

# Last Installment

(Continued From Page 2)

zone, the contact is arbitrarily placed near its center.

The contact between unit MB and the underlying unit MC is also somewhat transitional, but may be placed within very close limits between the more heavily bedded limestones at the base of unit MB, and the thin-bedded, argillaceous, dense limestones below. A characteristic feature of unit MB is the presence of occasional beds of fragmental limestone, which may be used to distinguish unit MB from unit MC in the subsurface.

In the outcrop areas the unit is divisible into two subunits, designated MB<sub>1</sub> and MB<sub>2</sub>. The upper subunit, MB<sub>1</sub>, consists of white to light-gray, buff, and brown coarsely crinoid-fragmental massive limestone. A few beds of medium-brown or gray, dense to sparsely fragmental limestone are present, as are zones bearing abundant white to light-gray chert. At the top, in the questionable transition zone, are a few tens of feet of dense to saccharoidal dolomite interbedded with fragmental limestone. Subunit MB<sub>2</sub>, consists of well-bedded medium-brown to dark-gray, dense to fragmental limestone, in beds up to two feet thick, separated by thin partings of calcareous shale or shaly limestone. The dense limestone carries an abundance of gray chert. In the subsurface the distinction between MB<sub>1</sub> and MB<sub>2</sub> is drawn with difficulty, but the break may be logged on the basis of texture and color.

Unit MB bears a brachiopod and coral assemblage typical of the Osage portion of the Madison group. In lithologic composition and stratigraphic position it appears that MB<sub>1</sub> represents the Mission Canyon limestone, whereas MB<sub>2</sub> represents the Woodhurst limestone member of the Lodgepole limestone. Unit MB is approximately the same as Deiss' Rooney chert member of the Madison and is correlative with the Osage portion of the Rundle limestone of Alberta.

Unit MC.—Unit MC, the basal unit of the Mississippian of this area, rests with complete conformity on the Upper Devonian. In the outcrop areas the relationship is generally obscured by slumping and brecciation involving the upper beds of the Devonian and in some areas extending up into the Mississippian. The most obvious break is marked by the base of a black fissile carbonaceous shale; however, between the black shale and the top of the Devonian in many localities there intervene a few feet of gray or brown, dense to fragmental limestones bearing a Kinderhook fauna. In most places the base of the zone of dense to fragmental texture, resting on the zone of saccharoidal texture, coincides with the lowest appearance of Mississippian fossils; in the Sawtooth range, however, the picking of the contact is very difficult. In the subsurface the top of the Devonian is readily established by the top of a persistent green shale.

Lithologically, unit MC is characterized by thin-bedded dense black argillaceous limestones interbedded with black or gray calcareous shales and bearing an abundance of black

chert, some of which may be bedded. Near the base, black to dark-brown shale or highly carbonaceous platy limestone is often encountered, but the carbonaceous material does not seem to form a persistent zone. Throughout the unit thin lentils of fragmental material are present and crinoid-fragmental limestone is often prominent in the basal few feet. On the Sweetgrass arch the lower portion of the unit is characterized by persistent sandy limestone and limy sandstone.

Unit MC is roughly equivalent to Deiss' Dean Lake chert member of the Madison and is probably correlative with the Banff shale of Alberta and the Paine shale member of the Lodgepole limestone of central Montana. A Kinderhook age is indicated by preliminary interpretation of the megafauna.

The black shale zone is similar in stratigraphic position to the Exshaw shale of Alberta, but Warren has shown that the type Exshaw is Upper Devonian in age. It is highly probable that the shale is equivalent to a black shale zone encountered in central and southwestern Montana and in the subsurface of Alberta and Montana.

### Devonian Rocks

Unit DA.—Unit DA rests conformably on the Devonian Unit DB, the contact being between saccharoidal dolomites and dense limestones. In the subsurface the unit is characterized by massive anhydrite interbedded with brown, dense to saccharoidal dolomite, the dolomite increasing and the anhydrite decreasing toward the base. At the top are 20 to 60 feet of green and gray-green noncalcareous shale; similar shale appears in minor amounts interbedded with anhydrite and dolomite throughout much of the unit. A few beds of limestone also occur. In the outcrop areas, the anhydrite has been removed by solution, causing slumping and brecciation of much of the upper three-fourths of the unit and making possible a division into two subunits DA<sub>1</sub> and DA<sub>2</sub>. Unit DA<sub>1</sub>, the breccia zone, is remarkably persistent and contains a mixture of all the rock types mentioned above, except anhydrite, as well as fragments of Mississippian rocks collapsed from above. The breccia is composed of angular blocks ranging from a fraction of an inch to several tens of feet across, firmly cemented by dense to saccharoidal brown limestone or dolomite. There are in the breccia relatively undisturbed sequences of strata which represent dolomite beds of sufficient thickness to be unaffected by solution of anhydrite. Unit DA<sub>2</sub> in its outcrop is almost without breccia and consists of massive brown coarsely saccharoidal dolomite, often cross-laminated. Insoluble residues from the cross-laminated zones exhibit no sand grains.

Fossils are rare and poorly preserved in the unit; however, the

following corals are recognized:

Phillipsastraea sp. cf. P. macouni Smith.

Disphyllum catenatum Smith.

Correlation is indicated with the upper part of the Minnewanka limestone of Alberta, and part of the Threeforks formation of central and southwestern Montana. The Silvertip conglomerate member of the Madison, and the Spotted Bear limestone and Lone Butte limestone members of the Jefferson described by Deiss apparently fall within this unit. Perry has applied the term, Potlatch anhydrite, to this unit in the subsurface of the Sweetgrass arch (type section is section 12 on the chart) and the usage appears to be applicable throughout the subsurface of the area covered by the chart.

Unit DB.—On the Sweetgrass arch unit DB lies disconformably on Cambrian shales; elsewhere it is underlain conformably by Devonian unit DC, the contact being marked by a fairly abrupt transition from limestones above to shale and shaly dolomite below. Unit DB is dominantly brown to brownish-gray dense limestone, becoming slightly argillaceous toward the base. A few thin zones of saccharoidal dolomite are present, and some of the limestones bear globular segregations of olive-brown saccharoidal limestone or dolomite. Many beds are marked by anastomosing worm burrows or solution channels filled with yellowish argillaceous limestone. The unit is well-bedded and tends to form steep cliffs. Large masses of strom-

atoporoids are common. In the subsurface the limestones contain a few thin anhydrite beds, and a few thin breccia zones appear in outcrop.

Deiss, Charles, Paleozoic formations of northwestern Montana: Montana Bur. Mines and Geology, Mem. No. 6, 1933.

Deiss, Charles, Stratigraphy and structure of southwest Saypo quadrangle, Montana: Geol. Soc. America, Bull., Vol. 54, pp. 228-231, 1943.

Warren, P. S., Age of the Exshaw shale in the Canadian Rockies: Am. Jour. Sci., 5th ser., Vol. 33, pp. 454-457, 1937.

Cooper, C. L., and Sloss, L. L., Conodont fauna and distribution of a lower Mississippian black shale in Montana and Alberta: Jour. Paleontology, Vol. 17, pp. 168-176, 1943.

Perry, E. S., The Kevin-Sunburst and other oil and gas fields of the Sweetgrass arch: Montana Bur. Mines and Geology, Mem. No. 1 (2d ed.), p. 5, 1929.

**Important Note: It was found impossible to run this article in its entirety in this issue. Concluding portion will appear next week.**

### THE TETON COUNTY ABSTRACT COMPANY

Licensed Bonded Abstractors  
CHOTEAU, MONTANA

We Are Interested in the Financing of

# OIL

Development - Production - Refining

## THE GREAT FALLS NATIONAL BANK

Great Falls, Montana

A Montana Institution Since 1891

Member F. D. I. C.

A complete line for progressive jobbers



Producers, refiners and marketers of Silver gas, Vee-dol motor oils and greases, Tydol motor oils, Silver diesel fuel and Silver tractor fuel.

## HOME OIL & REFINING CO.

Refinery and General Offices—Great Falls, Mont.

### Toole County Abstract Company

LICENSED BONDED ABSTRACTORS

SHELBY MONTANA

## Maloney BOLTED TANKS



Immediate Delivery

WE ARE EQUIPPED TO DO ALL KINDS OF TANK REPAIR WORK

## MONTANA TANK & SUPPLY

Main Office: Phone 30, Cut Bank

RAY SEARSON, Manager

Kevin: Phone 87