

Especially did pre-Permian drilling and exploration exceed that of past years. A total of 106 pre-Permian wells were completed. Of this number, 21 were dry, 6 were plugged back to the Permian for producers, and one was a temporarily abandoned gas well. This gives a percentage of dry holes of 15 per cent. Twenty-five of the pre-Permian tests could be considered wildcats and of these 10 were successfully completed as producers. The center of activity was in the Abell field in north-central Pecos County. Here 56 wells were completed, including 6 wildcat producers, 1 dry hole, 6 wells which were plugged back to the newly discovered Permian zones, and the 1 temporarily abandoned gas well.

A definite trend toward deeper drilling has been accelerated by new discoveries in the lower Permian (Leonard), lower Pennsylvanian ("Crinoidal"), and Ordovician, and Cambrian (Simpson and Ellenburger) formations.

There was a decline of 31.5 per cent in the number of wells drilled in southeastern New Mexico in 1941. A total of 371 wells were drilled, of which 294 were oil wells, 7 gas wells, and 70 dry holes—the highest percentage of dry holes in the past several years. There were four new discoveries for the year. The most active area was the Maljamar pool, where 61 wells were completed including 3 which were dry. The producing formations of the 1941 discoveries are the Yates, Seven Rivers, and Grayburg.

Geophysical activity has been conducted mainly with gravimeter and magnetometer.

57. R. M. ENGLISH, Carter Oil Company, Eldorado, Illinois
R. M. GROGAN, Illinois State Geological Survey, Urbana, Illinois
The Omaha Pool, Gallatin County, Illinois

The Omaha pool was discovered in November, 1940, by The Carter Oil Company's York No. 1, SE.-SE.-SW. Sec. 33, T. 7 S., R. 8 E., Gallatin County, Illinois. The producing area is now defined and extends over 360 acres located generally southwest of the discovery well. Production is from the Palestine and Tar Springs formations of the Chester series.

The pool lies on the crest of a large dome, and is exceptional in that igneous rock is found in intrusive contact with the producing sands. Sills and low-angle dikes from less than one foot to fifty feet in thickness composed of porphyritic lamprophyric rock rich in biotite and olivine occur at many levels in the Pennsylvanian and Chester series.

Contact effects indicate that at least some of the oil was in the sands prior to intrusion of the igneous material, suggesting a structure predating the intrusion. Pronounced doming of the structure probably accompanied intrusion. Earlier minor folding occurred at the close of the Mississippian.

58. WILLARD D. PYE, University of Chicago, Chicago, Illinois
The Physical Properties of the Bethel Sandstone of South-Central Illinois

For the past 10 months the writer has been engaged in making a detailed study of the physical properties of the Bethel sandstone as they are revealed in cores from wells drilled in south-central Illinois. The investigation has been undertaken in cooperation with the Illinois State Geological Survey.

The Bethel sandstone is found to be very uniform in all of its physical properties both vertically and laterally although some gradations exist. The study has revealed that most of the sand has come from older sediments. Most of it has undergone at least one earlier period of deposition under conditions in which the cement was silica and some has undergone at least three cycles of erosion. Some of the sand has been derived from redbeds and the grains are frosted. The original source of the sand was in part from dynamically metamorphosed rocks and in part from regionally or thermally metamorphosed rocks. A large part originally came from igneous rocks, probably granites since the associated feldspar is acidic.

Heavy minerals are very rare but those found constitute about thirty species. A number of varieties of tourmaline and zircon are distinguished. Ten varieties of quartz are found which are readily distinguishable and it is proposed that more data can be derived concerning the origin and history of a given deposit by a detailed study of quartz and its varieties and inclusions, than from heavy-mineral studies and without the laborious procedure of making heavy-mineral concentrates.

A detailed discussion of the inter-relations of the physical properties of the sand, together with an analysis of the effect of these upon the porosity and permeability of the Bethel, is given. This together with certain detailed information concerning the pores and pore pattern, the relationship of the silica and carbonate periods of cementation, and soluble minerals are discussed in the relationship they have upon securing

greater primary and secondary recovery of oil. The information cementation yields concerning the periods of folding and oil accumulation is brought out.

In conclusion, the physical properties of the Bethel sandstone are compared with other sands of the Chester series, and insofar as possible the detailed data from the Bethel is applied to the other sand zones. The paleogeography and source of sediments are likewise discussed.

59. R. P. GRANT, Department of Conservation, State of Michigan, Lansing, Michigan
Oil and Gas Developments in Michigan During 1941

During 1941 the "Basin" was the most active district in Michigan due chiefly to development in the Reed City, Detroit River (Devonian) field in western Osceola County, the Headquarters Traverse (Devonian) field in southern Roscommon County, and extensive development of Michigan "Stray" ("Mississippian") gas fields in Osceola, Missaukee, and Clare counties.

Ten new oil fields and extensions and six new gas fields were discovered during the year, with the "Basin" taking the limelight insofar as new developments were concerned. The most important oil strike in southwestern Michigan was the West Hopkins Traverse (Devonian) field in Allegan County. Actual oil production dropped approximately 17 per cent below 1940.

More gas wells were drilled in 1941 than in any year since 1936. Actual gas production reached an all time high with 6 per cent increase over 1940. The Gulf Oil Company's Bateson No. 1 in the Kawkawlin field in Bay County was drilled to a depth of 10,445 feet into the St. Peter (Ordovician) sandstone, but was plugged back to 7,800 feet and kept as a condensate well. Late in December a gas well was discovered in Calhoun County in the Traverse (Devonian) limestone, opening an entirely new area to development.

The Panhandle and Eastern Pipeline Company began construction of a gas transmission line approximately 250 miles long. The line will run from the Michigan Gas transmission line in the southeastern corner of Lenawee County northward to Pleasant Lake in Washtenaw County. One branch will be laid west to Kalamazoo, the other will extend north to Flint and Saginaw. Construction started at Saginaw and the line is expected to be completed during 1942.

Geophysical prospecting and core testing were carried on at a brisk rate particularly in the northern and south-central parts of the Southern Peninsula.

60. ALFRED H. BELL, Illinois State Geological Survey, Urbana, Illinois
Development in the Eastern Interior Basin in 1941

More wells were drilled in 1941 in Illinois and southwestern Indiana than in any previous year except 1907 when drilling reached a peak in that area. Drilling declined in western Kentucky, making the total number of completions in the Eastern Interior basin in 1941 slightly less than in 1940. Much of the 1941 drilling (both pool and wild-cat) was concentrated in the deep basin area in the region of the lower Wabash River in Illinois and Indiana where 44 new pools and 43 extensions were discovered. None of the new pools was of major size and the total output of new wells in the whole area failed to offset the decline of the older wells. Total production from the Eastern Interior basin in 1941 is estimated at 145,603,000 barrels as compared with 154,796,000 barrels in 1940, a decline of 6 per cent. Percentage of the national total was 10.3 in 1941 as compared with 11.5 in 1940.

Rocks of the Mississippian system continue to yield most of the oil in the area—91.5 per cent of the Illinois total of 133,750,000 barrels in 1941. No new Devonian production was discovered in Illinois in 1941 and the Devonian wells, which yielded an estimated 26 per cent of the Illinois total in 1940, produced only 6 per cent of the total in 1941. Pennsylvanian and Ordovician strata yielded estimated amounts of 1.7 and 0.9 per cent, respectively. Geologic studies indicate that lenticular sand conditions are important in controlling the occurrence of the oil.

61. GEORGE V. COHEE, Illinois State Geological Survey, Urbana, Illinois
Lateral Variation in the Chester Sandstones Producing Oil and Gas in the Lower Wabash River Area

Oil and gas production in the Wabash River Valley in southeastern Illinois and southwestern Indiana is from lower Pennsylvanian and Chester sandstones and the McClosky limestone of the Ste. Genevieve formation. The principal fields in the area are New Harmony Consolidated and Keensburg Consolidated. These fields include an