

**KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 57-1**

THE MINERAL INDUSTRY OF KANSAS

By

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THE MINERAL INDUSTRY OF KANSAS

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This chapter has been prepared under a cooperative agreement for the collection of mineral data, except mineral fuels, between the Bureau of Mines, United States Department of Interior, and the State Geological Survey of Kansas.

By

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For the seventh consecutive year a new high in mineral value has been established in Kansas as the value of mineral production, \$491 million, exceeded the 1955 record year by approximately \$20 million.

A 236-mile, four-lane, Kansas Turnpike was completed in October and highlighted construction activities during 1956. Approximately \$21 million was spent on county road construction and maintenance during 1956. A new salt industry for the manufacture of salt petrochemicals was established near Wichita. Exploratory drilling resulted in the discovery of 179 oil and gas fields. Discovery of gas in Wallace County opened a new gas area in the northwestern part of the State. Water was reported as a mineral commodity in Kansas for the first time. One hundred three of the 105 counties in Kansas reported mineral production in 1956.

Crude petroleum accounted for 70 percent of the total mineral value in 1956, and mineral fuels represented 85 percent of this total. Other leading minerals, following petroleum in order of value, were: natural gas, cement, stone, and natural-gas liquids. Eighteen counties had mineral production valued in excess of \$10 million. These counties in order of rank were: Barton, Ellis, Russell, Butler, Rooks, Greenwood, Stafford, Rice, Graham, Cowley, Cherokee, Grant, Allen, Barber, Stevens, McPherson, Sedgwick, and Pawnee. All minerals, except gypsum, pumice, and stone, increased in value from 1955.

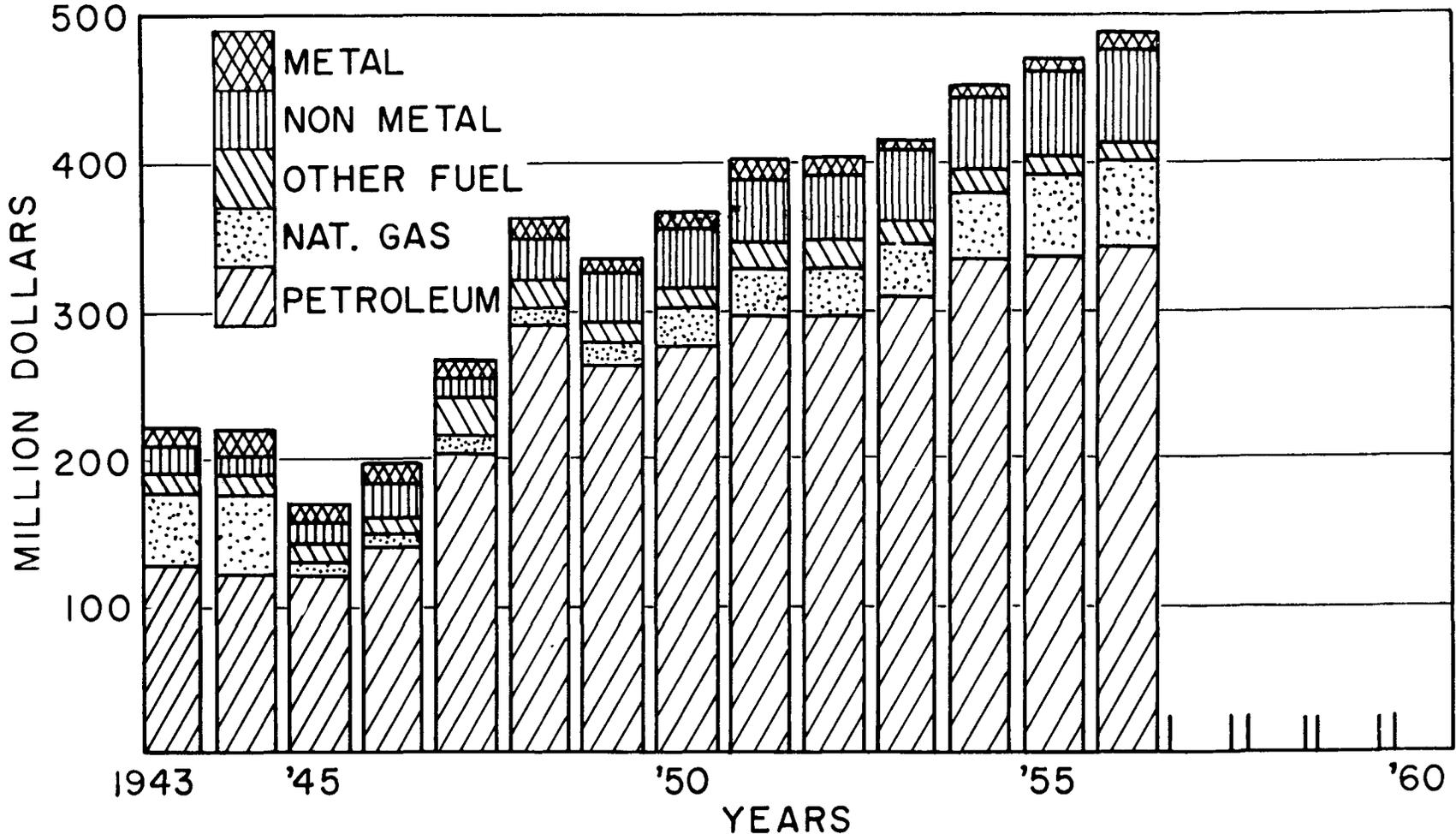


Figure 1. - Value of mineral production in Kansas, 1943-56 in million dollars.

TABLE 1.--Mineral production in Kansas, 1955-56 1/

Mineral	1955		1956	
	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Cement 2/-----376-pound barrels----	9,071,747	\$24,520,533	10,239,578	\$29,370,845
Cement (masonry)-----do-----	382,523	1,333,504	358,739	1,324,928
Clays-----	3/ 767,662	873,016	977,099	1,169,048
Coal-----	742,282	3,165,868	883,877	3,856,330
Helium-----cubic feet-----	42,750,000	662,619	45,035,200	698,000
Lead (recoverable content of ores, etc.)----	5,498	1,638,404	7,635	2,397,390
Marl (diatomaceous)-----	4/	4/	11,710	38,057
Natural gas-----million cubic feet--	471,041	52,286,000	5/ 525,932	5/57,852,000
Natural-gas liquids:				
Gasoline and cycle products-thousand gallons	118,599	6,318,000	105,482	5,928,000
LP-gases-----do-----	92,596	2,643,000	90,287	3,843,000
Petroleum (crude)--thousand 42-gallon barrels-	121,669	340,670,000	123,833	345,494,000
Pumice-----	2,320	59,710	4/	4/
Salt-----	910,866	8,432,325	1,004,042	9,167,364
Sand and gravel-----	10,664,986	6,909,666	12,515,164	8,022,312
Stone 6/-----	12,470,616	15,887,269	13,421,077	15,644,388
Zinc (recoverable content of ores, etc.)----	27,611	6,792,306	28,665	7,854,210
Value of items that cannot be disclosed:				
Gypsum (crude), natural cement, sandstone (dimension), and values indicated by footnote 4.-----		1,734,565		1,485,912
Total, Kansas-----		7/\$470,830,000		7/\$491,185,000

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Excludes natural cement value for which is included with "Value of items that cannot be disclosed."

3/ Excludes fire clay value for which is included with "Value of items that cannot be disclosed."

4/ Figures withheld to avoid disclosure of individual company confidential data; included with "Value of items that cannot be disclosed."

5/ Preliminary figures.

6/ Excludes certain stone value for which is included with "Value of items that cannot be disclosed."

7/ The total has been adjusted to eliminate duplication in values of clays and stone.

TABLE 2.--Average unit value of mineral commodities produced, 1951-56

Commodity	1951	1952	1953	1954	1955	1956
Cement-----376-pound barrels-----	\$ 2.38	\$ 2.38	\$ 2.51	\$ 2.63	\$ 2.70	\$ 2.87
Masonry-----do-----	- -	- -	- -	- -	3.49	3.69
Natural-----do-----	2.69	3.01	2.98	2.96	2.95	3.16
Clays-----Short tons-----	1.00	1.19	1.12	1.20	1.26	1.20
Fire clay-----do-----	2.09	2.18	2.00	2.00	2.34	2.22
Miscellaneous-----do-----	0.96	1.30	1.06	1.22	1.28	1.05
For cement manufacture-----do-----	- -	1.00	1.00	1.00	1.00	1.00
Coal-----do-----	3.94	3.90	3.92	4.02	4.27	4.36
Gypsum (crude)-----do-----	1.66	1.62	1.67	1.55	2.09	1.82
Gravel-----do-----	0.55	0.54	0.54	0.69	0.65	0.61
Helium-----per thousand cubic feet-----	14.35	12.75	13.18	15.81	15.50	15.50
Lead (recoverable metal content)-----pounds-----	0.173	0.161	0.131	0.137	0.149	0.157
Marl (diatomaceous)-----Short tons-----	- -	- -	- -	3.25	3.25	3.25
Natural gas-----per thousand cubic feet-----	0.081	0.083	0.086	0.106	0.111	1/0.110
Natural-gas liquids:						
Natural gasoline and cycle products						
per gallon---	0.062	0.063	0.056	0.050	0.053	0.056
LP-gases-----do-----	0.036	.040	0.034	0.031	0.029	0.043
Petroleum-----per 42-gallon barrel-----	2.57	2.56	2.69	2.81	2.80	2.79
Pumice-----Short tons--	3.20	7.86	11.42	3.96	25.74	20.72
Salt-----do-----	7.37	7.51	8.26	8.87	9.26	9.13
Brine-----do-----	- -	- -	- -	- -	- -	3.50
Evaporated-----do-----	12.91	13.31	14.26	15.37	16.09	17.03
Rock-----do-----	3.67	3.75	4.10	4.43	4.76	5.19
Sand-----do-----	0.65	0.63	0.70	0.69	0.65	0.65
Stone:						
Limestone (crushed)-----do-----	1.31	1.38	1.35	1.23	1.35	1.30
Limestone (dimension)-----do-----	18.28	16.22	15.65	18.95	17.90	24.09
Miscellaneous-----do-----	0.30	0.37	0.40	0.35	0.41	0.38
Sandstone (crushed)-----do-----	1.60	1.65	1.35	1.87	1.64	1.58
Sandstone (dimension)-----do-----	0.80	1.25	- -	7.89	19.19	19.62
Limestone for cement manufacture-----do-----	- -	- -	- -	0.89	1.00	0.90
Zinc (recoverable metal content)-----pounds-----	0.182	0.166	0.115	0.108	0.123	0.142

1/ Estimated.

EMPLOYMENT AND INJURIES

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The estimated average annual employment of the mining industries in Kansas was the same as 1955 with an average of 19,000 persons employed. Lead-zinc mines and quarries recorded increases of 12 and 11 percent respectively. Employment in lead-zinc mining increased with larger mine and smelter output during the year. Nonmetal mineral mining and quarrying employment showed a greater annual employment which resulted, in part, from increased construction activity. Limestone quarries reported the highest estimated average employment with 853 people employed, and sand and gravel operations employed an estimated average of 649 persons, according to the Employment Security Division, Kansas Department of Labor. Total nonmetal mining employment, excluding sand and gravel operators, was 3259, of which stone quarrying accounted for 2272 men employed. Employment in the mining industry remained the smallest part of the total employment of the non-agricultural industries in the State. ^{3/}

^{3/} Employment Security Division, Department of Labor, State of Kansas.

TABLE 3.--Average annual employment, mining industries and products of petroleum and coal, 1947-51 (average) and 1952-56 ^{1/}

Industry group	Average annual employment					
	1947-51	1952	1953	1954	^{2/} 1955	1956
Mining (total)-----	17,240	18,900	18,500	18,400	19,000	19,000
Metal-----	820	600	400	300	400	450
Nonmetal-----	1,520	1,700	1,700	1,600	1,850	2,050
Coal-----	1,000	700	500	500	350	350
Petroleum and natural gas extraction-----	13,920	15,900	15,900	16,000	16,400	16,150
Products of petroleum and coal-----	5,120	5,200	5,400	5,000	4,900	4,900

^{1/} Employment Security Division, Labor Department, State of Kansas.

^{2/} Revised figures.

Injuries.--Mineral industries, excluding petroleum, reported 3 fatal accidents, 15 partial permanent injuries, and 142 temporary injuries. The nonmetal industry, with a total of 3,259 men employed during the year, reported 2 fatal injuries, 10 partial permanent injuries, and 97 temporary injuries. Metal mining recorded 1 fatal injury, 5 partial permanent, and 38 temporary injuries. Coal mining recorded the lowest injury experience with 7 temporary injuries.

Wages.--The average weekly earnings of the mining industry was \$96.02 with an average of 43.2 hours worked per week, according to the Employment Security Division of the Kansas Labor Department. This represented an increase of \$8.25 per week and the average weekly hours increased 0.8 hours from the previous year. Petroleum mining increased \$7.88 in average weekly earnings to \$96.07 and average weekly hours rose 0.7 to 42.3 hours.

Production and exploration in the oil industry, road and building construction, and growing mineral economy directly reflected the higher weekly earnings. Overtime was another important factor in the higher weekly earnings and longer weekly hours. 4/

4/ Employment Security Division, Kansas Department of Labor.

TABLE 4.--Injury experience of selected mineral industry, 1956

Industry group	No. mines	Average active days	Men employed	Man days	Man hours	Days disability Nonfatal ^{1/}	Injury Experience ^{1/}						
									Severity rate		Frequency rate		
							Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	
Metal:													
Lead-zinc-----	22	283	394	111,566	889,932	3,249	1	43	6.74	3.65	1.12	48.32	
Total-----	22	283	394	111,566	889,932	3,249	1	43	6.74	3.65	1.12	48.32	
Nonmetal ^{2/} :													
Abrasives-----	5	33	9	294	2,500	- - -	-	--	- - -	- - -	- - -	- - -	
Gypsum-----	4	293	296	86,703	693,631	49	1	2	8.65	0.07	1.44	2.88	
Salt and brine-----	8	309	425	131,223	1,063,401	4,526	1	22	5.64	4.26	0.94	20.69	
Clay-----	15	244	257	62,628	517,883	2,092	-	16	- - -	3.95	- - -	30.90	
Stone-----	93	247	2,272	562,024	4,615,584	<u>3/</u>	-	67	<u>3/</u>	<u>3/</u>	- - -	14.52	
Fuels:													
Coal-----	24	245	272	66,511	499,632	<u>3/</u>	-	7	- - -	- - -	- - -	14.01	

^{1/} One fatal accident and one permanent total accident are equivalent to 6,000 days lost.

^{2/} Does not include sand and gravel.

^{3/} Data not available.

The Santa Fe Trail has been replaced by a modern one, the Kansas Turnpike. This ultramodern toll road was completed in October and was culminated in 22 months. The super highway will aid, indirectly, the mineral industries.

Freight movement by barge on the Missouri River dropped sharply from 1955. Barge companies could not compete with the railroads because of the shallowness of the river channel. Reduced freight rates and special rates for processing in transit offered by the railroads does not normally remove barge shipping from competing in freight shipments, but the shallow channel does not permit barges on the Missouri River to carry full loads. Proposed deepening of the channel to 12 feet would permit the barge companies to compete with the railroads again. The resultant stabilization, or perhaps lowered freight rates brought about by dredging the Missouri River to a depth of 12 feet, would further induce new industries to Kansas.

In 1956 the county engineers of the State built 6,665 miles of roads at a total cost of over \$11 million and maintained 61,047 miles of roads at a cost of approximately \$10 million. Road construction and maintenance bears a direct impact on the nonmetallic mineral production in the State. The only counties not reporting county road construction were: Atchison, Brown, Cheyenne, Dickinson, Grant, Lincoln, Morton, Stanton, and Wallace. 5/

5/ County Engineers' Annual Rept., State of Kan., State Highway Commission of Kansas, Highway Planning Dept. 1956.

Two natural gas pipelines were under construction in 1956, according to the Oil and Gas Journal. Twenty-eight miles of 16-inch line was being laid between Leavenworth, Leavenworth County, to St. Joseph, Mo. Seven miles of 10-inch line was constructed in North Topeka.

TABLE 5.--County road construction in 1956, by type 1/

Type	County disbursements			Contractor disbursements		
	Miles	Value	Average cost per mile	Miles	Value	Average cost per mile
Standard graded and drained-----	2,826	\$ 3,471,763	\$1,229	174	\$ 499,192	\$2,617
One course gravel or stone-----	1,060	786,395	742	206	224,770	1,093
Gravel or stone on existing surface-----	530	390,934	738	51	33,903	662
Gravel or stone stabilization----	539	761,819	1,413	32	100,771	3,160
Bituminous surface treated-----	659	1,179,638	1,790	125	242,486	1,942
Bituminous surface treated (including base)-----	311	1,056,087	3,393	108	446,217	4,139
Bituminous mix (on existing surface)-----	28	116,034	4,106	8	25,960	3,245
Bituminous mix (including base) and pavement-----	4	81,779	21,132	4	67,300	18,694
Total-----	5,957	\$ 7,844,449	\$ 1,317	708	\$1,640,599	\$ 2,319
Grand total-----	6,665	\$ 9,485,048	\$1,423			
Total all costs for construction <u>2/</u>		\$11,079,182				

1/ County Engineers' Annual Report, State of Kansas, State Highway Commission of Kansas, Highway Planning Department, 1956.

2/ Includes all other costs for road construction, bridges, right of ways, culverts, etc.

MINERAL FUELS

Mineral fuels has had an important role in Kansas economy. Growth and development has been characteristic of these commodities. All mineral fuels recorded increases over 1955. Secondary recovery of crude petroleum has become an important method for producing oil in the State.

Of 179 new fields discovered during 1956, 132 fields produced oil, 36 gas, 3 oil and gas, and 8 were dry. Ellis County led in discoveries with 19 new oil fields, followed by Barber County with 2 oil and 12 gas, Stafford County with 12 oil and 1 gas, and Cowley County with 10 oil and 1 oil and gas field.

Coal.--All coal mined in Kansas was Pennsylvanian in age. Only 14 of the approximate 53 coal seams in the State were being mined. The coal bearing formations that were exploited varied from 10 to 40 inches in thickness. These formations occur at the surface and may be found as deep as 285 feet from ground level. Kansas coal ranges in quality from high volatile A to high volatile C. The southeastern coal field, located in Bourbon, Cherokee, Crawford, Labette, and Linn Counties, accounted for 99 percent of all the coal produced in the State. Coal from this field was mined from the Cherokee group of the Pennsylvanian. The most important coal seam of the Cherokee group was the Mulberry. 6/

6/ Keystone Buyers Manual, 1957, pp. 347-350.

TABLE 6.--Coal production, 1947-51 (average) and 1952-56, in short tons

Year	Number of mines			Short tons	Value	
	Under-ground	Strips	Total		Total	Average per ton
1947-51 (average)--	22	37	59	2,279,954	\$8,550,984	\$3.75
1952-----	15	32	47	2,028,601	7,902,590	3.90
1953-----	28	21	49	1,715,004	7,101,386	4.14
1954-----	10	30	40	1,372,294	5,602,808	4.08
1955-----	5	19	24	742,282	3,165,868	4.27
1956-----	4	15	19	<u>1</u> /883,877	<u>1</u> /3,856,330	4.36

1/ Preliminary figures.

Mined output of coal increased 19 percent in quantity and 22 percent in value despite a smaller number of operators. Production during the year was confined to larger producers of which only 19 mines reported production over 1,000 tons. The average price for coal advanced 9 cents to \$4.36 per ton and was mainly responsible for the increased tonnage.

Helium.--Shipments of helium from the Government plant at Otis in 1956 exceeded the previous year by 5 percent, as the Government attempted to meet the increased demands of industry and Federal agencies. The use of helium for shielded arc welding continued to grow as industry was provided with a new tool to fabricate aluminum, magnesium, and equipment from special alloys.

Natural Gas.--The State's natural gas producing area was expanded in 1956 by the discovery of gas in Wallace County. Discovery well of Skelly Oil Co. reported an initial potential of 6 million cubic feet per day, however no production was reported because of the lack of pipeline connection. The Kansas portion of the Hugoton Gas Area, which produced 73 percent of the total natural gas in the State, includes two entire counties, Stevens and Grant, and parts of 7 other counties, Finney, Hamilton, Haskell, Kearny, Morton, Seward, and Stanton. The Hugoton Gas Area was first discovered in Seward County in 1922. The first well was assigned to the Liberal gas field which was later included with the Hugoton.

Producing formations of the Hugoton Gas Area was limited to the Chase Group of the Permian, which lies at an average depth of 2,500 feet. The Kansas Corporation Commission set well spacing in this area to one well per 640 acres.

Production of natural gas increased 12 percent in quantity and 11 percent in value to 525 billion cubic feet valued at \$58 million from 1955. Estimated proved recoverable reserves of natural gas at the year end was 17,566 billion cubic feet, an increase of 8 percent from the previous year. ^{7/} During the year 36 new gas pools

^{7/} Proved Reserves of Crude Oil, Natural Gas Liquids and Natural Gas, vol. 11, Amer. Petr. Inst. and Amer. Gas Assoc., Dec. 31, 1956, p. 19.

were discovered, of which important new fields were:

<u>County</u>	<u>Field Name</u>	<u>Initial production in thousand cubic feet per day</u>
Barber	Driftwood	54,000
Do	Elsea	25,000
Do	Elwood	7,340
Do	McGuire	27,100
Do	Medicine Lodge West	9,000
Do	Sharon Northwest	8,800
Kingman	Goetz	24,000
Meade	Fincham	30,000
Do	Plains	7,900
Do	Sanders	9,153
Seward	Plains West	21,000
Stevens	Hanke	7,500
Do	Panoma	16,124
Wallace	Sexson	14,000

TABLE 7 ---Marketed production of natural gas, 1947-51 (average) and 1952-56

Year	Million cubic feet	Value
1947-51 (average)-----	306,030	\$19,318,000
1952-----	412,544	34,241,000
1953-----	420,607	36,172,000
1954-----	412,369	43,711,000
1955-----	471,041	52,286,000
1956 <u>1/</u> -----	525,932	57,852,000

1/ Figures supplied by Conservation Division, Kansas Corporation Commission.

TABLE 8.--Marketed production of natural gas from the Kansas part
of Hugoton Gas Area, 1941-56

Year	Thousand cubic feet	Year	Thousand cubic feet
1941-----	40,759,482	1949-----	247,868,876
1942-----	46,365,484	1950-----	320,545,480
1943-----	70,921,532	1951-----	371,002,475
1944-----	92,922,821	1952-----	375,081,748
1945-----	90,345,203	1953-----	387,635,243
1946-----	119,637,983	1954-----	346,732,192
1947-----	157,663,036	1955-----	394,257,153
1948-----	185,872,594	1956-----	381,874,779

TABLE 9.--Gas wells drilled in Hugoton Gas Area, cumulative to 1948 and 1949-56, by counties

County	1948	1949	1950	1951	1952	1953	1954	1955	1956	
	cumulative	drilled	cumulative							
Finney-----	86	76	47	19	49	73	72	49	49	520
Grant-----	334	89	36	68	29	6	5	3	2	572
Hamilton-----	4	2	1	8	8	10	4	--	2	39
Haskell-----	171	42	39	33	30	27	39	40	19	440
Kearny-----	204	71	51	56	75	72	44	27	26	626
Morton-----	86	6	52	62	27	31	14	9	20	307
Seward-----	48	41	91	51	10	19	42	21	18	341
Stanton-----	125	9	17	25	7	27	24	--	--	234
Stevens-----	545	77	63	16	17	4	20	5	10	757
Total----	1,603	413	397	338	252	269	264	154	146	3,836

Carbon Black.--Carbon black production in Kansas

increased 9 percent from 1955. Increased quantities of natural-gas liquids were used in the manufacture of carbon black, replacing natural gas as the feed stock.

Natural-Gas Liquids.--Approximately 0.5 gallons of natural gas condensate were obtained from each thousand cubic feet of natural gas processed from the Hugoton Gas Area. Nearly all of the natural gasoline and cycle plants are located in this area.

Recovery of natural gas liquids from 15 gasoline and cycle plants declined from production of the previous year to 196 million gallons; but, the value increased 9 percent to \$9.8 million. Yield of natural gasoline and cycle products was smaller by 13.1 million gallons and LP-gases was 2 million gallons less than the previous year. An increase in the average price of \$0.01 per gallon for both natural gasoline and LP-gases to \$0.06 and \$0.04 respectively was responsible for the rise in value.

Estimated proved recoverable reserves of natural-gas liquids declined for the second consecutive year to 7,208 million gallons, a decrease of 68 million gallons from 1955. 8/

8/ Proved Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas, vol 11, API and AGA, Dec. 31, 1956, p. 10.

TABLE 10.--Natural-gas liquids produced, 1947-51 (average) and 1952-56

Year	Natural gasoline		LP-gases		Total	
	Thousand gallons	Value	Thousand gallons	Value	Thousand gallons	Value
1947-51 (average)-----	89,443	\$5,647,400	40,958	\$1,558,000	130,401	\$ 7,205,400
1952-----	115,206	7,286,000	77,406	3,116,000	192,612	10,402,000
1953-54-----	<u>1/</u>	<u>1/</u>	<u>1/</u>	<u>1/</u>	<u>1/</u>	<u>1/</u>
1955-----	118,599	6,318,000	92,596	2,643,000	211,195	8,961,000
1956-----	105,482	5,928,000	90,287	3,843,000	195,769	9,771,000

1/ Figure withheld to avoid disclosure of individual company confidential data.

TABLE 11.--Natural gasoline and LP-gases processed in 1956, in 42-gallon barrels 1/

Company	Location		Natural gasoline	Butane	Propane	LP-gases	Total
	Nearest town	County					
Cities Service Oil Co.-----	Burrton	Reno	59,686	- -	15,859	55,049	130,594
Do-----	Wichita	Sedgwick	379,042	- -	176,130	117,230	672,402
Colorado Interstate Gas Co.--	Lakin	Kearny	95,218	- -	- -	- -	95,218
Drillers Gas Co.-----	Cheney	Sedgwick	19,997	- -	- -	8,686	28,683
Dunn-Mar Oil and Gas Co.-----	Otis	Rush	29,775	3,890	- -	- -	33,665
Hughton Production Co.-----	Ulysses	Grant	172,468	107,952	144,926	- -	425,346
Kansas-Nebraska Natural Gas Co.	Deerfield	Kearny	102,194	- -	2,302	13,624	118,120
Kansas Power and Light Co.---	Medicine Lodge	Barber	75,092	- -	- -	- -	75,092
Magnolia Petroleum Co.-----	Ulysses	Grant	171,165	73,591	90,569	- -	335,325
Northern Natural Gas Co.-----	Holcomb	Finney	114,259	- -	- -	- -	114,259
Do-----	Sublette	Haskell	308,175	- -	- -	- -	308,175
Panhandle Eastern Pipeline Co.	Liberal	Seward	512,845	215,424	137,235	- -	865,504
Skelly Oil Co.-----	Cunningham	Kingman	43,034	- -	- -	42,642	85,676
Stanolind Oil and Gas Co.-----	Ulysses	Grant	426,802	390,975	561,598	- -	1,379,375
The Texas Co.-----	Atlanta	Cowley	40,934	- -	- -	38,879	79,813
Total-----			2,550,686	791,832	1,128,619	276,110	4,747,247

1/ Conservation Division, Kansas Corporation Commission.

Petroleum.--The relatively shallow oil bearing stratum, the special inducement that nature has given oil operators to drill in Kansas, has been exploited. This exploitation maintained the Sunflower State in fifth position among oil producing states.

Exploration for and recovery of oil was high in 1956. Nearly 124 million barrels of crude petroleum valued at \$345 million was produced to set a new State record for the third consecutive year. Secondary recovery of oil increased slightly from the previous year. Exploratory drilling totaled 17 million feet. ^{9/}

^{9/} Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 141.

The average 1956 price of crude petroleum was \$2.79 per barrel, a reduction of 1 cent from 1955. Indicated demand was slightly higher than the previous year.

Shipments of oil, both in and out of the State, were larger. Crude oil, refined and used, climbed 7 percent.

Drilling and Exploration.--Wildcat drilling in Kansas

was second only to Texas in the number of wells completed (1,073) in 1956, according to the Oil and Gas Journal. Most of the wildcatting took place on the Central Kansas Uplift. Exploration activity became more intense in the northwestern counties late in the year. Search for new gas reserves was continued in the Hugoton Gas Area.^{10/}

^{10/} Work cited in footnote 9.

Exploratory drilling brought another county, Rawlins, into the list of oil producing counties. Brumm field was discovered in June after 25 years of unsuccessful attempts.

A total of 6,628 exploration and development wells was completed during 1956, which represented an increase of 36 percent from 1955. This figure does not include disposal and reworked wells. The depth of wells drilled in 1956 dropped 228 feet to an average of 3,543 feet per well. Two facts partially explain this: (1) Development drilling in secondary recovery operations accounted for most of the increase in drilling activity. (2) Exploratory drilling declined 22 percent from 1955.

TABLE 12.--Oil and gas-well drilling in 1956, by counties

County	Proved field wells			Exploratory wells			Total			Grand total
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
Allen-----	227	--	45	--	--	--	227	--	45	272
Anderson-----	57	--	28	--	--	--	57	--	28	85
Barber-----	30	82	64	4	10	26	34	92	90	216
Barton-----	121	3	116	9	--	19	130	3	135	268
Bourbon-----	11	--	7	--	--	--	11	--	7	18
Butler-----	93	1	39	2	--	24	95	1	63	159
Chase-----	8	--	1	--	--	8	8	--	9	17
Chautauqua--	159	6	69	1	1	8	160	7	77	244
Clark-----	2	4	8	1	--	6	3	4	14	21
Coffey-----	14	--	10	--	1	3	14	1	13	28
Comanche-----	--	--	1	--	1	6	--	1	7	8
Cowley-----	192	5	114	10	1	31	202	6	145	353
Crawford-----	20	--	13	--	--	4	20	--	17	37
Decatur-----	9	--	12	3	--	6	12	--	18	30
Dickinson---	5	--	8	1	--	9	6	--	17	23
Douglas-----	3	--	--	--	--	2	3	--	2	5
Edwards-----	2	4	9	4	1	15	6	5	24	35
Elk-----	54	5	26	1	--	5	55	5	31	91
Ellis-----	151	--	127	16	--	33	167	--	160	327
Ellsworth---	29	--	24	1	--	5	30	--	29	59
Finney-----	9	49	1	2	--	8	11	49	9	69
Ford-----	--	1	--	1	--	5	1	1	5	7
Franklin----	92	--	16	--	--	1	92	--	17	109
Geary-----	--	--	--	--	--	1	--	--	1	1
Gove-----	1	--	--	--	--	2	1	--	2	3
Graham-----	139	--	90	4	--	40	143	--	130	273
Grant-----	--	2	--	--	--	--	--	2	--	2
Greeley-----	--	--	--	--	--	4	--	--	4	4
Greenwood---	114	--	41	1	--	4	115	--	45	160
Hamilton----	--	2	--	--	--	5	--	2	5	7
Harper-----	28	2	10	3	--	14	31	2	24	57
Harvey-----	10	2	13	2	--	12	12	2	25	39
Haskell-----	4	19	1	--	--	3	4	19	4	27
Hodgeman----	2	--	--	2	--	5	4	--	5	9
Jefferson---	--	--	--	--	--	1	--	--	1	1
Jewell-----	--	--	--	--	--	1	--	--	1	1
Johnson-----	--	--	--	7	--	1	7	--	1	8
Kearny-----	--	26	5	1	--	1	1	26	6	33
Kingman-----	56	30	31	3	--	20	59	30	51	140
Kiowa-----	18	5	10	--	4	17	18	9	27	54
Labette-----	22	--	19	--	--	--	22	--	19	41
Lane-----	--	--	--	--	--	1	--	--	1	1
Leavenworth-	--	--	--	--	--	2	--	--	2	2
Lincoln-----	--	--	--	--	--	2	--	--	2	2
Linn-----	29	--	25	--	--	--	29	--	25	54

TABLE 12.--Oil and gas-well drilling in 1956, by counties
(continued)

County	Proved field wells			Exploratory wells			Total			Grand total
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	
Logan-----	--	--	--	1	--	3	1	--	3	4
Lyon-----	11	--	5	1	--	7	12	--	12	24
McPherson---	76	1	42	2	--	22	78	1	64	143
Marion-----	161	--	52	7	--	41	168	--	93	261
Marshall-----	--	--	--	--	--	1	--	--	1	1
Meade-----	16	--	10	6	25	5	22	25	15	62
Miami-----	148	2	60	--	--	--	148	2	60	210
Montgomery--	128	3	94	--	--	3	128	3	97	228
Morris-----	25	--	7	1	--	15	26	--	22	48
Morton-----	33	65	15	--	--	1	33	65	16	114
Neosho-----	163	6	45	--	--	1	163	6	46	215
Ness-----	22	--	15	5	--	25	27	--	40	67
Norton-----	2	--	4	--	--	15	2	--	19	21
Pawnee-----	91	5	49	5	--	23	96	5	72	173
Phillips-----	7	--	5	--	--	2	7	--	7	14
Pratt-----	9	--	14	3	--	13	12	--	27	39
Rawlins-----	--	--	--	1	--	1	1	--	1	2
Reno-----	3	--	13	--	--	26	3	--	39	42
Rice-----	80	1	54	3	--	6	83	1	60	144
Rooks-----	68	--	73	5	--	12	73	--	85	158
Rush-----	24	2	12	4	--	18	28	2	30	60
Russell-----	97	--	49	2	--	6	99	--	55	154
Saline-----	2	--	1	--	--	5	2	--	6	8
Scott-----	--	--	--	--	--	3	--	--	3	3
Sedgwick-----	48	2	30	5	--	24	53	2	54	109
Seward-----	--	20	1	--	1	1	--	21	2	23
Shawnee-----	--	--	--	--	--	1	--	--	1	1
Sheridan-----	4	--	7	2	--	18	6	--	25	31
Sherman-----	--	--	--	--	--	1	--	--	1	1
Stafford-----	105	2	110	13	--	18	118	2	128	248
Stanton-----	--	4	1	--	--	2	--	4	3	7
Stevens-----	--	10	--	--	2	2	--	12	2	14
Sumner-----	83	3	51	4	--	30	87	3	81	171
Thomas-----	--	--	--	1	--	6	1	--	6	7
Trego-----	56	--	32	6	--	38	62	--	70	132
Wabaunsee---	1	--	1	--	--	3	1	--	4	5
Wallace-----	--	--	--	--	--	2	--	--	2	2
Wichita-----	--	--	--	--	--	2	--	--	2	2
Wilson-----	54	--	25	--	--	7	54	--	32	86
Woodson-----	125	1	59	3	--	4	128	1	63	192
Wyandotte---	--	--	--	--	2	--	--	2	--	2
Total: 1956-	3353	375	1919	159	49	773	3512	424	2692	6628
1955-	2179	323	1122	215	49	988	2394	372	2110	4876

Average footage of new wells drilled: 11/12/

11/ Includes oil wells, gas, and distillate wells and dry holes only. Excludes water-input wells, gas-input wells, salt water-disposal wells, and wells drilled deeper.

12/ Work cited in footnote

<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u> ^{13/}
3,437	3,468	3,478	3,552	3,771	3,543

13/ World Oil, vol. 144, No. 3, February, 1957, p. 124.

Ratio of success in exploratory drilling in 1956 was the same as 1955 with 21 percent, though 981 exploratory wells were drilled when compared with 1,252 in 1955.

Shallow drilling in the eastern part of the State resulted in the use of a larger number of cable tool rigs; approximately 815 rigs were used compared with 385 in 1955.^{14/}

14/ Work cited in footnote 9 , p. 150.

Production.--The production of crude petroleum, 124 million barrels, in 1956 was 2 million barrels more than was produced in 1955 and was a gain of nearly 2 percent. The El Dorado field replaced the Trapp field as the leading field in the State for crude petroleum recovery. Barton, Ellis, Russell, Butler, Rooks, and Greenwood Counties respectively recorded the State's largest outputs.

TABLE 13.--Production and indicated demand of crude petroleum, 30
 by months, 1956, in thousand barrels

Month	Production	Indicated demand
January-----	10,528	10,624
February-----	9,809	10,269
March-----	10,721	10,293
April-----	10,220	9,081
May-----	10,394	9,769
June-----	10,345	9,521
July-----	10,524	10,851
August-----	10,775	11,105
September-----	9,950	10,276
October-----	10,148	9,451
November-----	9,986	10,048
December-----	10,433	10,627
Total-----	123,833	121,915

TABLE 14.--Production of crude petroleum, 1947-51
(average) and 1952-56

Year	Thousand barrels	Value	
		Total thousand dollars	Average per barrel
1947-51 (average)-----	108,003	\$264,980	\$2.45
1952-----	114,807	293,910	2.56
1953-----	114,566	308,180	2.69
1954-----	119,317	335,280	2.81
1955-----	121,669	340,670	2.80
1956-----	123,833	345,494	2.79

TABLE 15.--Important new oil fields discovered in 1956

Field name	County	Initial production barrels per day
Workman North-----	Barton	1,696
Snake Creek East-----	Clark	360
Warner-----	Decatur	330
Engel-----	Ellis	596
Pleasant North (revived)	do	700
Brassfield-----	Graham	364
Banner South -----	Harper	1,408
Unger Southwest-----	Marion	3,000
Advance -----	Sheridan	513
Hoxie -----	do	581
Rattlesnake East-----	Stafford	1,393
Kindig-----	Thomas	401
Newcomer-----	Trego	3,000
Newcomer Northwest-----	do	1,642

TABLE 16.--Production of crude petroleum in Kansas, 1952-56, by fields
in thousand barrels (Oil and Gas Journal)

Field	1952	1953	1954	1955	1956
Bemis-Shutts-----	3,741	3,526	3,549	3,263	3,076
Bloomer-----	2,344	2,067	1,589	1,456	1,268
Burnett-Southwest--	2,709	2,303	2,170	2,464	2,230
Burrton-Haury-----	909	781	809	732	695
Chase-----	<u>1/7,152</u>	<u>1/6,007</u>	<u>1/5,339</u>	<u>1/4,897</u>	<u>1/4,689</u>
El Dorado-----	3,454	3,939	3,864	4,242	4,348
Fairport-----	879	834	823	903	964
Genesco-Edwards---	3,304	3,061	2,869	2,941	2,734
Gladys-----	<u>2/</u>	<u>2/</u>	<u>2/</u>	1,024	1,885
Gorham-----	1,990	1,793	1,692	1,589	1,543
Hall Gurney-----	3,954	4,640	4,528	4,064	3,587
Iuka-Carmi-----	1,244	1,314	1,421	1,464	1,486
Kraft-Prusa-----	5,449	4,721	4,357	3,826	3,498
Marcotte-----	1,964	1,831	1,681	1,712	1,621
Morel-----	2,092	1,798	1,654	1,470	1,461
Ray-----	1,624	1,393	1,280	1,312	1,225
Seeley-Wick-----	1,292	1,753	1,798	1,479	1,341
Silica-Raymond-----	<u>1/</u>	<u>1/</u>	<u>1/</u>	<u>1/</u>	<u>1/</u>
Stoltenberg-----	1,471	1,270	1,119	1,043	951
Thrall-Agard-----	1,650	1,121	1,002	775	748
Trapp-----	6,469	6,081	5,461	4,943	4,427
Welch-Bornholdt----	740	1,259	1,361	1,254	1,108
Other fields-----	60,414	<u>3/63,767</u>	<u>3/70,951</u>	<u>3/74,816</u>	78,948
Total Kansas-----	114,845	<u>3/115,259</u>	<u>3/119,317</u>	<u>3/121,669</u>	123,833

- 1/ Silica included with Chase.
2/ Included with "Other fields."
3/ Bureau of Mines figures.

TABLE 17.--Barrels of oil produced, shipped in, used and shipped out,
1955-56, 1/

	1955	1956
Produced-----	121,161,234	124,467,713
Shipped in-----	29,505,340	34,320,108
Total-----	150,666,574	158,787,821
Shipped out-----	57,527,501	58,713,375
Refined and used in Kansas---	93,139,073	100,074,446
Total-----	150,666,574	158,787,821

1/ Figures provided by Conservation Division, Kansas Corporation
Commission.

Secondary Recovery.--The recovery of oil by

secondary methods increased for the third straight year and accounted for 9 percent of the oil output in the State. Recovery methods were by injection of water, gas, and air. A total of 217 projects reported 6,990 producing wells and 4,302 input wells. The Cherokee and Forrest City Basins were the center for most of the repressuring projects.

Both fresh and brine waters were used for water flooding; however, brine was preferred to fresh water. The water was treated to make the chemical properties the same as that of the brine associated with oil. This is necessary to prevent "plugging" and to assure proper flow of repressuring water through the oil stratum.

Reserves.--Proved recoverable reserves of crude petroleum decreased 5.9 million barrels to an estimated 992 million barrels. According to the American Petroleum Institute and American Gas Association, estimated reserves of petroleum hydrocarbons, including petroleum, natural-gas liquids, and natural gas equivalent in Kansas rose to 4 billion barrels during 1956. Figure 2 shows that more exploratory-well footage was required than development-well footage for the increase in reserves.

TABLE 18.--Secondary recovery of oil from 8 counties in Kansas during 1956

County	Number of projects	Total oil production (barrels)	Estimated secondary recovery oil production (barrels)	Secondary as a percent of total production
Allen-----	12	844,728	557,198	66.0
Anderson---	7	658,605	567,688	86.2
Butler-----	29	8,138,153	4,080,185	50.1
Franklin---	5	347,569	290,028	83.4
Greenwood--	46	6,788,601	5,365,499	79.0
Miami-----	10	674,580	448,771	66.5
Montgomery-	16	748,019	377,502	50.5
Neosho-----	13	638,149	490,261	76.8
Total-----	138	18,838,404	12,177,132	64.6

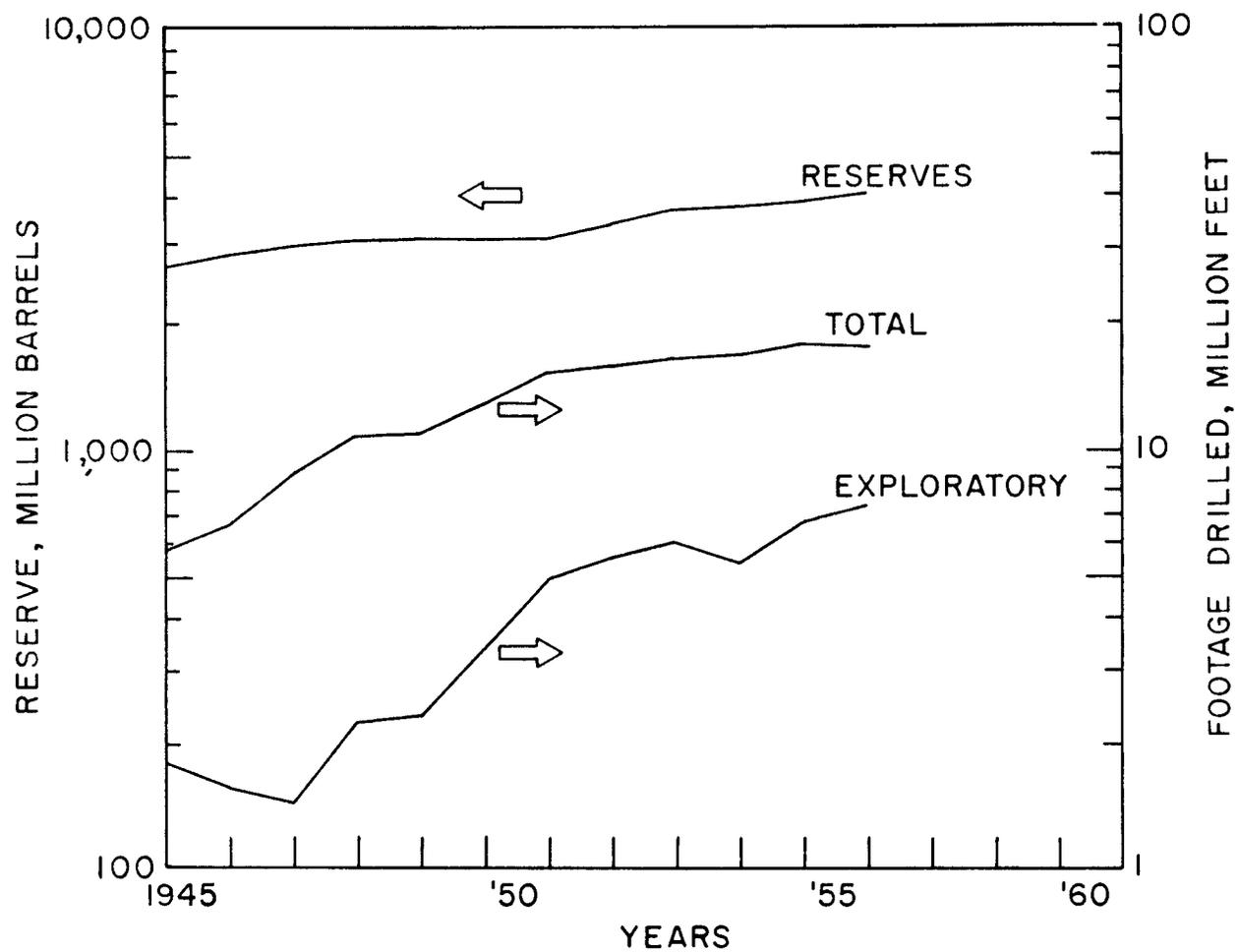


Figure 2.- Proved reserves of total hydrocarbons and footage drilled by years.

TABLE 19.--Capacity of petroleum refineries and cracking plants in Kansas, January 1, 1957
(Barrels per day)

Company	Location	County	Type of plant ^{1/}	Crude oil capacity		Cracked gasoline capacity	
				Operating	Shutdown	Operating	Shutdown
Anderson-Prichard Oil Corp.-----	Arkansas City	Cowley	S-C-A	18,500	- ---	6,800	1,200
Century Refining Co., Inc.-----	Shallow Water	Scott	S-C-A	2,000	2,000	1,550	950
The Chanute Refining Co.-----	Chanute	Neosho	S-C-A	1,500	- ---	1,500	- ---
Cooperative Refinery Association	Coffeyville	Montgomery	Comp.	24,500	- ---	10,420	- ---
Do-----	Phillipsburg	Phillips	S-C	9,500	- ---	2,780	- ---
Derby Refining Co.-----	Wichita	Sedgwick	S-C-A	20,000	- ---	9,025	- ---
El Dorado Refining Co.-----	El Dorado	Butler	S-C-A	18,350	- ---	6,300	2,500
Mid America Refining Company, Inc.-----	Chanute	Neosho	S-C	2,100	- ---	400	- ---
National Cooperative Refinery Assn.-----	McPherson	McPherson	Comp.	26,000	- ---	10,800	- ---
Phillips Petroleum Co.-----	Kansas City	Wyandotte	S-C-L-A	57,000	- ---	31,200	- ---
Skelly Oil Co.-----	El Dorado	Butler	S-C-A	45,000	- ---	22,250	- ---
Socony Mobil Oil Co., Inc.-----	Augusta	do	Comp.	35,000	- ---	11,000	- ---
Standard Oil Co., (Ind.)-----	Neodesha	Wilson	Comp.	22,500	- ---	4,200	2,650
Vickers Petroleum Co., Inc.-----	Potwin	Butler	S-C	15,000	- ---	5,700	- ---
Total-----				296,950	2,000	123,925	7,300

^{1/} The following symbols indicate the type of plant:

S-C-A Skimming, cracking, and asphalt
 Comp. Complete
 S-C Skimming and cracking
 S-C-L-A Skimming, cracking, lube, and asphalt

METALS

The entire production of metallic minerals originated in the Kansas portion of the Tri-State District. General Services Administration purchase program was instrumental in maintaining firm lead-zinc prices in 1956 and was partially responsible for the increased lead-zinc production in the Tri-State District. However, mine output was increased as operators were able to improve the recovery of lead. The lead assay in Kansas increased 1.4 percent and permitted larger tonnages of recoverable metal. Output of lead metal increased 39 and 46 percent in tonnage and value to 7,635 tons of lead valued at \$2.4 million.

Zinc output rose to 28,665 tons valued at \$7.9 million, an increase of 4 and 16 percent in tonnage and value over that of 1955. Cherryvale Zinc Co., reclaimers of zinc from waste products of the copper industry, was building a pilot plant to recover tin from scrap by a new process. If the project is successful, a commercial installation will be built.^{15/}

^{15/} To the Stars, Kansas Ind. Development Comm., vol. 11, No. 2, March-April, 1956, p. 23.

TABLE 20.--Mine production of lead and zinc, 1947-51 (average), 1952-56, and total 1876-56, in terms of concentrates and recoverable metals 1/

Year	Mines producing	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content <u>2/</u>			
		Short tons	Value	Short tons	Value	Lead		Zinc	
						Short tons	Value	Short tons	Value
1947-51 (average)-	74	11,554	\$ 2,256,539	60,374	\$ 5,794,245	8,775	\$ 2,769,074	32,517	\$ 9,008,836
1952-----	84	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
1953-----	58	4,399	665,189	28,668	2,064,783	3,347	876,914	15,515	3,568,450
1954-----	25	5,390	916,161	<u>3/</u> 38,896	2,638,102	4,033	1,105,042	<u>4/</u> 19,110	4,127,760
1955-----	36	7,362	1,352,876	51,252	3,980,849	5,498	1,638,404	27,611	6,792,306
1956-----	41	10,130	1,955,278	53,142	4,688,130	7,635	2,397,390	28,665	7,854,210
1876-1956-	--	831,049	71,545,223	5,438,316	260,768,713	633,873	86,407,062	2,826,434	409,259,838

1/ Based on Kansas ore and old tailings treated at mills during calendar year indicated.

2/ In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of lead and zinc is calculated from the average price for all grades.

3/ Includes 360 tons from old tailings remilled.

4/ Includes 194 tons from old tailings remilled.

TABLE 21.--Mine production of lead and zinc, by months
in 1956, in terms of recoverable metals

Month	Lead (Short tons)	Zinc (Short tons)
January-----	602	1,890
February-----	539	2,037
March-----	721	2,182
April-----	789	2,666
May-----	822	2,823
June-----	657	2,579
July-----	657	2,677
August-----	714	2,795
September-----	518	2,442
October-----	585	2,420
November-----	519	2,073
December-----	512	2,081
Total	7,635	28,665

TABLE 22.--Mine production of lead and zinc in the Tri-State district, 1947-51 (average) and 1952-56, in terms of concentrates and recoverable metals

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content			
	Short tons	Value	Short tons	Value	Lead		Zinc	
					Short tons	Value	Short tons	Value
1947-51 (average)-	37,271	\$ 7,236,837	166,227	\$16,425,167	28,017	\$ 8,818,457	88,983	\$24,946,096
1952-----	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984
1953-----	17,403	2,715,987	102,821	7,455,540	13,273	3,477,526	55,729	12,817,670
1954-----	24,497	4,127,232	1/127,053	8,483,611	18,314	5,018,036	2/64,322	13,893,552
1955-----	3/26,992	4,734,339	4/131,026	10,052,448	4/19,679	5,864,342	5/69,696	17,145,216
1956-----	28,597	5,282,389	107,997	9,334,754	20,373	6,397,122	57,215	15,676,910
Kansas-----	10,130	1,955,278	53,142	4,688,130	7,635	2,397,390	28,665	7,854,210
Southwest								
Missouri	496	102,096	1,862	161,502	388	121,832	1,035	283,590
Oklahoma--	17,971	3,225,015	52,993	4,485,122	12,350	3,877,900	27,515	7,539,110

- 1/ Includes 360 tons from old tailings remilled.
2/ Includes 194 tons from old tailings remilled.
3/ Includes 2,736 tons from old tailings remilled.
4/ Includes 44 tons from old tailing remilled.
5/ Includes 256 tons from old tailings remilled.

Nonmetal output increased approximately 12 percent over the previous year. Cement, stone, salt, and sand and gravel, in order of value, were important commodities produced.

Construction Materials.--Tight money and increased costs that sent residential building downward was offset by the increase in commercial construction and especially by public works projects. The Kansas Turnpike, the Nation's fourth longest toll road, was estimated to cost \$160 million and to require 20 years to repay.^{16/} Completion of

^{16/} To the Stars, Kansas Ind. Development Comm., vol. 9, No. 5, November-December, 1956, pp. 10-13.

this highway was expected to relieve the short supply of materials needed for other construction.

Bureau of Reclamation dedicated Webster Dam on the Solomon River near Stockton, Rooks County. The dam is to be built at a cost of \$11 million and will be completed in 3 years.

Cement.--The Kansas cement industry was highlighted with modernization and expansions in 1956. All plants operated above capacity to supply greater demands from construction, road programs, and oil well drilling. The State's total capacity was increased 1.3 million barrels. Shipments of masonry cement reflected a slight dip as residential construction slowed. Road construction and commercial building remained firm and reflected a gain of 12 and 19 percent respectively in shipments and value of cement from 1955. Most of the State shipments of cement was destined for local consumption, however, important quantities were exported to nearby states of Missouri, Oklahoma, Iowa, Nebraska, and Arkansas. Smaller amounts were shipped to more distant states, such as Michigan, Illinois, Minnesota, and other states.

Clays.--Production and value of clay rose 14 and 8 percent respectively, during the year as fire clay was reported for the first time since 1954. Almost all of the State production of clay was used for structural products and cement manufacture. Over 124 million unglazed brick^{17/} was produced during the year. A

^{17/} Kansas Business Review, vol. 10, No. 4, April, 1957.

large portion of the output went to residential building.

TABLE 23.--Production and shipments of portland cement, 1947-51
(average) and 1952-56, in 376-pound barrels

Year	Production (barrels)	Shipments		
		Barrels	Value	
			Total	Average per barrel
1947-51 (average)	8,004,240	7,940,534	\$16,979,805	\$2.14
1952-----	8,672,883	8,811,762	20,956,886	2.38
1953-----	8,766,206	8,546,250	21,428,536	2.51
1954-----	8,803,007	9,076,328	23,874,179	2.63
1955-----	9,219,533	9,071,747	24,520,533	2.70
1956-----	10,486,150	10,239,578	29,370,845	2.87

Kansas Industries, Inc. of Kansas City, Kansas, subsidiary of Texas Industries, Inc., reopened and began production in June of sintered lightweight aggregate from shale. The plant, formerly known as Mineral Products Co., had been idle since June, 1953. Kansas Industries, Inc., operated at limited production until completion of plant modernization.

Pidgeon Vitriified China Co., the only commercial dinnerware manufacturer in Kansas, shut down permanently in 1956. Water problem and management troubles were attributed to the cause.

Gypsum.--Though the production of crude gypsum increased slightly from the previous year, the value was below 1955. A drop of 27 cents per ton was recorded for crude gypsum during 1956. Certain-Teed Products Co. sold its Blue Rapids plant to Bestwall Gypsum Co. The plant continued to produce crude and calcined gypsum and wallboard.^{18/}

^{18/} Mining Congress Journal, vol. 43, No. 2, February, 1957, p. 146.

TABLE 24.--Clays sold or used by producers
1947-51 (average) and 1952-56

Year	Short tons	Value
1947-51 (average)---	638,073	\$524,303
1952-----	665,582	789,293
1953-----	670,694	749,579
1954-----	<u>1/</u> 697,832	<u>1/</u> 777,847
1955-----	<u>1/</u> 767,662	<u>1/</u> 873,016
1956-----	977,099	1,169,048

1/ Excludes certain clays, value for which is included with Table 1, "Value of items that cannot be disclosed."

Marl (diatomaceous).--Deposits of white marl are found 48

in the Ogallala formation of the Tertiary in Wallace and Logan Counties.19/ In the northeastern corner of Wallace

19/ Tolsted, Laura Lu, and Swineford, Ada, Kansas Rocks and Minerals, State Geol. Sur. of Kan., Third Edition, 1957, p. 18.

County, Delore Division of National Lead Co. of St. Louis mined diatomaceous marl. Pulverized marl was used as a flattening pigment in oil and water emulsion paints. Output of diatomaceous marl, 11,710 short tons, approximated the production in 1955.

Perlite.--A small quantity of perlite was expanded at the Kansas City plant of Penca-lite Perlite Co. for lightweight aggregate. It was used in non-load-bearing lightweight concrete and insulating plasters. No crude perlite was produced in Kansas.

Pumice.--Pumice was mined and crushed for use in ceramic pottery, abrasives, and cleansing powders. Purex Corp., Ltd., closed its 2 mines permanently in 1956. As a result of this shutdown, both production and value declined 69 and 75 percent respectively. Only two counties recorded pumice production.

Salt.--Wilson County was added to Ellsworth, Reno, and Rice Counties as a salt producing county. Frontier Chemical Co., a manufacturer of salt chemicals from brine in Wilson County, recently completed a \$7 million expansion program combining another abundant Kansas raw material, natural gas, to produce salt petrochemicals (organic chlorides, acetylene, and other chlorine compounds.) The plant is to be a breeder plant for other chemical industries to locate in Kansas.^{20/}

^{20/} To the Stars, Kan. Ind. Development Comm., vol 9, No. 3, May-June, 1956, pp.2-6.

The Wellington formation of the Permian accounted for the remaining salt mined in Kansas. The Wellington is approximately 325 feet in thickness and covers an area of 100 by 40 miles. The strata extends from Burrton, Reno County, to Kanapolis, Rice County. Estimations show that Kansas possesses enough salt to supply the entire United States for more than 250,000 years.

The huge agricultural industry in Kansas consumed the largest portion of rock and evaporated salt produced in the State. Meat packers, block salt for livestock, and leather tanners were among the large users of salt.

Output of salt increased 10 percent and 9 percent respectively for tonnage and value. The gain in production was attributable to the new salt industry, Frontier Chemical Co.

TABLE 25.--Salt sold or used by producers, 1947-51 (average) and 1952-56

Year	Evaporated salt		Rock salt		Brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1947-51 (average)	341,427	\$3,711,580	521,750	\$1,741,807	--	\$ --	863,177	\$5,453,387
1952-----	358,887	4,775,741	552,857	2,074,286	--	--	911,744	6,850,027
1953-----	370,569	5,285,805	534,658	2,194,751	--	--	905,227	7,480,556
1954-----	356,045	5,474,151	520,622	2,304,255	--	--	876,667	7,778,406
1955-----	361,612	5,819,536	549,254	2,612,789	--	--	910,866	8,432,325
1956-----	350,208	5,963,055	542,624	2,815,074	111,210	389,235	1,004,042	9,167,364

Sand and Gravel.--Continued high rate of construction and road building pushed mined output and value 17 and 16 percent above 1955. Completion of the Kansas Turnpike should tend to stabilize the supply of this commodity.

Kansas reported only 176 sand and gravel operations in 1956 compared with 199 in 1955. Only 50 Government-and-contractor operators produced sand and gravel during the year. Production was reported from 68 counties. Glass sand, molding sand, blast sand, engine sand, and filter sand were other sand uses.

Stone.--Production of stone gained 8 percent while the value declined 2 percent. The decline in value reflected a lower reported value for limestone for cement. Average unit price of dimension limestone rose sharply from the previous year and bolstered the declining value. Crushed limestone represented 72 percent of the stone produced.

Southwest Chat Co. of Baxter Springs, Cherokee County, utilized tailings for crushed stone uses from lead-zinc operations of the St. Louis Smelting & Refining Division of National Lead Co. which processes approximately 2,500 tons of ore per day.

TABLE 26.--Sand and gravel sold or used, 1947-51 (average) and 1952-56

Year	Commercial		Government-and-contractor		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1947-51 (average)--	4,754,729	\$3,000,290	1,861,218	\$987,099	6,615,947	\$3,987,389	\$0.60
1952-----	6,797,975	4,675,216	1,582,090	348,377	8,380,065	5,023,593	.60
1953-----	6,678,241	4,946,934	2,050,050	721,374	8,728,291	5,668,308	.65
1954-----	8,340,949	6,365,665	2,080,605	828,506	10,421,554	7,194,171	.69
1955-----	9,000,242	6,342,242	1,664,744	567,424	10,664,986	6,909,666	.65
1956-----	10,656,464	7,428,877	1,858,700	593,435	12,515,164	8,022,312	.64

TABLE 27.--Stone sold or used by producers, 1952-56, by kinds

Year	Limestone		Sandstone		Miscellaneous stone		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1952--	7,551,061	\$11,204,877	295,246	\$ 485,871	984,564	\$360,992	8,830,871	\$12,051,740
1953--	7,026,871	10,045,111	591,424	800,008	1,150,857	458,831	8,769,152	11,303,950
1954--	<u>1</u> /9,161,085	<u>1</u> /11,956,778	355,430	687,180	860,493	297,864	<u>1</u> /10,377,008	<u>1</u> /12,941,822
1955--	<u>1</u> /10,859,739	<u>1</u> /14,340,896	746,414	1,242,626	877,237	362,668	<u>1</u> /12,483,390	<u>1</u> /15,946,190
1956--	<u>2</u> /11,642,644	<u>2</u> /14,592,247	<u>3</u> /313,813	<u>3</u> /495,342	1,464,620	556,799	<u>3</u> /13,421,077	<u>3</u> /15,644,388

1/ Includes diatomaceous marl and limestone for cement.

2/ Includes limestone used for cement.

3/ Excludes dimension sandstone to avoid disclosure of individual data.

A new quarry was opened near Florence, Marion County, by Walt Keeler. The plant had a crushing capacity of 300 tons per hour. In addition to three sizes of aggregate, the plant produced agricultural limestone. ^{21/}

^{21/} Pit and Quarry, vol. 48, No. 11, May, 1956, p. 48.

Vermiculite.--Vermiculite was expanded in a plant at Wichita for insulation and as an aggregate of plaster. Production was 62 percent greater than the previous year.

Water.--Drought conditions throughout the Southwest focused attention to the supply and conservation of water. Water has become a vital factor to the expanding Kansas economy. The lack in programming long-range water needs of Kansas has hindered industrial growth.

Consumption and Uses.--Industrial consumption of water in Kansas reached 870 million gallons per day from privately developed sources. Foremost in this water consumption are the steam-electric generating plants. Actual consumption of water in industrial processes was approximately 3 1/2 percent, three-fourths of which is used for heat exchange and cooling purposes. The remainder is used for washing, movement of material and product, and for flushing wastes ^{22/}

^{22/} Water in Kansas, 1955, Kansas State Finance Council, July, 1954.

Mineral industries of Kansas use water for cooling, processing, boiler feed, and for sanitary and service purposes. Some process requires water that must meet exact chemical standards; others use any quality of water. Of the total water consumed, the agricultural output has been entirely dependent on water in the form of precipitation and moisture content of the soil. In recent years, irrigation has greatly enhanced farm output. All but 3 counties (Elk, Woodson, and Brown) reported irrigation practices in 1956.^{23/} Despite this widespread

^{23/} Work cited in footnote 22.

application of irrigation, some Kansans consider this expenditure of water for the production of surplus crops of doubtful economic benefit.

Conservation and Pollution.--The wastes from industry are complex and often contain oils, acids, greases, mineral salts, organic matter, and other chemicals. The major sources of industrial pollution, 65 in number, in Kansas were: petroleum refineries (14), chemical plants (7), salt plants (4), railroads (5), major milk plants (18), meat processing (16), and miscellaneous industries. The mineral industries were responsible for approximately 25 percent of these major polluting sources.^{24/} Some of these

^{24/} Work cited in footnote 22.

industries have recognized the damages of pollution and have applied conservation measures.

The oil producing industry, through conservation measures (salt water disposal, etc.), has made available appreciable quantities of useable water to consumers. Some pollution occurred, however, before the conservation measures were enacted. In 1955 approximately 75 percent of the brine produced in conjunction with oil is re-injected into disposal wells ^{25/} In the recovery of oil,

^{25/} Work cited in footnote 22.

fresh ground water supplies are conserved by "casing off" the well with steel pipe to prevent contamination by brine. Conservation programs by the other mineral industries would increase the availability of water in Kansas.

TABLE 28.--Value of mineral production in Kansas, by counties, 1955-56 1/

County	1955	1956	Minerals produced in 1956 in order of value
Allen-----	\$ 10,733,745	\$ 11,425,963	Cement, crude petroleum, stone, clays, natural gas.
Anderson---	2,224,905	2,043,103	Crude petroleum, stone, sand and gravel.
Atchison---	384,927	287,725	Stone.
Barber-----	7,099,826	11,309,986	Natural gas, crude petroleum, gypsum, natural-gas liquids, sand and gravel.
Barton-----	40,565,367	41,774,952	Crude petroleum, sand and gravel, clays, natural gas.
Bourbon----	1,124,214	1,140,544	Natural cement, stone, crude petroleum, coal.
Brown-----	25,059	23,083	Sand and gravel, crude petroleum.
Butler-----	24,056,370	23,356,706	Crude petroleum, stone, natural gas.
Chase-----	101,118	347,909	Stone, crude petroleum, natural gas, sand and gravel.
Chautauqua-	2,700,610	2,983,774	Crude petroleum, stone, natural gas, sand and gravel.
Cherokee---	11,035,808	13,148,802	Zinc, lead, coal, stone, clays.
Cheyenne---	2/	12,000	Sand and gravel.
Clark-----	1,227,626	1,398,307	Crude petroleum, natural gas, sand and gravel.
Clay-----	70,863	2/	Stone, sand and gravel.
Cloud-----	341,250	238,400	Clays, sand and gravel.
Coffey-----	570,061	531,892	Crude petroleum, stone, coal, natural gas, sand and gravel.
Comanche---	28,570	41,255	Natural gas, crude petroleum, sand and gravel.
Cowley-----	14,392,514	13,923,975	Crude petroleum, stone, natural-gas liquids, sand and gravel, natural gas.
Crawford---	1,192,358	1,740,832	Coal, crude petroleum, clays, natural gas.
Decatur----	978,386	1,097,517	Crude petroleum, sand and gravel.
Dickinson--	894,956	737,343	Crude petroleum, stone, sand and gravel.
Doniphan---	420,570	824,229	Stone.
Douglas----	194,174	176,367	Sand and gravel, stone, crude petroleum.
Edwards----	300,845	325,046	Crude petroleum, natural gas, sand and gravel.
Elk-----	2,506,361	1,994,613	Stone, crude petroleum, natural gas, sand and gravel.
Ellis-----	31,239,502	32,270,441	Crude petroleum, sand and gravel.
Ellsworth--	9,399,382	9,200,574	Crude petroleum, salt, sand and gravel.

County	1955	1956	Minerals produced in 1956 in order of value
Finney-----	\$ 4,896,237	\$ 5,554,236	Natural gas, crude petroleum, natural-gas liquids, sand and gravel.
Ford-----	140,661	141,611	Sand and gravel, natural gas, crude petroleum.
Franklin---	1,346,568	1,108,732	Crude petroleum, stone, clays.
Geary-----	363,674	345,700	Stone, sand and gravel.
Gove-----	90,082	76,148	Crude petroleum, sand and gravel.
Graham-----	13,975,460	16,991,280	Crude petroleum, stone.
Grant-----	12,583,273	12,889,377	Natural gas, natural-gas liquids, sand and gravel.
Gray-----	2/	2/	Sand and gravel
Greenwood--	18,168,147	18,891,267	Crude petroleum, stone.
Hamilton---	633,466	499,827	Natural gas, crude petroleum, sand and gravel.
Harper-----	1,682,349	2,436,329	Crude petroleum, natural gas, sand and gravel.
Harvey-----	720,009	724,364	Crude petroleum, sand and gravel, natural gas.
Haskell----	3,862,738	4,424,706	Natural gas, natural-gas liquids, crude petroleum, sand and gravel.
Hodgeman---	292,562	335,646	Crude petroleum.
Jackson----	2/	2/	Stone.
Jefferson--	2/	362,504	Stone, crude petroleum.
Jewell-----	2/	2/	Stone, sand and gravel.
Johnson----	379,095	280,689	Stone, crude petroleum, natural gas.
Kearny-----	7,279,019	7,558,474	Natural gas, natural-gas liquids, crude petroleum, sand and gravel.
Kingman----	4,990,367	6,457,401	Crude petroleum, natural gas, natural-gas liquids, sand and gravel.
Kiowa-----	185,393	738,803	Crude petroleum, natural gas, sand and gravel.
Labette----	582,461	371,448	Crude petroleum, stone, natural gas.
Leavenworth	560,719	931,084	Stone, sand and gravel, clays, crude petroleum, natural gas.
Lincoln----	2/	2/	Stone, pumicite.
Linn-----	405,071	403,144	Crude petroleum, stone, sand and gravel, natural gas.
Logan-----	2/	45,208	Sand and gravel.
Lyon-----	1,320,964	1,158,196	Crude petroleum, sand and gravel, stone.
Marion-----	2,935,554	4,062,554	Crude petroleum, stone, natural gas.
Marshall---	619,766	650,740	Gypsum, sand and gravel.
McPherson--	12,470,355	11,065,845	Crude petroleum, natural gas, sand and gravel.
Meade-----	1,660,734	2,170,662	Crude petroleum, natural gas.

County	1955	1956	Minerals produced in 1956 in order of value
Miami-----	\$ 2,048,120	\$ 2,049,376	Crude petroleum, stone, natural gas.
Montgomery-	9,263,885	8,179,238	Cement, crude petroleum, natural gas, clays, stone.
Morris-----	220,733	846,601	Crude petroleum, stone, sand and gravel, natural gas.
Morton-----	7,101,891	9,040,467	Natural gas, crude petroleum.
Nemaha-----	90,298	116,696	Crude petroleum, stone.
Neosho-----	6,866,771	6,859,458	Cement, crude petroleum, stone, natural gas.
Ness-----	998,309	1,348,779	Crude petroleum.
Norton-----	2,910,576	2,568,484	Crude petroleum, pumicite.
Osage-----	2/	356,002	Stone, coal.
Osborne----	241,951	246,277	Crude petroleum, sand and gravel.
Ottawa-----	2/	14,715	Sand and gravel.
Pawnee-----	7,261,478	10,063,216	Crude petroleum, natural gas, sand and gravel.
Phillips---	5,903,815	5,115,976	Crude petroleum.
Pottawatomie	136,712	169,540	Stone, sand and gravel.
Pratt-----	8,232,256	7,927,276	Crude petroleum, natural gas, sand and gravel.
Rawlins----	-- -	2,511	Crude petroleum.
Reno-----	10,075,846	9,679,369	Salt, crude petroleum, natural-gas liquids, sand and gravel, natural gas.
Republic---	2/	2/	Sand and gravel.
Rice-----	20,903,506	17,068,726	Crude petroleum, salt, sand and gravel, stone, natural gas.
Riley-----	132,900	160,449	Sand and gravel, stone.
Rooks-----	19,888,555	19,409,806	Crude petroleum.
Rush-----	2,174,739	2,999,145	Crude petroleum, helium, natural gas, natural-gas liquids.
Russell----	30,126,873	27,460,550	Crude petroleum, sand and gravel, natural gas.
Saline-----	3,591,176	2,565,077	Crude petroleum, sand and gravel.
Scott-----	282,894	205,519	Do.
Sedgwick---	9,043,225	11,012,401	Crude petroleum, sand and gravel, natural-gas liquids, natural gas, salt.
Seward-----	5,171,118	5,171,677	Natural gas, natural-gas liquids, crude petroleum.
Shawnee----	1,004,964	1,078,084	Stone, sand and gravel.
Sheridan---	1,066,801	1,155,456	Crude petroleum, sand and gravel.
Sherman----	30,314	44,972	Sand and gravel.
Smith-----	2/	1,701	Do.
Stafford---	18,464,346	17,450,385	Crude petroleum, natural gas, sand and gravel.
Stanton----	1,738,380	1,872,891	Natural gas, sand and gravel, crude petroleum.

County	1955	1956	Minerals produced in 1956 in order of value
Stevens----	\$ 12,214,872	\$ 11,230,119	Natural gas.
Sumner-----	8,064,466	8,885,627	Crude petroleum, natural gas, sand and gravel.
Thomas-----	36,568	69,297	Sand and gravel, crude petroleum.
Trego-----	3,032,586	4,112,152	Crude petroleum, sand and gravel.
Wabaunsee--	441,837	923,399	Do.
Wallace----	2/	40,487	Diatomaceous marl, sand and gravel.
Washington-	2/	63,950	Sand and gravel.
Wichita----	-- --	30,446	Do.
Wilson-----	3,754,058	6,127,749	Cement, stone, crude petroleum, clays, natural gas.
Woodson----	2,414,934	2,795,988	Crude petroleum, natural gas.
Wyandotte--	7,392,610	9,318,822	Cement, stone, sand and gravel, natural gas.
Value of items that cannot be disclosed--	2,551,901	2,314,693	
Total-----	\$470,830,355	\$491,184,862	

1/ The following counties are not listed because no production was reported: Greeley, Lane, and Mitchell.

2/ Value included with "Value of items that cannot be disclosed."

REVIEW BY COUNTIES

Mineral production was reported in 102 of the 105 counties in Kansas in 1956, with 55 counties reporting production valued at \$1 million or more. Barton County was foremost with \$41.8 million in mineral production during the year. No mineral production was reported in Greeley, Lane, and Mitchell Counties. Highway construction and building strengthened the economy of some counties. Growing production of crude petroleum was responsible for considerable gains in some county mineral values.

County road construction is included in the county review for the first time and is used to aid in measuring the mineral activity of road construction materials.

TABLE 29--Road maintenance and construction in 1956, by counties 1/

County	Maintenance		Construction		Total cost
	Miles	Cost	Miles	Cost	
Allen-----	924	\$ 188,420	10	\$ 4,123	\$ 192,543
Anderson-----	944	160,996	17	74,014	235,010
Barber-----	214	54,463	16	51,448	105,911
Barton-----	371	235,286	114	315,502	550,788
Bourbon-----	957	197,057	78	104,657	301,714
Butler-----	441	219,445	59	145,406	364,851
Chase-----	541	130,860	84	139,356	270,216
Chautauqua-----	682	53,411	38	79,342	132,753
Cherokee-----	960	241,683	170	150,017	391,700
Clark-----	676	60,537	52	81,092	141,629
Clay-----	229	109,405	31	175,376	284,781
Cloud-----	1,180	103,805	211	291,175	394,980
Coffey-----	214	61,009	11	32,984	93,993
Comanche-----	560	9,260	60	96,985	106,245
Cowley-----	274	155,286	28	112,738	268,024
Crawford-----	1,013	348,321	78	190,933	539,254
Decatur-----	212	25,966	17	47,812	73,778
Doniphan-----	674	31,067	22	26,950	58,017
Douglas-----	246	74,414	9	187,357	261,771
Edwards-----	183	29,764	30	50,614	80,378
Elk-----	726	98,449	22	90,745	189,194
Ellis-----	1,342	142,699	248	179,664	322,363
Ellsworth-----	219	39,793	16	49,686	89,479
Finney-----	1,265	56,212	80	49,827	106,039
Ford-----	382	78,735	27	64,140	142,875
Franklin-----	223	96,144	51	217,324	313,468
Geary-----	420	79,687	65	212,883	292,570
Gove-----	235	27,287	44	22,090	49,377
Graham-----	1,446	72,493	139	171,590	244,083
Gray-----	--	66,920	120	44,102	111,022
Greeley-----	760	25,277	29	18,146	43,423
Greenwood-----	812	111,798	47	81,940	193,738
Hamilton-----	847	31,795	43	21,591	53,386
Harper-----	1,194	118,155	136	162,393	280,548
Harvey-----	217	93,759	24	141,779	235,538
Haskell-----	760	42,100	54	10,275	52,375
Hodgeman-----	1,460	46,860	108	54,434	101,294
Jackson-----	1,200	157,430	143	122,344	279,774
Jefferson-----	889	256,324	49	81,994	338,318
Jewell-----	1,471	151,176	60	138,104	289,280
Johnson-----	249	118,422	63	201,154	319,576
Kearny-----	670	17,492	68	41,155	58,647
Kingman-----	310	70,089	65	77,905	147,994
Kiowa-----	842	50,930	81	122,666	173,596
Labette-----	1,084	220,087	228	223,635	443,722
Lane-----	800	31,825	26	7,800	39,625
Leavenworth---	101	58,178	60	169,979	228,157
Linn-----	928	141,553	14	8,955	150,508

TABLE 29.--Road maintenance and construction in 1956, by counties 1/
(continued)

County	Maintenance		Construction		Total cost
	Miles	Cost	Miles	Cost	
Logan-----	216	\$ 9,624	102	\$ 49,413	\$ 59,037
Lyon-----	304	104,149	47	61,785	165,934
McPherson-----	339	152,305	72	151,519	303,824
Marion-----	1,613	227,553	181	251,917	479,470
Marshall-----	299	90,000	4	28,600	118,600
Meade-----	205	20,298	28	54,468	74,766
Miami-----	1,256	236,104	36	160,919	397,023
Mitchell-----	249	17,949	54	172,883	190,832
Montgomery-----	213	130,733	58	281,848	412,581
Morris-----	1,009	115,586	92	175,002	290,588
Nemaha-----	271	79,552	8	34,038	113,590
Neosho-----	982	144,493	159	240,686	385,179
Ness-----	1,154	49,093	270	68,298	117,391
Norton-----	234	18,862	18	22,436	41,298
Osage-----	968	89,832	3	19,273	109,105
Osborne-----	209	39,854	37	67,378	107,232
Ottawa-----	1,191	142,135	11	12,364	154,499
Pawnee-----	212	93,400	80	114,475	207,875
Phillips-----	234	43,243	27	89,774	133,017
Pottawatomie---	232	85,234	17	64,287	149,521
Pratt-----	992	153,939	101	247,712	401,651
Rawlins-----	1,480	75,502	62	56,728	132,230
Reno-----	420	199,455	62	194,317	393,772
Republic-----	1,272	129,449	179	361,258	490,707
Rice-----	337	113,070	150	204,799	317,869
Riley-----	197	68,033	33	192,385	260,418
Rooks-----	1,378	85,667	170	181,409	267,076
Rush-----	1,090	105,588	171	103,966	209,554
Russell-----	425	134,810	77	157,289	292,099
Saline-----	1,077	349,012	56	75,990	425,002
Scott-----	618	31,550	61	43,523	75,073
Sedgwick-----	558	498,678	124	554,608	1,053,286
Seward-----	789	51,482	77	161,920	213,402
Shawnee-----	291	213,864	63	76,023	289,887
Sheridan-----	243	28,188	73	33,666	61,854
Sherman-----	257	15,409	16	87,055	102,464
Smith-----	244	19,034	8	45,472	64,506
Stafford-----	271	70,472	101	130,805	201,277
Stevens-----	552	44,886	137	130,095	174,981
Sumner-----	346	178,557	36	142,115	320,672
Thomas-----	210	57,882	68	128,377	186,259
Trego-----	1,188	48,824	40	75,880	124,704
Wabaunsee-----	230	51,245	14	64,658	115,903
Washington-----	313	37,102	38	154,353	191,455
Wichita-----	846	37,322	68	40,260	77,582

TABLE 29--Road maintenance and construction in 1956, by counties 1/
(continued)

County	Maintenance		Construction		Total cost
	Miles	Cost	Miles	Cost	
Wilson-----	906	\$ 124,131	105	\$ 133,720	\$ 257,851
Woodson-----	683	111,917	26	33,255	145,172
Wyandotte-----	117	267,820	--	- - -	267,820
Total-----	61,067	\$10,185,011	6,665	\$11,079,182	\$21,264,193

1/ County Engineer's Annual Report, State of Kansas, State Highway Commission of Kansas, Highway Planning Department, 1956.

Allen.--Production and shipments of both masonry and portland cements, by Lehigh Portland Cement Co. at Iola and Monarch Cement Co. at Humboldt, were the largest in the State during 1956. Monarch Cement Co. began a \$6.5 million expansion of its facilities.^{26/} Over 0.8

^{26/} Pit and Quarry, vol.49, No. 7, January 1957, p. 153.

million barrels of crude petroleum were recovered from 10 fields and twelve secondary recovery projects accounted for 66 percent of this total. Of 333 wells drilled for primary, secondary, and natural gas recovery, 227 were oil productive. Limestone was crushed by Monarch Cement Co., Nelson Bros. Quarries, and by the Allen County Highway Department for concrete, road metal, and screening purposes. A small quantity of agricultural limestone was crushed. The United Brick & Tile Co. at Iola and Humboldt Brick & Tile Co. near Humboldt mined clay for the manufacture of brick and tile. Natural gas was produced from the Humboldt-Chanute field.

Anderson.--Secondary recovery of oil yielded over 86 percent of the total petroleum for Anderson County and was responsible for most of the drilling activity during 1956. Nearly 0.7 million barrels of crude oil were produced from 21 areas in 8 fields. Production declined from previous year. A total of 116 wells was drilled during the year. At Garnett, crushed limestone was produced for concrete and road metal by the Garnett Rock Co. Paving gravel was quarried by the Anderson County Highway Department for road construction. Nelson Bros. Quarries crushed limestone near Mt. Ida for concrete and road metal.

Barber.--Over 1.9 million barrels of crude petroleum were produced from 51 fields in Barber County. Most of the production was by primary methods as only 2 secondary recovery projects were reported. Drilling activity increased 7 percent from the previous year with a total of 217 wells drilled in 1956. Exploration and development activities were concentrated, mainly, in the Rhodes and Hardtner fields. New oil and gas fields numbered 14 of which 10 were new Mississippian gas fields, the more important of which were the Driftwood and Elsea gas fields. Highway and Platt oil fields were important discoveries. Rhodes, the largest oil field in Barber County, produced 0.9 million barrels; however, much of the field was shut in during early months of the year because of no market. Output of natural gas from Barber County was over 50 billion cubic feet during 1956. Mined tonnage of crude gypsum was about the same as last year; however, value declined sharply. Natural gasoline was recovered by Kansas Power & Light Co. at its plant near Medicine Lodge. Paving gravel was quarried by Barber County Highway Department.

Barton.--The 1956 value of mineral production from Barton County, composed mostly of petroleum, was the largest in the State. Nearly 15 million barrels of crude oil were recovered from 153 fields, which was 6 percent more than the previous year. Of 273 wells drilled in 1956, 130 were oil, 3 gas, and 19 were dry wildcats. The remainder of wells drilled were dry development wells or service wells. Workman North, St. Peter East, and Klug West, each producing from the Lansing-Kansas City strata, were important new oil field discoveries. Arkansas Sand & Gravel Co., Dubois Sand Co., Gruber Sand Plant, Moos Bros. Sand Co., and the Barton County Highway Department quarried sand and gravel for paving and construction purposes. Most all of this tonnage was reported as sand. Over 600 million cubic feet of natural gas were recovered from the Heizer Southwest, Krier, Pawnee Rock, and Unruh fields. Production of natural gas declined from the previous year. Barton Brick & Tile Co. produced structural products from its new Hoisington plant. Great Bend Brick & Tile Co. mined fire clay for face brick and other structural clay products.

Bourbon.--Ft. Scott Hydraulic Cement Co. produced natural cement, the leading commodity in the county. Shipments increased from 1955. Dimension sandstone was quarried by Bandera Stone Quarry at its plant near Ft. Scott. Cullor Limestone Co., Ft. Scott Hydraulic Cement Co., and the Bourbon County Highway Department quarried and crushed limestone for road construction, riprap, and agricultural purposes. Three coal mines were operated in Bourbon County during the year; output declined 35 percent from 1955. A small quantity of crude oil was produced.

Butler.--Butler County ranked fourth in the total value of mineral production and in the value of petroleum in Kansas. The value of the 8 million barrels of crude petroleum produced from 65 fields was \$23.3 million, 97 percent of the total county mineral value. Secondary recovery operations accounted for half of the petroleum produced in the county. Wells drilled in the county during the year totaled 269 and 2 new oil fields were discovered. A small quantity of casinghead gas was recovered. Limestone used for road construction, building purposes, and agricultural limestone was crushed by the Amis Construction Co. of Augusta, and George M. Myers, Inc. with 2 plants, Seglem and Duvanel. The following companies were expanding oil refining facilities in the county: 27/

<u>Company</u>	<u>Unit</u>	<u>Capacity barrels/day</u>
American Oil Co.	Ultraformer	6,120
Do	Hydrodesulfurization	12,000
Skelly Oil Co.	H-F Alkylation	3,500
Socony Mobil Oil Co.	Catalytic reformer	9,000
Vickers Petroleum Co., Inc.	Ultraformer	3,500

27/ Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, pp. 198-202.

Chautauqua.--Petroleum production in Chautauqua County increased 9 percent to over a million barrels. Production by water flooding dropped from 75 percent of the petroleum recovered in 1955 to 54 percent in 1956. Approximately 268 wells were drilled during the year, 181 less than in 1955, and most of this activity was concentrated on secondary recovery projects. Sedan Limestone Co. of Sedan crushed limestone for building and paving purposes. Natural gas was produced from several fields. Gravel used for paving was quarried by the Chautauqua County Highway Department.

Cherokee.--The State's entire production of lead and zinc originated in Cherokee County. Twenty-nine mining companies operated 45 mines in the county. The 2 largest producers were The National Lead Co., St. Louis Smelting & Refining Division (7 mines); and Eagle-Picher Co. (7 mines). The Eagle-Picher Co. operated its lead smelter and pigment plant and produced sulfuric acid by the contact process at Galena. The county remained first in coal mined in Kansas, and output increased 4 percent from 1955. Only 6 strip mines, 2 less than last year, operated during the year and provided employment for 171 men. Important coal producers in the county were: Pittsburgh-Midway Coal Co. at Hallowell, and Wilkinson Coal Co. at Weir. Three new companies joined Baxter Chat Co. and Eagle-Picher Co. in the utilization of lead-zinc tailings for stone use; C. Y. Semple, Southwest Chat Co., and Southwest Rock & Chat Co. Chats were produced by the Baxter Chat Co. and Eagle-Picher Co. for railroad ballast, concrete, and road metal. Miscellaneous clay was stripped for the manufacture of structural clay products by the United Brick & Tile Co. at Weir.

Clark.--The Harper Ranch field in Clark County was mainly responsible for over a 14 percent gain in the county's production of petroleum in 1956. Crude petroleum and natural gas were produced from 8 fields in the county. Clark County Highway Department mined gravel for paving purposes.

Cloud.--Earl Beaver Sand Co. at Glasco, Ross Sand Co., Inc., and Walker Sand Co. near Concordia quarried sand and gravel for building and paving purposes. Plastic fire clays were mined at Concordia for use in face brick and other structural products by Cloud Ceramics.

Coffey.--Crude petroleum recovery declined to 161,000 barrels from 190,000 barrels, but it remained the leading mineral produced in the county. One new field, Crandall, was discovered from 28 wells drilled during the year. Coal production declined for the second straight year and was 30 percent less than in 1955. Coal was produced by S. L. Rogers Coal Co. at Arvonnia, and the Thorne Coal Co. at Lebo. Neosho Valley Rock Co., near Burlington, and Jones Rock Co., near Emporia, crushed limestone for concrete, road metal, and agricultural uses. Paving gravel was produced by Coffey County Highway Department. Natural gas was recovered.

Cowley.--Cowley County ranked tenth in the State for value of mineral production in 1956. Crude petroleum, the leading mineral commodity, declined 100,000 barrels to 4.6 million barrels reported from 98 fields. Eleven new fields were discovered in 1956 and 202 development oil wells and 5 gas wells were found from 367 wells drilled. Secondary recovery of oil is growing in importance as an additional 260,000 barrels brought the total to .9 million barrels. Anderson-Prichard Oil Corp. was increasing its crude capacity by 6,500 barrels per day and its straight-run asphalt capacity 250 barrels per day at the Arkansas City refinery. 28/ Crushed limestone was produced by

28/ Oil and Gas Journal, vol. 55, No. 4, Jan. 28, 1957, p. 198.

Anderson-Oxandale at Udall, and John V. Elam at Winfield, for riprap, concrete, and road metal. Dimension limestone was produced at Silverdale by Silverdale Cut Stone and Silverdale Limestone. The Texas Co. recovered natural gasoline and LP-gases at its plant near Burden. Sand and gravel was quarried for structural and paving uses by Cowley County Highway Department at Winfield, Arkansas City Sand & Gravel Co., McFarland Gravel Co., George M. Myers, Inc., and Wilson Bros., all of Arkansas City; Phillips & Son Construction, Winfield Sand & Gravel Co., both of Winfield; and Oxford Sand & Gravel Co. at Oxford. Blast sand, filter sand, railroad ballast sand, and engine sand

also were produced. The half billion cubic feet of natural gas recovered approximated the output of the year.

Crawford.--The mined tonnage of coal from Crawford County was second only to that produced in Cherokee County. Coal was mined by two methods: shaft and open-pit. Lucky Star Coal Co. of Pittsburg, and Blue Ribbon Coal Co., Girard, operated shaft mines. Important strip producers of 12 strip mines in the county were the Apex-Compton Coal Co. at McCune, and Clemens Coal Co. near Pittsburg. Sixty-four persons were employed by the underground coal operators and 162 men were employed by open-pit operators. A small quantity of crude petroleum was produced from 6 fields in Crawford County and secondary recovery represented 82 percent of the total 49,000 barrel production. W. S. Dickey Clay Manufacturing Co. mined miscellaneous clay and fire clay for the manufacture of face brick, building brick, building tile, and other structural products. Natural gas also was recovered in the county.

Decatur.--Production of crude petroleum from 10 fields was nearly 0.4 million barrels, an increase of 13 percent from 1955. Three new fields, Van Fleet, Warner, and Warner North were discovered and the Warner field recorded an initial potential of 330 barrels per day. Sand for paving purposes was produced by the Decatur County Highway Department at Oberlin.

Dickinson.--Limestone was quarried from 3 pits by Anderson-Oxandale and from 1 pit by Riddle Quarries, Inc., for building, paving, and agricultural limestone. Recovery of crude petroleum from 7 fields in Dickinson County was approximately 127,000 barrels. One new field, Bonaccord Northeast, was discovered from 23 wells drilled. Sand and gravel was produced for paving and building by Shoffner Sand & Gravel Co. near Solomon, and by C. Smith Sand & Gravel Co. near Abilene.

Doniphan.--Limestone was crushed by Everett Quarries, Inc., at Wathena; George W. Kerford Quarry, Inc., at Sparks, Wolf River, and Iowa Point; Wolf River Limestone, Inc., at Troy; and by the United States Corps of Engineers. The material was used mainly for riprap, concrete, road metal, and agricultural limestone.

Edwards.--Petroleum and natural gas were recovered from 14 fields in Edwards County. Production of natural gas increased 89 percent over that of 1955 to 727 million cubic feet. Sand and gravel was produced by Dave Showalter at Kinsley for paving and road maintenance.

Elk.--Production of stone ranked second in the State for 1956. Limestone was quarried and crushed by Concrete Materials Construction Co. near Moline and by Elk County Highway Department near Howard, for concrete, road metal, railroad ballast, agricultural limestone, and riprap. Production of crude oil declined slightly from the previous year. Only 1 new field was discovered and drilling activity declined to a total of 91 wells. Crude petroleum production was recorded in Elk County as early as 1920. Natural gas was produced from some of the 30 fields in the county. Gravel for paving and road maintenance was mined by the Elk County Highway Department.

Ellis.--Ellis County ranked second in the State for value of mineral production, and second among the oil producing counties with over \$32 million for petroleum in 1956. Over 11.6 million barrels of petroleum were produced from 112 fields. Sixteen new fields were discovered of which the Engel, with an initial potential of 596 barrels per day, and North, with an initial potential of 202 barrels per day, were important. Three new fields, Dechant, Pleasant North, and Richards were revived. One hundred sixty-seven oil wells were found from 332 wells drilled in 1956. A small quantity of building sand was produced near Victoria by Lewis C. Schmidtberger.

Ellsworth.--The 1956 production of oil, 3 million barrels from 18 fields in the county, declined for the third straight year. Drilling activity, resulting in one oil field discovery, also declined as only 60 wells, 9 less than 1955, were drilled. Rock salt was produced near Kanopolis by the Independent Salt Co. Much of the salt was consumed by the agricultural and chemical industries. Paving sand was quarried by the Ellsworth County Highway Department and Henry Millberger near Wilson.

Finney.--The Finney County portion of the Hugoton Gas Area produced 38 billion cubic feet of natural gas, 12 percent more than the record year of 1955. Drilling in the county resulted in 49 new gas wells and 11 new oil wells from 69 drilled wells. Discovery wells of the 2 new fields, Pleasant Prairie NW and Sequoyah, each had an initial potential, 200 and 177 barrels of oil per day respectively. Eight wildcat tests were attempted during 1956 and all proved dry. Oil and gas production originated from 10 fields. Northern Natural Gas Co. recovered natural gasoline at its plant near Holcomb. Sam Alsop Construction Co., Smith Sand Co., and Finney County Highway Department, all of Garden City, produced sand and gravel for building and paving purposes.

Franklin.--Secondary recovery projects accounted for 84 percent of the 348,000 barrels of petroleum produced in 1956. The quantity of oil recovered from the 5 fields in the county was considerably less than the 377,000 barrels of petroleum recovered in 1955. Crushed limestone was produced by Anderson-Oxandale, Dan Fogle, and Solomon Construction Co. Lightweight aggregate was expanded by the Haydite process by Buildex, Inc. Miscellaneous clay, mined near Ottawa, was the raw material used for making lightweight aggregate.

Geary.--Crushed and dimension limestone were quarried by the Walker Cut Stone Co. near Junction City. Grosshans and Petersen quarried and crushed limestone for concrete and road aggregate. Building and paving sand was produced by Junction City Sand & Gravel Co. and by More Sand Co. near Junction City.

Graham.--Graham County ranked ninth in the State for the value of mineral production, and most of this value resulted from the production of crude petroleum. Forty-eight fields produced over 6 million barrels of oil. Exploration and drilling activity declined from 1955 with most of the activity concentrated in the Holley and Cooper fields. Four new oil fields were discovered and one oil field, Brassfield, reported over 300 barrels per day initial production. Government-and-contractor operators crushed sandstone for riprap.

Grant.--Grant County was second in the State for the production of natural gas with a total of 77 billion cubic feet produced from 572 Hugoton Gas Area wells. This was a decline in production of 8 percent from 1955. Only 2 new gas wells were drilled during the year. The county was first among natural gasoline and liquefied petroleum producing counties and accounted for \$4.4 million.

Greenwood.--Secondary recovery projects yielded 79 percent of the 6.8 million barrels of oil produced from 50 fields in the county. Two hundred forty-six wells including oil wells, dry holes, input wells, and salt water disposal wells, were drilled during the year. Nearly all of the drilling was for the development of secondary recovery projects. Mignot field was discovered and 4 dry wildcats were drilled. Forty-nine water flooding and other secondary recovery operations were reported. Greenwood County Highway Department crews crushed limestone for paving purposes.

Hamilton.--Natural gas was the leading commodity produced in Hamilton County. Production from 2 fields recorded over 4.3 billion cubic feet of natural gas and a small quantity of petroleum. Gas output decreased 17 percent to 4.3 million cubic feet, and oil recovery declined 37 percent, 6,000 barrels, from 1955. Building sand, paving sand, and paving gravel were produced near Syracuse by Smith Sand & Gravel Co., Syracuse Sand & Gravel Co., and the Hamilton County Highway Department.

Harper.--The impact of oil can easily be measured in Harper County as the total mineral value, \$1.7 million, experienced a sharp rise of 45 percent over the record year of 1955. Practically all of this increase was attributable to the mounting crude petroleum production in the county. Recovery of oil grew 39 percent and originated from 7 fields. Three new fields were discovered from 59 wells drilled, which were less than half of the number of wells drilled in the previous year. The discovery well of the Banner South field reported an initial potential of 1,408 barrels per day and Sunny View South recorded 35 barrels per day. Unfortunately the Wildcat Creek field discovery yielded no oil and was abandoned. Developmental drilling resulted in 24 oil wells, 2 gas wells, and 7 oil and gas wells. Natural gas recovery accounted for the remainder of the increase in mineral value. Production of natural gas, 2.6 billion cubic feet valued at \$285,000, more than doubled the 1955 output. Paving sand was produced by the Harper County Highway Department.

Harvey.--Production of petroleum in Harvey County increased slightly from the previous year. Natural gas output gained 19 percent over last year. Oil and natural gas were recovered from 10 fields in the county. Two new fields, Burrton East (oil) and Burrton North (gas), were discovered. Building and paving sand was quarried near Burrton by Howard R. Thach.

Haskell.--The Haskell County section of the Hugoton Gas Area reported over 31.4 billion cubic feet of natural gas. Nineteen new gas wells were drilled in the development of the Hugoton Area. Pleasant Prairie field, the only oil field in Haskell County, increased its output to 121,000 barrels, a rise in production of 87 percent from 1955. Howard Mitchell produced building sand near Hugoton.

Kearny.--Approximately 63.5 billion cubic feet of natural gas valued at approximately \$7 million were reported in 1956. Twenty-six development wells were drilled, principally for natural gas, in the west central part of the county. One new oil field, South Side, was discovered from 33 wells drilled and was the second oil field in the county. Kansas-Nebraska Natural Gas Co., with its plant near Deerfield, and Colorado Interstate Gas Co., Inc., with its plant near Lakin, recovered natural gasoline and liquefied petroleum gases. Paving sand was produced for the Kearny County Highway Department. Building and paving sand was quarried near Ulysses by Glen Popejoy.

Kingman.--Crude petroleum produced from 25 fields in Kingman County was nearly 2 million barrels and represented a 33-percent increase from the record output of 1955. Drilling activity accounted for 142 wells and 3 new field discoveries; however, the Georgia Spur field was abandoned. Natural-gas liquids were produced by the Skelly Oil Co. at its plant near Cunningham. Recovery of natural gas more than tripled the 1955 output. Two gas field discoveries were: Goetz and Settle which logged an initial potential of 24 and 2.4 million cubic feet of natural gas per day respectively. Natural gas production in Kingman County was 6.9 billion cubic feet. Building gravel was produced by Ray Wells from his quarry near Kingman.

Labette.--Limestone was produced by the Labette County Highway Department at Oswego, for concrete, road metal, and building rubble. Over 100,000 barrels of petroleum were produced from 10 fields. Water flooding and gas repressuring represented a third of the total production. Fifty-seven wells were drilled, of which 22 were oil productive, 19 dry, and 16 were for repressuring old fields. Gas recovery of 91 million cubic feet declined approximately 10 million cubic feet from that of the previous year.

Leavenworth.--Limestone was crushed for riprap, concrete, road metal aggregate, railroad ballast, and agricultural limestone by Wyandotte County Engineers, Loring Quarries, Inc., near Coldspur, George W. Kerford near Lowmont, Kansas State Penitentiary at Leavenworth, and the City of Leavenworth. Building and paving sand was produced by the Missouri Valley Sand, Inc. and Inland Construction Co. Natural gas and crude petroleum were produced during the year.

Linn.--Value of minerals produced dropped for the second straight year but was only slightly lower than 1955. Water flood projects in Linn County accounted for nearly all of the crude petroleum produced from the county's 6 fields, and the recovery was slightly more than in the previous year. Drilling of 54 wells in 1956 was less than the estimated 43 drilled in 1955. Concrete and road aggregate and agricultural limestone were crushed by Lee Giles near Greeley and by Murray Limestone Products Co. near Centerville. Paving gravel was stripped by the Linn County Highway Department.

Lyon.--Production of petroleum in Lyon County originated from 8 fields and amounted to 350,000 barrels. Water flooding accounted for over 130,000 barrels of this production. Drilling activity in the county declined to 24 wells drilled, with most of the activity concentrated in Fankhouser field where 14 wells were drilled. Sand and gravel was produced from quarries near Hartford by Wesley Parks and near Emporia by Harry Waterman, for building and paving purposes. A small quantity of limestone for concrete aggregate and road metal was produced by Anderson-Oxandale near Bushong.

Marion.--Approximately 1.4 million barrels of crude petroleum were recovered from 32 fields in the county. Drilling activity was high in Marion County as 270 wells were drilled and 7 new fields discovered. Unger Southwest was an important discovery and also accounted for the drilling of 84 wells. Riddle Quarries, Inc. operated 2 crushing plants, 1 at Lost Springs and 1 at Marion, for the production of crushed limestone used for riprap, railroad ballast, concrete, road metal, and screenings. Natural gas recovery increased slightly from 1955.

Marshall.--Bestwall Gypsum Co. purchased the Blue Rapids plant from Certain-Teed Products Corp. Mined output of gypsum increased slightly from 1955. Building and paving sand and gravel were produced by the Blue River Sand & Gravel Co. at Blue Rapids, by C. V. Garrett at Blue Rapids, Hall Bros. at Marysville, the Heinzelman Construction Co. at Marysville, and by Hugo P. Vogler at Waterville. A small amount of filter gravel was produced.

McPherson.--The value of crude petroleum, \$11 million, accounted for nearly all of the mineral value in McPherson County. Almost 4 million barrels of crude petroleum were recovered from 38 fields. Total wells drilled in McPherson County declined from the previous year to 147. This drilling activity resulted in the discovery of 2 new fields, the Round Hill and the Harmac East. Cooperative Refinery Association operated its petroleum refinery near McPherson. Paving gravel was produced by McPherson County Highway Department.

Meade.--The recovery of petroleum, 490,000 barrels, was more than 1955. Drilling activity rose sharply from 1955 as 62 wells were completed. Six new fields, 1 oil and 5 gas, were found as a result of increased exploration. Most important of the 6 fields discovered in 1956 was the Fincham gas field with an initial potential of 30 million cubic feet of gas. Natural gas recovery, over 7 billion cubic feet, rose 155 percent from the previous year, and the discovery of the Fincham, Sanders, Plains, Horace, and Angell fields will make Meade an important gas producing county. Purex Corp., Ltd., closed its pumicite mines permanently.

Miami.--Crude petroleum was the leading mineral commodity reported in Miami County for 1956 and all production was from 35 areas in 5 fields. Ten water flood projects accounted for 67 percent of the 675,000 barrels recovered. Drilling of 285 wells resulted in 148 oil producers, 2 gas producers, 60 dry holes, and 75 were for repressuring. Limestone for concrete, road metal, and agricultural purposes was produced by L. W. Hayes, Inc., and the Miami County Highway Department near Paola. A small quantity of natural gas was reported.

Montgomery.--Montgomery County was second in the State in the output of cement. The entire production of portland and masonry cement was produced at the Independence plant of Universal Atlas Cement Co. Modernization and improvements were made on crushing, storage, and drying equipment of the Independence plant with no increase in capacity. Production of crude petroleum declined 85,000 to 748,000 barrels and was produced from 10 fields. Half of this production originated from 16 water flood projects. Most of the 320 wells drilled were for the development of water flood projects, however 3 dry wildcats were drilled. Structural clay products were manufactured from miscellaneous clay at Coffeyville by the United Brick & Tile Co., Ludowici-Celadon Co. manufactured floor and wall tile at its Coffeyville plant. Concrete aggregate and road metal were produced by Anderson-Oxandale at the James Quarry and Severs Quarry near Sycamore. Natural gas was produced in the county. Ozark Smelting & Mining Co. processed zinc ores into zinc pigment at its Coffeyville plant.

Morton.--Only two mineral commodities were reported in Morton County, natural gas and petroleum. The recovery of natural gas increased approximately 22 percent to over 73 billion cubic feet in 1956. Of the 114 wells drilled during the year, 65 were gas, 29 development oil wells, and 1 was a dry wildcat. The remainder of wells drilled were dry development wells or service wells. The recovery of natural gas originated from two areas, Greenwood gas field and Hugoton Gas Area, Recovery of 346,000 barrels of petroleum more than doubled the 1955 output.

Neosho.--Cement was the county's leading mineral commodity in 1956. Ash Grove Portland Cement Co. completed revamping its plant. Shipments declined from the previous year. The quantity of crude petroleum, 638,000 barrels, produced from 8 fields in Neosho County, was slightly less than the previous year. Secondary recovery operations accounted for nearly 77 percent of total oil recovered. An estimated 335 wells were drilled in 1956. Chanute Refining Co. and N.F.A. Oil Co. operated petroleum refineries near Chanute. Harry Byers and Joe O'Brien crushed limestone for concrete, road metal, and agricultural limestone. Neosho County Engineer quarried limestone for concrete and road metal near Urbana. Harry Byers quarried a small quantity of limestone rubble. Natural gas was recovered.

Ness.--The 486,000 barrels of crude petroleum produced from 12 fields in Ness County increased 37 percent for the second straight year. Five new fields were discovered, of which the Ryerse was an important discovery. Petroleum was the only mineral commodity reported in 1956.

Norton.--The 1956 production of crude petroleum from Norton County decreased 11 percent from .1 million to 0.9 million barrels. Exploration and development accounted for 21 wells and included 15 dry wildcats. This was approximately half the number of wells drilled in 1955. Pumicite was prepared by the Wyandotte Chemical Corp. at Calvert.

Pawnee.--Approximately 3.4 million barrels of crude petroleum were produced from 39 fields in Pawnee County, and this represented a gain of about 43 percent over 1955. Drilling of 175 wells resulted in 5 new field discoveries. The Larned Southwest oil field and Evers South gas field were important discoveries. Natural gas recovery, 4.6 billion cubic feet, declined from the previous year. Paving gravel was produced by the Pawnee County Highway Department. Sand and gravel for building, paving, and other purposes was produced by Johnson Sand-Gravel Co. and Larned Sand & Gravel Co.

Phillips.--The value of petroleum produced in Phillips

County, \$5.1 million, declined approximately 13 percent from the previous year. This was the second year that production declined. Fourteen wells were drilled, of which 7 were oil productive and 7 were dry. The petroleum refinery of the Cooperative Refinery Association was operated at Phillipsburg. Crude petroleum was the only mineral reported in the county.

Pratt.--Yield of crude petroleum, produced from 40 fields including 1 secondary recovery project, was 2.8 million barrels. Two new oil fields and 1 new oil and gas field were discovered in the county by the drilling of 39 wells in 1956. The 2 new oil fields were Carver-Robbins and Haskins; the oil and gas field was the Cullison. Natural gas production was over 1.3 billion cubic feet. Near Pratt, C. D. Hogard and the Pratt County Highway Department produced paving sand; Miller Sand & Gravel Co. mined building sand.

Reno.--The value of salt, \$6 million, from Reno County was the largest of the 3 counties reporting salt, and this value increased 3 percent from 1955. Salt was evaporated by Barton Salt Co. and Morton Salt Co.; rock salt was mined by the Carey Salt Co. All salt was produced near Hutchinson. The production of crude petroleum from 21 fields in the county was over 1 million barrels. This output declined slightly from the previous year. Drilling of 42 wells resulted in 3 oil and 39 dry holes. Natural-gas liquids were recovered near Burrton by the Cities Service Oil Co. J. N. Shears' Sons, Inc. produced building and paving sand from their pit near Hutchinson. Building sand was stripped by the J. E. Steele Sand & Gravel Co. near Hutchinson. A small amount of sand and gravel was produced by Fountain Sand Pit near Arlington, Haven Sand Co. near Haven, and J. A. Mummy near Nickerson for building and paving purposes and glass sand. Natural gas yield continued to rise, and the 1956 production of 476 million cubic feet was 5 percent greater than in 1955.

Rice.--Rice County yield of crude petroleum was 5.4 million barrels from 60 fields. The recovery of oil diminished 21 percent from 1955. Drilling of 144 wells resulted in the discoveries of 3 new fields, Bredfelt, Orth North, and Humphreys. Both evaporated and rock salt were produced near Lyons by the American Salt Corp. Approximately 804 million cubic feet of natural gas were produced in the county. Sand and gravel for structural and paving purposes was mined by Arensman Sand & Gravel Co. near Raymond; A. L. Stapleton near Alden; Rock Hill Stone & Gravel Co., Sterling Sand & Gravel Co., both near Sterling; and A. Wright & D. Birchenough near Lyons Riddle Quarries, Inc., crushed limestone near Little River for riprap, concrete, road metal, and agricultural purposes.

Rooks.--Crude petroleum production, the only mineral commodity reported in Rooks County, ranked fifth in the State. Recovery of 7.0 million barrels was from 79 fields. Exploratory drilling resulted in the discovery of 5 new fields which were: Annon South, Cresson, Gra-Rook North, Trarback, and Williams North. The discovery well of the Gra-Rook North field had an initial potential of 281 barrels of oil per day. Drilling accounted for 73 new oil wells from 159 wells drilled. Important producing fields included Marcotte, Barry Southeast, Jelinek, Northampton, and Palco Southeast.

Rush.--Petroleum recovery jumped 75 percent to 703,000 barrels and was from 16 fields. Four new fields were discovered from 61 wells drilled during the year. These were: Pechanec, Ryan West, and Web Southwest oil fields and Lohrey gas field. Yield of helium, recovered from natural gas by the Federal Bureau of Mines plant at Otis, increased from the previous year. Production of natural gas, over 2.5 billion cubic feet, was slightly less than 1955. Discovery well of the Lohrey field reported an initial potential of 6.7 million cubic feet per day. Natural-gas liquids were recovered at Otis by Flynn Oil Co.

Russell.--Mineral value, \$27.5 million, in Russell County declined for the second year and was \$2.7 million less than 1955; however, the county maintained its position as the third largest mineral producer in the State. Over 9.9 million barrels of crude oil were recovered from 36 fields. Two new oil fields, Kune and Worley, were discovered from 158 wells drilled and of this total, 99 were for development oil wells. Paving gravel was produced near Russell by the Russell County Highway Department. A small quantity of natural gas was produced in conjunction with petroleum production.

Saline.--Only two mineral commodities were reported for Saline County in 1956, crude petroleum and sand and gravel. Recovery of crude oil declined 28 percent to 812,000 barrels produced from 11 active fields in the county. Only 8 wells were drilled during the year, of which 2 found oil and 6 were dry. Putnam Sand & Building Co. and Salina Sand Co., Inc., produced sand and gravel near Salina for building and paving.

Sedgwick.--The value of mineral production in Sedgwick County, \$11 million, continued to rise and was 22 percent over 1955. Crude petroleum, salt, and sand and gravel were responsible for this growth. Petroleum yield, over 2.7 million barrels, was from 43 fields in Sedgwick County. Fifty-three wells found oil from 111 wells drilled during the year. Five new fields, Chambers Northeast, Gladys Southwest, Brumley Northwest, Latta North, and Greenwich Northeast, all producing from the Mississippian stratum, were discovered. Petroleum was refined by the Derby Oil Co. at Wichita. Cities Service Oil Co. operated its natural gasoline plant at Wichita. Seventeen sand and gravel operations were reported in 1956. Important producers were Inland Construction Co., Miles Sand Service, Dolese Bros., Walt Keeler Co., Inc., and Superior Sand Co., Inc. Much of the production was for construction in Wichita. Natural gas was also produced. Frontier Chemical Co. pumped brine for the manufacture of salt chemicals in Wichita.

Seward.--Production of 30 billion cubic feet of natural gas in Seward County originated from 5 fields. The Plains West gas field was discovered and recorded an initial potential of 21 million cubic feet of natural gas per day. Gas development projects accounted for nearly all of the drilling activity. Most of these wells were drilled in the Hugoton Gas Area. Much of the natural gas was processed by natural gasoline plants of Panhandle-Eastern Pipeline Co. and Northern Natural Gas Co. A small quantity of crude petroleum was produced.

Shawnee.--Crushed limestone was produced by Henry C. Luttjohann, Netherland Stone Co., and Shawnee County Engineer from quarries near Topeka. Pattons Crushed Stone Co. also produced crushed limestone near Pauline. Most of the limestone was used for concrete, road metal, and screening purposes. A small quantity was produced for agricultural purposes. Sand and gravel, principally used for building and paving, was mined near Topeka by the Kansas Sand Co., Inc., River Sand Co., Inc., Shoffner Sand, Inc., Inland Construction Co., and Victory Sand & Stone, Inc. Small quantities of blast sand, engine sand, and other sands also were produced. Road building, industrial construction, and residential construction in the City of Topeka was responsible, in part, for the increased construction materials output.

Sheridan.--The total output of crude petroleum, 402,000 barrels, increased approximately 14 percent from 1955. Wells drilled numbered 31 and resulted in the discoveries of 2 new fields: Advance and Hoxie. Both fields reported over 500 barrels per day initial potentials. The Chicago field, discovered in 1955, was abandoned because no production was reported. Paving gravel was stripped by Harry Henry, Inc. and Sheridan County Highway Department near Hoxie. Paving sand was produced by Carl Kaiser, near Grainfield.

Stafford.--Stafford County was seventh in total mineral value in Kansas for 1956. The recovery of petroleum from 158 fields was 6.2 million barrels. Of 249 wells drilled, 13 new fields were discovered. Important new fields were: Rattlesnake East (1,393 barrels per day), Dillwin (265), Liess (235), and Seevers Northwest (205). The Knoche South field was abandoned. Over 1 billion cubic feet of natural gas was produced during the year. Structural and paving sand was produced by the Partin Sand & Gravel Co. near Stafford. Paving sand was stripped by the Stafford County Engineer near Saint John.

Stanton.--The recovery of 17 billion cubic feet of natural gas in Stanton County was from the Hugoton Gas Area. This quantity of natural gas represents an increase of 9 percent from the previous year. Only 7 development and exploration wells were drilled. Harry Henery, Inc., operated a quarry near Manter for the production of paving sand and gravel.

Stevens.--Stevens County was the leading producer of natural gas in Kansas with over 102 billion cubic feet, all from the Hugoton Gas Area. Two new gas fields, Hanke and Panoma, were discovered and reported initial potentials of 7.5 million and 16 million cubic feet per day respectively. No other minerals were produced.

Sumner.--The 1956 mineral value, \$8.9 million, was 10 percent greater than 1955. Over 3 million barrels of petroleum were reported from 44 fields. The number of wells drilled was 175, of which 87 were oil productive. Four new fields were discovered: Beatie, Latta Northwest, Meek, and Portland South. Yield of natural gas increased to over 2.7 billion cubic feet. Paving gravel was produced by the Sumner County Highway Department near Wellington. Mulvane Sand Co., Inc., produced structural and paving sand near Mulvane.

Trego.--Approximately 1.5 million barrels of crude petroleum were produced from 29 fields, and output was 37 percent more than the previous year. Six new oil fields, Adair Southwest, Kroeger, Newcomer, Newcomer Northwest, Page Creek, and Rhoden, were discovered. The Newcomer and Newcomer Northwest reported initial potentials of 3,000 and 1,642 barrels per day respectively. Sand and gravel for paving purposes was produced by the Siebert Sand Co. at its pits near Ransom. Trego County Highway Department obtained paving gravel near Wakeeney.

Wilson.--Expanded facilities of the Consolidated Cement Co. plant at Fredonia resulted in increased production and shipments of cement. Wilson County replaced Neosho County as the third largest county for cement. The recovery of crude petroleum from 12 fields decreased slightly from 1955. Drilling activity increased considerably as 126 wells were drilled, compared with 86 wells drilled in 1955. Standard Oil Co. (Indiana) was adding a 6,000 barrel-per-day ultraformer and a 6,000 barrel-per-day hydrofining unit at its Neodesha refinery²⁹

²⁹ Oil and Gas Journal, vol. 55, No. 12, Mar. 25, 1957, p. 211.

Limestone was crushed by Carr Rock Products Co. at Neodesha, Benedict Rock Lime Co. at Benedict, and Anderson-Oxandale for concrete, road metal, screening, and agricultural purposes. Acme Brick Co. at Buffalo and Excelsior Brick Co. at Fredonia manufactured heavy clay products from miscellaneous clays. Natural gas was reported in the county.

Woodson.--The quantity of crude petroleum recovered from 23 fields in Woodson County was nearly 1 million barrels and included production by secondary recovery methods. Two oil fields, Annabelle and Rose East, and 1 gas field, Gordon, were discovered. A small quantity of natural gas was produced in the county.

Wyandotte.--Continued activity in construction and road building in the Kansas City area was shown in 1956. Lone Star Cement Corp. increased production and shipments of cement from 1955. Limestone was quarried and crushed near Turner and Kansas City by American Rock Crusher Co., Peerless Quarries, Inc., and Thompson Strauss Quarries, Inc., for riprap, concrete, road metal, and asphalt filler. Nine operators produced sand in Wyandotte County, which was used as structural, paving, filter, engine, railroad ballast, molding, and other sand uses. A small quantity of building gravel was also produced. Important producers included Stewart Sand Material Co., Peck-Wolf Sand & Material Co., Holliday Sand & Gravel Co., Builders Sand Co., and American Sand Co. The county was one of the great centers of activity for the production of crushed limestone in Kansas, and 3 producers were responsible for the large output. Crushed stone was used principally in Kansas City for construction and road building. Natural gas was produced from Roberts-Maywood field in Wyandotte and Leavenworth Counties.