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CONTENTS

SIXTEEN ENGRAVINGS OF WINTER SCENES

The Removal of the North Sea Mine Barrage

28 Illustrations

NOEL DAVIS

Skiing Over the New Hampshire Hills

37 Illustrations

FRED H. HARRIS

Winter Rambles in Thoreau's Country

15 Illustrations

HERBERT W. GLEASON

Where the World Gets Its Oil

21 Illustrations

GEORGE OTIS SMITH

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WHERE THE WORLD GETS ITS OIL

But Where Will Our Children Get It When American Wells Cease to Flow?

BY GEORGE OTIS SMITH

DIRECTOR UNITED STATES GEOLOGICAL SURVEY

IN THE course of the centuries the raw-material issue changes. In the long-bow epoch of England's military strength the conservationist feared a depletion of the yew wood which might give the Teuton, backed up by his larger forests, an obvious advantage in light ordnance. Later, when Great Britain's naval power depended upon her wooden ships of war, the anxious naval chief foresaw a possible shortage of the oak which made the walls that stood between England and her enemies.

The yew and the oak are no longer essential to national defense, for steel has proved the substitute in both arms and armor plate. Yet today those who plan for the future prosperity of their nation realize the extent to which other raw materials are essential to the general well-being, and for some of these we can see no adequate substitutes.

Foremost among these most useful and least abundant, if not, indeed, irreplaceable, commodities stands mineral oil, or petroleum, and not only the conservative Briton, but the most optimistic American, may well ask himself, Where will my children and children's children get the oil that they may need in ever-increasing amounts?

THE WORLD'S GREATEST OIL PRODUCER AND CONSUMER

The leadership of the United States as an oil producer and consumer is spectacular enough to satisfy our American love of doing things on a big scale. For sixty years, except in 1898 to 1901, when Russia reached the peak of its past petroleum production, the United States has led the rest of the world with its steadily increasing flow of oil.

But while we have contributed far more than half (61 per cent) of the oil

that the world has used in all these years—we have already reached the point where we are consuming more oil than we produce. Is this position of the world's greatest user of petroleum as safe as it is spectacular?

The story of the petroleum industry in the United States extends back only sixty years. On August 28, 1859, oil was struck in the Drake well, near Titusville, in northwestern Pennsylvania, and when the pumping began the oil flowed in a tiny stream of 40, and later only 15, barrels a day; but since that day of small things the tide of oil has mounted higher and higher: 5 million barrels were produced in 1870, 26 million in 1880, 45 million in 1890, 63 million in 1900, 209 million in 1910, and 356 million barrels in 1918, with the output last year perhaps 20, or even 30, million barrels in excess of that record. The crest of this flood of oil must surely soon be reached.

A NIAGARA OF OIL

We are the world's greatest consumers of petroleum; but, impressive as are the 1918 figures of consumption—413,077,113 barrels—no mind can easily grasp the idea of that quantity. Truly it is a flood of oil; for, if spread over the 60 square miles of the District of Columbia, these 413 million barrels would cover the area to a depth of nearly a foot and a half.

Or perhaps the eye can better visualize the torrent of oil that flows each year from the 203,400 wells, is pumped through the long pipe lines, and is brought up from Mexico in huge tankers, if we figure that a year's supply of oil equals the flow of the waters from the Great Lakes and their vast drainage basin over Niagara Falls for three hours and four minutes; or, in terms of the



Photograph from Dr. D. T. Day

THE SITE OF AMERICA'S PIONEER OIL WELL

A new chapter in industrial history began sixty years ago with the flow of petroleum from this 69-foot bore-hole on Oil Creek, Pennsylvania. Edwin L. Drake did not strike it rich, receiving only an annuity from the Keystone State and a monument from the industry he founded.

smaller stream flowing past the Nation's Capital, if the Potomac at Great Falls were a river of crude oil, the nation's annual requirements could be met only with the flow at the summer rate for nearly four days and a half.

So it is that while in 1918 our "home fires" in power plant, blast furnace, locomotive, and residence consumed a mountain of coal a mile and a third in diameter

and nearly 2,000 feet high, we also used a river of oil.

Credit is often due to the silent partner in a business, and the marvelous growth of our oil industry owes much to its own transportation system, unseen and unknown by most citizens, yet far more efficient than the railroad lines of which we are so proud.

Beginning with four miles of iron pipe



A SKETCH MAP SHOWING THE ELABORATE OIL PIPE-LINE SYSTEM WHICH FORMS A NETWORK BENEATH THE SURFACE OF THE EASTERN HALF OF THE UNITED STATES

There are enough oil pipe lines in the United States to girdle the earth at the equator and have 5,000 miles to spare.

laid down in western Pennsylvania at the close of the Civil War, this system now embraces a huge network of buried pipes from four to eight inches in diameter, trunk lines and laterals, aggregating nearly 30,000 miles (see map above).

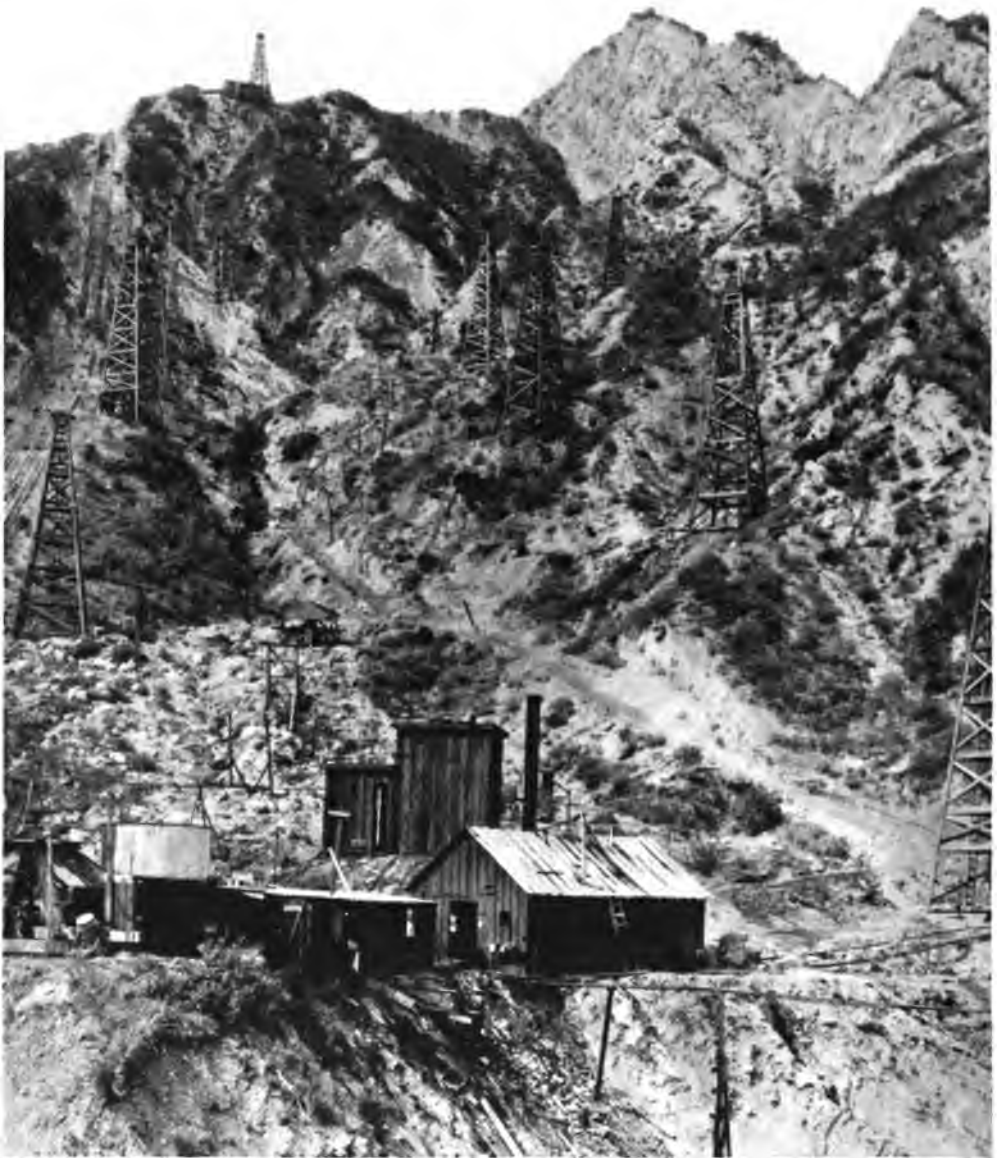
A VAST NETWORK OF OIL PIPE LINES

Along these hidden transportation lines there are pumping stations every 40 miles or so, but the daily circulation of oil in these long arteries is appreciated only by

the oil operators who sell their product at one end and the refiners or shippers who receive it at the other end.

Another measure of this pipe-line system is given in the fact that it would take approximately two days' flow from the 200,000 wells of the country simply to fill these pipes.

Petroleum's rank among the minerals is won not by attractive appearance, but by sheer usefulness. Few of us fully appreciate how essential this mineral oil is in



Photograph from U. S. Geological Survey

OIL WELLS IN VENTURA COUNTY, CALIFORNIA

The topography and the locality suggest "nothing venture, nothing have," which is one of the rules in hunting oil.



Photograph from U. S. Geological Survey

NUMBER FOUR WELL AT JOY FARM, OHIO, DRILLED IN 1864 AND STILL PRODUCING OIL

the world economy or realize all the changes that have come about in its use within a decade or two.

OIL NO LONGER OUR LIGHT BY NIGHT, BUT PREMIER POWER SOURCE

When most of us were in school, "oil" meant kerosene, and gasoline or benzine was something to be bought in a bottle at the drug-store or the paint shop. In those earlier days the oil refiner put as much gasoline in his kerosene product as the traffic would allow; today the automobilist complains that his gasoline contains too much kerosene. The refiner simply robs his less marketable kerosene of the more inflammable content; so that, as has been suggested, if Widow O'Leary's cow again kicked over the lamp, in all probability the spilt oil would not set Chicago or any other city on fire.

In those earlier days, too, fuel oil played no part in industry. Then, petroleum's future mission seemed to be to light up the dark corners of the world—to be the handmaiden of Minerva; today, oil has become the premier motive power, not only on land and sea, but even in the

heavens above and the depths below—truly the best servant of Mars and Mercury.

Marshal Foch is quoted as saying that "a drop of gasoline was worth in war a drop of blood," and M. Bérenger, the French Commissioner-General of Petroleum, expressed the same idea when he called attention to the fact that victory on the battlefields of Belgium, France, and Italy "could not have been gained without that other blood of the earth which is called oil."

"And if petroleum has been the life blood of the war, it will be still more *the life-blood of peace.*" The strategy of peace should, however, lead us so to plan for wise use of this precious fluid that Mother Earth will not too soon be "bled white."

MORE THAN 300 PRODUCTS OF PETROLEUM

The number and variety of uses of petroleum and its products are continually increasing, but even more striking is our increased dependence upon a few of the products of the oil refinery, notably gaso-



Photograph from U. S. Geological Survey

A GLIMPSE OF A SOUTHERN CALIFORNIA OIL FIELD

A forest of derricks, where many wells did the work of a few, thus illustrating the waste of capital and labor under conditions of competitive drilling.

line, kerosene, the many types of lubricating oils, and fuel oil.

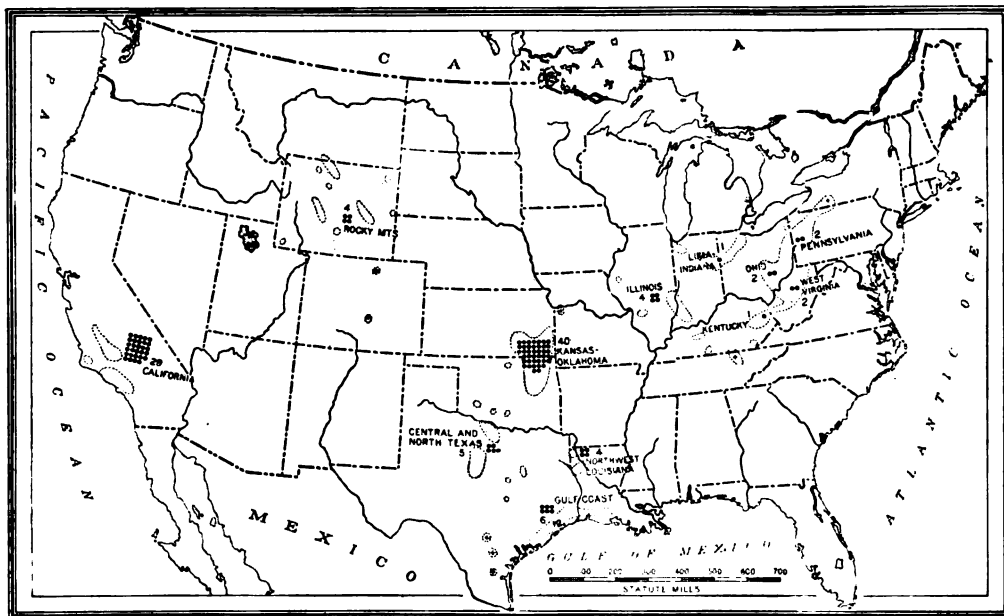
There are said to be 300 or more products of petroleum, each with its own use. Some of these products serve merely our convenience, such as the artificial "vanilla" flavoring or the cover of paraffine on the jar of jelly or marmalade; others were found during the war period to be absolutely essential to industry on a large scale—for example, the heavy oil used in tempering steel plates.

One picture of the demand for the principal petroleum products can be seen in a recent statement of United States Army peacetime requirements, which included 74 million gallons of fuel oil, 11 million gallons of gasoline, two million gallons each of lubricating oil and grease, and one million gallons of kerosene. Not only will the size of this single order open some eyes, but its make-up is significant and disconcerting.

Taking the figures of the Bureau of Mines on refinery production last year, we find that the output of gasoline was not quite double that of kerosene, and the output of lubricants was less than half that of kerosene, and here the army wants eleven times as much gasoline as kerosene, and twice as much lubricating oil. The discord between demand and supply in this one order is even worse for fuel oil, of which the output last year was about five times that of kerosene; and yet the army wants 74 times as much.

LUBRICANTS ARE THE BAROMETER OF BUSINESS

Too broad an inference from any one set of figures is unwise, but other statistics point in the same direction: Fuel oil is used on 357 vessels of our navy, and the Shipping Board has an-



From "World Atlas of Commercial Geology," U. S. Geological Survey

MAP SHOWING PRODUCTION OF PETROLEUM IN THE UNITED STATES IN 1918, AND THE OUTLINES OF THE PETROLEUM AREAS

Each black dot represents one per cent of the total production of petroleum in the United States. The dotted lines surround oil-producing areas. Where the production is less than one per cent, the area is indicated by the cross.

nounced that there will soon be 1,731 oil-burning vessels of the merchant marine under the American flag; gasoline is now sold at every cross-roads, and we know that the use of this fuel in automotive engines has more than quadrupled during the present decade; and the country's demand for lubricating oil, which is an essential in every phase of modern civilization, increases so rapidly that we must agree with the Bureau of Mines in the belief that the current consumption of lubricants is an excellent barometer of business and industrial conditions.

SIX MILLION PLEASURE CARS IN THE UNITED STATES

Inventive genius and economic necessity may from time to time change the relative demands for this or that petroleum derivative, but the sum total of these demands must increase as the number of swiftly turning wheels in the world increases.

It is when we think of the marvelous growth of the automotive industry that

we realize a future demand for lubrication that staggers even the prophetic statistician. With more than six million pleasure automobiles operated in the United States alone, we have an annual consumption estimated, by the officials of the foremost company manufacturing high-grade lubricants, at 120 million gallons of lubricating oil, where twenty years ago the demand for this purpose was practically nothing.

Moreover, today a fleet of half a million motor trucks travel up and down our city streets and State roads, delivering every kind of commodity from eggs to pianos, and these powerful motors furnish a market for 37½ million gallons of lubricating oil. But while we may expect the demand for oil by automobiles to continue to increase rapidly and the requirement by trucks may possibly double within a few years—indeed, a tire company estimates that even now a million trucks are in service—who can even guess at the number of tractors that may be operating on our farms within



Photograph from U. S. Geological Survey

THE SUMMERLAND FIELD IN SANTA BARBARA COUNTY, CALIFORNIA

Where man's conquest of the subterranean treasure extends beyond the shore-line. These wells were drilled 300 feet below sea-level to reach the oil.



Photograph from Hope Natural Gas Company

THE DEEPEST HOLE IN THE WORLD

America leads in courage and skill in exploring the earth's crust in the search for oil and gas. The Lake No. 1 well in West Virginia had reached a depth of 7,589 feet, or 240 feet deeper than the deepest well in Europe, when the steel cable parted nearly three-fourths of a mile below the surface. This is the second world record established by the Hope Natural Gas Company, the Goff well being 7,386 feet deep, but neither of these West Virginia wells has yielded anything but facts for the geologist.

the next five years? Already the number of tractors in operation is estimated as a third of a million, and they consume about 35 million gallons of lubricating oil.

We have, then, a total of fully 200 million gallons of lubricating oil already required to keep the automotive equipment of our country running smoothly, and we must not shut our eyes to the fact that millions and millions of gallons more will be needed each year.

HOW OIL SAVES POWER

The steady growth of industrial America is observed by all, but we need

the help of census statistics to realize the rate of that growth. The power used in our manufacturing has about doubled in the past sixteen years; the kilowatt-hours turned out by our public-utility stations have increased eight or nine fold in that same period. Indeed, the single State of New York will use far more electric power this year than the whole country did in 1902.

And so the demand for lubricants becomes stronger on the road, on the farm, and in the mill. Still, while we think of this rapid development of power as using increased amounts of oil, it is equally true that oil saves power; so that if ma-



Photograph from D. A. McDannald, Orange, Calif.

THE WONDER-WORKERS

Drillers whose skill taps the oil-sands half a mile or more beneath the surface.

chinery multiplies man-power, lubricating oil is a good and faithful servant that deserves more than a passing thought.

With all these demands for fuel and lubricants, who can venture an estimate of our needs even ten years hence? Whence will the petroleum come to meet these needs? That river of oil representing our 1918 consumption drew from the ground more than one-twentieth of the quantity estimated by the United States Geological Survey geologists as the content of our unrecovered underground reserve, and it also took nearly one-fifth of the oil stored above ground.

The estimate of about $6\frac{1}{2}$ billion barrels as now available is far less impressive when we realize how fast we are using it up and that while we have burned and wasted less than 1 per cent of the coal resources of the United States in

the last 100 years we have apparently used up 40 per cent of our available oil supply in only 60 years.

This is why the hunt for oil has become world-wide and suggests a compelling reason for Americans to lead in that hunt.

A HUNTER WHOSE WEAPON IS THE DRILL

The geologist has lately come into his own as a money-saver in the employ of oil companies. Today not less than 750 geologists are in the employ of corporations, large and small, selecting the most promising fields for oil exploration and sites for new oil wells. Where it costs from \$8 to \$20 a foot to drill a well and the oil sands are 3,000 to 4,500 feet beneath the surface, as in California; or 450 to 3,600 feet, as in Oklahoma; or possibly as much as 3,600 feet, as in the



Photograph from Mining Review, Los Angeles

THE LAKEVIEW "GUSHER" OF CALIFORNIA

In its day a record-breaker, but not comparable to the Mexican "gushers." The spectators on the sand-bag embankment later discovered their linen to be spotted with oil-mist.

new Ranger field in Texas, the expense attending the drilling of a single well is something to be considered in the economy of the business, especially when, as the Bureau of Mines states, oil wells, like everything else, cost about twice as much as they did before the war.

The geologist simply applies his science to the problem of making as many wells as possible successful and of preventing drilling where oil cannot be found. Every "dry hole" is, in the last analysis, a tax on the consumer, that patient Atlas of the world's ever-mounting load of high costs.

A recent study of the results of extensive geologic examinations on the Osage Indian lands shows conclusively that in this region, which rather favors the Government geologist in his effort to locate oil, his geology was right 87 per cent of the time, when tested by the drill. Business can ask of science no better percentage of success than that, and the

money and labor and supplies that can thus be saved to the nation constitute no small item.

A BIG LEAK—THE STOCK PROMOTION GAME

One of the leaks in the nation's task of finding oil is nearer home to many of us. The stock-promotion game attracts too many dollars to no useful purpose.

It has been stated that two years ago these much-advertised oil companies, with more assets on paper than on the ground or under the ground, were to be credited with a very small fraction of 1 per cent of the oil yield of Oklahoma; indeed, the issue of stock certificates reached the point where for every \$555 of ill-advised investment only one dollar's worth of oil was produced. Thus does the combination of unscrupulous stock-peddler and ignorant investor undo much that the conscientious oil-producer is striving to accomplish in getting the most oil out of the ground at lowest cost.



Photograph from Bureau of Mines

A "TANK" FARM

Where one of the group of huge storage tanks has been set on fire by lightning. In our automobiles we also use the electric spark for ignition, but to better purpose.

Conservation touches petroleum at many points. There is need for a country-wide thrift campaign looking to the saving of this essential resource. Manpower and oil ought to be conserved at all stages of production and consumption by better methods in the discovery, drilling, recovery, transportation, refining, and use of petroleum and its products.

The price of crude oil has just reached a new level, and eventually this must influence the price of the refinery products, a fact that ought to give impetus to thrift among users of every petroleum product.

WHERE THE WASTE BEGINS

Unwarranted optimism, which seems indigenous in most parts of the United States, has led both the oil industry and the public to waste this best of fuels. The program of wastage begins below the ground with only partial recovery, goes on above the ground with leakage and evaporation, and continues all along

the line to the indiscriminate burning of fuel oil under boilers with regard for convenience rather than for efficiency, or to the even less defensible use of petroleum for oiling our roads.

In oil-field operation, in refinery practice, and in the use of oil everywhere, too often the dollar test of economy is the only one applied. The situation, however, is critical enough to demand another rule—that of taking thought of the morrow and of weighing the questions of ultimate supply and demand.

But, with those early forest conservationists of old England in mind, the question may be asked, Are there no practical substitutes or other adequate sources? The obvious answer is in terms of present prices; the real answer is in terms of cost in man-power.

THE ADVANTAGES OF OIL OVER COAL

Whether on land or sea, fuel oil is preferred to coal because it requires less



© Underwood & Underwood

WORKING NEAR THE FIRING-LINE

The lineman repairing wires close to the huge oil tank, which the firemen are trying to keep below the explosion temperature. This \$2,000,000 fire on Long Island caused the greatest call for fire apparatus that New York City has ever known.

bunker space and fewer firemen; and, back of that, in the man-power required in its mining, preparation, and transportation, the advantage on the side of oil is even greater. So, too, the substitute for gasoline in internal-combustion engines, whether alcohol or benzol, means higher cost and larger expenditure of labor in its production. Moreover, for alcohol agricultural land would be required, and for benzol in the quantities needed a far greater coal consumption than is now necessary.

Again, while we fortunately have our great reserve of oil shales as an inde-

pendent source at some future date, we do well to consider the practical contingency suggested by Mr. Requa, that to develop this source on a scale comparable in output with our present oil supply "would require an industrial organization greater than our entire coal mining organization." Plainly, our country can not afford to support another such army of workers until we reach another stage in our industrial development.

The question of safeguarding America's oil supply has been prominently before the American people for more than ten years. In September, 1909, President



Photograph from Bureau of Mines

AN OIL TANK SET ON FIRE BY LIGHTNING

A pillar of smoke by day that represents a total loss to the world that needs oil.

Taft ordered that all public lands believed to contain petroleum should be reserved from disposition until a law could be passed that might assure an adequate supply of fuel oil and lubricating oil for our navy and in some degree check the wasteful overproduction in the rich oil fields of California. Such a law is now under consideration by the conference committee of the two Houses of Congress.

WHERE WE SHALL GET OUR OIL IN FUTURE

Ten years is a long period for these "temporary" withdrawals to run pending the enactment of suitable legislation, and in that time the country's need of oil, as measured by its consumption, has doubled. If in 1909 our Chief Executive had reason to plan the safe and sane disposal of the petroleum still in public ownership, in 1920 we surely need to look even further and see if possible where our children will get the oil they will require in increased amount.

On the accompanying map of the world (see page 200), are indicated the regions from which, according to present information, the oil supplies of the future are to be drawn.

The diagrammatic representation of the relative abundance of the oil resources in the ground in different countries is at best highly speculative. Most of the other countries outside of Europe have not been covered so thoroughly by geologic examinations as the United States. In fact, some of the oldest and most highly civilized countries have not been studied by geologists specially trained in the geology of oil and gas, as is shown by the fact that it remained for an American expert to bring to the attention of the British the probabilities of the occurrence of oil fields in old England itself.



Photograph from M. L. Alexander

ENGINEERING EXPERTS BRINGING UNDER CONTROL A "WILD WELL" IN LOUISIANA

A glance at the map shows that outside of the United States the great oil supplies of the future, so far as now known, are centralized mainly in the Near East, in South America, and in Mexico. According to reports, there may be great reserves of oil in Africa, and it is also possible that eventually considerable supplies may be discovered in the Far East.

In general, the regions developed first and drawn on most heavily are, of course, likely to be soonest exhausted. Therefore it is practically certain that, as the oil resources of the United States and Rumania diminish and the reserves of Mexico also yield under the pressure of rapidly increasing exploitation, the world



Photograph from Mexican Petroleum Co.

THE WORLD'S GREATEST OIL WELL

A well in Mexico named Cerro Azul No. 4 shot a column of oil higher than our Washington Monument and drenched the country with a rain of oil for two miles around. Engineer measurements showed the column to be 600 feet high and the flow to have been more than a million barrels in the week before man harnessed this great force.

will have to look for its oil supplies to those regions where inaccessibilities and lack of demand, due to the social and industrial backwardness of the peoples, have hitherto retarded exploration and production.

HOW MEXICO'S OIL HAS BEEN EXPLOITED

The rapidity with which a region of relatively recent development may be exploited is illustrated in Mexico, whose petroleum output has risen since 1910 until it is second only to the United States, having doubled in the last five years. Mexico has been a land of oil-gushers and big wells, and with less than 300 producing wells the potential daily production has been estimated as about one and a half million barrels, but the actual output is not much more than 10 per cent of that.

The increases in production in the United States and Mexico for the year 1918, as compared with 1917, are respectively twenty million and eight million barrels. This shows how large a responsibility for the world's oil supply Mexico is already assuming.

What is to happen when, following the United States, Mexico must reduce her output: with the progressive exhaustion of her oil resources, and what are to be the competitive conditions in the United States when the other great nations of the world, whose use of petroleum is now relatively insignificant, awaken to the realization of the unique and almost priceless advantages of this great natural resource?

The United States, though the largest producer and consumer of oil, has given



Photograph from Mexican Petroleum Co.

THE CERRO AZUL NO. 4 IN FULL FORCE

The great volume of gas and oil completely wrecked the derrick, and in the first blast of gas threw the 2-ton drill-bit high in the air, landing 125 feet from the well and within three yards of a "movie" photographer. Photographing a wild well is not without discomfort and danger.

too little heed to the future; Great Britain, almost the smallest producer, has been the first to foresee petroleum's "transcendental importance to the world's industrial future," and, following up vision with action, has been the most active in providing for that future.

BRITAIN'S METHOD OF CONTROLLING OIL SUPPLIES

Sidney Brooks's phrase, "commercial statesmanship," may be the transatlantic term for "dollar diplomacy," but it aptly describes the British method of seeking



TAMING A GUSHER

The big Mexican well, despite its great earth forces, was brought under control. A closer view of Cerro Azul No. 4 after the wrecked derrick was cleared away and heavy clamps, five feet long, fitted over the top of the well-casing (see successive steps in mastering the well, pages 196, 197, and 199).



THE HALTER HALF ON

The heavy valve is partly on and is spraying part of the oil hundreds of feet on one side. Any one who has screwed a nozzle on a garden hose understands the process in miniature, but this oil-hose was running at the rate of three barrels a second (also see illustrations on pages 196, 197, and 199).

Photographs from Mexican Petroleum Co.



Photograph from Mexican Petroleum Co.

THE VICTORY WON: THE WORLD'S PREMIER OIL GUSHER HARNESSSED

The successful issue of a week's campaign, for which there had been months of preparation. The valve is in position and ready to close. All of the flow now passes through the pipe, and the great reservoir of oil, 1,752 feet below the surface, is thus connected up with the 8-inch pipe lines running down to Tampico, where tankers load to supply the oil-hungry world (see other photographs of the Cerro Azul well on pages 196, 197, and 198, constituting a pictorial history of the great Mexican gusher).



Photograph from Arthur C. Veatch

ENGLAND'S DISCOVERY WELL

Located in Derbyshire by an American geologist, drilled by American engineers and skilled workmen, with American machinery and well supplies, this all-American well struck oil in England almost exactly 60 years after Drake discovered oil in Pennsylvania.

control of an oil supply adequate for the nation's needs. John D. Northrop, in a review of the political and commercial control of the petroleum resources of the world, thus sums up the British position:

"The strength of Great Britain's present position in the world's petroleum affairs lies in a strong governmental policy in the matter and in the wide scope of British petroleum investments, embracing practically every country of which petroleum is an important product and nearly every country of which it is a product of potential importance."

Not only do the British oil companies rejoice in such suggestive names as "British Controlled Oilfields," but at the stockholders' meetings the policy is stated in plain language as providing the safeguard of a voting trust so that no financial control "can divert even a single barrel of oil from national or imperial requirements."

It is easy to see that Great Britain's world-trade policy has given oil this "imperial" recognition; and when we picture the return of the American flag to the

seven seas, we too must plan for an oil supply available wherever needed. Any nation which today aspires to a large part in world commerce imposes upon itself an oil problem, for the future freedom of both the sea and the air will be defined in terms of oil supply.

AMERICAN SHIPS AND THEIR APPETITE FOR OIL

The new demand of our shipping program alone involves fuel oil in quantities equivalent to nearly one-half of the present domestic output, and, unless there is some corresponding decrease in other demands, this new requirement must be met with an increase in production of crude oil of nearly 200 million barrels.

The United States shipping program further calls for a chain of oil stations encircling the globe. The Shipping Board has already announced that the first steps have been taken to establish fuel stations along the trade lanes as well as at the world's cross-roads, and thus to assure unrestricted operation of our ships in the world's trade.

But economy on a large scale will mean that not only must the oil supply be put where it is needed, but the oil must come, if possible, from near-by sources. American tankers encircling the world with cargoes of Texas or California oil appeal to the imagination, but involve too high a transportation cost; better, some control of oil supply on other continents.

America's experience on the world scale has been gained as an oil merchant more than as an oil-producer. The illumination of the Orient with American kerosene has been followed by the lubrication of the whole world with special oils from American refineries; and now we hear of a garage in Guatemala 7,000 feet above the sea, or another in far-off Australia using American gasoline and lubricants exclusively.

This commercial campaign has been a worthy one, especially in its far-seeing outlook; but do we look far enough? We have been draining our own oil pools in part to supply the needs of the rest of the world, but we have made little effort to render the rest of the world self-supporting in oil production. Whether such a national policy is to be characterized as that of a spendthrift or that of an altruist, it is certainly too short-sighted.

NEED FOR OIL PIONEERS

The facts of the present situation call for some new pioneering by the United States. This appeal to American brains and American dollars is made for the patriotic purpose of providing for the future well-being of our own country. Already American geologists have helped to develop the oil resources of every continent, the latest contribution being that of A. C. Veatch, who as chief geologist for Lord Cowdray located the discovery well at Hardstoft, Derbyshire, England. This pioneer well struck oil at a depth of 3,078 feet, and since June has been flow-

ing at the rate of 12 barrels of high-grade oil a day.

Central England has thus been shown to be of importance as a source of petroleum; and it is gratifying to note that American geologists, American engineers and drillers, American rigs, and American oil-well supplies thus all "did their bit" for Great Britain at the time when the submarine menace led Lord Cowdray to place his petroleum staff at the disposal of the nation.

This pioneering spirit should now lead American capital and American engineering to seek new sources of petroleum supplies in foreign fields for the benefit of the America of tomorrow. Nor can this be done without popular support, inspired by general appreciation of oil as our servant, a servant that works 24 hours a day and 7 days a week.

The "open-door" policy is best for America and the world; encourage American capital to enter foreign fields and protect foreign capital wherever invested in our country. However, the spirit of reciprocity does not require that the United States shall always keep its own door of opportunity open to the nationals of all nations, irrespective of their attitude to Americans in the other parts of the world.

The part our Government should take in planning to meet our future needs is to give moral support to every effort of American business to expand its circle of activity in oil production, so that it will be coextensive with the new field of American shipping.

This may mean world-wide exploration, development, and producing companies, financed by United States capital, guided by American engineering, and safeguarded in policy because protected by the United States Government.

Thus only can our general welfare be promoted and the future supply of oil be assured for the United States.

INDEX FOR JULY-DECEMBER, 1919, VOLUME READY

Index for Volume XXXVI (July-December, 1919) will be mailed to members upon request