tar and oil near the west end of the Great Slave Lake.

The Province of Alberta is especially interesting to oil men on account of the remarkable tar sand



OIL SEEPAGES, NORTHWEST TERRITORY.

beds of the Athabasca River region—the most extensive natural exposure of asphaltum in the world. This rock, which is the basal member of the Cretaceous formation in Northern Alberta, is seen forming cliffs along the river for a distance of a hundred miles; it is a bed of sandstone about 200 feet thick, saturated with tar and heavy oil. Some twenty wells have been drilled in the tar

STARTING FROM HAZELTON, B.C.

UP THE SKEENA RIVER.

BY DOG TEAM.

TRANSPORTING OILS AND CANDLES TO THE ARCTIC CIRCLE.

sand region, but in nearly all cases they have been located upon the Devonian rocks and so have not been drilled into the asphaltic beds. These wells have not met with any success, but there are also a few holes which have been drilled on the outcropping tar sands, and these have found a small yield of heavy viscous oil.

The most important investigation of the prospects in the Canadian West in recent years was that made by Dr. Bosworth and his assistant geologists during 1914 and 1915. These observations extended over Alberta from south to north and right through the Northwest Territories to the Arctic Ocean—a further distance of 1,200 miles—and, although the full results of the investigations have not been made public, a brief account of the findings was published in the "Petroleum World" of February 1915. The section of the article referring to the tar sands territory is:

> "These regions," writes Dr. Bosworth, "have been referred to in print, but have been visited by few experienced geologists. The region is difficult of access—separated from the northern terminus of railroad systems by 150 miles of thick forest; the only road to them is by way of a winding river with ninety miles of dangerous rapids. The great sheet of asphaltic rock is evidently present over an area of two thousand square miles and probably it extends over as much as ten thousand square miles. Experiments by the writer show that it contains some fourteen gallons of

petroleum per ton, of which a considerable portion is gasoline.

"The exposure of asphaltum visible along this river is greater than all the other known asphaltic outcrops, pitch lakes and oil seepages in the world put together.

"The amount of petroleum in this tar sand, presuming the bed to extend over ten thousand square miles, and if it be constant in character, must be near two hundred thousand million tons, that is to say, sufficient to satisfy the world's demand (at present rate) for 2,000 years."

OIL SEEPAGE, NORTH-WEST TERRITORY.

The final paragraph of the article is significant:

> "The proper exploitation of the Tar Sands region may be considered as not yet commenced."

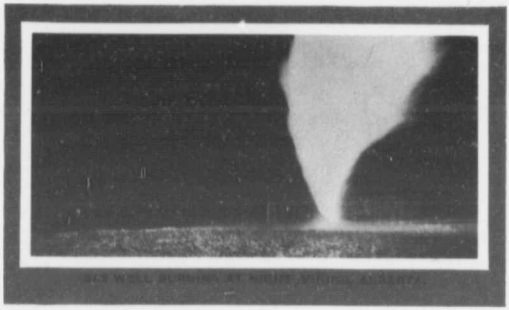
In other parts of the Province also some small quantities of oil have been found in sands of Dakota age and in other sands low down in the Cretaceous formation. Thus, from a well recently drilled on the Peace River, a few barrels of oil have been baled out and also in a deep

OIL SEEPAGE, NORTHWEST TERRITORY

well near Viking, eighty miles southeast of Edmonton, there is some showing of heavy oil.

In the southwest corner of Alberta, at Pincher Creek, some wells were drilled about fifteen years ago and from one of them there was a considerable flow of oil. This was stored in wooden tanks and was used chiefly for treating a skin disease then prevalent among the cattle. Recent attempts to produce oil at Pincher Creek have not led to any important results. The recent discovery of small quantities of oil in the Calgary region, and the "oil boom" which followed, have already been described in Chapter Seven.

Although the oil resources of Alberta have not been proved to be of commercial value, there is no doubt that the Province is possessed of a wealth of natural gas. All but a small part of Alberta is occupied by the Cretaceous formation, and wherever a hole is drilled into it natural gas is almost always found



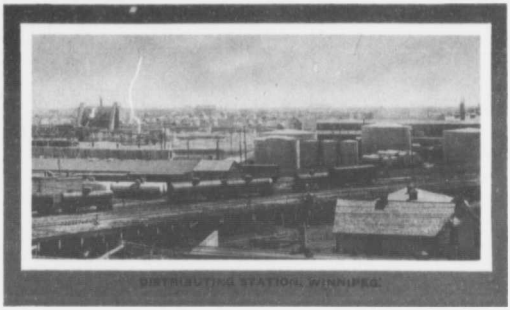
in more or less volume. The chief gas-bearing strata are the Dakota Sand, at the bottom of the Cretaceous formation, and the Belly River sand near the middle of it. Natural gas is obtained and used in many small towns, but the two principal developed fields are those at Bow Island and Medicine Hat.

The Bow Island Field is situated on the Sweetgrass anticline in Southeastern Alberta, which extends into Montana, and the gas is derived from the Dakota sands. There are twenty-one wells at Bow Island capable of productions varying from one to thirty million cubic feet per day. The pressure also is unusually high, being 795 pounds to the square inch. The city of Calgary and several smaller towns are supplied with gas from this field by means of a 16-inch pipe line which is 161 miles long. The annual consumption of gas supplied by this line is almost four and a-half billion cubic feet.

The gas-field of Medicine Hat is situated in the same anticlinal region, but the production is derived from the Belly River sand. Here there are twenty-five wells, all of them about one thousand feet deep, and capable of yielding from two to four million cubic feet per day. The pressure is about six hundred pounds to the square inch. Good gas wells have been brought in in many other districts during the search for oil, but generally these supplies of gas are too far away from any city to be of present use.

At Viking, about eighty miles southeast of Edmonton, two or three good gas wells have been drilled in 1916 on the Battle River anticline. It is said that these wells, which are about two thousand feet deep, can produce several million cubic feet of gas per day and that there is a pressure of five hundred pounds to the square inch. It is intended to supply the city of Edmonton from this field.

In the northern part of Alberta gas is obtained in every well which has drilled down anywhere near to the great sheet of "tar sand" which underlies that region. Thus at Pelican, on the Athabasca River, there are several large gas wells, and from the old Government Well drilled there a large flow of gas has been going to waste for nearly twenty years. Formerly these wells were intended for the supply of gas to Edmonton, but they are much more distant than the Viking field. In the foothill district southwest of Calgary also, some large flows of gas have been found during the drilling there in search



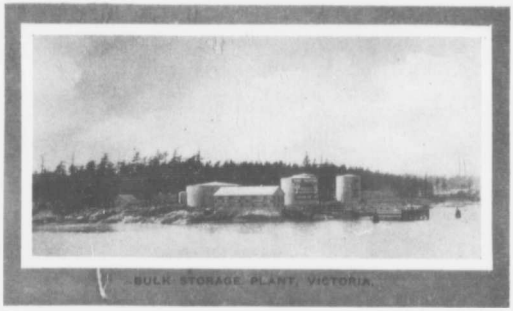
DISTRIBUTING STATION, WINNIPEG.

of oil. In the Dingman well there was a yield estimated at several million cubic feet per day.

In Manitoba a few holes have been drilled, some of them to a depth of over twelve hundred feet, but as yet no deposits of importance have been found. Over much of this country the rocks are concealed by glacial drift and much of it has not yet been thoroughly examined, so that the details of the geological structure are unknown except here and there. Natural gas is reported to have been struck in August, 1912, at a depth of 120 feet, in a well being drilled for water three miles west of Miami.

During 1913 two or three wells were drilled in the Pembina River valley, where oil indications had been found in 1907. A little natural gas was developed, but no oil.

No petroleum has been encountered in any of the prospect wells put down in Saskatchewan.



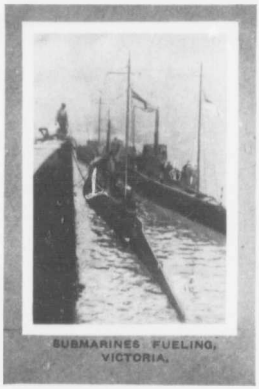
BULK STORAGE PLANT, VICTORIA.

There is, however, an occurrence of bituminous shales in the Pasquia Hills of east-central Saskatchewan, which may eventually serve as a source of oil and ammonium sulphate by distillation. The best exposures are found in the valley of the Nabi River. A sample of this shale taken at random gave 40 gallons of crude oil and 33 pounds sulphate of ammonia per ton.

The situation in British Columbia was described by William E. Park in October, 1913, whose discussion includes the following:

> "Though the Pacific Province of Canada is more than usually stirred by oil excitement, the oil industry west of the Rockies and north of the International Boundary is still in the purely wild-cat stage. There has been no discovery of commercial importance made in the Province up to the moment of writing; though in many quarters drillers are at work,

and, as is always possible with the driller, a new day may change the entire aspect of affairs. "The possible oil and gas resources of the Province are a matter of opinion; and this opinion is in some instances extremely optimistic, and in others just the contrary. The story of what has already been done or is now under way in the course of developing these possible resources, reveals the fact that tests have been made in several sections of the Province. So far, neither oil nor gas has been found in anything approaching commercial quantities, though indications have frequently been met with."



SUBMARINES FUELING, VICTORIA.

Small seepages of crude oil were reported many years ago by officers of the Geological Survey as having been found in the southeastern corner of the Province, in the valley of the Flathead River. The oil secured is of good quality, but so far it has been met with only in the form of seepages coming up with water in a spring. Similar seepages occur just over the summit to the eastward in the Province of Alberta, where two or three holes have been drilled to a depth of from 1,200 to 1,500 ft.

Oil seepages have also been reported on Vancouver Island, and oil shale deposits of a considerable extent are said to exist in the vicinity of Ashcroft. On Vancouver Island, on the southwest coast, two holes were drilled to a depth of approximately 1,000 feet, without success. A year's boring on the Queen Charlotte Island, farther north, has developed nothing. Little of importance has been discovered on the island between Vancouver Island and the mainland, except nitrogen gas, which has no commercial value.

These lesser islands have been carefully investigated by a responsible geologist, however, and his report indicates considerable possibilities for oil and gas. Operators have been drilling industriously, and are sanguine of success. Their optimism is due largely to the presence of seepages of oil found floating on the adjacent waters and supposed to come from submarine fissures.

Chapter 9.

PETROLEUM IN EASTERN CANADA

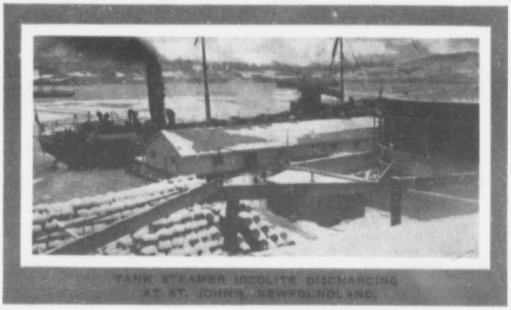
Oil men generally are deeply interested in the promise held out in the Province of New Brunswick. Indications of oil had been known for many years, but did not arrest attention until 1859—just after the Drake strike in Pennsylvania. A Canadian woodsman, visiting Pittsburg, Pennsylvania, told of these oil indications and so interested Dr. Tweedel, refiner and chemist, that he made a trip and after investigation and satisfying himself that oil was present, secured an option and then leased a tract of land in Westmoreland County, where he drilled four wells that average about 190 feet deep each. He got a flow of gas at once and a small quantity of oil, but as he found it impossible to shut off the flow of water which poured in, the wells were ruined. They were abandoned and nothing further was done for fifteen years.

American capital again was enlisted and the St. Joseph Petroleum Company and The Emery Oil Company were organized to develop production. Wells were sunk to a depth of 1,000 feet and several yielded petroleum in paying quantities, but the same trouble with an inflow of water was encountered, and this, added to the low price of the oil, because of the tremendous output from the many

SUPPLYING THE FISHING BOATS WITH DISTILLATE.

fields in the United States, put the two companies out of business.

The New Brunswick Petroleum Company, organized in 1899 by Matthew Lodge, of Moncton, N.B., undertook drilling operations in this field from 1900 to 1906. Some 72 wells were drilled in the Dover and St. Joseph districts in Westmoreland County, one at Beersville, Kent County, and four on the west shore of the Petitcodiac between that river and the present gas field in Albert County. Of the wells in the St. Joseph and Dover fields, about half produced oil in commercial quantities, the majority yielding from one-half to two and one-half barrels per day. The rights and properties of this company were acquired in 1908 by the Maritime Oilfields, Limited, which company has been more successful in the production of natural gas in the Stony Creek field. Up to January 1st, 1914, this company had put down forty-two wells, of which thirty-one were producing oil or gas, or both. Since 1910 there

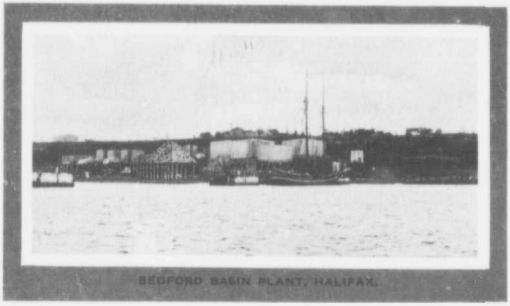


TANK STEAMER IOCOLITE DISCHARGING
AT ST. JOHN'S, NEWFOUNDLAND.

has been an annual production of petroleum of from 1,500 to 2,500 barrels, principally from the Stony Creek field.

Albertite, a black, shiny, mineral pitch, or bitumen, was discovered near the present site of the Albert Mines in 1849 by Dr. A. Gesner. This substance is a solid bitumen representing the residuum of petroliferous seepages; it occurs in veins in the shales at several points in Albert and Westmoreland Counties. While in itself an indication of petroleum in past times rather than the present, it is generally associated with petroliferous shales, and in the Albert Mine liquid petroleum was actually collected in buckets from seepages from sandy beds included in the shales associated with the albertite.

Petroliferous shale beds occur somewhat extensively in Albert and Westmoreland Counties, and are found also in Nova Scotia and Newfoundland. About



BEDFORD BASIN PLANT, HALIFAX.

forty years ago works were in successful operation at Rosedale, near Hillsborough, extracting oil from the Albert shales. However, the opening of the great oilfields of Ontario and the United States compelled these works to close.

The recovery of oil from shale had its origin in Scotland about sixty years ago, where, although it has had many vicissitudes, the industry is being successfully conducted at the present time. Considerable attention is now being given to the possibilities of again developing this industry in Canada. A test made in 1908 at the works of the Pumpherson Oil Company, Scotland, on thirty-six tons of New Brunswick oil shale showed an average recovery of forty gallons of crude oil and seventy-seven pounds of sulphate of ammonia per ton (report by R. W. Ells for the Mines Branch, Department of Mines, Ottawa).

Shale beds are mined exactly like coal deposits, and some of the large commercially valuable

HARBOR TRANSPORT, HALIFAX.

deposits that outcrop on the surface like the Newfoundland deposits and some of the New Brunswick beds can be openly quarried. When the mines are opened out by shafts or slopes, levels are run and connected together as in coal mines. Then the beds are prepared for working either on the long wall or the pillar and stall systems.

Up to the present time oil and gas have never been found in commercial quantites in Nova Scotia, though some seepages have been reported at various times.

Efforts were made in 1864 to find oil by the Pioneer Oil and Salt Company, near Lake Ainslie in Cape Breton, where for many years oil had been seen to rise on the water. The wells were sunk 600 feet and only traces of oil were found. At a later date, a test-well was sunk to a depth of 500 feet at Baddock with no better results. Several companies were organized about that time to test for oil in the vicinity.

In July 1912 the Lake Ainslie Oil Company, of Lake Ainslee, C.B., was putting down a number of wells and claimed to have struck a 75-foot oil sand. It is

WINTER DELIVERY IN QUEBEC.

probable, however, that the drill penetrated 75 feet of an oil shale, either of that thickness or cutting across the beds of the rocks dipping at a high angle.

Oil-bearing shale, however, is now becoming generally known in portions of Nova Scotia, and promises to furnish material at least as good as the oil shales of Scotland.

No oil or gas have ever been found on Prince Edward Island.

Gaspe, the most northeasterly county of the Peninsula of Gaspe, is the only county in Quebec which has ever produced oil in commercial quantity; but this field was never profitable. Between 1889 and 1901 wells were sunk in this vicinity by the Petroleum Oil Trust of Montreal, the Canadian Petroleum Company, and the Petroleum Oil Trust of London; at least 52 wells having been drilled in the field to depths ranging from 684 feet to over 3,000 feet. A small showing of oil was obtained in one of the wells.

CHAPTER 10.

COMPANIES, REFINERIES AND INDIVIDUAL PRODUCERS

Oil production in Canada in the early sixties, even as now, was a fruitful field for the promoter. Many scores of companies, syndicates and partnerships were formed in the two or three years following the first discoveries in Oil Springs and Petrolia, scarcely any of which survive today. When orderly business methods succeeded the haphazard ventures pursued by the operators who came first into the field, bona fide investment took the place of speculation, and the organizations formed to sell worthless stock, one by one went to the wall.

Of the various producers who have been successful under normal conditions and who have continued in the field down to the present time, the principal are:

John H. Fairbank Estate, J. L. Englehart & Co., Ontario Lands & Oil Co., John D. Noble, J. E. Armstrong, M.P., J. & J. Kerr Co., Crocker Parks Oil Co., John Anderson, John Walker, Alex Wilson, Richard Callinan, C. O. Fairbank, R. I. Bradley Estate, Walker Oil and Gas Co., Carman & Fairbank, T. H. Smallman & Co., and the Beaver Oil and Gas Co.

The refining companies now in operation are four in number and consist of the Imperial Oil Company,

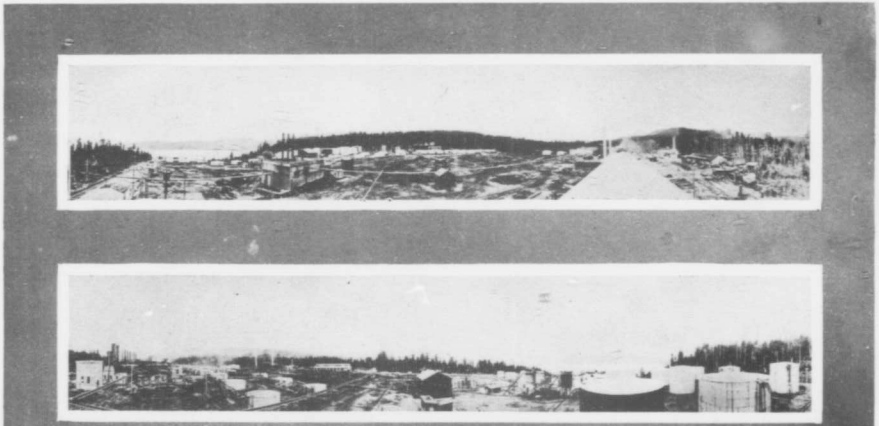
IMPERIAL OIL BUILDING, TORONTO.

Limited, the Canadian Oil Companies, Limited, the British American Oil Company, Limited, and the British Columbia Refining Company, Limited.

The largest of these is the Imperial Oil Company, Limited, incorporated by Dominion Letters Patent dated September 8th, 1880. Sixteen men identified with the oil industry signed the petition for the charter, and it is interesting to note that all of these who are still living are actively interested in the company—notably, Messrs. J. L. Englehart, Petrolia; Thomas H. Smallman, William Melville Spencer, C. N. Spencer, and F. A. Fitzgerald of London, Ontario. The present authorized capital of the company is fifty millions of dollars, of which twenty-five millions has been issued. The officers and directors of the company are: Walter C. Teagle, president; C. O. Stillman, J. L. Englehart and G. W. Mayer, vice-presidents; W. T. McKee, secretary and treasurer. Directors: T. H. Smallman, A. S. Rogers, J. P. Rogers, W. J. Hanna, K.C., G. H. Smith and W. W. Oswald.

A noteworthy development in this organization has been the large number of those on the Company's pay roll who have availed themselves of the opportunity opened to them to become stockholders. The Company maintains a pension fund for the benefit of aged, infirm and disabled employes—the working out of which has been an interesting and successful venture in co-operation between employer and employe.

The Canadian Oil Companies, Limited, was incorporated by Letters Patent of the Province of



TWO VIEWS OF THE VANCOUVER REFINERY.

Ontario, December 4, 1908, and has a present authorized capital of $2,600,000.

The officers and directors are: J. I. Lamprecht, president; F. B. Fretter, vice-president; F. H. Littlefield, secretary; F. C. West, treasurer. Directors—W. D. Ross, G. H. Muntz, Jas. Playfair, Simon Dyment, Frank Ginn, Edward S. Page.

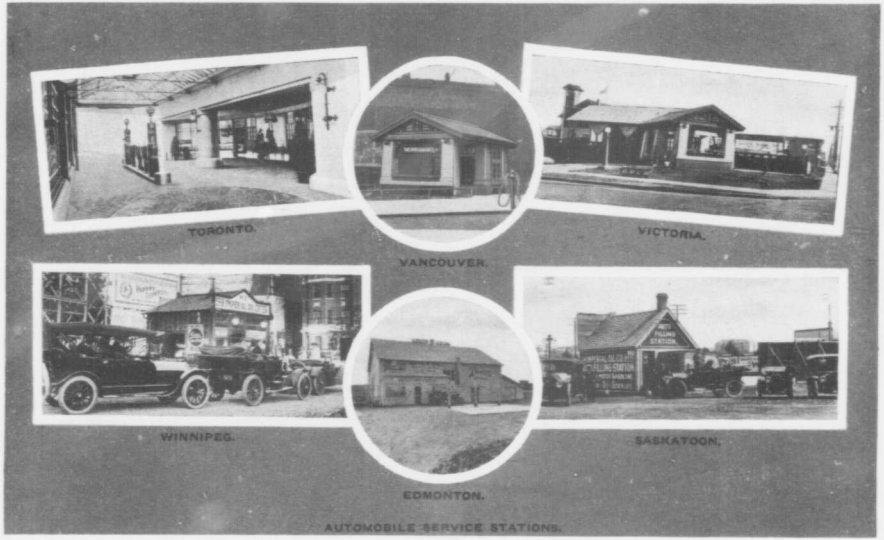
The British American Oil Company, Limited, was incorporated by Dominion Letters Patent June 4, 1909, and has a present authorized capital of $1,500,000.

The present officers are:
S. R. Parsons, president; C. L. Suhr, vice-president; A. L. Ellsworth, secretary-treasurer; W. A. Manion, general manager.

The British Columbia Refining Company, Limited, was incorporated September 2, 1902. Officers—C. H. Leckie, president; Leon Melekeov, vice-president; J. A. Cunningham, managing director and secretary-treasurer.

There are a great many other Companies and individuals from coast to coast in Canada engaged in the production, manufacture or sale of the products of Petroleum, and among these the following may be prominently noted:

McColl Bros. & Co., Toronto.—Operate branches at Montreal, Winnipeg, Calgary, Vancouver and other points. This Company was started about 1870 by Mr. J. B. McColl, who is still at its head.


TORONTO.
VANCOUVER.
VICTORIA.
WINNIPEG.
EDMONTON.
SASKATOON.
AUTOMOBILE SERVICE STATIONS.

The Galena Signal Oil Co., Toronto.—Specializing in the manufacture and sale of lubricating and illuminating products for railway use.

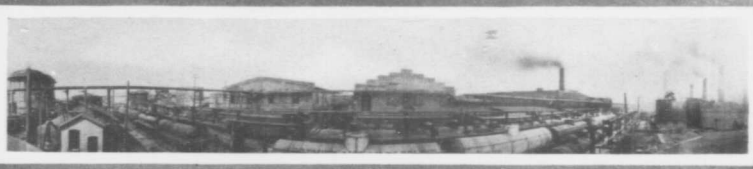
The Winnipeg Oil Co. Ltd., Winnipeg.—President C. W. Fillmore, Vice-President Andrew Wright, Secretary-Treasurer L. A. Warren. This company is one of the best known in the west, having been established some years ago, and the business has grown so as to have recently necessitated a reorganization and an increase in capital to cope with operations on a larger scale.

Prairie City Oil Co. Ltd., Winnipeg.—Operated by Mr. A. E. Lewis, is another well known company which has grown with the country. The company carries on a large business among merchants in the prairie provinces.

Among many other companies who are identified with the petroleum industry may be mentioned:

Beaver Oil Co. Ltd., of Montreal.
Canadian Economic Lubricant Company, Montreal.
The R. C. Miller Oil & Supply Company, Montreal.
Tate Oil Company, Sherbrooke.
W. L. Thom Oil Company, Montreal.
George W. Grant & Company, Toronto.
Brooks Oil Company, Hamilton.
The Commercial Oil Company, Hamilton.
Ontario Lubricating Company Limited, Hamilton.
C. C. Snowden, Calgary.
Western Oil & Supply Company, Vancouver.

There are now (March 1917) seven refineries in the Dominion of Canada that are recognized as of



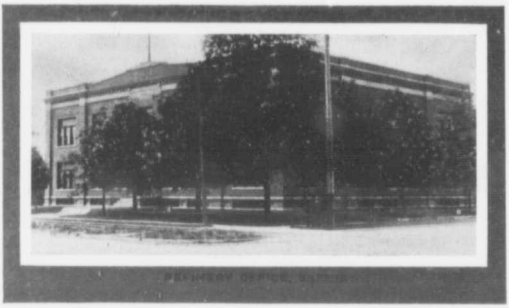
TWO GENERAL VIEWS OF SARNIA REFINERY.

commercial importance, one each at Montreal, Toronto, Petrolia, Sarnia, Regina and two at Vancouver.

The Petrolia plant is supplied with crude oil from the Oklahoma and Illinois fields, the crude being shipped from Toledo by barge to Froomfield, whence it is piped to the refinery.

The refinery in Toronto is located in the Ashbridge Bay district, where the City of Toronto is now spending over $20,000,000 in extensive harbor and other improvements. This plant is supplied principally from the Illinois and Oklahoma fields, the crude being transported to the refinery in tank cars.

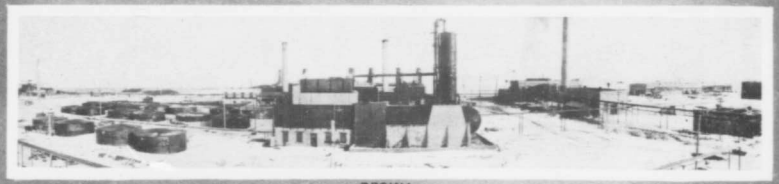
The refinery at Sarnia is the largest of the seven. The first buildings were erected in 1872, and the property used for refining, storage and all other purposes originally covered an area of fourteen acres. Not until 1899 was any considerable enlargement of the plant made. In that year the rapidly increasing consumption throughout Canada necessitated a change of policy. From time to time since, additional land has been acquired to provide for the manufacture of all the different products of petroleum, so that at the present time this plant covers an area of nearly 150 acres, below the city and running along the St. Clair river. Independent of the city of Sarnia, the refinery maintains its own extensive waterworks system, with a pumping capacity of over 20,000,000 gallons a day, thus assuring added fire protection to the entire property.



The mechanical department of this refinery employs a force of six hundred skilled mechanics, machinists, boilermakers, riveters, pipefitters, etc., and is equipped with improved machinery for fabricating storage tanks, tank cars, steel barrels, drums and other equipment.

Of the two refineries at Vancouver, the one located at Port Moody is run on crude oil imported from California and manufactures principally pitch and asphaltum products. The other and larger refinery is at Ioco, on the Burrard Inlet, about twelve miles east of Vancouver. The plant covers an area of eighty odd acres and employs about 275 men.

It is one of the most complete and modern of refineries. Its crude oil supply is transported from Peru in tank steamers and the output of finished products distributed by tank car to the trade in British Columbia and Alberta.



REGINA

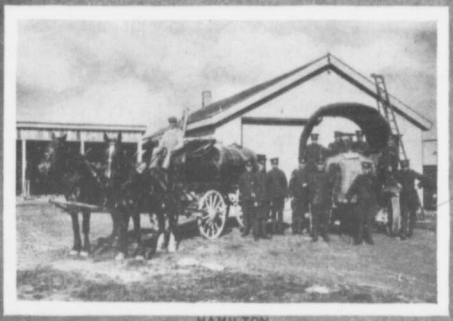
MONTREAL

THE REGINA AND MONTREAL REFINERIES IN COURSE OF CONSTRUCTION.

The Province of Saskatchewan has a refinery at Regina, outside of the northern limits of the city. Its crude supply is transported by tank cars from the oil fields in the northern part of the State of Wyoming. The plant covers sixty acres and was built recently to supply the increased requirements in Saskatchewan.

The "Good Roads" movement in Canada has resulted in an increased demand for petroleum asphalt and road making materials, and a refinery has just been completed at Montreal to supply this demand and manufacture in Canada these products which heretofore it has been necessary to import. This plant is designed to refine only high-grade asphaltum crude oils, producing therefrom approved asphaltic road materials. Its equipment consists of fourteen large crude stills, several reducing, re-running and pressure stills, agitators and a special drum plant for the manufacture of the metal package in which, together with tank cars, shipment is made. The refinery is located at Montreal East, on a plot of over seventy-five acres fronting on the St. Lawrence River. It has at its own wharf a sufficient depth of water to accommodate the ocean-going tank steamers in which the crude oils will be imported, as well as facilities to make shipments by water, either in bulk or in packages.

There is also now in course of construction at Dartmouth, across the harbor from Halifax, another large refinery to supply the trade in the Maritime Provinces as well as to furnish fuel oil for the bunkering of ocean going steamships.



HAMILTON.

NIAGARA MILITARY CAMP.

SUPPLYING THE CANADIAN ARMY WITH GASOLINE.

Since 1904, when the customs duty on the refined products of petroleum was put on a moderate protection basis and crude oil was put on the free list, there has been invested in the refineries of Canada, $13,700,000.

In the past year these refineries paid salaries and wages amounting to $4,500,000, contributed nearly $2,000,000 to the customs revenue, paid in other forms of taxation $812,000, and in railway freight charges to the Canadian roads $5,440,000. These disbursements were undoubtedly an important contribution to the industrial and commercial development of the Dominion and aided in maintaining a home market for agricultural and other products.

The refining industry has a prospective and important value to the Dominion through the reasonable expectation of the discovery of new oil fields in the Canadian North West referred to elsewhere. When such discoveries occur—an expectation justified by the best geological opinion—their value as an asset to Canada will be greatly enhanced by the possession of refineries which will make possible the whole benefit accruing to Canada. The refineries will enable Canadian industry and enterprise to advance the raw material to the highest point of manufacture instead of being obliged to export it in crude form, to be exploited by foreign manufacturers.

Under the tariff which has made the establishment, maintenance and expansion of this important industry possible, fully one-half the volume of petroleum products enters the Dominion free of any duty

except the temporary war tax. The free list includes asphaltum, oils for road making purposes, and gasoline. A moderate duty secures to Canadian refineries the home market for illuminating and lubricating oils. Without this the industry which plays an important part in the development and prosperity of Canada would be established and operated elsewhere. That the loss of a great wage bill, a material contribution to Canadian revenue, and a proportionate freight bill would be an economic misfortune need not be emphasized.

The mutual dependence and beneficial relationship of all industries under a protection system points to the conclusion that oil refining would be lost to Canada but for the moderate tariff which secures a home market for a part of the output. The protection afforded industries supplying the needs of the refineries makes a material difference between the cost of construction and maintenance in Canada and in the United States. Structural steel, machinery, stills, pipe, boilers, acid, etc., and almost all requisites are most costly in Canada. It is estimated that a refinery could be built in the United States at about one-third less cost than here. The advantage of local refining counteracts this to such an extent that, having regard for freight charges, the special war tax and the difference between the Imperial gallon used in Canada and the wine gallon, the unit of measurement in the United States, prices to the consumer are no higher in Canada than in the United States.

Chapter 11.

SOME PRODUCTS AND USES OF PETROLEUM

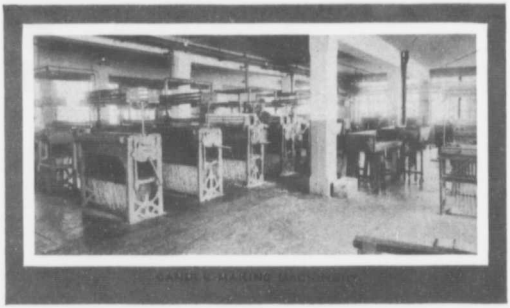
Fifty years ago, the principal product of crude petroleum was illuminating oil. Most of the residues resulting from the distillation (now the base of many valuable commodities) were regarded as waste and a nuisance that not infrequently had to be disposed of at an expense.

Today, crude petroleum is the source of: benzine, gasoline, kerosene, paraffine, paraffine wax, vaseline, white mineral oil, axle grease, lubricating oil, fuel oil, gas oil, road oils, asphalt and petroleum coke.

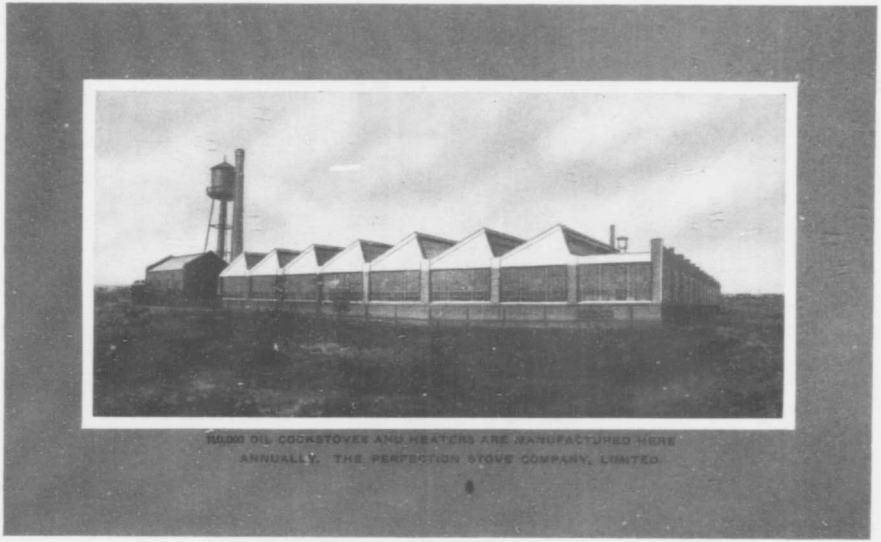
These are what may be termed the chief primary products of petroleum, each having a familiar use. The unfamiliar uses are so numerous that a complete and accurate record would embrace a list of not less than four thousand individual employments.

Paraffine, for instance, is best known in the form of candles, but it is used for a great many other things besides that. The modern match factory coats the head of the matches with paraffin to make them waterproof; manufacturers of confectioners' wrapping paper glaze the paper with a paraffin coating; paper drinking cups are waterproofed with it; barrels are lined with it and it is used in the manufacture of ornaments from gypsum

and other minerals; in the domestic canning of fruits, paraffin is indispensable; workers in wax flowers must have it; no modern laundry could be operated without it. It is the most effective protector known for stoppers in bottles containing corrosive liquids, and as an insulator for electric wires. In the etching of metals it protects the surface outside the lines against the acid.



The importance of petroleum lubricating oil is rarely under estimated. Every grade of oil, from the thinnest and lightest down to the thickest axle grease, finds a place in the list of petroleum lubricants. Animal oils cannot be used in high pressure steam engines, because fatty acids are formed and act injuriously on iron, steel, brass and copper. Pure petroleum oils are impervious to the action of the steam in an engine, because they are not decomposed. Unlike the vegetable or animal lubricants, petroleum does not "gum." Ground with



150,000 OIL COOKSTOVES AND HEATERS ARE MANUFACTURED HERE ANNUALLY. THE PERFECTION STOVE COMPANY, LIMITED.

graphite, mica or insoluble soap, a petroleum lubricator for heavy slow-moving machinery is the only known agent that reduces friction and so lengthens almost indefinitely the life of the bearings. There is also manufactured from crude petroleum a substitute for turpentine known as "mineral turps."

The oil stove of the present day really came into existence to take the place of the early type kerosene-oil stoves and the dangerous gasoline stoves.

The first kerosene oil stoves built were unsatisfactory because they were designed on the same principle, practically, as the early kerosene oil lamps. When these stoves were made they produced an odoriferous yellow flame. A flat wick and a short tapered chimney were used. After a short period of services, the wicks and burner parts became coated and fouled with carbon, and in addition to the smell there was a good deal of smoke. Furthermore, these stoves did not produce enough heat for general cooking. In an attempt to overcome the difficulties of this type of stove, the short-drum, perforated tube type of stove was produced. The early short-drum stoves, built between twenty-five and thirty years ago, were noted for their odor and lack of heat.

To overcome the difficulties experienced with these two types of kerosene oil burners, the gasoline stove was produced, and while very dangerous to operate, it produced a clean and powerful flame. Owing to the cheapness of the fuel—which was at that time only a by-product—the sales were large.

The evolution from the primitive, ill-smelling and dangerous devices of that period to the modern, odorless cooking appliances was even more rapid than the evolution from the stage coach to the railroad train, and just as pronounced and radical. In the latter part of 1901 the increased demand for gasoline began to manifest itself, and gasoline at that time was no longer the indifferently regarded product of the primitive days of the early gasoline stoves. As the price of gasoline increased and as the danger of the gasoline stove began to be more thoroughly understood, the real work of producing a satisfactory kerosene stove began. In the manufacture of the new one a radical departure was made from the early type. The new stove was designed to produce a blue flame instead of a yellow, with clean white points, burning from a circular wick over three inches in diameter. In order to secure clean and perfect combustion, a long chimney was used in combination with the burner. This stove gives perfect combustion and a flame powerful enough for all kinds of general cooking. Because of the economies which they afford in household use, especially in localities in which ordinary fuel is expensive, both the oil stove and the oil heater are coming into general use. There has been established at Sarnia, Ontario, a factory with a yearly output of 100,000 stoves and heaters, all of which is to meet the demand of the Canadian market.

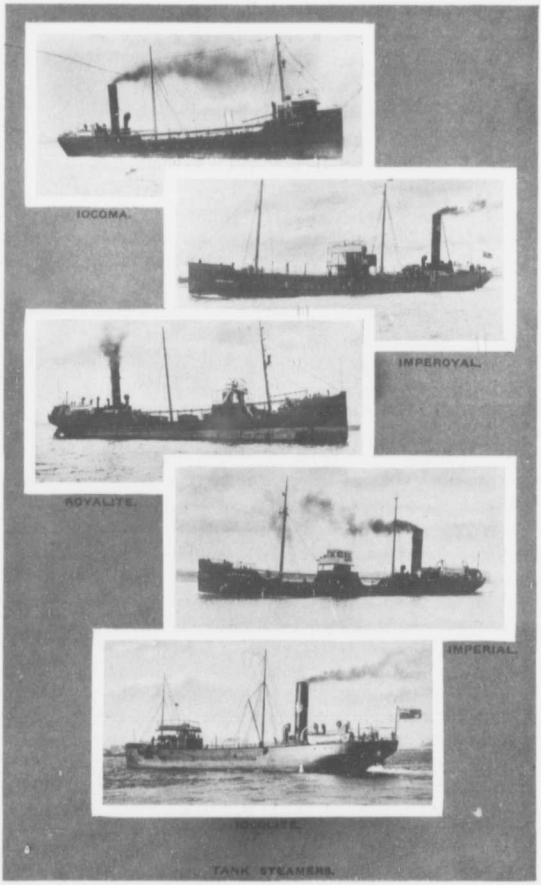
Chapter 12.

THE FUTURE OF THE INDUSTRY IN CANADA

The zeal which has brought the keenest minds of modern science to bear upon the conservation of the world's precious and dwindling store of petroleum, to obtain from it the maximum benefits for mankind, and has secured from the ablest administrators in modern industry such perfection of manufacturing and distributing processes, is exhibited in no less degree in the persistent and unwearying search for new sources of supply.

The possible exhaustion of petroleum, coal, and many other mineral resources is generally conceded. The question of time is largely a matter of speculation, based chiefly upon possibilities of discovery of new fields or deposits or of drilling to much greater depths. The earlier the depletion of supplies outside of Canada, the more important would become any resources that may be discovered or developed in this country.

Undoubtedly the problem of increasing the production, which has stared oil producers and consumers in the face for several years, has had much to do with the efficiency of the methods adopted for conserving and utilizing to the utmost extent commercially all of the constituents of crude petroleum. Ever since


IOCOMA.
IMPEROYAL.
ROYALITE.
IMPERIAL.
TANK STEAMERS.

the annual consumption of oil began to approach the annual production there has not been a year when some calculation could not be made to support a prophecy of the extinction of the industry, in the event of the known oil areas of the world continuing to contract. Predictions of the ultimate exhaustion of natural resources, other than oil, are fairly common; but while capital, and facilities for the exploration of new territories continue to accumulate and the demands of civilization become more urgent, it is unsafe to assume that the history of the past may not be repeated, and that some new discovery may not come to assure the world of a supply which will at least extend the life of the oil industry. Canada, Russia, Mexico, South America and India, all continue to offer wide opportunities for the oil prospector, and it is not too much to say that the northern regions of this country will be one of the world's famous mineral centres to the importance of which oil may contribute no small part.

Our own production at present is not merely an insignificant contribution to the world's output, but a small part of our own consumption. From 1865 to 1870 the yield in the Western Ontario field was about 200,000 barrels annually. The export demand produced wide fluctuations in the production and brought the output up to half a million barrels per year at times, until 1877. There ensued successive increases and declines until 1907, when the production reached 800,000 barrels, which would appear to be the maximum for the Canadian field.

The total quantity of crude petroleum entering the world's markets in 1915 amounted to 426,892,673 barrels, exceeding the former record established in 1914 by 28,194,307 barrels, or seven per cent.

The distribution of production is shown in the following table which gives the total yield since the year 1857.

	Quantity 1857-1915 inc. bbls. of 42 gals.
United States	3,616,561,244
Russia	1,690,781,907
Dutch East Indies	148,999,921
Galicia	136,032,500
Roumania	130,012,287
Mexico	123,270,377
India	80,789,711
Japan and Formosa	30,169,622
Canada	23,709,074
Peru	16,794,223
Germany	13,961,333
Trinidad	2,819,430
Egypt	1,308,496
Argentine	1,033,121
Italy	842,020
Other	372,000
	6,017,457,266

The science of geology in its relation to oil fields has progressed so far that the possibility of much effort being wasted in prospecting barren country is

eliminated, and the resources of the industry will be centred upon the exploration of any territory which affords promising possibilities, however slight, to the oil prospector. The historian of the future may yet have the privilege vouchsafed the compiler of these fragmentary notes of glimpsing the moving episodes which make up the life of a new oil field, and if this boon is accorded, may it be as fruitful not only in its contributions to the world's wealth, but in the advancement of the sciences, as was the discovery of petroleum in Canada.