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DEEPER PRODUCTION IN THE ALLENDALE OIL FIELD

By Gail F. Moulton

Introduction

During the 15 years since the discovery of production on the Adam Biehl farm in August, 1912, various geological reports on Wabash County have been issued by the Illinois Geological Survey. Of these the more important are as follows:

1. Rich, John L., The Allendale oil field: Illinois State Geol. Survey Bull. 31, pp. 59-69, 1914.
2. Rich, John L., Oil and gas in the Vincennes quadrangle: Illinois State Geol. Survey Bull. 33, pp. 164-166, and map, 1916.
3. Collingwood, D. M., Extension of Allendale oil field: Illinois State Geol. Survey Press Bulletin, May 17, 1924.
4. Moulton, Gail F., Further contributions to the geology of the Allendale oil field, with a revised structure map: Illinois State Geol. Survey Rept. of Investigations No. 7, 1925.

Each of the above reports appeared during or shortly after a period of renewed activity in the field. Now new developments are taking place which again direct the attention of the oil operators to the area. Therefore the present report has been prepared to present new data to producers interested in the development of production in the deeper sands, particularly in the McClosky (Ste. Genevieve), which lately has been proven productive.

Recent Development

Up to the present only two wells in Wabash County are known to have prospected as deep as the McClosky, and very few wells have gone deep enough to test the other Chester sands which are productive in the Lawrence County field. Most of the latter tests were not located on the most favorable structures in the county, so they cannot be considered particularly significant. Accordingly, the possibility of finding production in sands corresponding to the Kirkwood and Tracy sands of Lawrence County and the fact of production from the McClosky sand in the Eastern Gulf Oil Company's

Jesse Cisel well No. 4 (sec. 2, T. 1 N., R. 12 W.) make such deeper prospecting appear particularly attractive at the present time.

The Eastern Gulf Oil Company completed the first McClosky sand well for Wabash County on the Cisel farm in May, 1927 at a depth of 2209 feet. After drilling about two or three feet of pay sand, the drillers found that oil was rising rapidly in the well. Soon it was standing within a few hundred feet of the surface, and popular local rumors circulated claiming that the well would make from 100 to 1000 barrels per day. Bailing tests soon showed the error of these guesses, and later pumping has demonstrated that the well is of small commercial size.

Shortly after the drilling of this well, other wells were planned to test the newly found producing horizon. Among them was a well on the Kogan farm, just north of the Cisel well, which was drilled as a test of the Biehl sand but failed to find production there. An attempt to deepen this well resulted in failure following a considerable expenditure of money. No wells have yet been drilled to the McClosky since the discovery of production, but several tests are reported to be either planned or started.

Geology

Stratigraphy

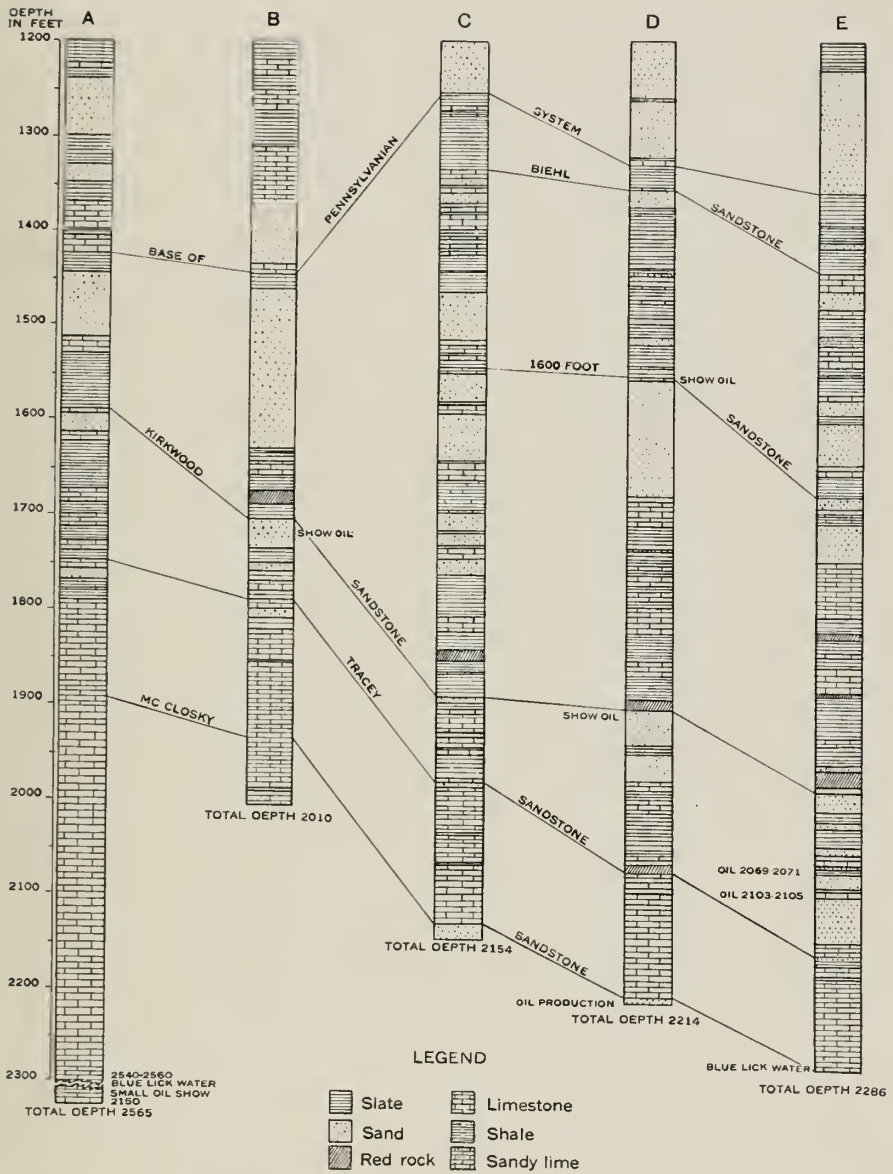
The surface in Wabash County is largely covered with unconsolidated deposits from a few feet to a hundred feet thick, which are principally sands, gravels, and clays of recent origin, unrelated in form or structure to the folds in the underlying consolidated rocks which contain the oil and gas.

The consolidated rocks belong to the Pennsylvanian and Mississippian systems. Below the surface deposits are found about 1200 feet of rocks of the Pennsylvanian system which, in turn, are underlain by rocks of Mississippian age of which only the upper 900 feet are known from wells drilled in Wabash County. If conditions in Wabash County are similar to those in Lawrence County and adjacent areas in Indiana, the remainder of the Mississippian system is probably represented by a series of massive limestone beds and a basal series of shales.

The character of the rocks, and the correlations of the sands found in Wabash County with the producing sands in Lawrence County are shown by the graphic logs of two typical wells in southern Lawrence County, and of the more important deep wells drilled in Wabash County and an adjacent portion of Indiana. (See figure 1.)

Producing Horizons

The producing horizons thus far proven for Wabash County are the Bridgeport sand of Pennsylvanian age, the Biehl-Jordan sands, the 1600-foot



A. Jane Jones well No. 7, sec. 28, T. 2 N., R. 11 W., Lawrence County.
B. Perkins well No. 1, sec. 13, T. 2 N., R. 11 W., Lawrence County.
C. Big Four Oil Company's Johnson No. 1, sec. 6, T. 1 N., R. 11 W., Wabash County.
D. Eastern Gulf Oil Company's Cisel No. 4, sec. 2, T. 1 N., R. 12 W., Wabash County.
E. Eastern Gulf Oil Company's Steckler No. 1, sec. 35, T. 1 N., R. 12 W., Knox County.

FIG. 1. Graphic logs of typical wells with correlation of the producing sands in Lawrence County and Wabash County, Illinois, and Knox County, Indiana. (Drawn by Ill. State Geol. Survey.)

sand, and the newly developed McClosky sand, all of Mississippian age. Only a small amount of additional production has been developed in the Bridgeport or 1000-foot sand since the 1925 report[1], and this sand is still of minor importance as an oil producer in Wabash County.

During the past two years very considerable extensions have been made to the producing area of the Biehl sand north of Allendale where the sand is found at a depth of about 1400 feet and has the irregular character and lenticular structure typical of the older areas producing from this sand. Largely as a result of the developments in secs. 6 and 7, T. 1 N., R. 11 W. and secs. 1 and 2, T. 1 N., R. 12 W., the Biehl has become one of the important oil producing sands of Illinois. Evidence of a "robber sand" has been found in at least a part of the new producing area. Kogan well No. 1 in sec. 1, T. 1 N., R. 12 W. was deepened when the production had declined to about 50 barrels per day. The drillers noticed that they went through a hard streak in the sand a few feet below the point at which the well had stopped originally, and then into softer sand again. The well was tested but gave practically no oil. Later, lead wool was used to plug the well back to the top of the hard streak, and the production increased. The presence of this peculiar condition suggests the need for care in drilling and shooting wells in this part of the field.

A sand of Chester age (the 1600-foot sand) which is found 195 to 215 feet below the top of the Biehl cap rock has proven productive in two separate areas in Wabash County. The first well producing from this deeper sand was completed in 1926, by Charles Foreman and others on the Cisel heirs' farm in sec. 1, T. 1 N., R. 12 W. Subsequently other wells in that vicinity have been drilled to this sand, but none of them have been large producers.

More recently, wells producing from the 1600-foot sand have been completed south of Allendale on the J. W. Price farm in sec. 14, T. 1 N., R. 12 W., indicating that the 1600-foot sand is probably present over a considerable area and that tests should be drilled to it on the higher parts of other known structures as outlined on the structure map (fig. 2).

Eastern Gulf Oil Company's J. Cisel No. 2 in sec. 2, T. 1 N., R. 12 W. was cored through the 1600-foot sand[2]. The solid pieces of sand obtained showed that much of the sand in this well was cemented by a limy material and that only a small proportion of the sand was permeable enough to be very productive. This condition is believed to account for the small size of the wells which have so far been found in this sand. It is entirely probable

[1] Moulton, Gail F., Further contributions to the geology of the Allendale oil field, with a revised structure map: Illinois State Geol., Survey Rept. of Investigations No. 7, 1925.

[2] Moulton, Gail F., Notes on a core bit for cable tools: Illinois State Geol. Survey Press Bulletin Series, Illinois Petroleum No. 2, May 29, 1926.

that in some other parts of the Wabash County fields better sand conditions will be found and larger wells will result.

The McClosky sand is the only one of the deeper producing sands of Lawrence County which has been proved productive in Wabash County. Two wells have tested this horizon in Wabash County, and two others in the northern part of the county have tested most of the possible oil sands overlying the McClosky. (See fig. 1 for logs, and table of logs, pp. 5-15, for drillers' records and geologic interpretation thereof.) The wells testing the McClosky are those drilled by Norwood Johnson on the W. O. Johnson farm, sec. 6, T. 1 N., R. 11 W., and by the Eastern Gulf Oil Company on the J. Cisel farm, sec. 2, T. 1 N., R. 12 W. Other deep wells were drilled by Treat and Hays on the J. E. Taylor farm, sec. 7, T. 1 N., R. 12 W., and by the Arkansas Fuel Oil Company on the Otis Matheny farm, sec. 18, T. 1 N., R. 12 W. The log of the latter well is given in the table of logs.

The McClosky has been found to lie approximately 800 feet below the top of the Biehl cap rock in Wabash County. As far as can be determined now, there should be no large variation in this interval in the county except that it will probably increase to the west, for all of the rocks, both Pennsylvanian and Chester, seem to thicken down the west dip. In other words, the west dip in the lower Chester beds may be expected to be somewhat steeper than in the upper Chester and Pennsylvanian.

The McClosky of Lawrence County is somewhat irregular in porosity although in some pools it has been found to be a rather consistent producer over areas of several hundred acres. Consequently, the problem of developing production from this pay is somewhat similar to locating production in the Biehl sand; the proper combination of sand conditions and structure must be found.

In the Eastern Gulf Oil Company's Cisel No. 4, the McClosky zone has at least two porous streaks, the lower one of which carries water. It seems possible, therefore, that drilling higher on the local dome in that vicinity might show the lower pay to be oil-bearing and might result in more satisfactory production.

Drilling Records

Several logs are given below to show the nature of the formations penetrated, the geologic interpretation of the data, and the depths of the various sands. A record of the pipe used is also given.

Driller's log from Big Four Oil Company's well No. 1 on Johnson farm in NW. ¼ NE. ¼ sec. 6, T. 1 N., R. 11 W.

Elevation—410± feet

		Thickness	Depth
	Pleistocene system	*Feet*	*Feet*
1.	Soil and sand	20	20
2.	Gravel	10	30

Driller's log from Big Four Oil Company's Johnson No. 1—Continued

		Thickness	Depth
	Unconformity	*Feet*	*Feet*
3.	Slate	15	45
4.	Quicksand	23	68
	Pennsylvanian system		
5.	Slate	12	80
6.	Sand; hole full of water	20	100
7.	Slate	25	125
8.	Shell, sandy	5	130
9.	Slate	75	205
10.	Lime	8	213
11.	Slate, red	2	215
12.	Slate	5	220
13.	Lime	20	240
14.	Slate	75	315
15.	Lime	10	325
16.	Slate	2	327
17.	Lime	8	335
18.	Slate	55	390
19.	Sand, hard; 12 bailers of water	36	426
20.	Lime	5	431
21.	Sand	35	466
22.	Slate	12	478
23.	Lime, broken	37	515
24.	Coal	2	517
25.	Lime	7	524
26.	Slate	6	530
27.	Lime	20	550
28.	Slate	4	554
29.	Sand	22	576
30.	Slate	5	581
31.	Lime, hard	3	584
32.	Slate	6	590
33.	Sand	12	602
34.	Lime	4	606
35.	Slate	10	616
36.	Lime, hard	12	628
37.	Slate	12	640
38.	Lime	10	650
39.	Slate	85	735
40.	Lime	3	738
41.	Slate	20	758
42.	Lime	2	760
43.	Slate	62	822
44.	Lime	5	827
45.	Slate	13	840
46.	Lime	8	848
47.	Slate	42	890
48.	Lime	2	892
49.	Slate	38	930

Driller's log from Big Four Oil Company's Johnson No. 1—Continued

		Thickness	Depth
		Feet	*Feet*
50.	Lime, gritty	20	950
51.	Slate	45	995
52.	Lime, hard	2	997
53.	Slate	37	1034
54.	Sand, hard	12	1046
55.	Sand, soft; show of oil	3	1049
56.	Sand, hard	7	1056
57.	Slate	2	1058
58.	Lime, hard	4	1062
59.	Slate	4	1066
60.	Lime	14	1080
61.	Lime, broken	40	1120
62.	Slate	74	1194
63.	Sand	61	1255
	Unconformity		
	Mississippian system		
	Chester series		
64.	Slate	13	1268
65.	Lime	5	1273
66.	Slate	3	1276
67.	Lime	4	1280
68.	Slate	56	1336
69.	Lime	8	1344
70.	Sand, water	8	1352
71.	Slate	2	1354
72.	Lime	6	1360
73.	Sand, water	12	1372
74.	Slate	4	1376
75.	Lime	6	1382
76.	Slate	2	1384
77.	Lime	14	1398
78.	Slate	7	1405
79.	Lime	3	1408
80.	Slate	4	1412
81.	Lime	6	1418
82.	Slate	3	1421
83.	Lime	4	1425
84.	Slate	21	1446
85.	Lime	2	1448
86.	Slate	22	1470
87.	Sand, soft	24	1494
88.	Sand, hard	23	1517
89.	Slate	4	1521
90.	Lime	4	1525
91.	Lime	5	1530
92.	Slate	2	1532
93.	Lime	5	1537

Driller's log from Big Four Oil Company's Johnson No. 1—Concluded

		Thickness	Depth
		Feet	*Feet*
94.	Slate	8	1545
95.	Lime, broken	8	1553
96.	Sand, water	30	1583
97.	Slate	3	1586
98.	Lime	9	1595
99.	Sand, broken	25	1620
100.	Sand, water	25	1645
101.	Slate	2	1647
102.	Lime, hard	18	1665
103.	Slate and broken lime	19	1684
104.	Slate	13	1697
105.	Lime, hard	4	1701
106.	Sand, hard	18	1719
107.	Slate	2	1721
108.	Sand, hard	12	1733
109.	Slate	3	1736
110.	Lime	12	1748
111.	Sand, hard	15	1763
112.	Slate	45	1808
113.	Lime, hard	14	1822
114.	Slate	20	1842
115.	Rock, red	11	1853
116.	Slate	12	1865
117.	Lime	2	1867
118.	Slate	24	1891
119.	Sand	6	1897
120.	Slate	6	1903
121.	Lime	25	1928
122.	Slate	6	1934
123.	Lime	11	1945
124.	Slate	2	1947
125.	Lime	5	1952
126.	Slate	23	1975
127.	Lime	5	1980
128.	Sand, water	8	1988
129.	Lime	47	2035
130.	Slate	3	2038
131.	Lime	30	2068
132.	Rock, red	2	2070
133.	Lime	65	2135
134.	Sand; water, 8 bailers at 2140 feet	19	2154

Pipe record

Casing	Depth set
Size	*Feet*
16-inch	73
12½-inch	190
10-inch	650
8¼-inch	1525

Pipe record

Casing Size	Depth set Feet
6⅝-inch	1697
5 3/16-inch	2000

Driller's log from Eastern Gulf Oil Company's well No. 4 on Cisel farm in SE. ¼ SE. ¼ sec. 2, T. 1 N., R. 12 W.

		Thickness Feet	Depth Feet
	Pleistocene system		
1.	Clay, yellow, soft	20	20
2.	Mud, blue, soft	16	36
	Unconformity		
	Pennsylvanian system		
3.	Slate, dark	29	65
4.	Sand, light, soft	55	120
5.	Slate, dark, soft	38	158
6.	Sand, light, soft	4	162
7.	Slate, light, soft	75	237
8.	Sand, light, soft	53	290
9.	Slate, light, soft	145	435
10.	Coal, black, soft	2	437
11.	Slate, light	3	440
12.	Lime, light, hard	3	443
13.	Slate, light, soft	14	457
14.	Sand, light, soft; 3 bailers of water	28	485
15.	Slate, dark	20	505
16.	Slate, light	6	511
17.	Lime, light, hard	4	515
18.	Sand, light, soft; hole full of water	22	537
19.	Slate, dark, soft	50	587
20.	Slate, light	8	595
21.	Sand, light, soft	63	658
22.	Lime, light, hard	2	660
23.	Slate, dark, soft	12	672
24.	Slate, light, soft	16	688
25.	Lime, light, hard	6	694
26.	Sand, light, soft	10	704
27.	Slate, light, soft	28	732
28.	Sand, light, soft	8	740
29.	Slate, dark, soft	9	749
30.	Coal, dark, soft	3	752
31.	Slate, dark, soft	5	757
32.	Sand, light	6	763
33.	Slate, dark, soft	99	862
34.	Lime, light, hard	2	864
35.	Slate, light, soft	12	876
36.	Slate, dark, soft	18	894
37.	Slate, light, soft	11	905
38.	Lime, light, hard	3	908

Driller's log from Eastern Gulf Oil Company's Cisel No. 1—Continued

		Thickness	Depth
		Feet	*Feet*
39.	Slate, dark, soft	19	927
40.	Slate, light, soft	55	982
41.	Slate, dark, soft	74	1056
42.	Slate, light, soft	14	1070
43.	Slate, dark, soft	16	1086
44.	Sand, light, soft	8	1094
45.	Slate, dark, soft	64	1158
46.	Sand, light, soft	4	1162
47.	Slate, dark	23	1185
48.	Lime, broken, light, soft	12	1197
49.	Sand, light, soft; hole full of water	63	1260
50.	Slate, light, soft	4	1264
51.	Sand, light, soft	62	1326
	Unconformity		
	Mississippian system Chester series		
52.	Slate, light, soft	2	1328
53.	Lime, gray, hard	6	1334
54.	Slate, dark, soft	23	1357
55.	Lime, light, hard	3	1360
56.	Sand, light, soft	14	1374
57.	Slate, dark, soft	64	1438
58.	Lime, gray, hard	2	1440
59.	Slate, brown, soft	3	1443
60.	Sand, light, soft	2	1445
61.	Slate, light, soft	11	1456
62.	Lime, white, hard	6	1462
63.	Slate, light, soft	11	1473
64.	Lime, light, hard	4	1477
65.	Slate, light, soft	16	1493
66.	Sand, light, hard	7	1500
67.	Slate, dark, soft	13	1513
68.	Sand, light, soft	10	1523
69.	Slate, dark, soft	22	1545
70.	Lime, light, hard	3	1548
71.	Slate, dark, soft	8	1556
72.	Lime, broken, gray, soft; show of oil at 1560	4	1560
73.	Sand, broken, soft	10	1570
74.	Sand, light, soft	2	1572
75.	Sand, broken, hard	5	1577
76.	Sand, light, hard	9	1586
77.	Sand, black, soft	8	1594
78.	Sand, light, soft	88	1682
79.	Slate, dark, soft	4	1686
80.	Lime, light, hard	26	1712
81.	Slate, dark, soft	24	1736
82.	Sand, light, soft	3	1739
83.	Slate, dark, soft	16	1755

Driller's log from Eastern Gulf Oil Company's Cisel No. 1—Concluded

		Thickness	Depth
		Feet	*Feet*
84.	Lime, light, hard	5	1760
85.	Slate, light, soft	4	1764
86.	Lime, light, hard	11	1775
87.	Slate, dark, soft	5	1780
88.	Lime, light, hard	10	1790
89.	Slate, light, soft	7	1797
90.	Lime, light, hard	28	1825
91.	Slate, dark, soft	29	1854
92.	Lime, light, hard	14	1868
93.	Slate, dark, soft	27	1895
94.	Rock, red	12	1907
95.	Sand, broken, soft; show of oil	8	1915
96.	Sand, light, gray	28	1943
97.	Slate, dark, soft	10	1953
98.	Sand, light	28	1981
99.	Lime, gray, hard	9	1990
100.	Slate, light, soft	10	2000
101.	Lime, light, hard	13	2013
102.	Slate, dark, soft; rainbow in bottom—Tracy (?)	45	2058
103.	Lime, gray, hard	5	2063
104.	Slate, dark, soft	5	2068
105.	Rock, red, soft	9	2077
106.	Lime, light, hard	6	2083
107.	Slate, light, soft	7	2090
108.	Lime, dark, hard	5	2095
109.	Slate, light, soft	5	2100
110.	Lime, light, hard	12	2112
111.	Slate, light, soft	5	2117
112.	Lime, light, hard	86	2203
113.	Lime, light, soft	4	2207
114.	McClosky sand	2	2209
115.	No record	5	2214

Pipe record

Casing	Depth set
Size	*Feet*
8¼-inch	1330
6⅝-inch	1705
5 3/16-inch	1983

Driller's log from Ellinson's well No. 1 on Price farm in center of E. ½ sec. 14, T. 1 N., R. 12 W.

		Thickness	Depth
		Feet	*Feet*
	Interval	190	190
	Pennsylvanian system		
1.	Shale	20	210
2.	Slate	90	300
3.	Slate, blue	40	340
4.	Lime, gray	10	350

Driller's log from Ellinson's Price No. 1—Concluded

		Thickness	Depth
		Feet	*Feet*
5.	Slate, blue	50	400
6.	Slate, white	50	450
7.	Lime, blue	10	460
8.	Slate, blue	60	520
9.	Sand, white; 7 bailers of water	10	530
10.	Slate, blue	45	575
11.	Sand, white; hole full of water	15	590
12.	Slate, gray	60	650
13.	Slate, dark	90	740
14.	Lime, blue	10	750
15.	Slate, gray	15	765
16.	Slate, blue	25	790
17.	Slate, black	40	830
18.	Lime, gray	10	840
19.	Shale, light	105	945
20.	Lime, brown	5	950
21.	Sand, light, hard	10	960
22.	Slate, dark	10	970
23.	Lime, dark	10	980
24.	Slate, dark	80	1060
25.	Lime, hard	5	1065
26.	Slate, gray	10	1075
27.	Slate, light	25	1100
28.	Slate, white	50	1150
29.	Sand, hard	10	1160
30.	Slate, white	10	1170
31.	Sand, white	120	1290
	Unconformity		
	Mississippian system		
	Chester series		
32.	Slate, dark	20	1310
33.	Lime	10	1320
34.	Sand, hard, white	60	1380
35.	Lime, brown	15	1395
36.	Slate, dark	25	1420
37.	Slate, gray	60	1480
38.	Slate, blue	20	1500
39.	Sand	20	1520
40.	Slate and sand	15	1535
41.	Lime, hard	5	1540
42.	Slate, broken	40	1580
43.	Lime, dark, hard	7	1587
44.	Sand oil	7	1594
45.	Slate and sand, broken	3	1597

Casing	Pipe record	Depth set
Size		*Feet*
8¼-inch		765
6⅝-inch		1390

Driller's log from Eastern Gulf Oil Company's well No. 1 on Steckler farm in SE. ¼ NW. ¼ sec. 35, T. 1 N., R. 12 W.

Elevation 410± feet

		Thickness *Feet*	Depth *Feet*
	Pleistocene system		
1.	Soil	8	8
2.	Quicksand	16	24
3.	Gravel	6	30
4.	Sand	48	78
	Unconformity		
	Pennsylvanian system		
5.	Slate	5	83
6.	Lime, gray, hard	5	88
7.	Slate, white	132	220
8.	Sand	5	225
9.	Slate, dark	8	233
10.	Slate, light	27	260
11.	Lime, gray, hard	5	265
12.	Slate	3	268
13.	Lime, white, hard	17	285
14.	Rock, red	3	288
15.	Slate	212	500
16.	Sand	5	505
17.	Slate	30	535
18.	Sand; water, 6 bailers	10	545
19.	Slate	20	565
20.	Sand	4	569
21.	Slate	13	582
22.	Sand	18	600
23.	Slate	12	612
24.	Sand	38	640
25.	Slate	138	778
26.	Lime	4	782
27.	Slate	73	855
28.	Lime, gray	4	859
29.	Slate	30	889
30.	Lime, white	2	891
31.	Slate	2	893
32.	Lime, soft, broken	6	899
33.	Lime, hard	5	904
34.	Slate	33	937
35.	Lime, brown	3	940
36.	Slate	20	960
37.	Lime	7	967
38.	Slate, light	83	1050
39.	Slate, dark	10	1060

Driller's log from Eastern Gulf Oil Company's Steckler No. 1—Continued

		Thickness	Depth
		Feet	*Feet*
40.	Slate, light	29	1089
41.	Lime, brown, hard	4	1093
42.	Sand, light	17	1110
43.	Slate	20	1130
44.	Sand, light; hole full of water at 1136 feet	40	1170
45.	Slate	60	1230
46.	Sand	130	1360
	Unconformity		
	Mississippian system		
	Chester series		
47.	Slate	34	1394
48.	Lime	1	1395
49.	Slate, dark	16	1411
50.	Sand, broken, dark, soft	6	1417
51.	Slate, dark, soft	27	1444
52.	Lime, broken, light, soft	19	1463
53.	Sand, broken, light, soft	5	1468
54.	Sand, broken, brown	3	1471
55.	Sand, brown, soft	13	1484
56.	Lime, brown, hard	8	1492
57.	Slate, gray, dark; fragments of coal	19	1511
58.	Lime, sandy, soft	9	1520
59.	Lime, gray, hard	2	1522
60.	Slate, dark, soft	5	1527
61.	Lime, light, hard	17	1544
62.	Slate, dark, soft	9	1553
63.	Lime, light, hard	2	1555
64.	Slate, dark, hard	21	1576
65.	Lime, light, hard	6	1582
66.	Sand, light, soft; pyrite and coal	14	1596
67.	Slate, dark, soft	8	1604
68.	Sand, light, soft	44	1648
69.	Slate, dark, soft	5	1653
70.	Lime, gray, hard	6	1659
71.	Slate, dark, soft	22	1681
72.	Sand, light	12	1693
73.	Slate, dark	5	1698
74.	Lime, light	3	1701
75.	Slate, dark	2	1703
76.	Lime, light	7	1710
77.	Sand, light	40	1750
78.	Lime, light	40	1790
79.	Lime, broken, soft	20	1810
80.	Slate, dark	15	1825
81.	Rock, red	6	1831
82.	Slate, dark	13	1844
83.	Lime, light	6	1850

Driller's log from Eastern Gulf Oil Company's Steckler No. 1—Concluded

		Thickness	Depth
		Feet	*Feet*
84.	Slate, dark	14	1864
85.	Lime, broken, light	26	1890
86.	Rock, red	4	1894
87.	Slate, dark	42	1936
88.	Lime, light	7	1943
89.	Slate	19	1962
90.	Sand, light	8	1970
91.	Rock, red	16	1986
92.	Slate, dark	6	1992
93.	Sand; water, 2 bailers	20	2012
94.	Slate, dark	5	2017
95.	Sand, light	7	2024
96.	Slate, black	19	2043
97.	Sand, light	8	2051
98.	Slate	6	2057
99.	Lime	12	2069
100.	Sand; oil from 2069 to 2071 feet	3	2072
101.	Shale, dark	5	2077
102.	Sand; water, 5 bailers an hour	16	2093
103.	Slate	3	2096
104.	Lime, light, hard	7	2103
105.	Sand; oil from 2103 to 2105 feet	47	2150
106.	Lime	13	2163
107.	Sand; water rose 700 feet	4	2167
108.	Slate; streaks of red rock	8	2175
109.	Lime	13	2188
110.	Slate	2	2190
111.	Lime; blue lick water	96	2286

Pipe record

Casing	Depth set
Size	*Feet*
10-inch	213
8¼-inch	855
6⅝-inch	1657
5 3/16-inch	2175

Structure

The structural features of a portion of Wabash County are shown on the map, fig. 2, by contours giving the elevation of the cap rock of the Biehl sand below sea level. These contours are on the same bed contoured in the last previous report, but the interpretation of the data given is somewhat different, particularly in the northeast and east part of the county. The two earlier maps[3] for that part of the county were not based on as complete data

[3] Collingwood, D. M., Extension of Allendale oil field: Illinois State Geol. Survey Press Bulletin, May 17, 1924.

Moulton, Gail F., Further contributions to the geology of the Allendale oil field, with a revised structure map: Illinois State Geol. Survey Rept. of Investigations No. 7, 1925.

as the present map, for little drilling had been done in that area until slightly less than two years ago. The structure of the Pennsylvanian rocks could not be relied upon to determine the details of the structure of the Chester beds. Nearly all of the wells which furnished the data for the earlier maps, as well as for the present one, were drilled only 125 to 200 feet into the

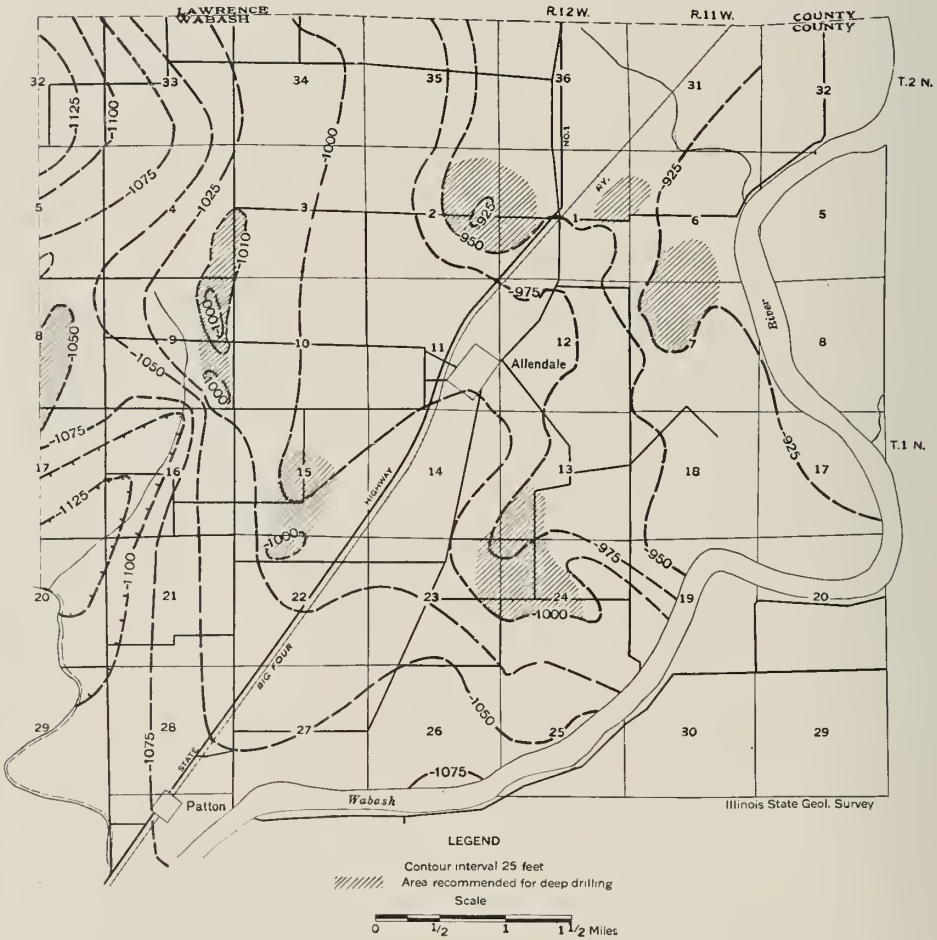


Fig. 2. Structure map of part of the Allendale field. Contours show elevation of Biehl sand in feet below sea level.

Chester. Since no persistent limestones or other beds which serve as dependable markers occur in this part of the Chester, correlations are very uncertain except for wells only a short distance apart. The recent drilling supplied the additional information needed to give the correct correlation of the records of wells in the eastern part of the county with those to the west,

so that it is now known that the eastward dip shown in Wabash County in the earlier maps does not exist.

As the map (fig. 2) shows, the general structure of Wabash County is a westward dipping monocline. The general dip is interrupted by several terraces and low domes which have been largely responsible for the accumulation of the various oil pools of the county. Beyond the western limit of the present map the rate of west dip increases so considerably that there is little hope of finding structures capable of causing oil accumulation developed on the slope.

A very short distance north of the Wabash County line in Lawrence County, the Chester beds rise rapidly to the north without any corresponding rise in the Pennsylvanian beds, so that several hundred feet of the upper Chester beds which are present in Wabash County are missing in Lawrence County. These relations are indicated by the correlation lines drawn connecting certain equivalent beds in figure 1 which shows in graphic form the succession of beds found in a few typical wells. Because of this relation between the Chester and Pennsylvanian, the present producing sands in the upper Chester beds in Wabash County are not known in Lawrence County, and the principal producing sands of Lawrence County are so much further below the Buchanan sand at the base of the Pennsylvanian that few operators have realized that they were not testing these sands by drilling to 1600 feet.

Further Prospecting

This report recommends further prospecting by deeper drilling only in areas already known to be structurally favorable for oil accumulation as a considerable amount of development should be undertaken to determine the conditions in the deeper sands, and the information now available does not indicate the presence of untested favorable structures. Results of recent development, however, clearly show that the possibilities of deeper production in and near the present producing area are good. Certain areas in which testing of lower horizons down to and including the McClosky sand is considered advisable have been outlined on the structure map, figure 2. Since nearly all of the leases within these areas are held by production, there is some likelihood that no active campaign of deeper drilling will be undertaken in the near future.

Prospecting in the 1600-foot and the McClosky sands in particular and the lower Chester sands in general is recommended on the basis of geologic structure determined from elevations of the top of the Biehl cap rock because that is the only Chester horizon for which data scattered over the field generally are available and because it is believed that the structure of the lower beds will be found to resemble closely that of the Biehl except

that the west dips will probably be somewhat steeper. The east or reverse dip, however, seems to be principally the result of later folding which affected the lower and upper Chester alike.

From an examination of published data on the Lawrence County fields[4], it appears that some of the best McClosky production has been obtained from wells located near abrupt changes in dip as, for example, where a steep dip flattens out or changes to a dip in the opposite direction. If similar structural features are most favorable in Wabash County, the areas shown in secs. 8 and 9, T. 1 N., R. 12 W., as suitable for testing should have an excellent chance of getting worthwhile production in the McClosky sand because immediately west of each of these small domes the westward dip is pronounced.

Prospecting for deeper production is also urged for all of the other shaded areas shown on the map, figure 2. Each area is believed to have good possibilities of getting production in one or more of the deeper sands down to and including the McClosky. It seems somewhat likely that deeper testing on the high parts of the present producing structures will result in the discovery of production in some of the other Chester sands which are now producing in Lawrence County. As most of the wells drilled deep enough to test the Kirkwood and Tracy sands were in locations of doubtful merit and did not adequately test defined structures, it is not demonstrated that production cannot be expected from the equivalents of both these horizons. Therefore, wells drilled to test the McClosky should be cased to exclude water as far as possible in order to determine conditions in these other sands. The Kirkwood and Tracy sands are reported to have had shows of oil in the deep well of the Eastern Gulf Oil Company on the Cisel farm in sec. 2, Wabash Township, and also in the deep test on the Steckler farm, Decker Township, Knox County, Indiana. These reports are important for they are known to be reliable, and they encourage the hope that the Kirkwood and Tracy sands may be productive in Wabash County.

For the present it is advised that testing should not be carried below the McClosky horizons, but operators should be sure that they have drilled all of the porous zones of the McClosky before abandoning a well. This statement is based on the fact that although a number of tests have been drilled several hundred feet into the main Mississippi lime in both southeastern Illinois and southwestern Indiana, wells in only one locality in Indiana are reported to have given any promise of oil production from the lower part of the lime. In consideration of the present price of oil and the great cost of such drilling, testing below the McClosky is not believed to be worth undertaking at the present time.

[4] Rich, John L., Oil and gas in the Vincennes quadrangle: Illinois State Geol. Survey Bull. 33, pp. 164-166, and map, 1916.

Casing

A word of caution in regard to casing should be heeded by operators in Wabash County. In several instances wells which were started for a test of the Biehl sand at 1400 feet have been carried deeper in an attempt to test the McClosky sand at 2200 feet. As the 6⅝-inch casing is usually set above the Biehl sand to case out the water from the Buchanan sand, and as several water-bearing sands interbedded with cavey shales are commonly found in the next few hundred feet, an attempt to continue drilling such a hole to 2200 feet is at best very expensive and may result in failure. It is therefore strongly urged that future wells drilled as possible tests to the McClosky sand be started with large enough casing to permit an 8-inch hole to be carried to at least the first water sand below the Biehl. In this way it should be possible to avoid much of the expensive underreaming, fighting a cavey hole, and drilling with light tools inside a 5 3 16-inch casing, which must be undertaken if present Biehl sand producers are deepened. Apparently the cost of deepening such a well in many cases is as great as drilling an entirely new well, and only about one in three such attempts is likely to be successful. Therefore, it is urged that only wells which are in large enough casing at the depth of the Biehl horizon be drilled on down to test the deeper pays.

Tentative casing sizes and depths are listed below:

Casing depth table based on top of Biehl cap rock at 1400 feet

Casing *Size*	Plan 1 *Depth*	Plan 2 *Depth*
20-inch	none	conductor
16-inch	conductor	350
12½-inch	350	775
10-inch	775	1350
8¼-inch	1350	1450
6⅝-inch	1700	1700
5 3/16-inch	2000	2000

Plan No. 1 gives no protection to the Biehl sand if water is found above 1700 feet unless mud is used to fill the space between the 8¼-inch and the 6⅝-inch casings. Plan No. 2 calls for casing to shut the Biehl sand out of the well with a string of casing without water behind it, thus protecting production in the vicinity. In other particulars, the plans are essentially similar. Depths of casing points should be modified to correspond to any differences between the depth of the Biehl cap rock and 1400 feet. These plans of casing call for a minimum of drilling in a wet hole, for each time casing is run the operator may expect from 100 to 300 feet of drilling before getting more water than can be carried.