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STATE OF ILLINOIS
WILLIAM G. STRATTON, *Governor*
DEPARTMENT OF REGISTRATION AND EDUCATION
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FREEBURG GAS POOL ST. CLAIR COUNTY, ILLINOIS

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DIVISION OF THE
ILLINOIS STATE GEOLOGICAL SURVEY
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FREEBURG GAS POOL
St. Clair County, Illinois

Wayne F. Meents

ABSTRACT

The Freeburg gas pool, discovered in 1956, is near the western border of southern Illinois and at the west edge of the main oil and gas producing region. Twenty-nine gas wells in the pool in an area of 2400 acres had initial open-flow capacities ranging from 139,000 to nearly 4 million cubic feet per day from Cypress Sandstone. Average depth to the top of the gas pay is 335 feet. At present the wells are shut in, but the contract for a pipeline has been let and gas should be marketed in the East St. Louis area by the winter of 1959.

The Freeburg gas reservoir and its underlying formations may be important for the underground storage of natural gas brought from other areas. Because of the economic importance of the gas reservoir, the geology and production history of the area are summarized here.

INTRODUCTION

The Freeburg gas pool in St. Clair County is in the south part of T. 1 S., R. 7 W., and the north part of T. 2 S., R. 7 W., about eight miles southeast of Belleville, the county seat, and at the south edge of the city of Freeburg. It is about 20 miles from the industrial gas market of East St. Louis.

The pool is on the western boundary of the principal oil and gas producing area of Illinois (fig. 1). The producing zone consists of two lenses of sandstone in the Cypress Formation.

The Illinois Power Company of Decatur, Illinois, has option to buy the gas (in place) from the operator, McCandlish and Gwaltney Drilling Company of Vincennes and Washington, Indiana, and expects to have the gas for sale within several months from the date of publication of this Circular.

The Freeburg gas reservoir and its underlying formations may also be important for the underground storage of natural gas brought in from other areas. Because of the reservoir's economic importance, therefore, the geology and production history of the area are summarized here.

DEVELOPMENT

The discovery well, the No. 1 Behrens in the SW$\frac{1}{4}$ SW$\frac{1}{4}$ NW$\frac{1}{4}$ sec. 33, T. 1 S., R. 7 W., was drilled by E. E. Rehn in 1955 to the Kimmswick (Trenton) Limestone at a total depth of 2000 feet. Rehn plugged the well but in 1956 Leo Dare drilled it out and completed it in the Cypress Sandstone at a depth of 389 feet. The well had an open-flow gauge of 206,000 cubic feet of gas per day. It also produced much water with a slight show of crude oil when the casing head valve was open to a greater degree in a gas test on October 24, 1956. Since then 28 gas wells have been completed. The gas-producing area is somewhat rectangular in shape, about $2\frac{1}{2}$ miles long and $1\frac{1}{2}$ miles wide, and includes about 2400 acres.

Open-flow capacities of the gas wells range from 139,000 cubic feet per day up to 3,780,000 cubic feet per day. The average open-flow gauge is 1,713-000 cubic feet per day. Two of the wells penetrated the water table, and in several other wells the sandstone became shaly, thus lowering the open-flow average. The shut-in pressures on the better wells range from 163 pounds per square inch dead weight (psid) to 164 psid. In three wells in a separate sandstone reservoir on the west side of the pool, shut-in pressures range from 152 psid to 154 psid. The average depth to the top of the gas pay is 335 feet. Gas gravities measured 0.57 and 0.56 (air is 1.00), indicating a dry gas. This also is verified by Orsat gas analyses (table 1). The Illinois Power Company has calculated the gas reserves down to zero pressure for the field to be 5,400 MMcf.

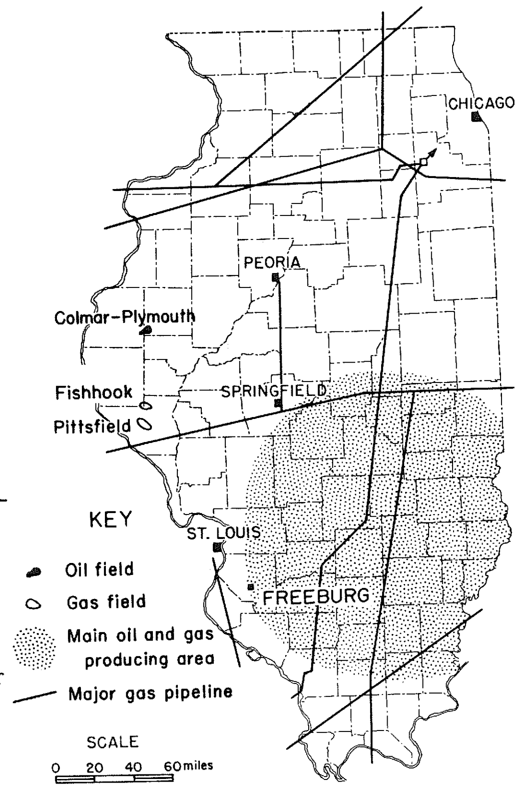

Fig. 1. - Index map showing location of the Freeburg Gas pool with respect to nearby oil and gas pools, the main oil-producing area, and the major gas pipelines.

Table 1. - Analyses of Gas from Two Wells in the Freeburg Gas Pool

H. Reinheimer Well No. 1
SW$\frac{1}{4}$ SW$\frac{1}{4}$ SE$\frac{1}{4}$ sec. 32, T. 1 S., R. 7 W., St. Clair County

Absorption method (Orsat)

	percent
Carbon dioxide	2.2
Illuminants	0.4
Oxygen	0.3
Carbon monoxide	0.3
Hydrogen	0.2
Methane	96.2
Ethane	0.0
Nitrogen	0.4
Total	100.0

Specific gravity		Btu/cu ft	
Calculated	0.58	Gross	983
Measured	0.57	Net	885

W. Baltz Well No. 1
SE$\frac{1}{4}$ SW$\frac{1}{4}$ NW$\frac{1}{4}$ sec. 32, T. 1 S., R. 7 W., St. Clair County

Absorption method (Orsat)

	percent
Carbon dioxide	2.1
Illuminants	0.6
Oxygen	0.1
Carbon monoxide	0.4
Hydrogen	0.2
Methane	95.8
Ethane	0.0
Nitrogen	0.8
Total	100.0

Specific gravity		Btu/cu ft	
Calculated	0.58	Gross	983
Measured	0.56	Net	885

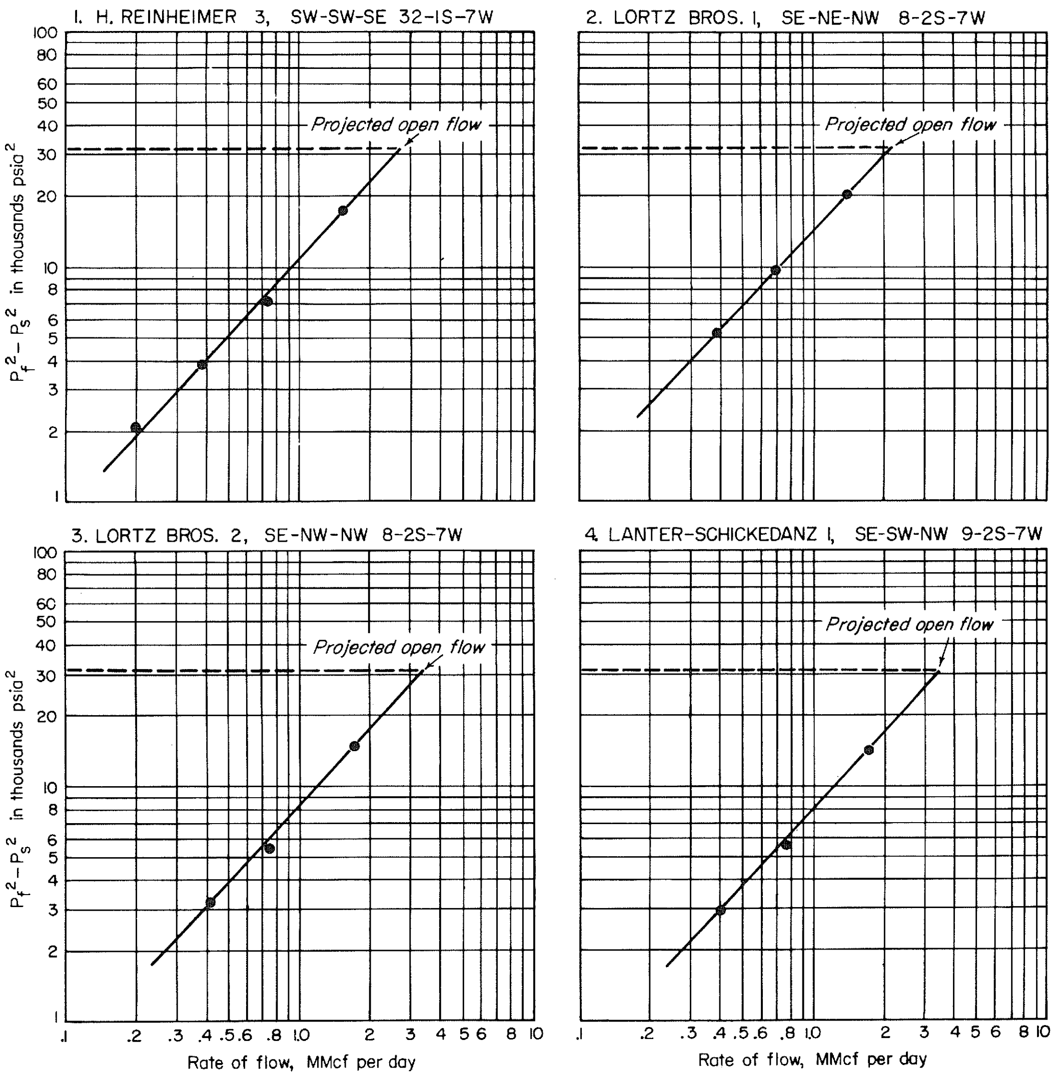

Fig. 2. - Thirty-minute back-pressure tests on four Freeburg Gas pool wells.

GAS TESTING PROCEDURE

The open-flow gas measurements listed in table 2 were taken by the author through 2-inch connections at the well heads. A 2-inch by 2-foot flow nipple was inserted into the available 2-inch gate valve that was standard equipment on all of the wells. For checking build-up pressures and for back-pressure tests a $\frac{1}{4}$-inch steel needle valve on a $\frac{1}{4}$-inch nipple welded into the 2-inch by $5\frac{1}{2}$-inch swage nipple below the 2-inch gate valve also was available. The open flows were measured by the orifice well tester on wells up to 890,000 cubic feet per day and with a Pitot tube on wells ranging from 1,400,000 to 3,780,000 cubic feet per day. In addition, the side static pressure method four diameters from the outlet of the flow nipple was used on three wells ranging from 2,860,000 to 3,700,000 cubic feet per day.

Table 2. - Results of Tests on Wells in the

Farm and well	Approximate location	Elev. ft.	Base Beech Creek (Barlow) above sea level	Gas depth*	Total depth	5½ in. casing set at†	Shut-in pressure psi**
W. Baltz 1	SE SW NW 32-1S-7W	479	158	343-360	377	342	154 G
H. Reinheimer 3	SW SW SE 32-1S-7W	467	159	334-368	368	338	164 D
Ed Stoneman 1	SE NW NE 32-1S-7W	478	112	392-420	478	391	163 D
Elmer Stoneman 1	NE SE SW 32-1S-7W	473		337-369	369	337	164 G
W. H. Stoneman 2	SW SW SW 32-1S-7W	470	173	362-369[B]	373	373[A]	163 D
Behrens 1	SW SW NW 33-1S-7W	460	114	372-406	400	455[C]	153 G
W. Beisiegel 3	SE SW SW 4-2S-7W	452	138	335-374	374	350	164 D
Sheppard-Sentry 1	SW NW SW 4-2S-7W	474	127	376-416	420	376	165 G
W. Beisiegel 1	NE NW SE 5-2S-7W	437	144	314-350	350	312	165 G
W. Beisiegel 2	SE SW SE 5-2S-7W	454	140	340-383	383	342	165 G
John Frisch Heirs 1	NE SW NW 5-2S-7W	456	158	320-358	359	331	164 G
John Frisch Heirs 2	SE SW SW 5-2S-7W	447	154	323-344	344	316	165 G
Sylvester Frisch 1	NE NE NW 5-2S-7W	470	150	342-380	379	345	164+ D
Sentry Royalty 1	NW SW NE 5-2S-7W	453	152	322-359	359	323	163+ G
Sentry Royalty 2	SE SE NE 5-2S-7W	442	136	329-376	376	334	165 G
Sentry Royalty 3	SW NE NE 5-2S-7W	447	140	334-377	377	325	164 G
Sentry Royalty 4	SE NE SW 5-2S-7W	450	147	323-366	372	335	164 D
Virgin & Frisch 1	NW NW NW 5-2S-7W	465	175	296-324	324	293	154 D
Cortner 1	NE SE SE 6-2S-7W	448	153	343-358	358	342	163+ G
Edward Groth 1	SW SE NE 6-2S-7W	461	150	335-352	372	335	152+ D

Footnotes on page 6.

Freeburg Gas Pool, St. Clair County, Illinois

Open-flow volume Mcf per day††				Build-up pressure psig									Open flow projected from back pressure flow
5 min.	10 min.	15 min.	Longer (min.)	½ min.	1 min.	2 min.	3 min.	4 min.	5 min.	10 min.	Longer (min.)	Date tested	
2200	1980	1910	1760 (40)	90	112	122	127	130	133	138		1-58	1450
	3180		2860 (55)	114	125	135	139	141	143	148+	152 (15)	11-57	2800
380	355	345	340 (20)	38	60	94	114	125	133	146		11-57	
2830	2630	2610	2600 (20)	139	145	150	153	154	155	158		1-58	2800
185	162	152	139 (35)	7	14	25	36	45	54	90		10-58	
	350	303	206 (50)[E]		63	77	85	92+	97	115	140 (25)	10-56	
1170	1050	998	890 (30)	80	97	129	135	138	140+	149	153 (15)	8-58	990
1910	1860	1820	1850 (20)[F]	135	147	151	153	154	155	158		6-58	2400
1730	1560		1400 (30)	80	108	123	131	136	139	147		4-58	1400
293	279	269	264 (20)	26	46	76	96	111	121	144	152 (15)	6-58	
	3710	3780	3780 (20)	131	139	142	145	148	150	156	158 (15)	11-57	4100
2310	2270	2250	2230 (20)	146	153	157	158	159	160	162+		6-58	2900
	2860		2700 (25)	120	134	142	146	148	150	155+		11-57	2700
3120	3120			127	138	144	148	150	152	157		1-58	2700
2050		1960	1900 (25)[J]	96	122	138	142	146	148	154		4-58	1650
2650	2380	2300	1950 (50)		110	123	129	133	136	143		4-58	2000
2280	2170	2140	2040 (30)	126	135	141	145	147+	149	155	159 (15)	6-58	2400
1735	1720	1720		116	129	137	140	142	144	148	150 (15)	11-57	1780
162	162			16	32	51	69	82	94			1-58	
746	746			76	109	129	134	138	140	145		4-58	620

Footnotes on page 7.

Table 2. - Results of Tests on Wells in the

Farm and well	Approximate location	Elev. ft.	Base Beech Creek (Barlow) above sea level	Gas depth*	Total depth	5½ in. casing set at†	Shut-in pressure psi**
Joe Lanter 1	SE NE SW 8-2S-7W	448	154	320-350	360	321	164+ D
John Lanter 1	SW SW NE 8-2S-7W	456	148	324-363	366	328	162+ D
John Lanter 2	SE NE SE 8-2S-7W	488	150	365-395	405	367	159 D
Lortz Bros 1	SE NE NW 8-2S-7W	451	143	326-365	368	327	163 D
Lortz Bros 2	SE NW NW 8-2S-7W	454	136	334-362	367	335	164+ D
Lortz Bros 3	SE SW NW 8-2S-7W	448	160	312-348	350	315	164+ D
Lortz Heirs 1	SE NE NE 8-2S-7W	499	146	375-405	415	374	164+ D
Fischer-Beisiegel 1	NW NW SE 9-2S-7W	387	110	304-322	350	305	164 G
Lanter-Schickedanz 1	SE SW NW 9-2S-7W	440	150	310-360	362	310	164 D

* B = Lower gas sand only.

† A = Perforated 366 to 371 feet; original total depth = 2008 feet.
C = 4-inch casing, perforated 389 to 393 feet; original total depth = 2000 feet.

** D = Dead-weight tester.
G = Pressure gauge.

Gas gravities were measured and gas samples analyzed by the Illinois State Geological Survey. Shut-in pressures were measured by using a dead-weight tester on 16 wells and by a standard Bourdon pressure gauge on the other wells, which were either low-pressure wells or were difficult to reach, such as wells in muddy fields.

BACK PRESSURE TESTING

Isochronal back-pressure tests (fig. 2) and the projected open-flow readings from back-pressure tests (table 2) were measured with a 2-inch Critical-Flow Prover by K. Robertson and William May of the Illinois Power Company.

Back-pressure tests were made for several reasons: 1) they reveal the open-flow capacity of the well; 2) they determine its ability to deliver gas against different pressures; and 3) they eliminate the risky operation of flowing the well wide open for an open-flow gauge, which is especially dangerous on a large-volume well producing from friable sandstone.

Freeburg Gas Pool, St. Clair County - continued

Open-flow volume Mcf per day††				Build-up pressure psig									Open flow projected from
5 min.	10 min.	15 min.	Longer (min.)	½ min.	1 min.	2 min.	3 min.	4 min.	5 min.	10 min.	Longer (min.)	Date tested	back pressure flow
1940	1820	1750	1620 (40)	96	118	132	138	142	145	152		10-58	1450
1800	1660	1620	1570 (25)	104	123	133	137	142	145	153		9-58	1500
950	830	800	750 (40)	72	98	120	130	135	138	146		10-58	950
2500	2400	2360	2300 (35)	112	128	139	144	147	149	155		7-58	2250
4100	3910	3780	3380 (50)	116	126	134	138	140	142	148		9-58	3400
2500	2400	2320	2320 (20)	124	138	148	153+	156	158	162		9-58	1850
746	703	672	593 (50)	52	76	102	115	123	129	141		8-58	700
H	960[K]	810[L]		110	125	138	143	146	148	154		10-58	
4550	4080	3940	3700 (40)	119	132	139	143	146	148	153		9-58	3650

†† Steady flow on last test, no decline.
H = Steady water stream.
K = With water spray.
L = Valve was partially closed until water disappeared.
E = Slugs of water in 47 min., valve was partially closed until water disappeared.
F = With fair oil spray.
J = With good oil spray.

In figure 2, P_f = formation or reservoir pressure and P_s = the sand face pressure. The back pressures for datum points in graph 1 are 158 psid for 200 Mcf, 152 psid for 400 Mcf, 141 psid for 700 Mcf, and 107 psid for 1500 Mcf. In graph 2, back pressures are 149 psid for 400 Mcf, 135 psid for 700 Mcf, and 94 psid for 1400 Mcf. In graph 3, back pressures are 155 psid for 400 Mcf, 146 psid for 700 Mcf, and 116 psid for 1700 Mcf. In graph 4, back pressures are 155 psid for 400 Mcf, 147 psid for 700 Mcf, and 119 psid for 1700 Mcf. In other words, these wells will produce about 400 Mcf with an average well-head back pressure of 153 psi, about 700 Mcf with a well-head back pressure of 142 psi, and about 1600 Mcf for 109 psi back pressure.

CORE ANALYSES

Core analyses listed in table 3 were furnished by the Illinois Power Company. The majority of the wells have been cored in the Cypress Formation, and the cores of the sandstone section have been analyzed.

The typical permeability of the sandstone in core analyses from four wells is 195 millidarcys; the average porosity is 21 percent.

Analyses of cores taken from wells in the north part of the field show that the sandstone there is slightly less permeable and the open-flow gauges are lower. The permeability of the lower sandstone section in the Lanter-Schickedanz No. 1 well in the south section of the field is nearly 1000 millidarcys, which is high for sandstone of the Cypress Formation in Illinois.

Table 3. - Partial Core Analyses from Four Wells in the Freeburg Gas Pool

Lanter-Schickedanz No. 1
SE$\frac{1}{4}$ SW$\frac{1}{4}$ NW$\frac{1}{4}$ sec. 9, T. 2 S., R. 7 W.

Depth (ft)	Horizontal permeability (md)	Porosity (%)
317	230.0	21.9
318	179.0	21.0
319	512.0	23.3
320	336.0	23.3
321	665.0	22.5
322	595.0	22.5
323	910.0	23.2
324	201.0	24.3
325	287.0	23.2
326	96.0	23.3
327	632.0	22.7
328	525.0	22.3
329	475.0	23.3
330	34.0	21.9
331	176.0	20.4
332	245.0	21.0
333	287.0	24.1
334	359.0	23.6
335	220.0	23.3
336	69.0	20.4
337	70.0	22.3
338	188.0	23.7
339	78.0	23.8
340	137.0	25.5
341	94.0	24.7
342	108.0	24.1
343	11.0	19.0
344	6.1	17.2
345	110.0	24.2
346	416.0	24.7
347	299.0	23.5
348	249.0	23.7
349	678.0	23.3
350	584.0	23.4
351	610.0	23.3

Lanter-Schickedanz No. 1—continued

Depth (ft)	Horizontal permeability (md)	Porosity (%)
352	700.0	23.5
353	816.0	25.0
354	800.0	23.4
355	880.0	23.3
356	533.0	24.2
357	896.0	23.3
358	770.0	23.4
359	720.0	22.7
360	994.0	23.4

Average permeability 404
Average porosity 23

John Frisch Heirs No. 2
SW$\frac{1}{4}$ SW$\frac{1}{4}$ SW$\frac{1}{4}$ sec. 5, T. 2 S., R. 7 W.

Depth (ft)	Horizontal permeability (md)	Porosity (%)
322	27.0	17.4
323	71.0	20.7
324	573.0	22.7
325	45.0	22.3
326	627.0	20.7
327	431.0	21.9
328	348.0	21.9
329	627.0	23.8
330	193.0	21.9
331	261.0	19.7
332	382.0	23.2
333	25.0	17.1
334	197.0	20.5
335	190.0	17.5
336	IMP	3.3
337	96.0	14.6
338	418.0	21.4
339	159.0	18.5
340	340.0	19.5
341	251.0	18.8

Table 3. - Continued

Depth (ft)	Horizontal permeability (md)	Porosity (%)
John Frisch Heirs No. 2—continued		
342	152.0	19.0
Average permeability	271.0	
Average porosity	20.2	
W. Baltz No. 1 SE¼ SW¼ NW¼ sec. 32, T. 1 S., R. 7 W.		
345	81.0	24.3
346	124.0	23.0
347	127.0	25.4
348	128.0	24.5
349	91.0	24.1
350	80.0	19.6
351	120.0	22.3
352	125.0	22.9
353	79.0	20.0
354	70.0	22.7
355	30.0	21.7
356	16.0	17.8
357	11.0	17.5
358	7.0	16.0
359	----	----
360	0.8	14.3
361	0.9	18.9
362	1.7	17.3
363	0.4	16.9
Average permeability	46.6	
Average porosity	19.6	
Sentry Royalty No. 3 SW¼ NE¼ NE¼ sec. 5, T. 2 S., R. 7 W.		
329	2.9	17.4
330	38.0	19.7
331	56.0	20.2
332	47.0	21.5
333	120.0	20.9
334	51.0	19.1
335	37.0	19.3
336	16.0	18.7
337	41.0	21.5
338	65.0	21.9
339	62.0	21.7
340	69.0	17.9
341	48.0	23.8
342	60.0	24.3
Sentry Royalty No. 3—continued		
343	45.0	20.4
344	58.0	18.1
345	16.0	23.2
346	84.0	23.5
347	83.0	23.7
348	68.0	22.7
349	57.0	23.1
350	65.0	22.9
351	66.0	22.9
352	60.0	22.1
353	55.0	21.7
354	76.0	20.7
355	70.0	21.0
356	56.0	21.7
357	57.0	23.9
358	17.0	18.6
359	93.0	21.0
360	105.0	22.3
Average permeability	57.6	
Average porosity	21.3	

STRUCTURE

The Freeburg gas reservoir is a stratigraphic trap about 25 feet below the base of the Beech Creek (Barlow) Limestone (fig. 3). The sandstone in the Cypress Formation (figs. 3, 4), which is about 50 feet thick on the east side of the pool, thins out to shale updip to the west side. The shale interval between the base of the Beech Creek (Barlow) Limestone and the Cypress gas sand, where the sand is present, ranges from 28 feet on the east and south sides to 16 feet on the north side.

The structure at the base of the Beech Creek (Barlow) Limestone appears to be a double anticlinal nose dropping some 60 feet to the east, which is the normal regional dip into the Illinois Basin. The Beech Creek also dips about 50 feet to the north and to the south of the pool, the length of this north-south section being four to five miles, according to available

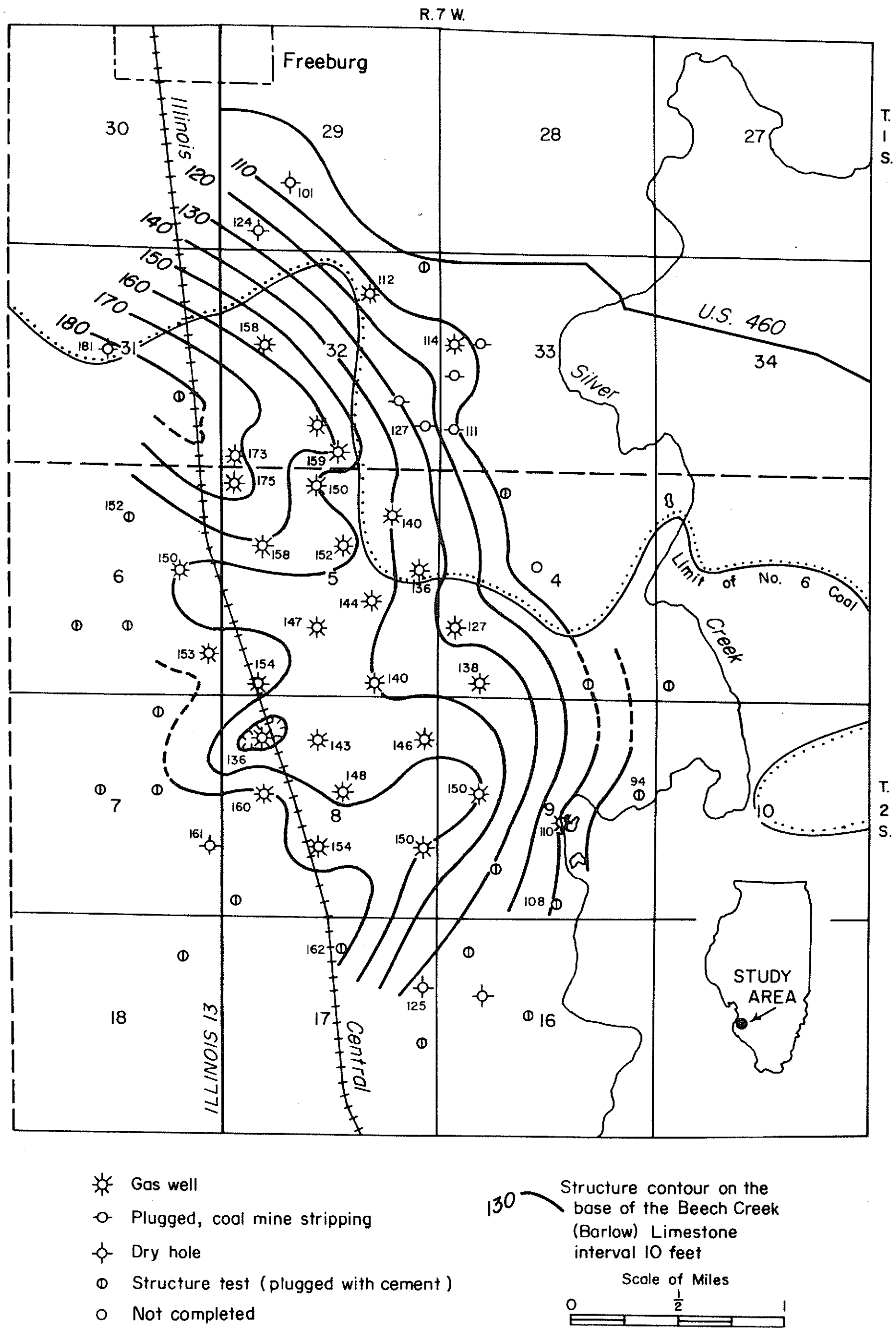

Fig. 3. - Freeburg Gas pool showing structure contours on top of the Beech Creek (Barlow) Limestone.

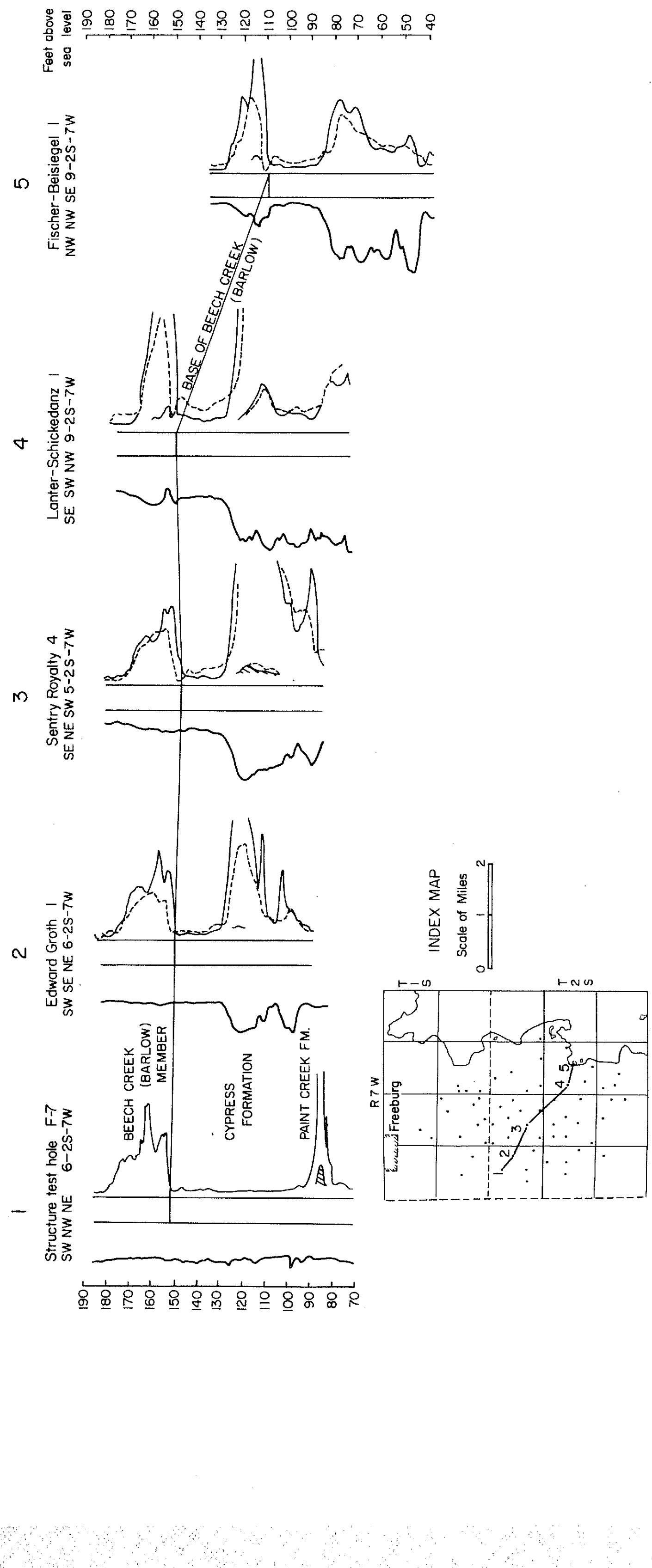

Fig. 4. - Electric log cross section of the Cypress gas sand showing that the sand shales out up-dip to the northwest.

well data. A well drilled in the NE$\frac{1}{4}$ SE$\frac{1}{4}$ sec. 19, T. 2 S., R. 7 W., encountered the base of the Beech Creek (Barlow) Limestone at an elevation of 134 feet above sea level.

The cross section of electric logs (fig. 4) shows a large body of sandstone in well No. 4 and indicates that it splits into two benches in wells No. 2 and No. 3. The shut-in gas pressure of well No. 2 indicates by its low psi reading that the upper sandstone bench of that well does not correlate with the upper bench of well No. 3. The reading in No. 2 was 152 psi compared to the normal reading of 164 psi in No. 3. It would seem that the upper sandstone of No. 2 well represents a lens or constitutes a separate reservoir.

The limit of No. 6 Coal (fig. 3) roughly encircles the northern part of this structure and continues eastward around the eastern projection of the structure into sec. 9, T. 2 S., R. 7 W. The coal is probably eroded in section 16.

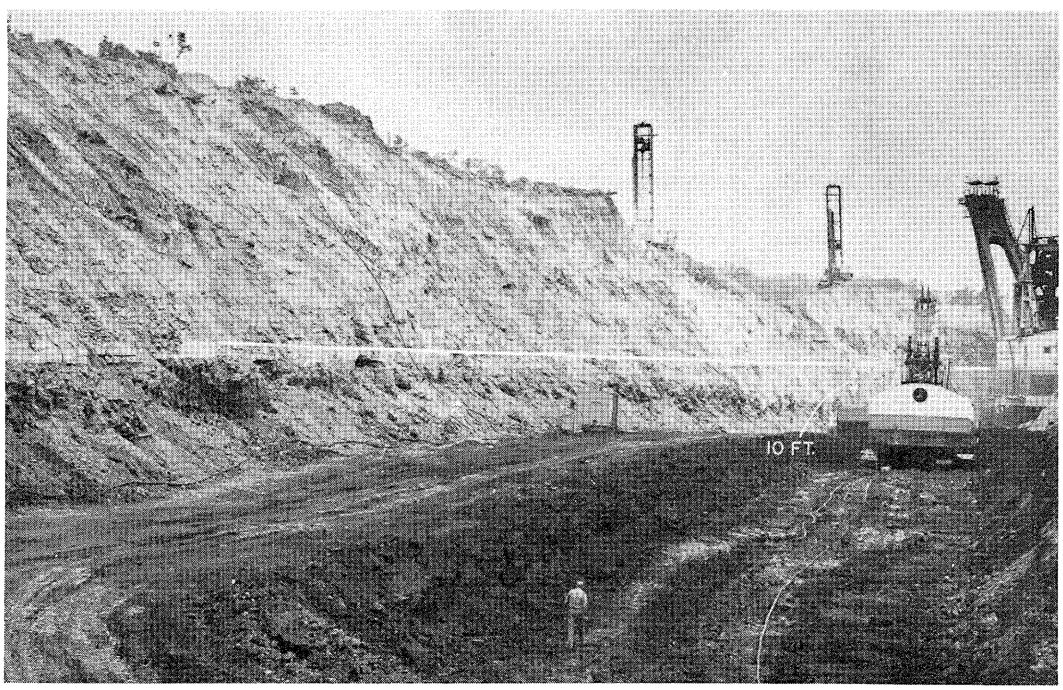

Fig. 5. - The horizontal white line drawn on the photograph marks the top of the Jamestown Limestone at the left. It shows that the limestone dips 10 feet within the distance, as marked, but it actually dips 20 feet within three-eighths of a mile. The exposure was in the highwall of Peabody Coal Company's River King Mine.

Figure 5 shows the northeast dip of the Jamestown Limestone above the No. 6 Coal through sec. 33, T. 1 S., R. 7 W. The rock face exposed in this picture is about three-eighths of a mile long and is facing southeast. The Jamestown Limestone drops about 10 feet from the left-hand side of the picture to the first shovel and about 20 feet for the length of the cut. The white line across the center of the picture is level.

STRATIGRAPHY

A thin cover of glacial drift overlies the bedrock in the area of the Freeburg gas pool. Pennsylvanian rocks underlie the drift and are exposed in the high wall of the Peabody Coal Company's River King Mine in secs. 32 and 33, T. 1 S., R. 7 W. (fig. 5). D. L. Reinertsen in 1958 described the section in detail, as follows.

	Thickness (ft.	in.)
Pleistocene Series		
Glacial drift	15±	
Pennsylvanian System		
McLeansboro Group		
Interval, partially covered. Appears to be mainly composed of medium greenish gray shale with an 18-inch to 2-foot sandstone (?) zone near the base (not accessible)	7±	
Limestone or claystone (inaccessible)	1±	
Shale, gray to medium dark gray with greenish cast	2±	
Cutler Limestone, brownish gray, very hard, argillaceous, dense	1±	
Shale, greenish gray, appears to be fissile but is plastic when wet; in beds up to 6 inches thick interbedded with very argillaceous nodular limestone bands up to 1½ inches thick that become thicker and more abundant toward top; very irregular top	3±	
Bankston Fork Limestone, gray to brownish gray, dense to finely crystalline, somewhat argillaceous in part, thick-bedded to massive	2	3
Shale, gray to dark gray with a slight greenish cast in part, containing a zone of flattened calcareous nodules up to 1 inch thick 5 inches from the top	3±	
Shale, light to medium gray, rather poorly bedded in lower part; better bedded and dark gray to black toward top	4	0
Jamestown Limestone, brownish gray, massive, very dense and hard, somewhat argillaceous	2	0
Shale, dark gray to black, fairly well bedded, somewhat slaty in part with numerous flattened oval ironstone concretions		7
Jamestown Coal, normally bright-banded with some calcite on vertical facings; fairly hard; considerable oxidation on surface		3
Clay-shale, dark gray to black, soft, crumbly, weathered, with a semblance of bedding downward		2
Herrin Limestone, medium to dark gray, fairly hard, very fossiliferous, very silty and argillaceous. Grades downward into:		11
Limestone, light to medium gray, massive to thick-bedded, hard, fossiliferous. Thickness increases toward east of pit		20-72+

	Thickness (ft.	in.)
Shale, black to dark gray, slaty and hard in part, containing dense, hard, dark gray to black calcareous concretions up to 10 inches thick and 2 feet across (not well exposed)		6-84
Herrin (No. 6) Coal, normally bright-banded	6	
Underclay		

The Pennsylvanian System is 138 feet thick over the top of the gas producing area in the Walter Stoneman No. 2 well in the SW$\frac{1}{4}$ SW$\frac{1}{4}$ SW$\frac{1}{4}$ sec. 32, T. 1 S., R. 7 W. Rotary cuttings from this well of formations below the Pennsylvanian are described by E. Atherton below.

	Thickness (ft.)	Depth (ft.)
Mississippian System		
Chester Series		
Hardinsburg Formation		
"Shale"	22	160
Golconda Formation		
"Lime"	7	167
"Shale"	8	175
"Lime"	20	195
Limestone, cherty, light brownish gray, very fine to coarse, fossiliferous, trace of glauconite, streaks of dolomite	2	197
Shale, gray, flaky; trace of shale, red	24	221
Limestone, oolitic, light brownish gray to light brown, medium to coarse; little dolomite, gray, extra fine	9	230
Shale, gray, flaky; limestone, light grayish green, sublithographic	6	236
Shale, gray, flaky	16	252
Limestone, light brownish gray to light brown, fine to coarse, fossiliferous	6	258
Shale, gray, light greenish gray, flaky	20	278
Limestone (Beech Creek Member), very argillaceous, brownish gray, gray, dense, few carbonaceous specks	10	288
Limestone (Beech Creek Member), oolitic in part, brownish gray, medium dark gray, fine to coarse, fossiliferous, scattered black grains	9	297
Cypress Formation		
Shale, gray, red; sandstone, shaly, calcareous, argillaceous, greenish gray, very fine, angular, friable; siltstone, gray, coarse	16	313
Sandstone, gray, very fine to little fine, angular, friable, slight show of oil	22	335
Shale, red; sandstone, as above, very fine	6	341
Shale, gray; sandstone, olive gray to dark gray, quartzitic	12	353

	Thickness (ft.)	Depth (ft.)
Shale, gray, slightly carbonaceous; little shale, red; sandstone, gray, very fine, compact, slightly carbonaceous	9	362
Sandstone, light gray, very fine to fine, angular, friable, oil show	2	364
Sandstone, gray, very fine, angular, friable, black specks, oil show	4	368
Paint Creek Formation		
Limestone, light brownish gray, coarse, very fossiliferous; shale, extra-fossiliferous, sandy, red and light grayish green	12	380
Shale, red, greenish gray	7	387
Limestone, sandy in part, light brownish gray, mostly coarse, very fossiliferous; streaks of shale, greenish gray	7	394
Shale, silty, greenish gray, red streaks; little shale, yellow	5	399
Siltstone, very shaly, greenish gray	9	408
Yankeetown (Benoist) Formation		
Sandstone, calcareous, medium light gray, very fine, compact, slightly micaceous; trace of sandstone, white, fine, angular, friable	17	425
Renault Formation		
Shale, gray, green, red, yellow, purple	24	449
Aux Vases Formation		
Sandstone, light gray, fine to little medium, angular to subangular, friable	43	492
Siltstone, dark green; shale	2	494
Valmeyer Series		
Ste. Genevieve Limestone (samples from depth 490 to 560 feet probably out of place; log unreliable)		
Limestone, oolitic, light brownish gray, fine to coarse, crinoidal, glauconitic in part	6	500
Limestone, oolitic, pale buff, medium to coarse, light-shelled ooliths; limestone, sandy to very sandy, pale gray, fine to coarse, slightly glauconitic; limestone, hematitic, gray, fine to coarse, very fossiliferous,	10	510
Shale, red, green, gray	5	515
Sandstone, light gray, light greenish gray, very fine, friable; limestone, silty to very silty, gray	10	525
Limestone, oolitic in part, sandy in part, light brownish gray, fine to coarse	30	555
Limestone, oolitic to obscurely oolitic, light brownish gray, fine to coarse, rather dense	30	585
Limestone, oolitic, grayish brown, fine to coarse, in part with sand grains, medium to coarse, sub-rounded; little dolomite, cherty, light brownish-gray, extra fine	35	620

	Thickness (ft.)	Depth (ft.)
St. Louis Limestone		
Limestone, cherty, medium light brownish gray, sublithographic	30	650
Limestone, medium light brownish gray, dense; little dolomite, brownish gray, very fine, vuggy	25	675
Limestone, slightly cherty, light brownish gray, sublithographic; limestone, as above; dolomite, very calcareous, light gray, extra fine	13	688
"Limestone"	10	698
Limestone, cherty, medium light brownish gray, sublithographic to dense; little limestone, oolitic, grayish brown, fine to medium, dense; little limestone, dolomitic, gray, extra fine	30	728
Limestone, light brownish gray, dense	12	740
Dolomite, calcareous, light brownish gray, extra fine	6	746
Limestone, cherty, medium light brownish gray, dense	10	756
"Limestone"	10	766
Limestone, cherty, grayish brown, dense, in part obscurely oolitic	8	774
Salem Limestone		
"Limestone"	10	784
Limestone, oolitic, medium light brownish gray, mostly very fine to fine, few microfossils	12	796
Limestone, slightly oolitic, medium light brownish gray, little grayish brown, very fine to fine, coarse, fossiliferous, <u>Endothyra</u>	34	830
Limestone, oolitic, brownish gray, medium to coarse, fossiliferous; little limestone, brownish gray, sublithographic; dolomite, calcareous, silty, gray, extra fine	25	855
Limestone, oolitic in part, medium light brownish gray, fine to coarse, abundant microfossils	10	865
Limestone, brownish gray, sublithographic	10	875
Limestone, oolitic, light brownish gray, medium to coarse	20	895
Limestone, slightly cherty in part, grayish brown, very fine to coarse, fossiliferous; streaks of dolomite, brownish gray, very fine, few carbonaceous flakes	30	925
Limestone, very dolomitic in part, light brownish gray, little light gray, very fine to coarse, fossiliferous, carbonaceous flakes	10	935
"Limestone"	20	955
Limestone, dolomitic in part, light gray, grayish brown, fine to coarse, very fossiliferous, crinoidal	30	985
Limestone, light brownish gray, mostly coarse, very fossiliferous, crinoidal, in part with black grains and gray bryozoa	20	1005
Limestone, light grayish brown, light gray, fine to coarse, very fossiliferous, crinoidal, some chalky white bryozoa, few dark bryozoa	20	1025

	Thickness (ft.)	Depth (ft.)
Limestone, as above, dolomitic in part; dolomite, light grayish brown, extra fine	31	1056
Warsaw Formation		
Dolomite, gray, extra fine, in part very calcareous, fossiliferous; geode quartz	14	1070
Dolomite, as above; limestone, gray, fine to coarse, very fossiliferous, glauconitic; little geode quartz	10	1080
Dolomite, as above, slightly glauconitic; little geode quartz	16	1096
Dolomite, gray, extra fine, in part calcareous, fossiliferous; limestone, very cherty, very fossiliferous, light gray, gray, with dark grains and fossils, fine to coarse	12	1108
Dolomite, cherty, dark gray, extra fine, shaly, in part calcareous, fossiliferous	22	1130
Burlington-Keokuk Limestone		
Limestone, very cherty, light gray, mostly coarse, very fossiliferous	8	1138
Shale, red, light green	7	1145
Limestone, very cherty, light gray, coarse, very crinoidal	43	1188
Limestone, very cherty, slightly dolomitic, light gray, very fine and coarse, crinoidal	10	1198
Limestone, as above; dolomite, cherty, medium light gray, extra fine	10	1208
Limestone, very cherty, dolomitic, light gray, very fine and coarse, crinoidal; grading to dolomite, very fine	20	1228
Limestone, very cherty, dolomitic, light gray to pale buff, very fine and coarse, fossiliferous, bryozoan; grading to dolomite	20	1248
Same, mostly dolomite, light gray, extra fine, very cherty	30	1278
Dolomite, medium light gray, extra fine	10	1288
"Limestone and dolomitic limestone"	40	1328
Limestone, very cherty, light buff, very fine and coarse, very fossiliferous; little chert, dolomitic, light gray, extra fine, glauconitic	5	1333
Limestone, as above; dolomite, cherty, gray, extra fine, slightly glauconitic	10	1343
Chert, gray, light blue-gray; little dolomite, gray, extra fine, slightly glauconitic	5	1348
Limestone, very cherty, light buff, brownish gray, fossiliferous; dolomite, very cherty, gray, extra fine	10	1358
Dolomite, cherty, gray, little brownish gray, extra fine, black specks, slightly glauconitic; little limestone, cherty, brownish gray, fossiliferous, rather dense	15	1373
Limestone, extra cherty, very dolomitic in part, brownish gray, little light gray, extra fine; dolomite, very cherty, light gray, extra fine, very glauconitic	10	1383

	Thickness (ft.)	Depth (ft.)
Limestone, extra cherty, brownish gray, dense; dolomite, extra cherty, brownish gray, extra fine; chert, very glauconitic	7	1390
Dolomite, extra cherty, light gray, extra fine, extra glauconitic	4	1394
Fern Glen Formation		
Shale, gray, glauconitic	8	1402
Shale, grayish green	15	1417
Shale, grayish green, gray	13	1430
Shale, red	2	1432
Kinderhook Series		
Chouteau Limestone		
Limestone, very silty, dolomitic, red, extra fine	2	1434
Limestone, light brownish gray, light gray, brown, light olive gray, sublithographic	5	1439
Limestone, brownish red, sublithographic	6	1445
Limestone, red, brown, sublithographic	8	1453
New Albany Shale		
Shale, very dark gray, few spores	6	1459
Silurian System		
Niagaran Series		
Thorn Group		
Dolomite, light gray, extra fine, few very fine vugs, few small spots of oil	8	1467
Limestone, silty, dolomitic, light gray to gray, light olive gray, sublithographic	31	1498
Dolomite, argillaceous, calcareous, gray, marly	14	1512
"Limestone"	14	1526
"Dolomite"	9	1535
Limestone, medium light olive gray, little light gray, gray, sublithographic	20	1555
Dolomite, calcareous, silty, gray, extra fine; limestone, dolomitic, silty, medium light olive gray, extra fine	18	1573
Limestone, medium light olive gray, sublithographic	7	1580
Limestone, very dolomitic, silty, light olive gray, light gray, extra fine	12	1592
Bainbridge Group		
Moccasin Springs Formation		
Dolomite, argillaceous, gray, greenish gray, red, extra fine; little shale, red	22	1614
Dolomite, argillaceous, greenish gray, red, extra fine; limestone, light olive gray, sublithographic	10	1624
Limestone, argillaceous, red, shaly	10	1634
Limestone, light gray, rather dense; limestone, light reddish brown, abundant red argillaceous grains	4	1638
Limestone, very silty, dolomitic, red, extra fine; little shale, calcareous, silty, red	20	1658
"Dolomite, argillaceous"	10	1668

	Thickness (ft.)	Depth (ft.)
Limestone, very silty, dolomitic, red, grayish green, extra fine; little shale, silty, red, grayish green	5	1673
Limestone, as above; little limestone, light brownish gray, sublithographic, scattered red grains	10	1683
St. Clair Limestone		
Limestone, light olive gray, sublithographic, few red grains	10	1693
"Limestone"	10	1703
Limestone, light brownish gray, little red, white, light brownish red, sublithographic, scattered red grains	31	1734
Alexandrian Series		
Limestone, cherty, light gray, little light greenish gray, sublithographic, glauconitic	14	1748
Limestone, cherty, light brownish gray, sublithographic, in part dolomitic; little dolomite, calcareous, brownish gray, extra fine	10	1758
Limestone, dolomitic, slightly cherty, light brownish gray, extra fine	5	1763
Dolomite, calcareous, light brownish gray, extra fine	5	1768
Ordovician System		
Maquoketa Shale		
Shale, medium dark greenish gray; sandstone, calcareous, gray to light gray, very fine, compact, pyritic in part, abundant black specks	27	1795
Shale, medium dark greenish gray; some laminae of siltstone and sandstone, medium dark greenish gray	20	1815
"Shale"	15	1830
Shale, dark greenish gray	20	1850
Shale, as above; interlaminated siltstone, dark greenish gray	10	1860
Shale, dark greenish gray	10	1870
Shale, calcareous, dolomitic, dark greenish gray; dolomite, very calcareous, extra silty, olive gray, extra fine	40	1910
Dolomite, as above, with black specks	6	1916
Kimmswick ("Trenton") Limestone		
Limestone, light brownish gray, very fine to coarse, little white chalk, few fine dolomite crystals, in part with Receptaculites	49	1965
Limestone, as above; little limestone, very dolomitic, brown, light gray, very fine to fine	40	2005
Plattin Limestone		
Dolomite, slightly cherty, grayish brown, very fine to fine	4	2009

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