OILFIELDS OF THE UNITED STATES*

By DR. HUGH D. MISER,
U.S. GEOLOGICAL SURVEY

THE modern petroleum industry in the United States of America dates from the drilling of the first commercial oil well in 1859. Up to the present, about a million wells have been drilled for oil and gas, and the total production of petroleum has been 22,452,498,000 barrels, which has been contributed by twenty-three of the forty-eight States.

Statistics of the supply and demand of crude petroleum and refined products for the United States for 1939, as published by the Bureau of Mines, United States Department of the Interior, are:

	Thousands of barrels.
Domestic production (crude petroleum)	1,264,256
Imports (crude petroleum)	33,095
Imports (refined products)	25,804
Exports (crude petroleum)	72,073
Exports (refined products)	116,909
Domestic demand (refined products)	1,228,069
Total demand (crude petroleum and refined products)	1,417,051

Much is known concerning the geology of the oil-fields of the United States, and additions to our geological knowledge of them are being made continually by the 3,000 or more petroleum geologists in the country. Data on the structure and stratigraphy of the oil-bearing rocks are supplied in large measure by the wells that are drilled for oil and gas and also by geophysical methods of exploration. Many of the wells exceed 10,000 ft. in depth and the deepest, which was completed in 1938 in California, reached 15,004 ft. The depths explored by geophysical methods exceed 30,000 ft.

The oil-bearing rocks of the United States are widely distributed and are of many different ages. They occur in all parts of the geological column from the Ordovician to the Pliocene. The common reservoir

rocks are sand, sandstone, limestone, dolomite, and chert.

The relation of oil to geological structure was noted so early as 1860 in the United States, but oil companies did not employ great numbers of geologists before the present century, when the demand for petrol increased rapidly because of the growing number of motor-vehicles.

Anticlines were first sought as favourable structural features on which to locate drilling sites for oil; but, with further drilling and the consequently increased knowledge of the occurrence of petroleum, it was learned that oil pools are associated with many other types of structural features, which include faults, salt domes, and buried hills. In addition, oil reservoirs like those of the east Texas field in Texas and the Coalinga and Midway-Sunset pools in California belong to a type recently designated as stratigraphic traps. Such reservoirs may be due to lensing, to unconformities, and to various lateral gradations in porosity and permeability of the reservoir rocks.

Estimates of the proved reserves of petroleum in the United States at the beginning of 1940 range from 18,500 to 19,700 million barrels. The estimates include the amount of petroleum recoverable by current methods of production from pools already proved by drilling. They do not include the as yet unknown amounts of petroleum that will be discovered in the future in new fields or in deeper zones or extensions of the present producing fields.

With the greatly increased depths to which wells have been drilled in recent years, the proportion of oil reserves found at the greater depths has increased. The first production below 10,000 ft. was obtained in 1935 at Binger, Oklahoma, where the output has averaged 30 barrels per day. During 1937-39 substantial amounts of oil between 10,000 ft. and 13,266 ft. have been discovered and developed in forty fields, of which eight are in California, five are in the Gulf Coast region of Texas, and twenty-seven are in the Gulf Coast region of Louisiana.

* Abstract of a paper presented, by permission of the Director of the Geological Survey, United States Department of the Interior, to Section III (Geological Sciences) of the Eighth American Scientific Congress.

EARTHQUAKES AND STRUCTURES

UNDER this title, there is published in the *Journal of the Royal Society of Arts* (August 23, 1940) the text of a paper read by Mr. D. Laugharne Thornton in which he gave an account of the salient features to be observed in the design of structures for regions subject to earthquakes. Mr. Thornton, an authority on vibration, has treated the behaviour of earth waves in his recent book "Mechanics Applied to Vibrations and Balancing". The subject of his paper was primarily of interest to engineers, to whom the problem set by earth phenomena is how to mitigate the great loss of life and property attendant on them. It concerns also those charged with public safety, to whom several of his inferences and conclusions are likely to be of moment, such, for example,

as the care which must be taken to ensure that the form of structure, the choice of materials, and the nature of the loading permitted must be adapted to the local conditions.

On the engineering side, the matter is one of dealing with stresses of great intensity and with materials in which the seismic waves suffer so little damping that they may be felt hundreds of miles from the epicentre. In general, the information gathered by seismologists does not satisfy the needs of the engineer, who requires data regarding 'near' earthquakes, for it is in the vicinity of the disturbance that the destructive effects on buildings occur. To this end, instruments would require to be placed on the foundations as well as in the principal parts of