9. HEATH-AMSDEN BOUNDARY ON CENTRAL MONTANA UPLIFT AT BIG WALL FIELD, MUSSELSHELL COUNTY, MONTANA.
EMERSON K. BEEKLY, Northern Natural Gas Company, Billings, Montana.

The Big Wall field was discovered by The Texas Company in 1948. The main producing reservoir is a stratigraphic unit within which are irregularly bedded sands having a linear distribution. These sands also produce at the Melstone and Northwest Sumatra fields.

Workers agree on most aspects of the Heath formation of the Big Snowy group (Chester) and the Amsden formation, but the relationship of the sand-shale producing zone to these formations has remained conjectural. Initially an Amsden affinity was held, and of late the zone has been placed in the upper Heath formation. Both the lower Amsden and Heath formations are considered Upper Mississippian in age by the U. S. Geological Survey.

One factor has probably caused more confusion than any other in differentiating the producing unit from the Heath. The dark gray to black shale within which the producing sands are found is differentiated from the Heath shales only with difficulty, particularly when examined as cuttings. The sands and shales of the producing zone contain much carbonaceous plant material, the only discernible fossil, as compared with the distinctive marine fauna of conodonts and brachiopods found in the top of the Heath. Compaction slickensides are common in the carbonaceous shale. Cross-bedded sandstones and conglomeratic material indicate a more turbulent environment during deposition than there was in Heath time. Thin pebble conglomerates at the base in many places sharply mark the boundary with the Heath formation. All of the evidence mentioned indicates a hiatus, however brief, which does not favor correlation with the Heath.

10. DISCOVERY-PAPER—GRIEVE UNIT, NATRONA COUNTY, WYOMING.
W. G. OLSON, Consultant, Casper, Wyoming.

11. PRELIMINARY POOL REPORT—BURKE RANCH OIL FIELD, NATRONA COUNTY, WYOMING.
R. P. SWIRCZYNSKI, Houston Oil Company of Texas, Casper, Wyoming.

The Burke Ranch oil field is in the east-central part of Natrona County, 24 miles north of Casper, Wyoming, on U. S. Highway 87 to the Salt Creek oil field.

The Burke Ranch oil reservoir is a stratigraphic trap associated with a minor fold and/or monoclinal dip off the east limb of the Casper arch.

The Dakota sandstone is the only productive zone of this field. The zone averages 20 feet of permeable sand, and is found at subsea depths of 1,020–1,224 feet.

The crude is paraffine base, and is 35.5° A.P.I. gravity, dark brownish green in color.

The well status, on December, 1954, is 5 dry holes, 12 producers, and one drilling location. The productive limits have not been delineated.

12. GENOU TREND—STRUCTURAL FEATURE ON SWEETGRASS ARCH, MONTANA.
ANDREW G. ALPHA, Signal Oil and Gas Company, Denver, Colorado.

The Genou trend is a pre-Cambrian igneous structural alignment on which are located several structural highs visible on contour maps drawn on the Madison. The trend crosses the South arch of north-central Montana in a northeast direction, just south of Collins. This trend parallels the pre-Paleozoic and early Paleozoic structural features of the Canadian Shield in Canada and Minnesota. Geophysical evidence points to a similarly oriented structural fabric in the subsurface across central Montana and North Dakota.

Stratigraphic evidence indicates the age of the igneous emplacement as pre-Cambrian. Biostromes and probably some bioherm reefs occur on the trend. Oil shows are found in fractures, vugs, and pores throughout 80–420 feet of the basal Devonian section and in the top of the Mississippian, but the yield was only water with a rainbow of oil on drill-stem tests. The Swift sandstone is saturated with heavy black oil but also yielded nothing on tests.

13. DISCOVERY PAPER—DESERT CREEK FIELD, SAN JUAN COUNTY, UTAH.
R. W. SPALDING, Shell Oil Company, Durango, Colorado.

14. FRACTURE PRODUCTION FROM MANCOS SHALE, RANGELY FIELD, RIO BLANCO COUNTY, COLORADO.
VICTOR E. PETERSON, Equity Oil Company, Salt Lake City, Utah.

A high-grade oil has been produced from fractures in the Mancos shale section of the Rangely field for many years. A study of these fractures reveals that they belong to two distinct systems: a predominant system trending northeast-southwest part way across the field, and a subsidiary system situated south of and parallel with the axis of the fold. These fractures can be related to axial bending and arching in the Rangely anticline. Production in the Mancos shale section of this pool is entirely dependent on sustained openings in the fractures. The quantity of oil produced is small in comparison with that derived from the Weber sandstone of this field, but the Mancos pool has produced in excess of 4,500,000 barrels of oil.

15. BEAVER CREEK FIELD, FREMONT COUNTY, WYOMING.
DAVID J. EWING, Stanolind Oil and Gas Company, Denver, Colorado.

The Beaver Creek field is located in Fremont County, Wyoming, approximately 14 miles south-

east of the town of Riverton, Wyoming, and 5 miles northwest of the Big Sand Draw field. Geologically, the field is on the east side of a south-extending tributary embayment of the Wind River basin.

The Beaver Creek anticline was mapped in detail and leased by the Midwest Refining Company in 1930, on the supposition that structural closure might increase in Cretaceous sediments beneath the unconformity at the base of the gently folded Tertiary Wind River formation. This idea was substantiated by later refraction and reflection seismograph work. Operation of the Midwest Refining Company Beaver Creek leases was assumed by the Stanolind Oil and Gas Company following its organization in 1932.

In 1938, the Stanolind completed the discovery well, the Johnson No. 1, as a 9,000-MCFPD gas well in the Lakota sandstone, following plug-back from total depth of 8,992 feet in the Nugget sandstone. Problems in production and marketing delayed further development until 1945. From 1945 to the present, drilling activity has been dependent on demand for additional gas and development of new oil-producing zones.

Total daily field production is 120,000 MCF gas from the Frontier, Muddy, and Lakota sandstones, and 2,100 barrels of 38°–45° gravity oil from the Mesaverde and Tensleep sandstones and the Madison limestone. A recent deep field wildcat, which bottomed at 13,462 feet in granite wash, failed to find productive oil or gas in the Cambrian.

16. GEOLOGY OF PINCHER CREEK GAS AND NAPHTHA FIELD AND ITS REGIONAL IMPLICATIONS, ALBERTA, CANADA.

W. B. GALLUP, Royalite Oil Company, Ltd., Calgary, Alberta.

For the purpose of this discussion the Pincher Creek area is considered as a geologic sub-province having a somewhat unique orogenic history. Certain sedimentary facies including the reservoir rock were probably subject to orogenic control.

The Pincher Creek field itself is a structural trap involving biostromal Mississippian strata. Ancestral accumulation may have been controlled by the westward pinch-out of the biostrom. A study of the orogenic history explains to some extent the coincidence this facies change has with the outer edge of the foothills.

The absence of foothills in the area may be merely the end result of a series of events and not due to greater age or exceptional conditions of erosion.

17. DISCOVERY PAPER—FERTILE PRAIRIE FIELD, FALLON COUNTY, MONTANA.

JAMES O. STAGGS, McAlester Fuel Company, Billings, Montana.

18. BLACK HOLLOW FIELD, WELD COUNTY, COLORADO.

C. J. MCGINNIS, The California Company, Denver, Colorado.

The Black Hollow field is the only pre-Cretaceous oil producer in the Denver-Cheyenne basin. Production is from the Lyons sandstone of Permian age at a depth of approximately 9,000 feet. The initial test was located on an anticlinal closure defined by the seismograph. The pool covers 1,300 acres on which 10 producers and one dry hole have been drilled. The field is in the development stage. Accumulative production, on September, 1954, totals 430,000 barrels.

19. PINE FIELD, DAWSON, FALLON, PRAIRIE, AND WIBAUX COUNTIES, MONTANA.

JAMES H. CLEMENT, Shell Oil Company, Billings, Montana.

The Pine field is located on the northwest-trending Cedar Creek anticline in Dawson, Prairie, Wibaux, and Fallon counties, Montana. Pine Unit No. 1, the discovery well, was drilled to test a subsurface seismic closure located near the crest of the known surface anticline. The well was completed in January, 1952, daily pumping 467 barrels of 33° gravity crude and 148 barrels of water, from the Upper Ordovician Stony Mountain (Gunton) formation. Subsequent outstep drilling was notable in that improved reservoir conditions were found in the Ordovician, and Silurian production was established in zones found water-bearing in the discovery well.

Thin Devonian strata, shales and shaly dolomites, are effective barriers to vertical migration over Silurian productive zones. Silurian rocks thicken and rise structurally southeastward with associated development of porous and productive intervals. Upper Ordovician strata contain the major productive zones with included shale zones acting as effective cap rocks.

Development indicates oil accumulation in the Pine field to be controlled by structure, but with stratigraphic variation important in reservoir properties. The structure is basically an asymmetric anticline, modified by minor culminations and saddles. Structure contours indicate a closure of approximately 200 feet.

No gas caps are present in the field. Porosities of the pay intervals vary from 6 to 16 per cent with a mean of 11 per cent. The average permeability is approximately 5 md. Connate water in the pay intervals is estimated to average 30 per cent.

The crude oil produced is black, 35° A.P.I. gravity with sulphur content of 0.44 per cent and a GOR of 150. Reservoir pressure is on the order of 4,150 psi. The greater part of the recovery will probably be determined by liquid expansion, and no active water drive has been ascertained.

Approximately 3,800 acres are considered proved productive in the Pine Unit. Eighteen wells have been completed in the Unit, of which 14 are commercial producers, 2 are dry holes, and 2 are