

flush production at 2,100 feet was developed in the Lodgepole (Mississippian) in the Roselea field, 56 miles north of the North Dakota line in Manitoba. Subsequent wells in the Roselea field have reported initials as high as 2,500 barrels of oil per day. The lack of sufficient well information makes it impractical to calculate the reserves represented by the fields thus far discovered; however, the most conservative estimate places this figure between 500 million and 1 billion barrels of recoverable oil.

The year 1953 witnessed the completion of the 300,000 barrels per day Interprovincial Pipe Line from Edmonton, Alberta, to Sarnia, Ontario, and marked the beginning of construction of three new refineries in North Dakota, which on completion will process 33,500 barrels of basin crude daily. 1953 also saw the completion of the 100,000-barrel-per-day common carrier Service Pipe Line from the Beaver Lodge-Tioga area to Mandan, North Dakota, the beginning of construction of a natural-gasoline plant at Tioga, North Dakota, and the completion of Stanolind's products line from Mandan to Fargo, North Dakota. There remains, however, an urgent need for additional marketing facilities before the full economic potential of the basin can be realized. Judged from recent official and unofficial announcements, plans to create new facilities are under way and the next five years should show marked progress in this direction.

With geophysical activity maintaining its record-breaking pace, and millions of acres of leases approaching one year closer to the expiration date of their primary terms, it is expected that 1954 will witness an unprecedented wildcat and field development program in the Williston basin. Excellent shallow production in Manitoba, the discovery of the first commercial oil in South Dakota, plus continued success in Montana, North Dakota, and Saskatchewan will serve as an incentive to substantiate this 1954 prediction.

#### 9. MISSISSIPPIAN OIL ACCUMULATIONS IN NORTHERN MONTANA.

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Mississippian reservoirs in northern Montana have produced oil in an amount almost equal to the combined total from all other producing zones. Six important fields, four in the Sweetgrass arch area and two in the Williston Basin, currently yield a total of over 350,000 barrels of oil monthly. Without exception, the producing zones are carbonate reservoirs which contain either intergranular, vuggy or fracture porosity. A discussion of each field is presented to illustrate that stratigraphic variations are equally, if not more important, than structural closure in governing accumulation. The stratigraphy of the Mississippian is treated briefly to show regional correlation of the producing zones.

#### 10. WILLISTON BASIN PALEOZOIC UNCONFORMITIES.

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The Williston basin is primarily a Paleozoic basin. Regional Paleozoic unconformities are present in the basin at the base of the following: Cambrian, Ordovician, Middle Devonian, Lower Mississippian, Middle Pennsylvanian, and Middle Permian. The unconformity at the base of the Mississippian is the most pronounced of the regional unconformities. Regional stratigraphic sections and isopach maps are used as illustrations.

#### 11. EXPLORATION FRONTIERS IN NORTH DAKOTA.

CHARLES TALLARD, Continental Oil Company, Bismarck, North Dakota.

Most of the fields in North Dakota were located by a combination of surface mapping and the reflection seismograph. Detailed surface mapping in southwestern North Dakota will be very valuable in locating other structural anomalies; however, the essentially flat Tertiary and Upper Cretaceous beds and the glacial débris north and east of the Missouri River hamper this method of exploration.

Other fields have been located by a combination of seismograph and subsurface studies, and in the future this combination will become a much more valuable method of exploration.

#### 12. WILLISTON BASIN IN SOUTH DAKOTA, AN OIL FRONTIER.

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No oil in commercial quantities has been found in South Dakota. The geology, however, is replete with the promise that oil will be found in this state. The north-plunging Lemmon syncline, that is, the south end of the Williston basin, occupies the west half of South Dakota. Paleozoic sediments, the source of oil in North Dakota and in adjacent areas in Montana, are known in the subsurface of South Dakota and comprise 37,000 square miles. Cretaceous sediments, which produce oil in Nebraska, occur throughout the state, over an area of about 77,000 square miles. Mesozoic and Paleozoic sediments may range up to 10,000 feet in thickness.

Cross sections indicate the wedging-out of formations of Ordovician, Silurian, Devonian(?), Mississippian, and Pennsylvanian age. These wedge-ends should form porosity traps and be prolific sources of oil. A pre-Jurassic unconformity overlies the truncated edges of most, if not all, of the older formations. Oil reservoirs may be found here. Isopach maps indicate a wide areal distribution of several potential oil-bearing formations.