MOVING A DERRICK IN THE TURNER VALLEY

THEME, being the essence of the contract in practically all drilling ventures, the tedious process of tearing down and rebuilding the derrick when one well is completed and another is about to begin, is avoided by "skidding" the rig to a new location.

Here we see the all-steel derrick from Royallite No. 7 on its way to be christened Royallite No. 12. The towering structure was jacked up and placed, on Athey trailers and towed by a 10-ton caterpillar tractor for an eighth of a mile without mishap.

EVEN morning when I reach the office, my first care is to tear yesterday's leaf off the calendar pad, and it is surprising how few of them are now left.

Swaying at the end of a strap in the rush-hour crowd on the street car, I vainly try to read my evening paper and from every page advertisers warn me of the rapidly waning number of shopping days till Christmas. Ily, twisting the dials of the radio after supper, I tune in on a jovial, rollicking laugh and find Santa Claus addressing his youthful admirers over the ether.

Now the hungry printing presses await material for the Christmas Number of the "Review" and there is no blinking the fact that another year is well-nigh spent.

And what a year to look back upon.

The dove of peace has hovered over the better part of the Globe and, although the sword is occasionally ruffled in its scabbard the brotherhood of man is gradually becoming more than a poet's dream.

Labor and capital have not exactly lain down together like the lion and the lamb, but the spirit of conciliation has been abroad and the fallacy of improving industrial conditions by costly strikes is more fully appreciated than ever before.

Science and invention have continued to march on to victory over the limitations of time and space; on land, on sea and in the air, man has demonstrated the superiority of mind over matter, and is reaching out to new conquests.

Here in Canada we have seen a year of progress. An immense tonnage of steel has gone into new construction; our mines have poured out an amazing flood of the base and precious metals; our harvest has been plentiful and even our oil production has assumed an almost calculable proportion.

As an organization we have shared in our country's prosperity. Our efforts to secure a more adequate domestic supply of petroleum have met with appreciable, if belated, success. Our ventures in the foreign fields have prospered and, whilst adding to the material advancement of Colombia and Peru, have ensured for our Dominion an ample supply of crude oil to take care of its rapidly growing demand for petroleum production.

The unceasing roar of industrial machinery, the clank of tractors in the world's granary and the hum of automobile wheels on our rapidly expanding system of good roads have called forth the ultimate effort of our refinery and distribution services.

As individuals we have profited by our Company's activity. We have enjoyed security of tenure in our employment; happy intercourse with our colleagues, and the knowledge that, whether we froze in the Canadian West, sweltered in the dank jungles of Colombia, ploughed the sandy wastes of Peru, sailed the seven seas, or sat at a desk in St. Church Street, we were working towards a common end and our labours, however humble, were not in vain.

If that is the story of the past twelve months, what of 1929?

Economists can see no reason why Canada should not continue in the flowery meads of prosperity, and provide for her people ever increasing opportunity for material advancement.

If such be our portion, let us realize that with every added blessing there comes an added responsibility.

A duty to the country which affords us its protection; a duty to the community in which we live; a duty to the industry and the company to which we owe our livelihood; a duty to the less fortunate amongst our fellowmen and, above all, a duty to the Divinity that shapes our ends, rough hew them how we will.

While then we enjoy the glamour, the mystery and the frivolity of Christmas, when we step over the threshold of a New Year and set our feet on the un trodden path of the future, let us walk as those who cannot be spoiled by success or daunted by failure, those who have seen the Star in the East and must, come weal or woe, press on.
THIRD INVESTMENT TRUST TO BE LAUNCHED, 1929

The Third Co-operative Investment Trust for the benefit of employees of Imperial Oil, Limited, which the parent companies will become operative in 1929 under regulations broadly similar to those which governed the Second Cooperative Trust. The Third Co-operative Investment Trust will be the second, will extend over a period of three years and employees of one or two years’ service and who are in good standing will be eligible to participate up to 10 per cent. of their salaries, under a plan hereinafter described for the Third Trust affecting participants in the First or Second Trust, or both, to have the sale of stock acquired through the Trust. These are as follows:

(a) If an employee who was a participant in the first stock acquisition plan only, partake with the ownership of more than one-half of all stock he received on the termination of his participation therein, he is to be in good standing when required to be in good standing on the certificates of at least one-half of such stock or other evidence of continued ownership satisfactory to them, he shall be ineligible to participate in the third plan for one year following such disqualifying act, provided, however, that if any employee has ever suffered disqualification for violation of the conditions of the eligibility provisions of the second plan, he shall be free from penalty in any case to dispose of all the stock he received on the termination of the plan, through participation therein.

Conditions governing the operation of the Third Investment Trust will be fully set down in pamphlet form and brought to the attention of the Trust and who may be regarded as permanent employees may participate by regularly depositing all of their stock received by him since his date of employment for at least six months prior to the announcement of this plan for the benefit of the employees of the Company and all dividends upon stock on purchase shall be invested in stock of the Company and all dividends upon stock purchased shall be invested in like manner.

(b) If an employee who was a participant in the first and second plans, is in good standing on the certificates of at least one-half of such stock or other evidence of ownership thereof satisfactory to them, he shall be eligible to participate in the third plan for one year following such disqualifying act.

(c) If an employee who was a participant in the first stock acquisition plan only, partake with the ownership of more than one-third of all stock he received on the termination of his participation therein, he is to be in good standing when required to be in good standing on the certificates of at least one-half of such stock or other evidence of continued ownership satisfactory to them, he shall be ineligible to participate in the third plan for one year following such disqualifying act.

(d) If an employee who was a participant in the first stock acquisition plan only, partake with the ownership of more than one-third of all stock he received on the termination of his participation therein, he is to be in good standing when required to be in good standing on the certificates of at least one-half of such stock or other evidence of continued ownership satisfactory to them, he shall be ineligible to participate in the third plan for one year following such disqualifying act.

All employees who are as of January 1, 1929, have for one year been employees of Imperial Oil, Limited, are entitled to participate in the third plan for one year following such disqualifying act. Deposits shall be made in amounts not less than $100 nor exceeding $1,000 in any one period, payable in monthly installments, and at any time the employed employee is paid, at the rate of at least 10 per cent. of annual salary, provided, however, that such deposits shall be in even dollars or half dollars.

Employees who attain to one year of service after inauguration of the Trust and who may be regarded as permanent employees may participate by regularly depositing all of their stock received by him since his date of employment for at least six months prior to the announcement of this plan for the benefit of the employees of the Company and all dividends upon stock on purchase shall be invested in stock of the Company and all dividends upon stock purchased shall be invested in like manner.

The Trustee of the Second Investment Trust are making every preparation to close the Trust at the close of March, so that distribution of stock acquired for employees under the Trustee can be made in the shortest possible time. There are five thousand individual accounts to be balanced and settled on their own joint portions of the stock held.

The Company Executive and the Trustees hope that employees will continue to hold their stock as an investment. In the past they have always urged to this end and this advice appears to have been sound as those who disposed of holdings in many cases enjoyed considerable capitalization. In this respects, the Company, Imperial Oil, Limited is a subsidiary will receive the full amount of stock which is being purchased from him and placed to his credit from his holdings in the deposits of the Company and from dividends. If there be any uninvested balance it will be distributed to their claim.

The first indication of possible production was a gas seepage on the banks of the Sheep River, in what is now the Royalite Plant Yard. Geologically this seepage proved to be located on an anticline running through the valley in a southwesterly direction. The Calgary Petroleum Company was formed in 1912, and under the direction of Mr. A. W. Dingman, President, and associates, the first well was drilled. Production was obtained in this well. Gas was found in several horizons from 884 ft. to 3,060 ft. oil at 1,157, 2,718 and 3,839 ft. In May 1914 oil was obtained at a depth of 3,839 ft. being light straw-colored oil of 60 gravity, sprayed from the well accompanied by 3 to 4 million feet of gas containing some 200 grams of hydrogen sulphide per 100 cu. ft., giving the gas the disagreeable odor so well known in Turner Valley. This strike caused considerable excitement and started the famous 1914 boom when some 200 wells were completed in 50 days.

The Royalite Plant is in the Turner Valley.

PRODUCTION METHODS IN THE TURNER VALLEY FIELD

BY S. C. COLVIN, ROYALITE OIL COMPANY

Turner Valley is located in the foothills of Alberta at an altitude of 4,000 ft., 42 miles southwest of Calgary. The present producing area is 8 miles long by 15 miles wide, while drilling is being carried on over an area of 10 miles by 2 miles. There are 32 wells producing, 26 wells drilling, and 17 wells shut down, making a total of 75 wells, varying in depth from 2,100 to 5,000 ft., varying according to the well location on the anticline—centre wells being shallower than those located on the flank.

The next well to be drilled into commercial production was the Southern Alberta No. 1 well. This well obtained production in the fall of 1916 at a depth of 3,227 ft., producing 30 barrels per day of 56 gravity light crude over a period of 3 years. This company also erected a refinery, and marketed several products refined from this crude throughout Southern Alberta. The Producers, Illinois Alberta, and Herron Elder wells also obtained small quantities of light oil. The Herron Elder well, producing a light straw-colored oil of 37 gravity, being the heaviest crude obtained in Turner Valley.

Operations in the field gradually lessened until 1921 when a compressor station was built consisting of six 100 H.P. Clark gas engine driven compressors, using natural gas as fuel. A 56 mile line 16 inches long connecting this plant with the main transmission line to Calgary was laid. This marks the first commercial use for natural gas from the Turner Valley field other than use for fuel during drilling operations. This compressor station was doubled in 1923.

On October 14th, 1924, No. 4 Royalite was drilled into the limestone production, producing 21 million cu. ft. of gas and 500 barrels of gas oil per day. Apparatus was designed and built to extract the gasoline from the gas with a reflux tower of 27 ft., and carried considerable slush ice along with the gasoline. Later, Smith separators were installed to recover the gasoline, and the gas was used for fuel in the field owing to the high sulphur content of 640 parts per million. This is the highest sulphur content of any gas in Canada, the other high
sulphur gas fields being persia with 7,000 grains per 100 cu. ft., and Texas with 1,200 to 10,000 grains per 100 cu. ft. This artificial sulphur content presented a very serious problem, and has been overcome by the erection of a liquid purification plant commonly called a scrubber. Today is the largest plant of its kind in the world, and operated at 300 lbs. working pressure—double the pressure of any other plant operated on artificial gas. This plant will purify 45 million cu. ft. of gas per day, removing 97% of the sulphur.

Purification of gas for domestic purposes is not a new process. The artificial gas plants have purified gas for a great many years, using the iron oxide box method, consisting of a box or pipe, mixed with wood shavings, ground corn cob, or other material to mix with the oxide, enabling the oxide to present a greater and more porous surface to the gas. Iron turnings were principally used, and after wetting down with water were allowed to oxidize and rust in the air. The gas under low pressure passed through the oxide boxes, and the hydrogen and carbon of the gas unite with the iron oxide to form iron sulphide. The oxide becomes charged it is necessary to replace the battery of boxes and revitalize the oxide by removing the iron sulphide mixture from the boxes, and distilling the wet mixture over several days during a period of time, and keep the mix wet to prevent spontaneous combustion.

This method was not adaptable to our present needs, being cumbersome, and not suitable for the high pressure and volume that we were required to handle. The Royalite Oil Company, after a great deal of research and work, decided to use the liquid purification method to be used at high pressure. The process is as follows:

The gas is first stripped of the gasoline, then heated to remove the by the law of chemical mass action, and may be caused to flow from right to left. Such conditions produce the actinide stage or secondary process, that of purifying the chemical solution NaH, NaHCO, CO, H, and sodium oxide. This reaction is brought about by leaving the sodium solution at 70° F., discharging into the top of a battery of 4 actinides. The actinides are steel shells 15' 34 filled with 4,500 sq. ft. of baffling, over which the solution flows against a current of air 2 34' times the volume of the gas being treated. Five Buffalo Forge Stoker Fans are used for this purpose, supplying air at 6° water pressure. The liberated H₂S is blown from the top of two 54' x 126' heavy steel stacks. The purified solution flows to a pump from which it is pumped to the absorbers by 6 74' high pressure pumps driven by individual 80 H.P. engine. Each pump is capable of pumping 5,000 gallons of chemical solution per hour at 350 pounds pressure through the scrubber's 975 receivers. The purified gas enters the transmission lines consisting of one 6'' line to Okla. 16 miles long, one 10'' line to Calvary 30 miles long, and one 12'' line to Calvert 30 miles long, by connecting to main 16'' line to Calgar. The gas passes through the plants and is delivered to Calgary under its natural pressure.

The pipeline system in the field comprises the following: Gas gathering lines for piping gas from the wells to the plants, fuel gas lines for furnaces, power boilers, etcetera; water lines serving the field; crude oil gathering lines; gas gathering lines. There are more than 150 miles of pipe in the field.

The question has been raised as to the fuel value of natural gas from which the gasoline has been removed. The analysis of natural gas from Turner Valley, after the gas has been removed, compared to dry natural gas from other fields as follows:

<table>
<thead>
<tr>
<th>Turner Valley Gas</th>
<th>Dry Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane 74.5%</td>
<td>74.5%</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>17.8%</td>
</tr>
<tr>
<td>Helium 7.7%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Oxygen 0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>N₂</td>
<td>0.0%</td>
</tr>
<tr>
<td>N₂O</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

There are 210 more B.T.U. per 1,000 cu. ft. of Turner Valley gas than of Dry Gas. B.T.U. value of Natural Gas as compared with Manufactured Gas:

- Natural gas 1,500 B.T.U. per 1,000 cu. ft.
- Manufactured gas 755 B.T.U. per 1,000 cu. ft.
- Liquid fuel gas 350 B.T.U. per 1,000 cu. ft.

Mr. B. A. MYERS has been appointed manager for the Turner Valley Gas which was established at the beginning of July. His headquarters was in the Turner Valley Center. Mr. Myers is a comparatively young man but has crowded a long and diversified experience in the oil field. He was born in Roseville, Penn., along Oil Creek, and never lived out of sight of an oil derrick. At an early age he began working on wells and learning the trade, and in 1923 he accepted the position of Resident Manager. In 1923 he was engaged by the National Transit Company. From 1930 until 1917 Mr. Myers worked in various branches of the oil business, combining office experience with further experience in production, drilling, refining, transport, etc. In August 1917 he accepted the position of Field Superintendent with the Moor Oil Company at Oil City, Penn., and had under his supervision some five hundred oil and gas wells. In February 1919 he resigned that position to become manager of the Carter Oil Company as foreman at Highgate, Wyo., and later at Barberton, Ohio. In November 1921 he went to the Salt Creek field in Wyoming as Field Superintendent and remained there during the development of the field. In February 1926 he went to Maracaibo, Venezuela and to Maracaibo, Venezuela and to Maracaibo, Venezuela, where he was engaged for the Standard Oil Company of New Jersey. In 1927 he accepted a position as Field SUPERINTENDENT for the Maracaibo Oil Company. He served very successfully in that capacity until his resignation in July 1927 when he was promoted to the position of Resident Manager. In this new office Mr. Myers will assume even heavier responsibilities that have weighed upon his shoulders during the past.
IMPROVED ROADS FOR THE PRAIRIES

Mechanical monsters are the Canadian Rather. Recently, the prairie roads in the vicinity of Regina, Saskatchewan, and other modern structures were built by railway builders, all engaged in carrying out an important project for improved provincial highways. The entire Province is keenly interested in the work, which promises within the period of the next few years a substantial mileage of improved surface and relief from that clinging terror, "gumbo," which during the spring and fall in summer wet spells has made highway travel exceedingly difficult. The big mechanical equipment, large trucks carrying gravel, graders spreading the gravel on the road surface, and mammoth motor driven oil sprinkling machines, began their work of waterproofing Saskatchewan highways

On Highway Route Number 1. Rather appropriately the scene of this endeavor was just east of the Imperial Refinery at Regina whose operations have made possible a supply of the necessary road oil for this work. A large investment is represented by the equipment required for this experiment and that the experiment promises to be quite successful in a matter of keen satisfaction to the Government of the Province and to the contractors and Imperial Oil, Limited, the three parties who cooperated to carry out the work. In mid-September, Hon. George Spence, Minister of Highways for the Province of Saskatchewan, accompanied by members of his technical staff motored over a finished portion of road. The trip was made immediately after heavy rains had created conditions for a thorough test. The car was driven at a speed in excess of 35 miles an hour. It traveled easily over the oiled and gravelled surface, negotiating at high speed and in perfect safety the curve immediately east of the Imperial Oil Refinery. In order to provide a comparison between the roads of yesterday and the roads of tomorrow, the car was then run over a portion of highway which had not been treated and some new difficulty was experienced in attaining a speed of ten miles an hour and where skidding was frequent. At the end of September conditions at a speed in excess of 35 miles an hour. It traveled easily over the oiled and gravelled surface, negotiating at high speed and in perfect safety the curve immediately east of the Imperial Oil Refinery. In order to provide a comparison between the roads of yesterday and the roads of tomorrow, the car was then run over a portion of highway which had not been treated and some new difficulty was experienced in attaining a speed of ten miles an hour and where skidding was frequent. At the end of September conditions

OIL EXPLoration BY ELECTRICAL METHODS

By E. G. Leonardson

Geophysical methods of prospecting have as their theory the measurement of certain physical properties of the earth's crust. These measurements are made by means of instruments which are sensitive to the presence of certain types of energy. The instruments used are generally of the electrochemical or electromagnetic type and are designed to detect variations in the earth's magnetic field, electric field, or electrical conductivity. The results of these measurements are then used to infer the presence or absence of oil or gas reservoirs. The methods are based on the principle that the electrical properties of the earth's crust vary with depth and that these variations can be detected by measuring the electrical conductivity of the subsurface. The conductivity of the rocks is a measure of the amount of electrical current that can flow through them. Their conductivity is an important factor in the development and exploration of oil and gas fields. The presence of oil or gas is often indicated by an increase in electrical conductivity due to the high electrical conductivity of the hydrocarbons. The conductivity of the rocks is an important factor in the development and exploration of oil and gas fields. The presence of oil or gas is often indicated by an increase in electrical conductivity due to the high electrical conductivity of the hydrocarbons. The conductivity of the rocks is an important factor in the development and exploration of oil and gas fields. The presence of oil or gas is often indicated by an increase in electrical conductivity due to the high electrical conductivity of the hydrocarbons.

(1) Near Parachute Camps (Colorado).
(2) From Imperial Oil Company, Quarterly Review, 1930.
IMPERIAL OIL REVIEW

The following table gives a rough idea of the limits between which the conductivity of the rocks may be expected to vary in practice:

<table>
<thead>
<tr>
<th>Resistivities in Ohms per Meter</th>
<th>Coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays and slates ..................</td>
<td>0-10</td>
</tr>
<tr>
<td>Calcareous slates ..................</td>
<td>10-20</td>
</tr>
<tr>
<td>Shaley limestones ..................</td>
<td>20-40</td>
</tr>
<tr>
<td>Igneous and metamorphic formations</td>
<td>40-1000</td>
</tr>
<tr>
<td>Rock salt ..........................</td>
<td>1000-10,000</td>
</tr>
</tbody>
</table>

From this table it is readily seen that the various rocks of a geological formation may differ tremendously in their electrical conductivity. The ratio of the order of 1 to 50 are not abnormal and will actually be true where soft clay and a compact rock. This is in marked contrast with the ratio encountered, for instance, in gravimetric studies. The densities of rocks and minerals (with few exceptions) lie between two and eight or so that, at its maximum, the ratio likely to be encountered will be in the order of one to four, and usually it will average much less than this. A similar remark may be made about seismic methods (variations of density) or magnetometry (variations of magnetic susceptibility).

No wonder then that the study of the electrical conductivity constitutes a feasible method for applied geophysics.

Fundamental Principles

One way to study the conductivity of the subsoil is to pass an electric current through the ground. This latter then acts as a limitless conductor; the current enters the earth at one point, A, and leaves it at another point B. Points A and B are called the "earth contacts."

In the case of homogeneous ground, the application of Ohm's law for a limitless conductor permits the calculation, a priori, of the equipotential surfaces, and of the equipotential curves observable at the surface of the ground. These latter have the form shown by solid lines in Figure 2.

If the soil is not homogeneous, but composed of rocks of different conductivities, the electric current will be distributed according to the same law; the equipotential surfaces, the equipotential curves and the potential profiles will be somewhat different from the theoretical ones as described above; disturbances in the shapes will appear. The problem of electrical prospecting is to locate these disturbances accurately and to interpret them correctly.

The following examples show how such interpretations may be made:

Suppose a mass Z lies beneath the middle region of AB, where the equipotential surfaces are practically vertical planes. Were it a perfect conductor it would be at exactly the same potential throughout (since the drop in potential is proportional to the resistance encountered). Therefore an equipotential surface would not cut through it, since that implies a difference in potential between the materials on opposite sides of the surface, but would pass around it, so that the body would lie entirely on one side or the other of the given surface.

The action of conductive material is, therefore, to repulse those equipotential surfaces near it. If the mass is not a perfect conductor the resulting disturbances are less striking, but exist to a marked extent, nevertheless. Figure 2 shows the observed results.

If the burried mass is more highly resitant, and is a poor conductor, the opposite effects will be observed. The equipotential curves will be attracted by it.

These simple examples show us the form of the disturbing effects incurred by the potential field in the case of an heterogeneity in the ground and enable one to understand roughly how the results may be interpreted.

We will now cite some types of problems which may be solved by means of potential measurements.

Study of the Trend of the Beds in a Salt Formation Hidden Under a Cover

If a current is caused to flow in an homogeneous soil between two earth connections A and B, the equipotential surfaces in the neighborhood of A and B are approximately semi-spherical. If the rocks, instead of being homogeneous, are made up of tilted strata, the current will flow more easily in a direction parallel to the beds, where aqueous conductive fissures are present, than perpendicular thereto. There will be a longitudinal and a transversal conductivity, which will differ from each other. The equipotential surfaces will be ellipsoids of revolution with their axes of revolution perpendicular to the trend of the beds. The equipotential curves will be ellipses, the major axes of which will be coincident with the trend of the beds.

Figure 3 shows the results obtained in this manner in Fervailla-la-Campagne (Normandy, France) in 1912. The tilted Silurian formations are covered by more than 200 feet of Jurassic clays and limestones. They were successfully traced many miles. The resulting conclusions were tested by drilling and proved correct.

General Study of Anticlinal and Synclinal Folds Under a Cover

The method explained above is very efficacious in the study of numerous problems of tectonics and stratigraphy such as: Study of the directions of anticlinal and synclinal folds when concealed beneath overburden; location under covering material of the contacts of tilted formations.

A problem of the latter general type was treated in the study of the May syncline (Normandy, France) in 1929.

The formations consist of a series of anticlines and synclines, of Silurian age, which are cut by Jurassic strata. The general section of the folds is as follows:

Armorican sandstones 600' (oldest) from the top: 30-57:
Calcareous siltstones 300-600' (oldest): May syncline sandwiched between two trays of Carboniferous, 500' and 800' (youngest): Black shelly sandstone 600' (oldest)

The beds are tilted at an angle of 30-60 degrees from the vertical and covered by horizontal Jurassic sediments, the thickness of which amounts to 200-300'.

The conductivity of the different rocks of the Silurian are quite different. The Armorican sandstones, the iron carbonate and the May sandstones are very resistant, the shales are, on the contrary, much more conductive. A prism, the problem was then one favorable to electrical exploration the only difficulty being the thickness of the overburden.

The detailed form of the syncline under its cover was determined over a length of more than two miles and a width of one mile. It was furthermore discovered that the northeastern limb of the syncline was cut off by a fault; this fault also was traced electrically.

Location of a Fault

If the current passes from one formation characterized by a certain conductivity into another one the conductivity of which is entirely different, a disturbance in the form and in the disposition of the equipotential curves is observed. What happens is no different from what occurs when a ray of light passes from one medium into another one of different index of refraction. A refraction is observed.

This phenomenon is equally well shown on the "profiles of resistivity," that is, on a graph giving the resistivities of the greatest different points along a line causing the contact in question. Figure 4 shows the results obtained in Alseaus along the Rhone fault, near Lobann. This fault,
which brings Oligocene into contact with Triassic sandstone (Volsinian sandstone) disappears under Quaternary terraces. Its position was accurately indicated by means of profiles of resistivities at a number of places.

Location of Salt Domes, Burner Ridges, etc.

The problems solvable by various modifications of the electric method are quite numerous, and to give an adequate idea of their scope would require too long a list of examples. As a matter of fact, at practically every place where differences of conductivity exist between geological formations, the problem of the discrimination of these formations can be solved. There is no limit to the depth to which researches can be carried, it is merely a question of scale, but it is evident that at great depth only very large structures will be located.

Fig. 5 represents an electrical survey of the Boldsclaire anticline in Roumania, carried out prior to any oil discovery in that area. The curves numbered 1, 2, 3, 4 are equiresistivity curves indicating the resistivities of the formations. The ridge of the anticline appears as a conductive area surrounded by more resistive rocks.

Fig. 6 shows the equiresistivity curves traced around the Hetteneschlag Salt Dome. This latter dome is one of two which were discovered in 1926 and 1927 by an electrical survey in upper Alsace (France) (1).

Previous to these discoveries there was no idea that such structures as salt domes could exist in the Oligocene basin of the Upper Rhine. Both domes were investigated by drilling and proved to confirm the electrical conclusions.

Conclusions

The varied problems discussed above show that in the field of structural studies, the potential methods are able to solve typical problems of hidden structures with which the oil geologist is concerned: study of anticlinal and synclinal folds, following of tilted horizons, tracing of faults, and isolation of salt domes. The potential methods have been applied with success to many large fields of exploration. It is evident that the potential method will continue to be an important one in the search for new fields of oil and gas and in the development of established fields.

Imperial Personalities

STANDARD compilations of biographical data fail to enlighten the present writer with regard to the present offering on the Personalities Page. Although biographical dictionaries comprise data relating to many hundreds of the great and approximately great, they offer nothing whatever in the way of information about this gentleman who, if for nothing more than his distinctive appearance, let alone his universal popularity as the personification of good nature, has a deserving claim upon our consideration.

There is no evidence even that ever he was born, which may in some measure account for his immortality. We find no notation of educational pursuits, though obviously he is a man whose information is as wide as his sympathies are broad. If ever he married there is no advice to that effect. His business activities at this season of the year are more extensive than those of any other individual but remain unrecorded in biographical volumes. If he be a club man, which presumably he must be, for his hearty appearance and unassuming good nature would surely win him welcome in any association of human beings, we have no record of memberships with which to repel the reader of his glowing prowess is unnoted. Nor can we find, what is a favourite item for notation in the dictionary biographical, any intimation that he has favourite pastime occupations or sports and yet we know he indulges a hobby which each year makes millions of people his grateful beneficiaries.

Even the Amenity and Benefits Department which catalogues, indexes and cross-indexes the 7,000 ride down the streets by the Company hostess at Negritos in Peru dressed in his ever popular scarlet tunics and long boots, with the desert sand blowing cheerily through his flowing white beard, and mounted upon a philosophical burro who accepts as one of the inexplicable aberrations of these strange people from Canada his rider's insistence upon trying to make him (the burro) look like a reindeer by the simple expedient of affixing to his bridle a spread of reindeer antlers. On the rider's back bulge a big bag, to the contents of which our employees' children will look forward in a fever of expected excitement. At the same time and at nearly the same hour, such is the amazing ability of our subject to be everywhere at once on the 25th of December, he will stride into the Community Hall at Icaco, B.C., bow to the delighted plaudits of our employees' children there and distribute tokens of affection and goodwill. Simultaneously he will be visiting the homes of our employees in Victoria and doing his bit in the Community Hall at the Regina Refinery. He will squeeze his bulging sack practically every chimney in Sarnia, parade the corridors of 56 Church Street in Toronto, lavish gifts and blessings on the employees in Montreal East and join with Superintendents Allan at the Dartmouth Refinery in wishing good cheer to all. He will pour orifices of our tankers at sea and poke his head in here and there from Cartagena to Bogota in Colombia to voice the old wishes and sentiments of Christmas tide.

Surely one so well known to all our employees in an Imperial Personality, notwithstanding Doctor Sinclair's recent advances in the field of cryptidology, do not include the name of Sarnia on your list. It is a very real personality, to dispute whose existence is unanswerable, unfeeling and unique, as someone has wisely remarked, to dispute the existence of fairies and gnomes. May he touch us all nearly at this time and as our agent carry material contributions of good cheer to those who, less fortunate than ourselves, are more in need of it.
DOS BOCAS means “Two Mouths.” Here it is that the Magdalena River forms a tributary of the great Magdalena River. From this point, the journey would intimate a small oil-drilling camp of the International Petroleum Company, consisting of two or three “barracas” houses and a miniature mess-hall, accompanied by the few necessary natives’ quarters; approximately sixteen miles from El Centro, the centre of field operations, and thirty-four miles from Barrancas-Bermeja, the Interna-
tional Petroleum Company’s Magdalena River project. What a wealth of detail this description would omit, for surely it is one of the most beautiful places in the tropics.

Imagine yourself in the camp at Barrancas-Bermeja, and you are going to spend Sunday at Dos Bocas. The night before, you set that most necessary of modern inventions, the alarm clock. You arise with the bugle, at five o’clock, and after a hurried dressing, and with two women’s caps on your head, you hasten to catch the company’s train to El Centro. The train starts, and in a short time Bar-

canas camp and village, enjoying their Sabbath repose, are left far behind. You are in the heart of a tropical jungle. The morn-
ing is cool, the sun does not appear until the afternoon. The first beam of gold strikes the sky and forest and immediately the dull shades turn from grey to every imaginable hue of vivid green, picked out with diamonds of dew. The sunlight warms the air, the still trees speed past you in ever changing forms. It is the success of the conquest of this vast forest; the modern International Petroleum train races through like a dragon, and

The view is low you have a peaceful swim in water clear as crystal.

even the earth whose pitted surfaces, your head not even the roads, eyes not only of civilization, but even habitations, are seen. Neither is this the only road. You cross others and realize a rapid river which runs between one oil well and another, and here are one or two more under con-
struction. Six short years ago this was virgin forest.

At Dos Bocas the camp is on a jutting cliff. The river washes the base and forms a larger bay above and a smaller bay below. The opposite bank is low and shallow. Standing on the cliff and looking up the river you see it flowing in tidal streams between two great walls of tropical trees and creepers; it abruptly falls at the edge of the tributaries — and be-

hind, wonder of wonders, stands the mountains.

Would not Nature be cruel, if in this place, de-
signed for bathing for gods or men, she had placed the hideous alligator? Below, past the steeper rapids, where the temperature is warmer there are alligators in plenty, but here lurks no danger. Before lunch then you hasten to don your bathing-dress. If you are timid you cham-

ber down the rocks; but if you are bold one jutting from the diving-board on the shore beneath you beneath the delicious cold water from the mountains. After the look of the inland warmth of mid-day it seems another world. If the river is low you have a peaceful swim in water clear as crystal, (so common ‘

thing in the tropics at this low altitude), but if there has been much rain, you fight your way up-

stream to the most hideous, gain-
ing but little headway. The brave man runs along the bank and jumps into the rapids above; there is no thought of swimming, the whirling

Oil Exploration by Electrical Methods

Continued from Page Ten

rock climbing. But along this problem will not be

prerequisite to the problem will not be

annuance to electrical prospect-

ing and some other method will have to be tried. The geophysicist can never make the problem solv-

able, only its inherent nature controls that aspect. Such a state-

ment may perhaps be considered as self evident and not worth

pointing out. However, it is not superfluous to point this out em-
phasizing the need for exploring electrical prospecting which is 100% ef-

fective is not a satisfactory one.
ASPHALT, ITS DEVELOPMENT AND USE

PART IV

C. M. Baskin - Assistant Superintendent, Montreal East Refinery

In our first article we described the ancient origin of asphalt and the development of its use into an art which attained considerable proportions. Subsequent developments, as sketched in succeeding articles, show how the utilization of asphalt deteriorated to a point where it had to be practically relabeled as a lost art. The small quantities of asphalt that was used up to the end of the 19th century was invariably of native origin. In some cases, this asphalt was found in pure state, but mostly it was obtained mixed with large quantities of mineral matter.

Modern development of Petroleum asphalt is based on the ever-growing demand for asphalt binders, for waterproofing and road building. Construction of highways first became a national problem in the depression by 1929 when Macadam. Shortly followed the idea of a binder in road construction. At first the binder for railroad work was water, but within a few years this matter of binder made a radical departure. The tendency became a "water-proofing bituminous binder" which brings us the door of modern petroleum asphalt.

How was the growth of the Petroleum Industry instrumental in developing modern asphalt for paving and waterproofing? Crude petroleum, the world over is a mixture of hydrocarbons. That is, chemically speaking, petroleum is a mixture of substances composed mainly of carbon and hydrogen, hence the term hydro-carbon. Thus in reality Petroleum consists of a very complex mixture of substances, but it is a bewildering mixture of hydrocarbons which substances differ from one another in form, pattern and combination, differences, particularly that of different proportions of carbon to hydrogen in one component. It is possible for the reader to see that we are just beginning to understand hydrocarbons and the place of asphalt in the entire scheme.

We can start out with the following statement:

1st—That Crude Petroleum is a mixture of substances composed mainly of carbon and hydrogen.

2nd—The substances making up this mixture vary in consistency from hydrocarbons gaseous at ordinary temperatures to hydrocarbons solid at the same temperatures.

3rd—The old method of classifying crude petroleum, and which methods have been most successful is a classification according to their "base."

It is beyond the scope of our present article to go into the technical side of Petroleum. With the above three items as starting points we shall attempt to convey to our readers some elementary ideas of the basic differences in crude petroleum.

Fig. 1—The Graph Chart

The chemist in his effort to establish some law and order in the organic field started to split up and put together the various mixture of hydrocarbons. Numerous compounds were isolated, their properties carefully studied. In this manner it was found that the hydrocarbons could be formed into groups and classes based on their similarities and dissimilarities.

By the above method crude petroleum have been studied the world over. We shall attempt here to give some idea as to the classification of crude petroleum and the place of asphalt in the whole scheme.

say gasoline, a substance liquid at ordinary temperatures; if we raise its temperature by some means or other the first phenomenon observed is that the liquid turns into a gas. The temperature at which this group of hydrocarbons will start to gasify or evaporate is known as the initial boiling point and the temperature at which the last drop evaporates is known as the final boiling point. The whole range of ascending temperature point corresponds to all the different boiling points of the compounds in the group of hydrocarbons that go to make up the mixture known as gasoline.

Boiling an oil, however, merely changes its physical state, just as boiling water merely turns it into a gas known as steam, but in no way changes its composition. If the gas, or still better, vapor formed by boiling a hydrocarbon is cooled back to ordinary temperatures it will revert to its original state without any radical change having been effected.

The solid hydrocarbons have also undergone boiling points, with this difference that they have to go through two stages. First they have to be raised to a temperature at which they become liquid, and further raising of temperature will reach the boiling point. Here also, cooling the vapor will first turn it back to liquid and further cooling will bring it to its original solid state.

We can, therefore, restate the second item to read as follows, crude petroleum the world over are mixtures of hydrocarbons of varying and always ascending boiling points. In the third item we say, crude petroleum are usually classified according to their base. This needs some explanation as to what is meant by far from being a classification of petroleum. Again, as pointed out above, petroleum is a mixture of hydrocarbons of ascending boiling points. The higher the boiling point the heavier the compound we are dealing with until, finally, we approach a point where the compounds are very high in boiling point and are solid or semi-solid at ordinary temperatures. It is in the liquid portion of solid or semi-solid hydrocarbons in a crude petroleum that we refer to as the base.

We also mentioned above that the scientific world in their efforts to classify and label were looking about for differences and similarities. In studying the light hydrocarbons or those hydrocarbons having low boiling points, the intrinsic differences between one compound and another is relatively small, that is, the light portions of all crude petroleum are very similar. The differences between one crude and another become really accentuated the further down we go towards the heavy solid or semi-solid hydrocarbons, or the "cookie." The study of heavy hydrocarbons shows very remarkable differences not only in composition and structure, but also in physical properties such as consistency, susceptibility to temperature change, plasticity, adhesion, and cohesion.

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For our purposes it is sufficient if we understand this matter of base from the standpoint of physical characteristics only. The physical properties will sufficiently illustrate the reason how and why modern asphalt is derived from crude petroleum. The utilization of asphalt in antiquity was primarily based on the fact that the ancient artisan noticed its tendency to cement and adhere to surfaces. He found that he could join two objects together much as an artist joins a thin film of this black sticky matter. From this, and from what we have already said, it would follow that if the solid or semi-solid portion of a crude petroleum is found to be black in appearance and capable of cementing properties, then the base is asphalt, hence the term "asphaltic base crude".

Most of the crude petroleum, however, contain mixtures of solid and semi-solid hydrocarbons whose properties are just the opposite of those of the asphalts. They may be semi-solid or quite solid at ordinary temperatures, but in color they are not as dark as asphalt compounds. The most outstanding difference is that asphalt is by far the most crystalline in form especially when viewed through a microscope. While the asphalt may be solid or semi-solid, the compounds seem to have no cementing value and do not lend themselves as a binding medium. It is the lack of cementing value that makes these solids and semi-solid compounds so valuable in certain fields of industry, such as road building. While the asphalts when interposed between two surfaces retard the movement of the substances between them, the asphalts act as a sealer. The othergroups of solid and semi-solid hydrocarbons, while adhering tenaciously to other surfaces, are easily ruptured within the same substance. If we restrict the hydrocarbons are known as the paraffins and naphthas. These paraffins are made up of many crystalline parts. The ends of which are mainly made up of these compounds, are known as "asphaltic asphalts".

At present petroleum is produced from numerous sources and distributed all over the world. This tremendous variety of sources yields crude oils with a wide range of characteristics in appearance, content of the different hydrocarbon groups, and base. Actually there are very few crude oils whose lower ends of semi-solid and solid hydrocarbons are either all asphaltic or all paraffinic. As a rule crude oil will contain a mixture of bases, containing both paraffine and asphalt. We, therefore, call a petroleum either asphaltic or paraffinic base depending on what the greatest portion of its ends is made up from. In most cases, however, crude oils are mixtures of bases.

The most important fact to keep in mind about petroleum is that it is invariably a mixture of different boiling point hydrocarbons. Our whole refining industry is based on this single fact. Thus, you will note on the graphic chart reproduced here that all the different portions of a crude petroleum correspond to areas on the different commercial products have definite ranges of boiling points. Separation of these different products is based on the above difference in boiling points.

The basic method employed to effect a separation in these mixtures of hydrocarbons is distillation. We can best illustrate the separation of different boiling point products by distillation when considering the following example.

Consider a mixture of wood, water, and wood alcohol boiling at 118.8 F. The boiling point of water is 212 F. The mixture is therefore heated in a distillation retort at 118.8 F. and maintained at this temperature until all the alcohol is driven off in form of a vapor. If the alcohol vapor is passed through a series of pipes with cold water circulating around them, it will cool below its boiling point and can be recovered as liquid alcohol. The water will remain intact in the retort.

The same principle applies to all volatile substances, that is those substances that will turn into vapor under certain conditions. In the above example we deal with a mixture of volatile substances made up of two portions each of which has one definite temperature point at which it will turn completely into a vapor. The only difference with petroleum is that it contains virtually thousands of substances the boiling points of the liquid or semi-solid oils will be lower than in the case of the crude contains a mixture of several components in this case are of the different hydrocarbons. For instance, if the crude to be processed contains only ten per cent of a certain consistency asphalt the temperature that we would get rid of the other oils would be correspondingly lower, about 570 F. If the asphalt content of this particular crude had been 35 per cent, the temperature at which we would get rid of the other oils would be correspondingly low, about 550 F.

Now, the asphalt still as shown in Figure 2 was quite satisfactory when handling crude with a high asphalt content. As the temperature of distillation was not too high to affect thorough separation. It is to be observed that the usual practice in refining is to fill the asphalt still about three-quarters full. The empty space serves for expansion and vapor space. The more of the crude is distilled off the greater grows the vapor space. It is essential that this vapor space be hot enough to prevent the rising vapors from condensing and dropping back into the asphalt still. Since this run back would contaminate the final product. With the asphalt content, the crude can be successfully handled in such a simple distillation retort, due to the low temperaturer. Required. By maintaining a somewhat higher temperature on the bottom of the still the top or vapor space will be sufficient to prevent recondensation and runback.

To case a low asphalt content crude is to handle the problem of effecting thorough separation becomes much more difficult. An apparatus similar to that shown in Figure 2 becomes impracticable since the non-asphaltic oils that have to be vaporized and removed from the crude become more asphaltic with rising boiling points that is difficult to maintain the proper temperature in the lower rising vapor space in the still and prevent recondensation and run back into the asphaltic residue. Even the usual method of spraying in steam on the bottom to assist in the expulsion of the vapor is not sufficient.

It is evident that the main factor to consider in designing an apparatus that will overcome the above difficulties is a means of getting rid of the vapors as soon as they are formed so that it is not possible for them to condense and run back. Numerous methods have been tried, but the most practical that has yet been evolved is a continuous distilling apparatus into which the crude is pumped at one end and the finished asphalt is delivered at the other end.

Figure 3 represents a simple continuous distilling apparatus. The crude petroleum is pumped through a long coil set in a fire box. The temperature is controlled so as to have the crude petroleum in the outlet at a point at which all the non-asphaltic oils are vaporized. The end of the coil is then connected to a large condenser and the stripped asphalt is drawn off from the bottom of the coil. The asphalt is drawn off from the bottom of the coil and the stripped asphalt is drawn off from the bottom of the coil. Further development in this field of continuous distillation showed that the application of these vaporizing oils to the above apparatus are still more practical and give a more thorough separation.

With the above basic principles in mind we can go on in our next article to stop boiling asphaltic products are produced by modern methods of refining.
IMPERIAL OIL REVIEW

MONTREAL EAST REFINERY

By S. Williams

It was in 1915 that Imperial Oil, Limited chose the Island of Montreal as a location for a large refinery. In choosing thus the Imperial Directors have been amply justified for the refinery has ever continued to grow, until now it runs at six times its original capacity to supply the always increasing market with asphaltic products and lubricating stocks as well as with motor fuels and other petroleum fuels.

There is very little record of a turning of a first sod or any such formality in regard to the Montreal East Refinery, but what we do know is that when in the Fall of 1915 the engineers arrived to lay out the plant they found the boilermakers hard at work erecting tanks, and that from the first day on the Montreal East Refinery energetic activity has ever been the watchword.

At the end of 1916 the stills began operating, the first laid out included only three asphalt stills, two steam stills, three rerun stills, fourteen crude and pitch stills and ten pressure stills. There were also continuous naphtha treating and acid plants, as well as asphalt filling and drum plants.

The original production of asphalt gasoline, refined oil, lubricating distillates and fuel oil, was required to supply the Quebec District, but the fuel oil was also used at the seat of war and on ocean vessels, while the three asphalt stills were the instruments by which Imperial then began to cater to the paving and roofing business of Canada. The capacity of the plant in 1916 was 4,000 barrels a day, a mere sixth of its present capacity of 25,000 barrels a day which has been made possible by many additional to its equipment. These additions include eight more asphalt shell stills, one vacuum asphalt pipe coil, two more filling buildings and a cold patch plant.

There are three more rerun stills, two more crude stills and four sets of bubble tower equipment on the crude and rerun stills. The pressure stills have now been replaced by two cracking coil units, and there is also a gas absorption plant and an Ethyl gasoline plant as well as improved lynch-wash, clay-treating and acid plants.

The cracking coils and asphalt pipe coil are examples of the most up-to-date refining units on the Continent.

Asphalt was first made from light Mexican crude, and later from Panuco crude, which until quite recently was considered best for this product. In 1927 the depletion of crude obtainable from the Mexican field began to indicate that it was unsafe to depend too much on it for asphaltic base crude and so, after intensive study and investigation of ways and means, the management definitely established that good or better asphalt could be produced from the oil found in the International Petroleum Company’s concessions in Colombia. The vacuum pipe coil above mentioned, designed and built by the Imperial Oil Staff, has been the instrument by which Colomhi asphalt has been able to replace, in the Canadian market, the Mexican product.

Furthermore, Colombia crude is rich in anti-knock and lubricating oil components which are not present in Mexican crude, and so we find today at Montreal East that considerable portion of the refinery is devoted to the oil of the stills is Colombian. Most of the rest of the crude charge comes from Peru, from which, as we all know, Marvelube is obtained.

This means that not only the asphalt, gasoline, etc., but also the crude oil itself, is an Imperial product, from start to finish.

But all these changes and accomplishments at the refinery were not attained in a year or even a year. They have meant hard work and patience on the part of the Marketing Department at Cote St. Paul. They are results of long periods of training and vigil within the plant, not only while there was the bustle of business to encourage work, but also during the long nights. They necessitated constant attention to maintenance and large construction programmes throughout the bitter Winter months, preparing for the opening of navigation in the Spring which lies too far off to keep our ever-hungry marketing stations supplied.

During the Winter, because the St. Lawrence River freezes over, the refinery output is necessarily curtailed. To us, therefore, the opening of navigation is most important. The ice on the St. Lawrence during the Winter sometimes becomes several feet thick towards the end of April, generally, it begins to break up then in a night or a couple of days, the River is clear, and once more the boats loaded in the port of Montreal are free to sail down to the sea. Sometimes, of course, there are ice jams, such as occurred in the Spring of 1928, and huge mountains of ice block the river which then remains frozen in from the head of Montreal Island.

It is only a short time after the clearing out of the ice that the Imperial tankers begin to arrive from the South with their cargoes of crude. It is recorded that during a week in May, 1922, eight boats and four tugs sailed at the Imperial Oil dock. Such was then considered worthy of note. But this summer we would be surprised to find that there was more than one single day when a boat did not tie up there. Usually there are three or four tied up, and they do not stay long, either. Big crude boats with over 100,000 barrels to discharge are away again after twenty-four hours. And so the Refinery can justly be termed a “port”, for not only do many large boats call at the wharf for bunkers, but the immense tankers of the Imperial fleet depend upon our stores and purchasing departmen for supplies, as well as upon the mechanical staff for repairs, which must be made with utmost dispatch.

While touching on marine matters, it may be well to mention the Levit Station, which although over 200 miles from Montreal is nevertheless part of the refinery, and is under the management of the Refinery Superintendent. Levit Station consists of five tanks with the necessary loading rack and dock facilities. These tanks are filled with gasoline and refined oil and gas oil, which are received in bulk from Halifax refinery. From Levit these products are distributed to the lower Quebec territory. If this station did not exist, the crude oil would have to be shipped up to Montreal, refined there and then the products carried back in tank cars to points of consumption.

In other words, Levit Station owes its existence to a saving in freight rates.

Since its origin in 1915, Montreal East Refinery has been subject to many improvements and expansions which have from time to time been necessary in order that the manufacturing end of the Imperial organization may be kept in line with an exacting and ever-widening trade. To go into all the changes of equipment and increases of capacity which have taken place would require considerable space. Suffice it to say that although for half the year the plant operates at only a thirty per cent load, it processes one-fifth of all the crude oil entering Canada.

Right from the beginning there has always been present among the personnel of the refinery a feeling of friendly cooperation and interest in the work on hand, which sentiment is known throughout Canada, as the “Imperial Spirit.”

Let us take for example sport, which can never happen properly without true co-operation. Refinery records note many successes that the Refinery boys have won. As early as 1920 we boasted a baseball team and tennis. There have been keen, stirring games of golf and tennis. In 1922 the Hockey team placed Cote St. Paul Marketing Station such a fast game that they soon called quits and promised to take everyone to a dance and feed. If only the team would stop scoring goals. Last Winter the team won the Eastern Industrial Hockey League.
MEN OF GOOD WILL

"What's today?" cried Scrooge calling downwarward to a boy in Sunday clothes, who perhaps had listened in to look about him.


Dickens.

GOOD will towards men.

In every walk of life, this is the thing. Mixed with a little common sense and judgment it will solve many of our problems. It will help kill the ugly breed of antagonisms and prejudices and in their place will come a spirit of tolerance and sweet charity, not dissolving the differences which separate us.

We will find sooner or later, as all sensible men do, that it does not pay to nourish a spirit of antagonism or ill will towards anyone. Indeed, the most delightful experience we can have, is to be on good terms with our brother man and nothing can quite equal the inward glow that comes to one as a result of this attitude.

The world needs it, and never more than now. These dark days will then become luminous by its spirit. Every morning will become "a joy-sanguard morrow." So speak the cheery word of good will. It will do you more good than you can estimate. It will also help lift the load of those who have lost their loved ones during the year, or of those who have anxiously fought to retain or regain their health.

Christmas is the time to show it, although men of good will cannot hide it during the year. Christmas Day, however, provides a fitting and unique occasion to express this attitude of mind, towards our fellows.

With this in mind, I turn again to the old memory-laden words which are filled to the brim with the spirit of good will, and wish you each and every one a Merry Christmas and a Happy New Year. "May it be said of us, as it was said of Scrooge, that he knew how to keep Christmas well, if any man alive possessed the knowledge." And so, as Tiny Tim observed, "God bless Us, Every One!"

P. F. SINCLAIR.

THE REVIEW COVER

On the cover of the December issue of the Imperial Oil Review is reproduced in buttone a photograph made at night in the Turner Valley. In it the Royalite Plant stands out in the background against a winter sky.

The two upper views are of El Centro in the Republic of Colombia and show, first, the river back of the Company's staff houses and the club and, below it, the road and can plant and a large loading. The two lower views were taken at Batanaya-Benay. The upper one shows activities on a corner of the producing field; the lower cliffe was made on pay day which, seemingly, is as welcome an event in the tropics as in Canada.
December 15th, 1928.

The Editor,
The Imperial Oil Review,
56 Church Street,
Toronto, Canada.

Dear Sir:

Directors join with me to extend to all employees of Imperial Oil Limited and its subsidiaries, and to all readers of the "Imperial Oil Review", cordial greetings and sincere wishes for a Merry Christmas and a Prosperous and Happy New Year.

Yours very truly,

[Signature]
President.