MINERALOGY

Untapped Sources of Oil

Greatest potential source is the ocean bottom. Other inaccessible places may contain oil but the problem is to find it and get it out.

By A. C. MONAHAN

➤ THERE is plenty of oil in the earth's crust, scientists say. The problem is how to find it, and then how to get it out. The greatest untapped source is the 10,000,000 square miles of continental shelf that extends from a few to a few hundreds of miles underwater from the shores of continents and islands.

There is also plenty of unfound oil in dryland areas, they believe. But it is deep down, perhaps a mile or more, below the present known deposits. Or it is beyond the Arctic Circle, buried below accumulated ice and hundreds of feet of frozen earth. And perhaps it is in accessible places but not in the ordinary petroleum traps from which most crude oil is now obtained. To locate this oil, new scientific instruments are needed. Geophysicists are working frantically to develop them.

Geologist Explores for Oil

The petroleum geologist is the number one man in oil exploration. There is no divining rod that will locate petroleum. The first step, after surface surveys, is a wide and intensive study of the underlying structure of the earth in the general type of geological formation favorable to oil formation. In these every bit of geological information must be taken under consideration. Included are rock outcrops on the surface, crust structures within mines if any are in the region, and the logs of every deep well drilled in the general area whether for deep water, minerals or any other purpose.

Geologists now know the crust of the earth from the Arctic to the Antarctic well enough to be able to plot roughly the areas favorable for finding petroleum deposits. They call such regions "petroliferous." These areas now must be closely studied by geologists and geophysicists, the latter using such instruments as the seismograph, gravity meter and the magnetometer.

One noted petroleum geologist estimates that there are 1,000,000,000,000 barrels of oil in the world's continental shelf. He is Wallace E. Pratt, former vice-president of the Standard Oil Company of New Jersey, who has devoted much of his life to the application of geology to the discovery of petroleum. Exploration for this oil has not yet reached the drilling stage, except relatively near shore, but ocean-bed instrument studies are being made in the Bahama seas, some 200 miles off the coast of southern Florida. The scientists are working deep in the water under diving bells.

Many Oil Wells in Ocean

There are, of course, many producing oil wells in the ocean offshore from California, Texas, Louisiana, Venezuela and elsewhere. They are largely in proven areas that extend under the sea from producing field ashore. Three wells have been drilled from 10 to 30 miles out from Louisiana in the Gulf of Mexico, and several others are planned.

Much of the petroleum in continental shelves can never be recovered because of the depth of the water over them and their location, such as in the Arctic ocean. No one has yet figured out the best way to mine the under-ocean oil. At the 10-mile well off Louisiana, the plan used was relatively simple because the water at the site is only 16 feet deep at low tide.

A platform on piles was erected 20 feet above mean high water. This gives protection against high waves. The platform is large enough to hold all drilling equipment, fuel, fresh water and standby units.

One suggestion of how to tap the continental shelf oil is by the use of anchored diving bells, large enough to house a derrick and drilling rig. Underwater pipelines would bring the oil ashore. Another is to use large floating platforms of the type once proposed for mid-ocean landing fields for transatlantic airplanes.

A third suggestion is to tunnel out from the shore through the ocean bed to the oil sands and drill the wells in the tunnel.

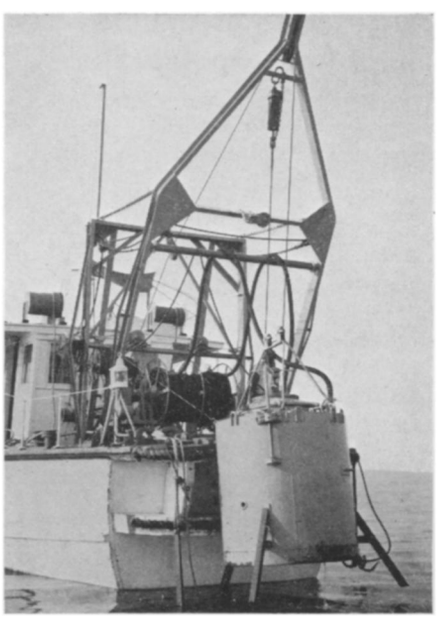
It is not expected that there will be any attempts to tap oil supplies deep under the ocean while a plentiful supply can be obtained otherwise. There is much petroliferous area in the world as yet unexplored. Active explorations by instruments and core-drilling are underway in many of them, including Australia, a continent producing no petroleum as yet, Siberia, Alaska and in both the Americas.

Other Sources of Liquid Fuels

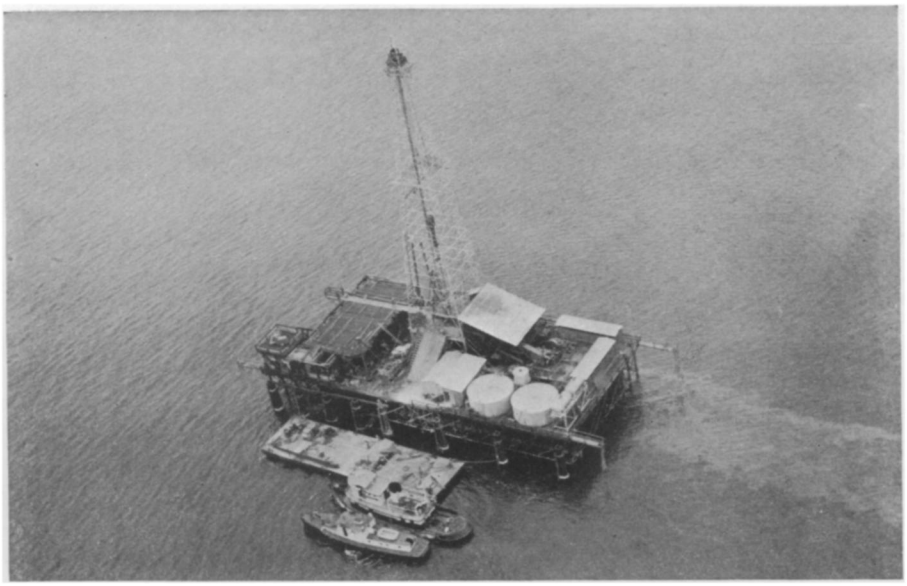
There is also the possibility that continental shelf oil may never be needed, particularly if liquid fuels can be obtained cheap enough from coal, oil shale or natural gas. Liquid fuels from vegetation, such as alcohol, may also limit the need for gasoline.

Of more immediate importance than the oil in the continental shelf, of which the United States has a million square miles, is the hidden petroleum in petroliferous areas within the continent. About one-eighth of the petroliferous areas of the world are in America.

They are largely in the interior. One great area extends northwesterly from



DIVING BELL — Engineers with gravity instruments are being lowered in this apparatus off the Florida coast in the Bahama seas. They are studying structures holding oil for the Standard Oil Co. of New Jersey.



BORING UNDERWATER—Ten miles out in the Gulf of Mexico the search for hidden oil goes on. This picture shows the operation of well-boring underwater from a platform by the Magnolia Petroleum Company.

Texas, passing just east of Denver, through the Wyoming and Montana oil fields up to Calgary, Canada. After a break, it goes almost up to adjoin the North Alaska field now being drilled by the Department of the Navy.

Another area extends westward from the present Ohio and West Virginia fields to the Mississippi, covering Lower Michigan. Less promising geological formations exist in Florida, Southwest Alaska, Hudson Bay country and along the Arctic coast of North America. The Uinta Basin, eastern Utah, now under exploration, is expected to yield much oil.

New Exploratory Methods

To the layman any method of determining the deep underground structure of the earth without digging deep shafts or drilling wells seems a mystery. However, scientists are using several. The seismic, gravity and magnetic methods have proved most useful. Now technicians are attempting to employ induction currents and radio.

The seismic method, perhaps the most helpful of those used, employs the seismograph, best known to the public as the device used to detect and record earthquake tremors. In this method, explosives are used near the surface to set up sound waves, some of which go downward deep into the earth. They are reflected back when they hit a dense layer of minerals. The reflections are recorded at several scattered stations; then the location of the layer is determined by mathematics.

In the gravity method, deviations in the direction of the force of gravity caused by dense underlying formations are measured. The magnetic method depends upon the influences of underground structures on a free-swinging magnetic needle. The instrument used is called a magnetometer.

Essentially a magnetic survey is a method of determining the contours of underlying granites and other formations known to scientists as the "crystalline basement." A knowledge of this basement, particularly in areas covered by marine sediments, is of fundamental importance to oil exploratory work. The magnetometer, for detailed work, is ground-based, often trailer-mounted. For general preliminary surveys the same magnetometer which was trailed behind and under airplanes to detect submerged Nazi U-boats is employed. It has been used for greater details than can be obtained with planes, borne by a helicopter.

Radio Seems Promising

Several electrical methods have been tried to locate oil deposits. Now the use of radio seems promising. A government patent, No. 2,426,918, was issued Sept. 3, 1947, to William M. Barret, Shreveport, La., for a method developed by him. He states that he has found earth layers do not quench electromagnetic waves of radio frequency as rapidly as had been assumed, so that he can project them into the ground and receive their echoes.

Another electrical instrument is under development in the New York laboratory of Frank Rieber, an inventor well known for his widely used refraction and reflection seismograph. The instrument will use radio reflections rather than shock waves by man-made explosions as with the seismograph.

Instruments Find Oil Traps

Present exploratory instruments are successful in locating oil in what are known as traps formed in the earth's crust by overlaps and folding of underground strata. But all oil is not in such traps, Mr. Rieber believes. There is oil in traps of a different sort, widely spread in porous layers between other layers. He calls the first a structural trap; the second, a stratigraphic trap. The instrument on which he is working is primarily to discover the oil in these stratigraphic traps by locating porous layers and tracing them to spots where the oil might accumulate.

Present known oil reserves in the United States may become exhausted in from 15 to 30 years, as many believe, but oil men all seem to feel that undiscovered deposits will keep the country supplied for a much longer period than that.

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"Chemicity" has to do with processes using jointly chemistry and electricity.

When *eggs* are kept for any considerable period, in cold storage for instance, they are best packed in suitable containers with their big ends up; otherwise the yolk may be displaced.