MEMORANDUM

Subject: Pre-Pennsylvanian stratigraphy and oil possibilities

Area: North of Township 20S; west of Range 24W.

Wells discussed: Atlantic area 20S-33W
National Refining #1 Wells, 13-23S-30W
063-00348 Valerious #1 Todd, 24-13S-27W (Garrison)
063-00217 Atlantic #1 Wright, 13-12S-27W

The Atlantic well which penetrated to the Arbuckle has not been examined by me. Attached is a letter giving Atlantic's classification of the Mississippian. Oral communication with Mr. Brant, of Atlantic, gave an idea as to the general character of the Mississippian. The other three wells have been studied in detail by means of residues through the entire pre-Pennsylvanian section.

Description of stratigraphic units:
Mississippian: Chester. General opinion of paleontologists seems to be swinging toward the idea that no Chester is present in western Kansas. Ryniker has sent fossils to Weller of Chicago, has had no report, and means to contact him on the current field trip.
Mississippi Lime: The well is Scott County had 615' of Miss. Lime, and the well in 23S-30W, 650'. This is probably about the maximum section to be expected in this area. The divisions shown by Brant are not yet recognized by me. Following are my tentative divisions which will later be split into smaller units.

Unit 1. 220' Limes, brown to gray, mainly dense to finely crystalline, with oolites. Some layers are highly oolitic. Chert present in scattered layers, contains no oolites. There are a few minor layers of shale and fine sand and some disseminated fine sand, but no sands of resevoir importance. This unit is producing in the Scott Co. area. Porosity appears to be due to the differential solution of the matrix between the oolites as a result of exposure. No appreciable primary porosity has been seen. Probably an oil source, as non-solid carbonaceous material shows after acid treatment.

Unit 2. 150'. Granular brown dolomitic lime, finely crystalline. Shows some suggestion of oolites. Contains considerable fine sand, both as thin layers and disseminated. Some chert in upper part. Commonly has pinhole porosity but has shown no evidence of worthwhile porosity. Porosity might be developed on exposure but high clastic content suggests that thin quartzitic sand layers would spoil it. Not particularly interesting either as a source or a resevoir.

Unit 3. Approx. 150'. The base is probably the base of the Boone or Burlington. Chert, with from 2-40% of fine granular white to brown lime. Somewhat glauconitic. Contains no clastics except in basal few feet. Chert is mainly "primary" in type but chalcedony and quartzose chert in upper part suggest an unconformity at top. Normally porous, as evidenced by presence of water. Porosity probably along fracture lines in chert. Exposure might develop more porosity through limited solution and by fracturing but upper surface would tend to become plugged by Penn. shale. Resistant nature of this unit will make its paleo-outcrop a wide band on the Pre-Penn. surface.

Not attractive as a source. Not particularly attractive as a trap for the reason that it is so permeable laterally that oil has had a chance to escape. Similar to the Chat of eastern Kansas.

Unit 4. Tentatively classified as Fern Glen or St. Joe lime. 0-100'. Lime, white to brown, with oolitic tendency. Varies in thickness and lithologic character. Contains considerable disseminated fine sand and green shale. May be dolomitic in a few wells. Non-solid carbonaceous material is shown after acid treatment in scattered samples but not as a general rule. Has little or no primary porosity but may develop porosity on exposure. Not important as either source or reservoir.

Kinderhook. Approx. 50'. Dolomite and sand, with thin layers of green shale. Dolomite is brown, finely crystalline. Sand is mainly fine and closely interbedded with the dolomite but some sand layers up to 10' are present in some wells. The sand has some siliceous cement and resembles Misener. Porosity is limited and the sand layers are relatively thin. Some porosity is present in the Kinderhook where it overlies Arbuckle.

Not promising as an oil source. As far as seen, not promising as a reservoir but sand of good thickness and porosity may be developed in some areas.

Post-Decorah Ordovician This has not been worked out in detail. The lithology varies from fiely crystalline brow dolomite in the north to highly cherty gray dolomite to the south. Probably of Viola and Upper Simpson ages. Porosity condition can not be generalized as the Misener period of exposure may have developed porosity in some beds in some places. Probably not present at all in structurally high areas.

Decorah. This material is called Decorah by virtue of the fact that the top has been traced westward from areas in which the Decorah has the normal sand and shale facies. Decorah in this area means ten to twenty feet of dolomitic sand which grades downward into sandy shaly dolomite which carries oolitic chert. None of the shales are more than a few inches thick. Not an attractive reservoir.

Arbuckle. The Arbuckle as traced westward from Range 10W maintains the Miller-Purcell facies with some younger dolomites which are probably the lateral equivalents of the shaly Decorah. There is no evidence of major unconformity at the top of the Arbuckle, in fact, the best Arbuckle top is the top of the Decorah. The character of the Arbuckle is normal in that it is more cherty to the south and more sandy to the north. The Cotter thins northward. Little is known of the Pre-Cotter. North of Twp. 13S, all of the Arbuckle should develop porosity on exposure. Lack of shaly Decorah indicates that Decorah border pools of the type of Chase can not be depended upon except in isolated spots in which Miller-Purcell shaly residuum might form a seal. It is probable that the Miller has porosity below the post-Decorah Ordovician and below the Kinderhook.

Paleo-geology and structure. There are two important unconformities, the Misener and the Mississippian:

The paleo-outcrops of Misener time range from Viola to Arbuckle. The Arbuckle area can not be outlined as only two wells with Kinderhook-Arbuckle contacts are known, 24-13-27, and 11-12-27. Arbuckle correlations show that between 30-100' of Arbuckle is missing in these wells. There are enough wells to the south and east to show that thisArbuckle area does not connect with that of the Central Kansas Uplift

Presumably this represents the east or southeast edge of a high which may have the same relation to the Central Kansas Uplift as the Chautauqua Arch is to the Ozark Uplift.

The Post-Mississippian unconformity indicates regional tilting to the north in late Mississippian and early Penn. time, as the Mississippian top lies on progressively older beds toward the north. The top Miss.-Arbuckle interval tend to thin toward the northwest, reflecting the combined effect of the Misener high and the Mississippian tilting. Tilting may have been great enough for the plane of peneplantion to intersect all beds from the Mississippian to the Pre-Cambrian somewhere to the north and west. Western Gove County and Thomas County appear to be areas in which the Misener high might be present. The axis of the post-Miss. high might be further to the north and west.

Speculation as to traps for oil:

Pre-Cotter Arbuckle sealed by Penn. along axis of post-Miss high. Should have good porosity. Sources might be from both Penn. and Arbuckle.

Miller-Purcell Arbuckle sealed by Penn. residuum. On post-Penn. uplifts along margin of post-Miss high. Small areas with fair to spotty porosity. Source from Arbuckle.

Arbuckle sealed by Kinderhook along Misener highs. Porosity good. Source from Arbuckle.

Other beds from Upper Simpson to Unit 2 of the Mississippian sealed by Penn. along flanks of Post-Miss. high. Porosity largely determined by local conditions and by unpredictable depositional conditions. Source, Penn. and Arbuckle. Possibly indigenous to individual beds in local areas.

Unit 1 of Mississippian, sealed by Penn. The type of production found in Scott County. Areal extent small and influenced by local topographic conditions. Oil probably indigenous to Unit 1. Found far down the flanks of post-Miss. uplift.

With the exception of the absence of Kinderhook and Decorah shales and of beds of Maquoketa and Hunton age; the age of the beds, their lithologic character, and the time of uplifts duplicate conditions which are associated with oil on the Central Kansas Uplift, and on the post-Miss. trends to the east. It does appear, however, that regional conditions favor migration of oil in western Kansas, for the reason that the section is more nearly a solid lime section. This suggests that oil may have been lost more easily during past periods of exposure, but it also suggests that oil which may be present may be in larger accumulations.

Pennsylvanian oil possibilities have not been discussed for the reason that this phase has not been studied by me. The basal Pennsylvanian does not appear to be a good reservoir in the wells studied and, with the precedent of the Central Kansas Uplift, it is not probable that it will develop except is localized areas.