THE PETROLEUM INDUSTRY IN INDIANA IN 1904.

By W. S. Blatchley.

Once more it can be recorded that the Indiana petroleum industry has broken its record. The output for the year 1904 was greater than in any previous year, both in number of barrels produced and in value, though the average market price declined nearly 7 cents. Since 1898 each year has seen an increase in production, and in the seven years the annual output has more than trebled. As a very full report, accompanied by a map, was made on the industry in the State for the year 1903, but brief mention of the more important developments in 1904 will be given in connection with the statistics for the year.

The Trenton Rock Oil Fields of Indiana for the Year 1904.

The new productive territory and the most important developments of the year were mainly in the Muncie-Parker-Selma field of Delaware and Randolph counties, the center of operations having shifted from Marion, Grant County, to Muncie, in Delaware. Here the greater number of wells put down in 1904 were sunk from 280 to 320 feet in Trenton limestone, it having been discovered in the latter part of 1903 that a second or third pay streak occurs in that area at a depth of 240 to 300 feet below the top of Trenton. Heretofore most of the productive wells of the State had been drilled less than 90 feet in the Trenton rock.

In Grant County the new developments were mainly in Washington and Jefferson townships. In Washington, north of Marion, sections 10 and 11, the south halves of 25 and 26 and all of 28, 29 and 33 were added to the fair to good productive area of the map of the previous year. In Jefferson Township, in the southeastern corner of the county, sections 5, 6, 7, 8, 17, 18, 19 and 20

came in as light productive territory, while bores sunk in 9, 10, 15, 16 and 22 were for the most part dry. Some fair to good territory was opened up in the vicinity of Matthews, in sections 31, 32 and 33 (23 N., 9 E.), and in 1, 2 and 4 (22 N., 9 E.). Bores sunk in sections 22, 27, 28, 32, 33 and 35, Monroe Township, Grant County, were for the most part dry or productive of gas.

No noteworthy extensions of productive territory were made in Huntington County. In Wells quite an area in the immediate vicinity of Poneto was added to the map, section 31, Harrison Township; 34, 35 and 36, Liberty Township; 3 and 6, Nottingham Township, and 1 Chester Township, proving, for the most part, fair territory.

In Blackford County the only new developments of consequence were in sections 6, 7 and 8, Licking Township, where a number of light producers were drilled in.

As noted above, Delaware County furnished the most of the new producing territory. In Washington Township sections 11 and 12 yielded a number of fair wells. In Union Township new productive territory was added to the map along the Mississinewa River, between Eaton and Pittsburg; sections 16, 17, 20 and 22 having yielded a number of fair producers, while some good wells were completed on the north half of 14, one mile north of Eaton.

Quite an area of fair to good territory was opened up in Niles Township, in the northeastern part of Delaware County; sections 19, 20, 21, 22, 28, 29 and 30, in the southwestern corner of the township, producing a number of good wells, while sections 31 and 32 and the west half of 33 were lighter.

Section 1, just east of Shideler, in Hamilton Township, yielded a few light wells. Of two deep bores sunk in wildcat territory on the J. G. Leffer farm, in section 22, Hamilton Township, the first came in dry, while the second started at 60 barrels per day. The records of the two showed as follows:

	No. 1. *Feet.*	*No. 2.* *Feet.*
Drive pipe	57	37
Casing	346	343
Top of Trenton	960	914
Total depth	1,396	1,238

A bore sunk by the American Sheet Steel Company of Pittsburg just north of Bethel, in Harrison Township, was drilled clear through Trenton limestone, its thickness being found to be over 800 feet.

In Delaware Township the main developments of the year were in sections 8, 9, 16 and 17, three or four miles southwest of Albany. Of three deep bores sunk on the J. G. Boots farm, in section 16, No. 1 was dry, while Nos. 2 and 3 started at 260 and 200 barrels, respectively. A record of the bores was as follows:

	No. 1. *Feet.*	*No. 2.* *Feet.*	*No. 3.* *Feet.*
Drive pipe	80	80	80
Casing	380	370	370
Top of Trenton	940	960	965
Total depth	1,280	1,290	1,297

In Center Township, Delaware County, the only new territory opened up was west of White River and just southeast of Muncie, in sections 14 and 15, where the wells drilled were generally light in output. Two bores on the J. C. Quick farm, in section 14, one of which yielded salt water and the other 25 barrels, had the following records:

	No. 1. *Feet.*	*No. 2.* *Feet.*
Drive pipe	104	108
Casing	348	350
Top of Trenton	898	890
Total depth	1,212	1,210

Liberty Township, in which the towns of Selma and Smithfield are located, was, in 1904, the seat of the greatest activity in the entire Indiana field. By the close of the year the entire township, with the exception of sections 2 and 12, in the northeast corner and the west half of section 18, was producing more or less oil, and most of the area could be classed as good, the lighter sections being 6, 7, 13, 24 and 25.

The scene of most excitement during the year was in the hamlet of Smithfield, where, at one time, in May, 37 derricks were to be seen on an area of not more than 40 acres. A few of the first wells in the town came in as big producers, but by August the pool had been pumped down until only small wells resulted. In October the main work was being done near Mt. Pleasant cem-

etery, in section 36, Delaware Township, where a new pool of much promise had been opened.

In general the oil in the deep pay wells in Liberty Township is found between 270 and 300 feet in Trenton. An occasional bore is sunk as low as 350 feet in, but they are poor producers. Sometimes what is known as a "stray pay" is found at 150 to 200 feet. The bores in which they occur make quite a showing for a few days, but soon drop to little or nothing. The average deep pay well holds up better than the more shallow ones, a 250-barrel one yielding about 75 barrels at the end of six months. But little gas is now developed in the bores sunk in the township. In October there was barely enough to utilize gas engines for pumping, and for such purpose gas was selling at 60 cents per thousand cubic feet. Drilling was being done with Hocking Valley coal, costing $3.00 per ton.

The oil from the deep pay wells is a little heavier than that from the more shallow ones, and has a tendency to hold together with water, so that most tanks have to be steamed. It is a higher grade product than any other Indiana oil, but the Standard does not recognize that fact, and pays the same per barrel as for South Lima. The average deep pay well is shot with 160 quarts of nitroglycerine. The "sand" or pay streak usually runs from eight to ten feet in thickness, but in some of the best wells occurs 30 to 50 feet thick.

On account of greater depth and increase in cost of lumber and iron, the cost of a well in the deep pay region about Selma ran about $600 more in 1904 than in the shallow bores of the same region in 1903. A careful estimate of the cost of drilling and fitting up the first productive deep pay well on a lease in the Selma field in October, 1904, ran about as follows:

Rig or derrick	$425
Drilling	900
Drive pipe	120
Casing	120
Shooting	140
Tubing and pumping outfit	220
Power house and power	725
Two tanks	180
Belting and lead lines	125
Incidentals	100
Total	$3,055

After the power was in place, each succeeding well could be added for about $1,700, and, without shooting, each dry hole cost $1,000. The price of drilling was 50 cents a foot to the bottom of the first 50 feet in Trenton, $1.00 a foot for the next 100 feet and $1.50 for the remainder. Twenty-five cents extra per foot was charged for all drive pipe above 100 feet. The rig was erected by the operator and the contractor furnished his own fuel. Most drilling was being done by contract, though a few of the larger companies were operating their own strings of tools. In general the Standard rig was used, but a few Star machines were at work. Drillers were receiving $4.50 and tool dressers $3.50 per shift of 12 hours, while pumpers were getting $50 a month.

One of the best areas operated in southwestern Liberty Township in October was in sections 20 and 29, on the farms of Collins and Cecil. On the Collins lease of 140 acres there were six wells yielding 125 barrels each and one dry hole within 600 feet of one of the best wells. On the Edward Cecil lease there were four and on the Walter Cecil nine wells, the thirteen averaging 75 barrels each. A record of No. 1 Walter Cecil and No. 2 Collins ran as follows:

	No. 1 Cecil.	*No. 2 Collins.*
	Feet.	*Feet.*
Drive pipe	123	207
Casing	328	320
Top of Trenton	927	913
Total depth	1,197	1,190

The No. 1 Cecil was what is termed a crevice well, coming in on July 27 as a 200-barrel producer without being shot. The No. 2 Collins started September 30 at 200 barrels and was producing 100 barrels daily on October 27. No top or shallow pay was found in either well. On the Louis Reese lease a bore 80 rods south of the Cecil No. 1 developed top pay at 30 feet in Trenton. This was about five feet thick, and was good for eight to ten barrels daily. The bore was continued to 275 feet in Trenton and started off at 150 barrels. Before being operated an annual rental of $1.00 an acre had been paid for this area for ten or more years.

A few light wells and several dry holes were sunk in the north half of Perry Township, just south of Liberty, during the year.

On the Z. T. Dunkin lease of 100 acres, in the northwest quarter of 28, Liberty, there were 19 producing wells on October 27.

Of these 15 were deep pay wells, drilled between March and October. Three of them started at over 100 barrels and the 19 were making a total of 350 barrels on the date mentioned. Two of the wells, Nos. 8 and 10, had the following records:

	No. 8. *Feet.*	*No. 10.* *Feet.*
Drive pipe	94	96
Casing	345	345
Top of Trenton	951	946
Total depth	1,229	1,231

No upper pay was found in either. No. 8 started at 25 barrels and No. 10, on July 10, at 125 barrels. On October 27th it was yielding 25 barrels per day. Dunkin was receiving $50 a day royalty from the 100 acres, and had received altogether about $10,000.

On the Arthur Cecil lease of 200 acres, just north of Dunkin, in section 21, there were 22 wells producing, 16 of which were in deep pay. The average bore on this lease found Trenton at 932 feet and the lower pay at about 1,210 feet. Water was usually found in the upper porous stratum where oil was formerly looked for, but not in sufficient quantity to cause trouble. The lower pay averaged about 11 feet in thickness.

On the H. K. Lewis farm, just north of Smithfield, the sound of the pumping gas engine was heard on every side. Twenty-one wells were producing, eighteen of which were in deep pay. Only one dry hole had been bored, and the best well started at 320 barrels. Three others had an initial output of 300 barrels each. A record of the No. 8 bore, which started June 25 at 300 barrels, may be taken as an average of the lease, and showed as follows:

	Feet.
Drive pipe	103
Casing	340
Top of Trenton	922
Total depth	1,208

When finished this bore and the seven preceding made 850 barrels a day for some time. The new wells since put down had not kept the production up to that figure, i. e., the production fell off faster than the new wells could add to it, and on October 27 the 21 producing wells were yielding a total of 600 barrels per day.

The Utica shale, which overlies the Trenton, is in the vicinity of Smithfield, about 200 feet thick and light brown in color. The Hudson River shales and limestones run more uniform in color and texture than in the main field. About Marion they are said to vary from light to dark blue every 25 or 30 feet.

The latest and one of the best so-called pools opened up in Liberty Township in 1904 was in the northeast corner, in the northeast quarter of section 11, the southeast of 2 and the northwest of 1. The pool also includes the southwest quarter of 36, Delaware Township. The Commonwealth Jewel and Oil Company were operating 20 wells in the southwest of 36 and northwest of 1, which were making 1,200 barrels per day the last of October, and had produced as high as 1,500 barrels. The James Baughn No. 1, in the southwest of 36, finished July 13, was the biggest producer in the State for the year. It is said to have started at 800 barrels and filled 40 250-barrel tanks the first two weeks. On October 27 it was yielding about 50 barrels per day. The record of the bore showed as follows:

	Feet.
Drive pipe	27
Casing	325
Top of Trenton	921
First oil	1,181
Total depth	1,213

From the time the first oil was struck, at 1,181 to the bottom, a distance of 32 feet, the drill passed through a very porous brown limestone or pay streak. No shallow or top pay occurs in this part of the township.

From the office of the Commonwealth Jewel Company, on the middle of the south line of section 36 (northeast corner of Liberty Township), or near Mt. Pleasant cemetery, 75 derricks could be counted on October 27, all of which had been erected since June 17, when the first well in the pool came in on the M. S. Thorpe lease. Most of the drilling has, for some reason, been done on the lowlands along the streams, though there is no reason for the belief that such locations will furnish the better wells. Much untested territory, which will eventually prove productive, lies west and southwest of the Mt. Pleasant pool.

In Randolph County the main developments of the year were

in Monroe and Stony Creek townships. North of the famous Cecil pool, near Parker, a number of good wells were drilled in on section 34 (21 N., 11 E.) and on 3, 4 and 5 (20 N., 11 E.). Section 28, Stony Creek Township, has also become good territory, while the area between it and Parker is all productive.

The importance of the developments in the Muncie-Parker-Selma field is best shown by the following table of production by months for the year, the output for October being nine times as great as for January:

NUMBER OF BARRELS OF OIL PIPED OR SHIPPED FROM THE MUNCIE-PARKER-SELMA OIL FIELD IN 1904, BY MONTHS.

January	42,835
February	33,081
March	40,869
April	46,504
May	73,162
June	115,048
July	176,624
August	240,050
September	311,098
October	384,380
November	356,173
December	382,302
Total	2,202,126

The most important developments of the year 1904 in Jay County were in sections 12, 13, 14, 16, 17, 20, 21, 23, 24, 26, 27, 31, 32, 33 and 36, Bear Creek Township; in sections 10, 13, 24 and 28, Richland Township; sections 5, 8, 17 and 32, Wabash Township, and sections 3, 4 and 17, Noble Township.

In Bear Creek Township the developments of greatest importance were in sections 16, 17, 20, 21 and 33, in what was formerly considered worthless territory, having been condemned by numerous dry holes, that were drilled several years ago. This area now furnishes wells that have an initial production of from 25 to 100 barrels.

The developments in Richland Township were in the deep pay. The oil was found at different depths in Trenton, varying from 85 to 415 feet. On two farms adjoining are wells in which the oil pay is found at five different depths in the sand; that is, each well

yields its oil from a different horizon from that of its neighboring well. One well yields from the top or shallow pay, 15 to 20 feet in Trenton. A second well, only 400 feet distant, is producing from 300 feet in Trenton. A third an equal distance from the second, gets its oil from 80-foot pay, a fourth from 156-foot pay, and a fifth from 415-foot pay. The deeper pay wells were the most prolific producers in the start, some of them yielding from 200 to 450 barrels.

In Wabash Township some especially good wells were finished in section 17 and four fair ones in section 32. In Noble Township two wells were completed during the latter part of the year in section 17 which opened up a large area of new territory that promises to be of considerable importance.

In section 19, Greene Township, a pair of fair producers were also completed late in the year. In them the oil pay was found at a depth of 85 feet in Trenton, the initial production being 25 to 40 barrels.

Two small wells were also drilled in sections 15 and 23, Madison Township. While the initial output was small, the showing was sufficient to warrant further drilling in that vicinity. These wells, together with a showing of oil at or near Saratoga, Randolph County, indicate the possibility of an extension of the field from Wabash Township, Jay County, southward into Randolph County.

In Adams County the new developments were in sections 32 and 36, Wabash Township and sections 27, 28, 33 and 34, Jefferson Township. The wells drilled in sections 28 and 34, Jefferson Township were large producers, and indicate that a new area may become productive in that vicinity.

In most of the isolated areas producing Trenton limestone petroleum in the State the production gradually fell off, and was less in October, which is considered the best month in the year, than in January.

In the Alexandria field 46 bores were sunk, 14 of which were dry, while the average initial output of the productive wells was but 11 barrels. The production by months follows:

NUMBER OF BARRELS OF OIL PIPED FROM THE ALEXANDRIA, INDIANA, FIELD IN 1904, BY MONTHS.

January	19,705
February	19,537
March	20,745
April	21,639
May	23,646
June	29,207
July	28,666
August	28,012
September	6,834
October	6,071
November	7,128
December	5,446
Total	216,636

In the Peru-Rich Valley field nine bores were sunk during the year, four of which were barren. The five productive ones had an average initial output of 6½ barrels each. The production of this pool for the year was but 54,540 barrels, distributed among the months as follows:

NUMBER OF BARRELS OF OIL PIPED FROM PERU AND RICH VALLEY, INDIANA, OIL FIELDS IN 1904, BY MONTHS.

January	4,554
February	2,907
March	3,903
April	4,550
May	4,061
June	5,453
July	4,988
August	5,675
September	5,374
October	4,478
November	5,241
December	3,356
Total	54,540

No new wells were drilled in the Broad Ripple (Marion County) field and the production dwindled from 8,126 barrels in 1903 to 4,558 barrels, distributed among the months as follows:

NUMBER OF BARRELS OF OIL PIPED FROM BROAD RIPPLE, INDIANA, FIELD IN 1904, BY MONTHS.

January	153
February	655
March	154
April	595
May	627
June	...
July	647
August	575
September	...
October	610
November	542
December	...
Total	4,558

STATISTICS OF THE INDIANA TRENTON ROCK PETROLEUM INDUSTRY FOR 1904.

As already mentioned, the output of petroleum from the Trenton limestone fields of Indiana was greater in 1904 than in any previous year. This was due largely to the discovery of oil in the "deep pay" in Delaware County and the consequent development of hundreds of new wells in that section. A second reason for the increased production was the fair average price received throughout the year. New wells were constantly coming in, and all the old ones were pumped to their full capacity. When the price of oil falls below 80 cents the operator often becomes disheartened and stops drilling. Producing wells are also often disconnected. When the price ranges from 80 cents to $1.00 the operator is making a good profit, and the amount of production, provided the field has not reached its limit, is always advanced.

While the tendency in price during nearly the entire year was downward, it at no time fell below 95 cents. Starting the year at the maximum price of $1.31, it held that figure until February 12, when it dropped to $1.26. This price was paid until March 1st, when it began slowly to decline, and on July 13 reached the minimum of 95 cents. This was maintained until September 1, when it rose to 98 cents. On September 25 it had reached the dollar mark and on November 11 advanced to $1.02. This price

was paid until December 17, when another decline began, the price at the close of the year being 96 cents. The average price for the year, taking both time and amount received into consideration, was $1.07\frac{1}{2}$, as against $1.14\frac{3}{20}$ in 1903.

The total production of Trenton rock oil in Indiana in 1904 was 11,281,030 barrels, which, at the average price of $1.07\frac{1}{2}$, brought into the State $12,127,107. Compared with 1903, this was a gain of 2,119,699 barrels, or 21.3 per cent., as against a gain of 21.6 per cent. in 1903. However, on account of the lower average price, the amount received by the producers was but $1,669,448, or 15.9 per cent., more than in 1903.

The first of the following tables gives a complete record of the monthly production of petroleum from the Trenton limestone fields of Indiana for the 14 years beginning January 1, 1891, and ending December 31, 1904. This does not include the amount used in the field for fuel and other purposes, or that wasted by the burning of tanks or the leaking of pipes, but only that shipped or piped by the companies who purchase the oil from the operators. The second table shows the annual production, the average yearly price and the total value by years for the same period.

I. TOTAL PRODUCTION OF TRENTON LIMESTONE PETROLEUM IN INDIANA FROM 1891 TO 1905, BY MONTHS.

(Barrels.)

MONTH.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
January.....	6,171	15,841	111,824	259,000	300,568	365,582	290,746	317,014	297,291	353,451	425,140	554,038	651,355	714,594
February....	5,981	18,946	96,025	232,107	230,559	241,743	309,922	272,780	220,440	302,493	384,735	460,073	568,789	664,058
March.....	5,159	24,794	134,549	282,376	310,303	386,586	311,961	325,301	290,257	364,590	432,922	573,412	724,969	797,133
April.....	4,973	26,184	146,493	287,330	352,077	395,032	328,779	310,034	325,774	381,804	447,261	579,711	680,921	804,121
May.....	5,757	31,033	186,939	321,502	397,001	417,963	340,023	311,208	344,831	426,363	482,118	635,752	751,348	851,071
June.....	8,136	40,888	209,616	333,479	403,569	434,167	369,803	320,477	334,282	446,492	481,807	633,452	809,438	940,391
July.....	10,809	49,203	221,666	327,349	434,376	422,968	375,249	314,861	329,086	437,087	506,065	696,911	831,005	998,229
August.....	11,603	56,109	248,353	345,031	420,132	407,238	371,921	332,777	347,621	466,127	523,106	697,040	838,615	1,084,560
September...	16,500	66,034	245,615	319,588	409,169	415,675	362,528	326,264	332,283	418,716	519,087	672,611	857,117	1,104,771
October.....	19,029	95,699	252,568	339,424	393,153	391,283	408,179	319,490	326,781	467,521	532,960	725,973	873,160	1,139,000
November...	20,801	129,270	245,607	304,030	373,789	337,331	430,958	300,644	326,802	406,684	510,788	656,457	778,323	1,098,832
December....	21,715	144,067	236,038	337,450	361,436	362,164	423,069	300,457	332,266	441,347	479,485	650,131	796,291	1,084,270
Totals....	136,634	698,068	2,335,293	3,688,666	4,386,132	4,680,732	4,353,138	3,751,307	3,807,714	4,912,675	5,725,474	7,535,561	9,161,331	11,281,030

II. PRODUCTION OF TRENTON ROCK PETROLEUM IN INDIANA FROM 1891 TO 1905, WITH VALUE.

	1891.	1892.	1893.	1894.	1895.	1906.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Total production (barrels of 42 gal.)...	136,634	698,068	2,335,292	3,688,666	4,386,132	4,680,732	4,353,138	3,751,307	3,807,714	4,912,675	5,725,474	7,535,561	9,161,331	11,281,030
Total value at wells of all oils produced, excluding pipeage...	$54,787	$260,620	$1,050,882	$1,774,260	$2,807,124	$2,954,411	$1,871,849	$2,228,276	$3,331,750	$4,740,731	$4,775,045	$6,460,440	$10,457,659	$12,127,107
Value per bbl.	$0 40	$0 37	$0 45	$0 48	$0 64	$0 63	$0 43	$0 59⅔	$0 87½	$0 96½	$0 83⅔	$0 85⅔	$1 14⅝	$1 07½

From the first of the above tables it will be seen that the largest production of Trenton rock petroleum in Indiana in any one month was in October, 1904, when 1,139,000 barrels were brought to the surface. The total production of Indiana Trenton rock oil for the 14 years reached the enormous sum of 66,453,785 barrels, which sold for $54,884,941, or an average of $3,920,353 per year.

In the third table there is shown the number of wells completed in Indiana by months from June, 1891, to January, 1905:

III. NUMBER OF WELLS COMPLETED IN THE INDIANA TRENTON LIMESTONE OIL FIELDS FROM 1891 TO 1905, BY MONTHS.

YEAR.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1891.....	.....	.....	.....	.....	.....	.....	6	6	15	15	15	8	65
1892.....	11	13	18	13	17	19	17	30	25	52	33	47	295
1893.....	20	30	31	36	45	47	47	55	27	72	56	76	542
1894.....	90	103	103	80	110	107	84	123	100	107	97	85	1,189
1895.....	61	45	81	111	122	153	132	140	129	106	102	85	1,267
1896.....	76	90	86	136	148	150	113	121	70	58	66	66	1,180
1897.....	41	35	40	47	49	52	60	45	55	89	119	54	686
1898.....	41	23	29	43	38	55	53	80	72	82	92	86	694
1899.....	75	48	68	64	87	99	77	104	106	118	106	105	1,057
1900.....	113	67	98	148	165	163	158	155	135	152	118	108	1,580
1901.....	111	72	81	121	167	171	167	169	184	207	220	132	1,802
1902.....	176	113	169	182	247	297	288	279	323	295	320	243	2,932
1903.....	168	178	233	236	331	408	377	387	337	366	375	290	3,686
1904.....	235	157	234	202	296	393	394	383	378	388	320	344	3,724
Total...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20,699

From this table we learn that but 38 more bores were sunk for oil in the Trenton rock fields of Indiana in 1904 than in the previous year. In 1903 the gain over 1902 was 754. Outside of Delaware and Randolph counties, the great majority of new bores were sunk in already proven territory by companies whose members were content to sink fair producing wells and develop what oil they could beneath their leases rather than seek far and wide for new territory which might produce a "gusher."

From the table it may also be learned that up to January 1, 1905, 20,699 bores had been drilled in the Trenton rock fields of

Indiana for oil alone. On that date there were 15,228 producing wells in the fields, as against 12,098 on January 1, 1904, a gain of 3,130 for the year. By subtraction it will be noted that of the total number of bores sunk for oil in the Trenton rock fields of the State 5,471 have proven dry, or have been abandoned as non-productive. The number abandoned in 1904 was 211, or 36 more than in 1903, while the number of dry holes drilled during the year was 383, or seven more than in 1903. Of the total number of bores sunk in 1904, 10.2 per cent. were dry, this percentage being exactly the same as in 1903.

On October 15, 1904, there were approximately 14,440 producing wells in the Trenton rock fields of the State. The production of oil for the entire month of October was 1,139,000 barrels, or an average of 2.54 barrels per well for each day of the month. The average daily output in October, 1903, was 2.48 barrels for each productive well. This shows a slight gain for the year, due to the larger production of the deep pay wells in the Selma-Parker field.

Since the average output per well is always less during the winter months than during other seasons, the average for the year would probably be about 2.4 barrels per well per day, a seemingly small amount, yet totaling more than 11,250,000 barrels for the field for the year 1904.

These figures go to prove that the days of the gusher are practically over in the older portions of the main field, where most of the bores were sunk. It is better for the practical producer that this is true. A well starting at 200 barrels or more a day creates an excitement and a rush for territory that, in the end, proves harmful to all concerned. Large bonuses are paid out and big risks taken which are foreign to territory whose wells are small but sure producers. As has been stated in my former reports, one large well will not make any man a fortune; twenty small ones may in time. The yield of the large producer will quickly grow much less; that of the twenty small ones will hold out for a long time. There is yet room for thousands of wells in the known productive territory. At present prices, eight to ten wells, pumped by one power and yielding on an average but one and a half barrels each per day, will prove a paying investment.

The following table shows the number of producing wells, number of dry holes, total bores and average initial production of wells drilled in each of the Trenton rock oil producing counties of Indiana in 1903 and 1904:

COUNTY.	Producing Wells, 1903.	Producing Wells, 1904.	Dry Holes,* 1903.	Dry Holes,* 1904.	Total bores,* 1903.	Total bores,* 1904.	Percentage of Dry Holes, 1903.	Percentage of Dry Holes, 1904.	Average Initial Production of Productive Wells, 1903.	Average Initial Production of Productive Wells, 1904.
Adams	287	237	30	25	317	262	9.4	9.5	15.1	13.1
Allen	2	0	2	0	4	0	50.	0	25.	0
Blackford	353	201	41	21	394	222	10.4	9.4	11.1	9.8
Delaware	74	831	48	121	122	952	39.3	12.7	20.7	44.4
Grant	1,289	977	94	91	1,383	1,068	6.8	8.5	15.1	11.2
Hamilton	0	0	7	0	7	0	100.	.0	.0	.0
Huntington	302	324	10	8	312	332	3.2	2.4	19.4	18.2
Jay	180	277	33	52	213	329	15.5	15.8	13.4	17.1
Madison	46	35	19	15	65	50	29.2	30.	8.	10.5
Miami	1	5	1	3	2	8	50.	37.5	5.	6.4
Randolph	78	86	50	27	128	113	39.	23.9	43.	43.2
Wabash	3	0	1	1	4	1	25.	100.	3.	.0
Wells	695	368	40	19	735	387	5.4	4.9	14.	12.
Totals	3,310	3,341	376	383	3,686	3,724	†10.2	†10.2	†14.2	†18.6

*These columns include bores sunk for oil which yielded gas.
†Denotes *average*.

From the table it will be seen that the average initial production for the year in the entire field gained 4.4 barrels, being 18.6 barrels per well, as against 14.2 barrels in 1903. This gain was due almost wholly to the high initial output of the deep pay wells of Delaware and Randolph counties, all the older producing counties, except Jay, falling off in initial production. In Delaware the average jumped from 20.7 to 44.4 barrels, while in Randolph there was but a slight gain, as most of the productive bores sunk in that county in 1903 were heavy producers at the start. In Jay County there was a gain of 3.7 barrels per well.

The table gives only a partial idea of the importance of the deep pay developments in Delaware County. The number of productive bores in the county increased from 74 to 831, while the percentage of dry holes dropped from 39.3 to 12.7 per cent. Of the 72,152 barrels increase in new production in the entire field during the year, Delaware County alone furnished 36,877 barrels, or more than 50 per cent.

Grant County outranks Delaware in the number of bores sunk during the year and in the lower percentage of dry holes, but the

wells being mostly in shallow pay, showed only about one-fourth the average initial production of those of Delaware. Huntington again leads all the older producing counties, with an average initial output of 18.2 barrels, while its percentage of dry holes was but 2.4. A bore sunk within known productive limits in Huntington County is almost as sure a venture as one can make anywhere in the United States in the oil business. Wells County dropped to third place in the number of bores sunk, but at the same time decreased its percentage of dry holes from 5.4 to 4.9, ranking next to Huntington in low percentage. From a careful study of the table one can learn many other facts regarding the relative importance of each county in the field.

CORNIFEROUS ROCK PETROLEUM.

No new territory producing Corniferous rock petroleum was opened up in Indiana in 1904. The two wells at Terre Haute still continue to produce, but the output is slowly decreasing, having fallen from 13,940 barrels in 1903 to 8,303 barrels in 1904. The greater part of this was sold to local consumers at an average price of $1.25 per barrel, the whole amount received being $10,260.

In the Jasper County field 9,800 barrels of heavy Corniferous petroleum were produced during the year. This, at the average price of $1.10 per barrel, brought $10,780. In September the Indian Asphalt Company ceased to purchase it at their refinery at Asphaltum, Jasper County. Richmond Levering, president of the company, kindly furnished me the following information regarding the physical and chemical properties of the Jasper County product. The figures "were taken from actual runs made at the refinery upon a large scale."

"Distillation started at 248° F. Thirty-eight gravity oil, light yellow in color. The total amount of distillates obtained when running the crude down to asphalt were 49 per cent, the loss was 4 per cent. and the amount of asphalt 47 per cent.

Average gravity.	*Flash.*	*Fire.*	*Viscosity.*
26.2	272°	302°	170
25.4	292°	335°	210
24.8	312°	348°	310
24.0	338°	374°	728

"The viscosity of the crude at 90° Fahr. is 1274; gravity, 19.40 B.; at zero the crude will not flow through the viscosimeter, although its chill point cannot be obtained accurately, as there is no paraffine in it."

Huron Sandstone Petroleum.

Petroleum from the Huron sandstone is now produced in Indiana only in the vicinity of Princeton, Gibson County. A number of wells producing oil from this formation were pumped from 1900 to 1903 near Loogootee, Martin County, but all have been abandoned, the output for 1904 having been but 198 barrels, valued at $218.

In the Princeton field, on January 1, 1905, there were 45 wells producing oil, eight yielding gas and 13 dry holes. Some of the latter would probably yield one or two barrels each per day if pumped. During the year 50 bores were sunk. Of these the majority were small producers, having an initial output of about five barrels. The top of the oil-bearing stratum, which is a bluish gray, sharp-grained sandstone, is found at an average depth of 890 feet below the surface. The oil is found at about 40 feet below the top of this "sand." It is darker and thicker than that found in Trenton limestone, registering about 31° Beaumé. For a long time the Indiana Pipe Line Company paid 35 cents less per barrel for it than for the Trenton limestone product, but on August 15th advanced the price to the same figure.

The Princeton field for the year 1904 produced 32,207 barrels, distributed among the months as follows:

NUMBER OF BARRELS OF OIL PIPED OR SHIPPED FROM PRINCETON, INDIANA, FIELD IN 1904, BY MONTHS.

January	1,412
February	1,399
March	2,920
April	1,319
May	2,047
June	2,315
July	2,971
August	2,991
September	3,345
October	3,093
November	4,554
December	3,841
Total	32,207

The output of the Princeton field for the year sold for $28,733, or an average of 89.2 cents per barrel.

Adding to the output of the Trenton rock petroleum fields that produced by the Corniferous limestone at Terre Haute and in the Jasper County field, and by the Huron sandstone at Loogootee and Princeton, we find the total production and value of petroleum in Indiana in 1904 to be as follows:

	Barrels.	*Value.*
Trenton Rock Oil	11,281,030	$12,127,107
Corniferous Rock Oil	18,103	21,040
Huron Rock Oil	32,207	28,733
Total	11,331,340	$12,176,880