STATE OF ILLINOIS
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DIVISION OF THE
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URBANA

REPORT OF INVESTIGATIONS—NO. 127

ILLINOIS MINERAL INDUSTRY IN 1946

BY

WALTER H. VOSKUIL

PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS

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Topographic Mapping in Cooperation with the United States Geological Survey.
This report is a contribution of the Mineral Economics Section.

September 15, 1947

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ILLINOIS MINERAL INDUSTRY IN 1946

BY

WALTER H. VOSKUIL

INTRODUCTION

THE ILLINOIS MINERAL INDUSTRY is a key factor in creating and supporting the industrial activity in Illinois and, to considerable extent, in other states of the Upper Mississippi Valley. The primary materials of industrial production—fuels and iron ore, the latter from the Lake Superior district—are available in abundant quantities and are assembled for processing at a low cost on Lake Michigan near the large market of Chicago and of smaller cities in the industrial belt. There are abundant cheaply mined and good quality coals at points accessible to manufacturing centers. In addition to this, certain minerals essential to the processing of primary steel, such as refractory materials and fluxes, are also present in the area, together with a variety of mineral products for foundry, chemical, construction, and other uses.

This wide array of manufacturing industries lies in the center of one of the most efficient and low-cost food producing areas in the United States, if not in the world. A fertile soil has provided an area of high food yields, a mechanized agriculture has brought production costs down to a low level, a flat topography has aided in the introduction of cost-saving farm machinery and the low cost of transporting farm products to consuming centers, and the use of power on farms, by displacing animal power, has added millions of acres to the farm land available for the production of food.

The unusual and excellent endowment of industrial, mineral, and agricultural resources offers opportunities for production and employment that are probably unmatched elsewhere.

The wide variety of mineral production in the State and the high rank of Illinois among the states in the production of several of these minerals, as shown in table 1, indicates the State's important position as a mineral producer.

Not only is Illinois an important producer of minerals, but it also ranks high as a center for the processing of mineral raw materials from the raw condition into primary raw materials for the use of industry. This is shown in tables 1 and 2 and figure 1.

ACKNOWLEDGMENTS

This report is made possible through the cooperation of the Bureau of Mines of the United States Department of the Interior, the Illinois State Department of Mines and Minerals, and the cooperation of mineral producers throughout Illinois in furnishing information regarding their operation.

Special acknowledgment is made to Douglas F. Stevens and Miss Ethel M. King, who have assembled the statistics for the report on stone, sand, gravel, clay and clay products, silica and tripoli, and the metals; to Mrs. Nina T. Hamrick for assisting in the preparation of the sections on petroleum, natural gas, and fluorspar; and to W. L. Busch for aid in preparation of the section on coal.

Each section of this report was prepared in close collaboration with the heads of the several mineral research divisions of the Illinois State Geological Survey. Special assistance and advice were contributed by Ralph E. Grim, Petrographer and Principal Geologist in charge of the Geological Resources Section; G. H. Cady, Senior Geologist and Head of the Coal Division; A. H. Bell, Geologist and Head of the Oil and Gas Division; J. E. Lamar, Geologist and Head, and Robert M. Grogan, Associate Geologist, both of the Industrial Minerals Division; F. H. Reed, Chief Chemist and Head, and G. C. Finger, Chemist and Head of the Fluorspar Division, both of the Geochemistry section.

ECONOMIC REVIEW OF THE MINERAL INDUSTRIES

General

The most significant feature in the mineral industries in the year 1946 has been a substantial rise in prices. Coal advanced from an average per ton value, f.o.b. mines from $2.34 to $2.57 in Illinois and $3.06 to $3.40 in the nation. Oil prices in Illinois rose from a pre-war level of $1.32 to $2.07. Higher prices are reported for sand, gravel, and stone.

Production of coal fell from 578 million tons in 1945 to 532 million tons in 1946, a drop of 8 percent. Consumption fell from 560 million tons in 1945 to 500 million tons in 1946, a drop of 11 percent.

Crude oil production and demand in the post-war period are being sustained at war levels. Production of petroleum in the United States in the year ending December 1946 was 1,733,424,000 barrels as compared with 1,713,655,000 barrels for the year ending December 1945. Illinois gained slightly in 1946 with a total of 75,297,000 barrels as compared with 75,094,000 barrels in the previous year.

The sustained demand for oil products after the war was unexpected and contrary to forecasts by students of the oil industry. Difficulties in the coal industry in the past year have brought about some changes in the pattern of fuel consumption. One of the significant developments in fuel use is the trend toward Diesel-powered locomotives. This trend has gained impetus since 1940 when Diesel installations rose from 797 in that year to 3,100 in 1945, and Diesel fuel consumption rose from 62,175,000 gallons to 522,681,000 gallons in 1946. This is calculated to be an equivalent of 22,000,000 tons of coal.

Limestone and dolomite increased in amount from 11 million tons to 15 million tons and in value from 11 million dollars to nearly 17 million dollars. Silica sand showed a decrease in value from 3.7 million dollars in 1945 to 3.2 million dollars in 1946. Gravel practically doubled in value of output from 3 million to 5.7 million dollars. Lime output and value showed little change.

Fluorspar

Shipments of fluorspar from mines in the United States were 277,940 tons in 1946, valued at 5.4 million dollars; this may be compared with 323,961 tons in 1945 valued at 5 million dollars. Illinois maintained its rank as the chief producing state in 1946 by supplying 56 percent of total shipments.

The Long-term Outlook

Beyond the immediate economic conditions in the mineral industries is the long-term outlook for a continued flow of mineral supplies. The heavy draft upon our mineral resources during the war and the necessity of imposing restrictions upon civilians in the free use of minerals has given rise to concern over the adequacy of mineral supply. The period encompassing World War II and the years immediately following may mark a turning point in mineral exploitation and utilization. The period in which the minerals were obtained from rich favorably placed deposits—the high-grade ores of the Mesabi range, the enormous low-cost oil reservoir of East Texas, the choice coking coals of the strategically located Connelsville coking coal—is giving way to an era in which it will be necessary to make use of lower grade materials or less easily accessible sources for coal, petroleum, iron ore, copper, lead, and zinc. Some of the more significant changes in the offing are as follows:

In coal, a forseeable depletion of the elite type of coking coal deposits of low-ash and low-sulphur content, and the need for exploring the feasibility of obtaining metallurgical coke from hitherto non-coking coals. Of local significance is the imminent depletion of some of the choice sections of No. 6 coal in southern Illinois and the need for developing less favorable portions of this coal seam.

In petroleum, the trend has been definitely toward deeper horizons in new drilling, more extended efforts in secondary recovery in old fields, the commercial development of synthetic processes for making liquid fuel out of natural gas, and a distinct possibility

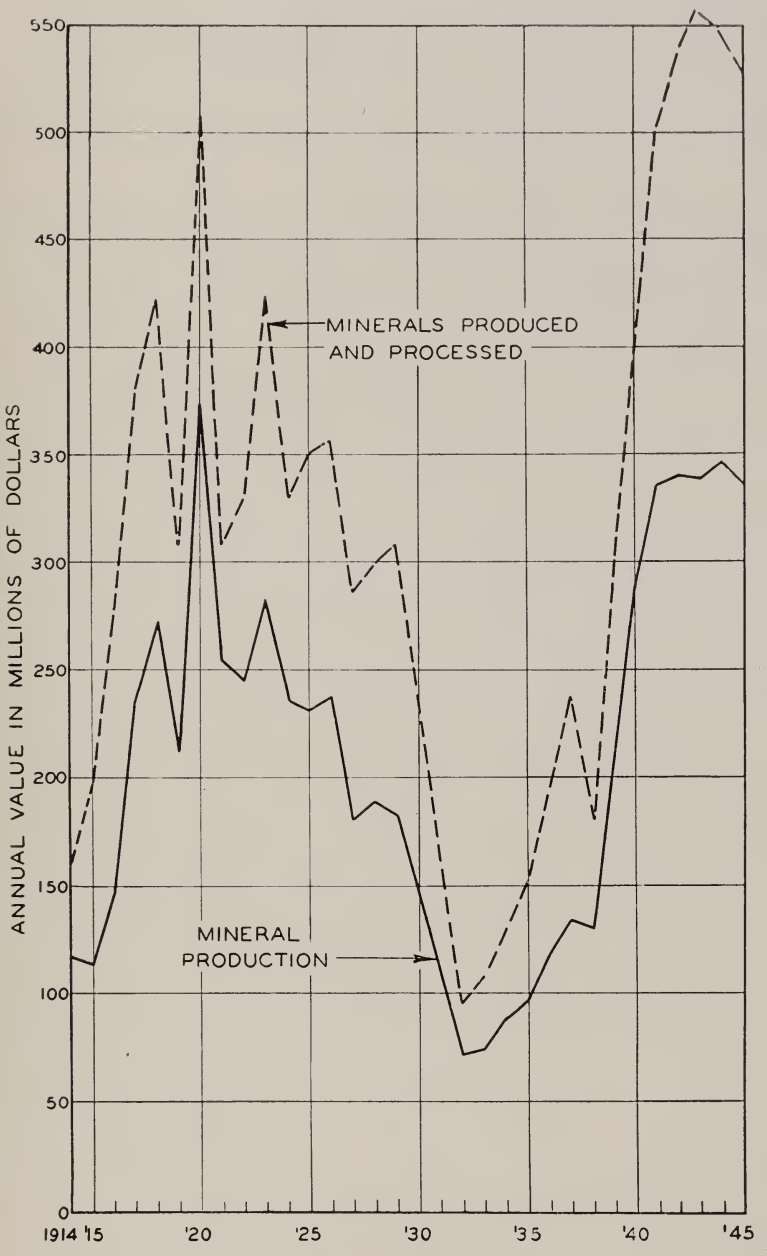

FIG. 1.—Value of annual mineral production in Illinois, 1914–1945.

that this process may be applied to coal in the not too distant future.

In iron ore, the life of the high-grade iron ore supplies in the Lake Superior district is now recognized as limited in duration and, in anticipation of depletion, alternative sources of ore must be sought. Potentially these are obtainable from the vast tonnages of low-grade ore in the Superior district, or from high-grade ore deposits in Canada, Cuba, Venezuela, Brazil, Sweden, Sierre Leone, Labrador, and Chile.

Line No.	Material	Detail table	Unit	1944				
				Quantity	Value at plants		Rank among states	
					Total	Av.	Amt.	Value
1	*Coal—bituminous*	21, 23	Tons	77,400,000	$172,602,000	$2.23	3	4
	Petroleum							
2	Crude oil	31, 32	Bbls.	77,413,000	*107,370,000	1.39	6	6
3	Natural gas—marketed	—	M cu. ft.	* 18,137,000	* 1,128,000	* .062	* 15	*16
4	Natural gas—used in fields	—	M cu. ft.	* 15,546,000	* 855,000	* .055		
5	Natural gasoline	32	Gals.	61,351,000	3,870,000	.063	6	5
6	Liquefied petroleum gases	32	"	133,018,000	4,130,000	.031	3	3
7				—	*117,353,000	—		
	Stone, rock products							
8	Limestone, dolomite, marl	53, 54	Tons	10,668,128	10,689,477	1.00	4	3
9	Cement	60	Bbls.	3,597,074	5,592,703	1.55	[c]13	[c]14
10	Lime	61	Tons	290,988	2,266,539	7.78	6	5
11	Ganister, sandstone	62	"	548	4,774	8.71		
12				—	* 18,553,493	—		
	Clays, clay products							
13	Clays (except fuller's earth)	63	Tons	188,604	500,113	2.65	8	14
14	Fuller's earth	63	"	42,277	390,346	9.23	3	4
15	Clay products—refractories	64	"	200,021	4,053,387	20.26		
16	Structural	"	Eqv. tons	737,587	4,258,517	5.77		3
17	Whiteware and pottery	"	—	—	6,764,620	—		
18				—	15,966,983	—		
	Sand and gravel							
19	Silica sand	65	Tons	3,331,185	4,642,979	1.39	1	1
20	Other sand	66	"	2,956,570	1,450,369	.49		
21	Gravel	"	"	6,057,765	2,968,300	.49	2	2
22			"	12,345,520	9,061,648	.73		
	Silica and tripoli							
23	Ground silica	67	Tons	156,353	1,076,785	6.88	1	1
24	Tripoli ("amorphous" silica)	68	"	12,031	205,732	17 02	1	1
25			"	168,384	1,282,517	7.62	1	1
26	*Fluorspar*	82	Tons	176,259	5,954,991	33 79	1	1
	Metals							
27	Zinc	83	Tons	7,262	1,655,736	228.00	18	18
28	Lead	"	"	1,971	315,360	160.00	14	14
29	Silver	"	Troy ozs.	2,437	1,733	0.711	21	21
30				—	1,972,829	—		
31	*Miscellaneous minerals*	84	Tons	* 19,192	* 84,856	*4.43		
32	*Annual mineral production*			—	* 342,832,317	—		5
	Minerals processed, but mostly not mined in Illinois[d]							
33	Coke and byproducts	30, 85	—	—	47,330,798	—	6	5
34	Packaged fuel	—	Tons	1,837	23,037	12.54	5	5
35	Pig iron	85	"	5,686,397	118,953,078	20.92	4	4
36	Sulfuric acid	"	"	234,245	2,328,395	10.00	2	2
37	Slab zinc (out-of-state ore)	"	"	148,100	33,766,764	228.00	[f] 3	[f] 3
38	Miscellaneous minerals processed[g]	"	"	—	* 4,431,111	—		
39	*Total minerals processed*			—	*206,833,183	—		
40	*Total minerals produced and processed*			—	*$549,665,500	—		

* Revised figures.
[a] Compiled from various sources, as stated in each table. See footnotes for each table.
[b] Subject to revision.
[c] Rank among districts—U. S. Bureau of Mines.

ILLINOIS, SOLD OR USED BY PRODUCERS, 1944–1946[a]

1945					1946						
Quantity	Value at plants		Rank among states		Quantity	Value at plants		Percent change in amount from 1945	Percent change in value from 1945	Rank among states	Line No.
	Total	Av.	Amt.	Val.		Total	Av.			Amt. Val.	
73,446,900	*$171,866,000	*$2.34	3	4	62,554,000	$163,881,000	$2.57	−14.8	− 4.7		1
* 75,094,000	* 105,130,000	* 1.40	6	6	75,297,000	118,216,290	1.57	+ 0.3	+12.4		2
* 16,663,000	* 1,016,000	* .061	14	15	(e)	(e)	—	—	—		3
* 15,544,000	* 838,000	* .054			(e)	(e)	—	—	—		4
55,233,000	3,330,000	.06	6	5	51,200,000	3,070,000	0.06	− 7.3	− 7.8		5
120,683,000	3,980,000	.033	3	3	109,834,000	4,173,692	0.038	− 8.9	+ 4.8		6
—	* 114,294,000	—			—	125,459,982	—	—	+ 9.7		7
* 11,122,679	* 11,340,341	1.02	4	3	15,242,858	16,609,721	1.09	+37.0	+46.5		8
* 4,382,000	* 7,089,000	* 1.62			[b] 6,270,000	[b] 11,600,000	1.85	+43.0	+64.0		9
287,607	2,228,909	7.75	6	5	273,616	2,243,438	8.20	− 4.9	+ 0.7		10
8,573	10,791	1.26			8,336	10,900	1.30	− 2.8	+ 1.0		11
—	* 20,669,041	—			—	[b] 30,464,059	—	—	+47.4		12
169,429	510,979	3.02	8	14	172,894	568,384	3.29	+ 2.0	+11.2		13
43,664	403,085	9.23	3	4	33,134	296,637	8.95	−24.1	−26.4		14
227,755	4,170,977	18.31			208,802	5,170,788	24.81	− 8.3	+24.0		15
1,123,775	7,486,053	6.66			1,752,428	14,752,254	8.42	+55.9	+97.0		16
—	6,920,883	—			—	12,274,324	—	—	+77.4		17
—	19,491,977	—			—	33,062,387	—	—	+69.6		18
2,576,460	3,723,731	1.45	1	1	2,256,503	3,407,547	1.51	−12.8	− 8.4		19
3,306,383	1,708,718	.49			4,810,604	2,829,148	.59	+45.5	+65.6		20
6,093,060	2,975,805	.49			10,232,669	5,792,757	.57	+67.9	+94.7		21
11,975,903	8,408,254	.70	2	2	17,299,776	12,029,452	.70	+44.5	+43.1		22
140,376	935,389	6.66	1	1	138,023	1,002,836	7.27	− 1.7	+ 7.2		23
11,144	184,189	16.53	1	1	(e)	(e)	—	—	—		24
151,520	1,119,578	7 45	1	1	138,023	1,002,836	—	—	—		25
147,251	5,014,807	34.06	1	1	154,525	5,493,642	35.55	+ 4.9	+ 9.5		26
* 8,310	* 1,911,300	230.00	18	18	8,771	2,175,208	248.00	+ 4.3	+13.8		27
* 3,005	* 516,860	172.00	*14	*14	3,931	794,062	202.00	+30.8	+53.6		28
* 2,198	* 1,563	0.711	*20	*20	2,532	2,046	.808	+15.2	+30.9		29
—	* 2,429,723	—			—	2,971,316	—	—	+22.3		30
* 17,846	83,814	* 4.70			(e)	(e)	—	—	—		31
—	* 343,377,194	—		5	—	[b]374,364,674	—	—	+ 9.0		32
—	44,642,444	—	6	6	—	43,191,213	—	—	− 3.3		33
16,690	186,593	11.20			(e)	(e)	—	—	—		34
5,061,368	116,303,897	22.98	4	4	(e)	(e)	—	—	—		35
216,482	2,186,468	10.10	2	2	(e)	(e)	—	—	—		36
116,669	26,833,850	230.00	[f] 3	[f] 3	(e)	(e)	—	—	—		37
—	* 3,505,218	—			—	3,599,238	—	—	+ 2.7		38
—	* 193,658,470	—			—	46,790,451	—	—	—		39
—	*$537,035,664	—			—	[b]$421,155,125	—	—	—		40

[d] Other processed minerals produced in Illinois include pig lead, expanded vermiculite alumina, phosphates, etc., but data for them are not available.
[e] Not available.
[f] Rank among states for total slab zinc smelted.
[g] Includes mineral wool.

TABLE 2.—VALUE OF ILLINOIS MINERAL PRODUCTION
SUMMARY OF ANNUAL VALUES, 1914–1946[a]
(In thousands of dollars)

Year	Mineral production of Illinois (thousands)	Minerals processed, but mostly not mined, in Illinois (thousands)	Total minerals produced and processed (thousands)
1914	$117,166	$ 44,843	$162,009
15	114,446	82,871	197.317
1916	146,360	130,082	276,442
17	234,736	144,754	379,490
18	271,244	149,740	420,984
19	213,701	95,077	308,778
20	373,926	137,228	511,154
1921	254,019	54,136	308,155
22	244,618	85,820	330,438
23	282,761	142,131	424,892
24	235,796	95,506	331,302
25	231,658	118,702	350,360
1926	237,242	119,642	356,884
27	180,394	105,099	285,493
28	188,099	110,622	298,721
29	182,791	125,516	308,307
30	148 311	89,303	237,614
1931	108,066	52,014	160,080
32	71,693	24,385	96,078
33	74,837	34,786	109,623
34	89,212	41,405	130,617
35	96,484	57,038	153,522
1936	117,916	78,693	196,609
37	133,437	104,359	237,796
38	130,155	50,482	180,637
39	215,157	86,324	301,481
40	287,327	114,814	402,141
1941	333,225	168,338	501,563
42	341,835	199,281	541,116
43	*337,912	*221,939	*559,851
44	*342,832	*206,833	*549,666
45	*343,377	*193,658	*537,036
1946	374,365	46,790	421,155

* Revised figures.
[a] Compiled from following sources:
For years 1914-1922, Incl.—U. S. Geological Survey, Mineral Resources of United States.
1923-1931, " —U. S. Bur. Mines, Mineral Resources of United States.
1932-1938, " —U. S. Bur. Mines, Minerals Yearbooks.
1939-1946, " —Summary of canvass made by Illinois Geological Survey and U. S. Bureau of Mines, and from Minerals Yearbooks.

Clearly, the steel industry and the nation are faced with the necessity of formulating a policy with respect to ore development—a policy which can have the effect of making far reaching changes in the geographical pattern of the American Steel industry.

DEPLETION OF RESERVES

The depletion of certain favorably located and high-grade mineral deposits has given rise to a fear of mineral shortage and has tended to obscure the essential nature of mineral resources.

The limiting factor in estimates of mineral resources has been the concept of mineral reserves as definite measurable ore bodies, the depletion of which was equivalent to mineral exhaustion. This concept is being replaced by the concept that the reserves of elite ores upon which the mining industry originated and carried on through its first stages, is but a small part of the total reserve, that the reserves of ore in ore bodies of less than elite quality, the ores of mediocre and low rank, are many times in volume the quantity available in the choice ore bodies. Advances in mineral technology or changes in price bring larger volumes of material into the realm of commercial ore. To maintain a continued flow of mineral from these lower rank materials without an undue rise in the price of ore is a major problem of mineral technology.

A second factor in depletion of mineral supply, or possibly in deterioration of mineral supply, is the depletion of one mineral out of a group of geographically closely associated minerals, the close geographic association of which is the basis of industrial production. The consequence of such an event is either a decline of the industrial district, or the importation, at high cost, of ores from outside sources to replace the depleted local ore. This is, in fact, a situation which may develop in the steel industry of the lower lake points in Chicago, Gary, Cleveland, and Detroit, now depending upon the high–grade iron ores of the Lake Superior district. Competition will develop between the low–grade ores and taconites of the lake district that supply the lake–based furnaces and the high–grade imported iron ores that supply the tidewater furnaces. This may be a matter of major consequence to the industries of the Upper Mississippi and Ohio valleys.

A Program of Conservation

Although the draft upon our mineral supplies is heavy and may tend to increase in the future, we must not assume that mineral exhaustion is imminent, but we shall find it necessary to proceed along constructive lines in the economical and efficient use of our mineral supply.

There are three clearly indicated steps in preserving and maintaining a continued flow of minerals, two of which are the direct concern of the conservationist and the third, although not augmenting or conserving the original resources itself, has a conservational consequence in that it increases the efficiency of resource utilization. These three steps are:

1. The reduction of loss and waste in present mining practices.
2. A program of ore discovery, including discovery and measurement of "sub-ore."
3. A program of technological improvement through research to improve the efficiency of resource utilization.

First in the program of mineral conservation is the reduction of loss and waste. A large part of our mineral production in coal, in oil, in iron ore, to mention only the three leading mineral materials of industry, comes from high–rank low–cost favorably located deposits. This factor of low–cost production in each of these important minerals together with the factor of low–cost assembly of these important materials into the centers of processing and manufacture form the basis of our highly productive industrial economy. The low–cost deposits of minerals represent only a small part of our total mineral reserve. Nevertheless, at present, mining is concentrated on the richest and most accessible deposits and they are being exhausted at a rate which forecasts an early dependence upon leaner and less accessible ores. We must simply recognize this form of mineral exhaustion and, knowing this to be the case, develop the means by which mineral flow can be maintained from low–grade and less accessible deposits.

In the meantime, the advantages of low-cost production can be extended if every effort is made to mine these beds or ores with a minimum of waste and loss. This is a problem of mining technology, of economics, price, competitive relationships among mining districts. We can, in this discussion, merely indicate the location of

the problem and its relationship toward prolonging the life of low–cost reserves.

The second cornerstone in mineral conservation is a continued program of mineral discovery. This program has been successful in the petroleum industry up to the present although there are signs appearing that discoveries of the magnitude required for present day oil consumption are becoming more difficult to find. With waning discovery of obvious mineral outcrops, search must be directed to the less obvious deposits, of which vast numbers must be hidden by the ubiquitous overburden. Every art of geology must be employed to this end.

The third cornerstone in mineral conservation is technology. Technology has been termed the "multiplier of our natural resources," although "Technology, or the science of technique, includes all innovations in the arts of production and trade brought about by science, invention, and scientific management, it has created, and is continually transforming, modern industrialism. Its elemental power caused and will continue to make necessary changes and adjustments in our economic, political, and social order."[1]

Applied to the utilization of mineral resources, technology is probably the most important factor in extending the life of mineral reserves.

Technology of utilization does not create mineral supplies. It does not, in any way, invalidate the need of the first two steps in mineral conservation described above, namely efficient production and use of the high-rank favorably located deposits, and an intensified and expanded program of mineral exploration. Technology, in itself, is of no avail unless the mineral raw materials are there to be produced. But there are innumerable ways in which technology aids in increasing available mineral supply and in increasing the usefulness of a mineral after it is mined so that we may truly say "technology is a multiplier of mineral resources."

Technological change and improvement in the mineral industry begins with the technique of exploration. The search for mineral deposits which began with the adventurous efforts of the individual prospector, has been transformed until it requires the services of the geologist, geophysicist, and geochemist. Closely associated with discovery is the technique of mineral recovery. The utilization of low–grade ores in copper mining is one of the outstanding achievements of the mining industry and an example of what can be done by applying technology to the problem. In the near future low–grade mineral–bearing deposits not now considered minable will have to be used, and technology must find a way to make these ores economically available. This is particularly true today of lead and zinc.

Technological advances in mining practices today are effecting economies and reducing wastes so that existing mineral deposits may have their usefulness extended through more complete recovery from the earth.

In the realm of mineral processing and preparation, technology has made some of the greatest contributions toward "multiplying" the effective use of minerals. The meaning of this can be most effectively demonstrated by giving an example in petroleum technology and the supply of motor fuel. The automobile ranks high on the list of things the average American chooses to buy, and this accounts for the 30 million automobiles we shall have in this country as soon as the manufacturers can supply them. This growth of automobile use since 1905 required a large quantity of gasoline and the crude petroleum from which the gasoline is obtained. So great was the demand that the fear of a shortage of gasoline has been repeatedly expressed. In fact a shortage of gasoline would surely have occurred if the supply had had to be obtained from refining methods in vogue in the early days of the oil industry. This is what has happened since.

1. Original source: Straight-run refining of oil; gasoline yield was about 18 percent of the crude oil.

[1] Hearings before the Temporary National Economic Committee. Congress of the U. S., Part 30, p. 16209, April 1940.

2. Cracking process: Processes were developed to make more gasoline by "cracking" the heavier oil produced in "straight-run refining"; the result was that the percentage of gasoline recovery went up to 50 percent and only half as much crude oil was needed to supply a given amount of gasoline.
3. Catalytic cracking and hydrogenation: This process made it possible to convert crude oil entirely into gasoline, but we do not yet need to go that far.
4. Coal gasification and synthesis: This made it possible to gasify coal and build liquid fuels out of the gas.
5. The same process made it possible to convert natural gas into motor fuel at costs that are now almost competitive with that of producing gasoline from crude oil.

Thus it is seen how technology has, in this instance "multiplied" the product from a natural resource but, in addition to that, has developed means of bringing hitherto unusable materials into the class of source materials for the widely used motor fuel.

COAL

Coal in 1946—The National Picture

The production of bituminous coal in 1946 was 532,000,000 tons, a decline of 7.9 percent from the previous year. Figures for bituminous coal production since 1939 are given in table 3.

Table 3.—National Bituminous Coal Output Since 1939[a]

Year	Tonnage output in thousands	Percent increase by years	Year	Tonnage output in thousands	Percent increase-decrease by years
1939	394,855		1943	590,177	+1.3
1940	460,772	+16.7	1944	619,576*	+4.8*
1941	514,149	+11.6	1945	577,617*	−6.8*
1942	582,693	+13.3	1946	532,000	−7.9

[a] Figures for 1939 through 1945 from U. S. Bureau of Mines Mineral Market Report M. M. S. No. 1468 (Nov. 19, 1946). Figures for 1946 (preliminary) from U. S. Bur. of Mines Weekly Coal Report No. W. C. R. 1545 (March 1, 1947). Does not include mines with annual production of less than 1000 tons each.
* Revised figures.

Table 4.—Bituminous Coal and Lignite, Production by Districts, 1944-1946
(In thousands of tons)

	1944[a]		1945[b]		1946[c]	
	Amount	Percent of total	Amount	Percent of total	Amount	Percent of total
Price Area 1						
Dist. 1. Eastern Pennsylvania	61,224	9.88	56,747	9.82	53,520	10.06
Dist. 2. Western Pennsylvania	87,560	14.13	79,068	13.69	74,770	14.06
Dist. 3. Northern West Virginia	47,206	7.62	44,966	7.79	39,120	7.35
Dist. 4. Ohio	33,877	5.47	32,737	5.67	32,848	6.17
Dist. 5. Michigan	140	0.02	126	0.02	108	0.02
Dist. 6. Panhandle	5,419	0.87	4,609	0.80	4,387	0.82
Dist. 7. Southern Numbered 1	61,932	10.00	56,007	9.70	53,438	10.05
Dist. 8. Southern Numbered 2	126,403	20.40	116,749	20.21	112,903	21.23
Total—Price Area 1	423,761	68.39	391,009	67.70	371,094	69.76
Price Area 2						
Dist. 9. West Kentucky	19,465	3.14	20,444	3.54	18,916	3.56
Dist. 10. Illinois	76,792	12.39	73,011	12.64	62,554	11.76
Dist. 11. Indiana	27,962	4.51	25,183	4.36	21,818	4.10
Dist. 12. Iowa	2,141	0.35	2,046	.35	1,554	.29
Total—Price Area 2	126,360	20.39	120,684	20.89	104,842	19.71
Price Area 3						
Dist. 13. Southeastern	20,329	3.29	19,551	3.39	17,192	3.23
Total—All Eastern Districts	570,450		531,244		493,128	
Percent of U. S. Total		92.07		91.98		92.70
Total—U. S.	619,576		577,617		532,000	

[a] Figures for 1944 from U. S. Bur. of Mines Weekly Coal Report W. C. R. No. 1495 (March 16, 1946).
[b] Revised figures for 1945 from U. S. Bur. of Mines Mineral Market Report M. M. S. No. 1468 (Nov. 19, 1946) and Weekly Coal Report W. C. R. No. 1546 (March 8, 1947).
[c] Preliminary figures for 1946 from U. S. Bur. of Mines Weekly Coal Reports W. C. R. No. 1545 (March 1, 1947) and W. C. R. No. 1546 (March 8, 1947).

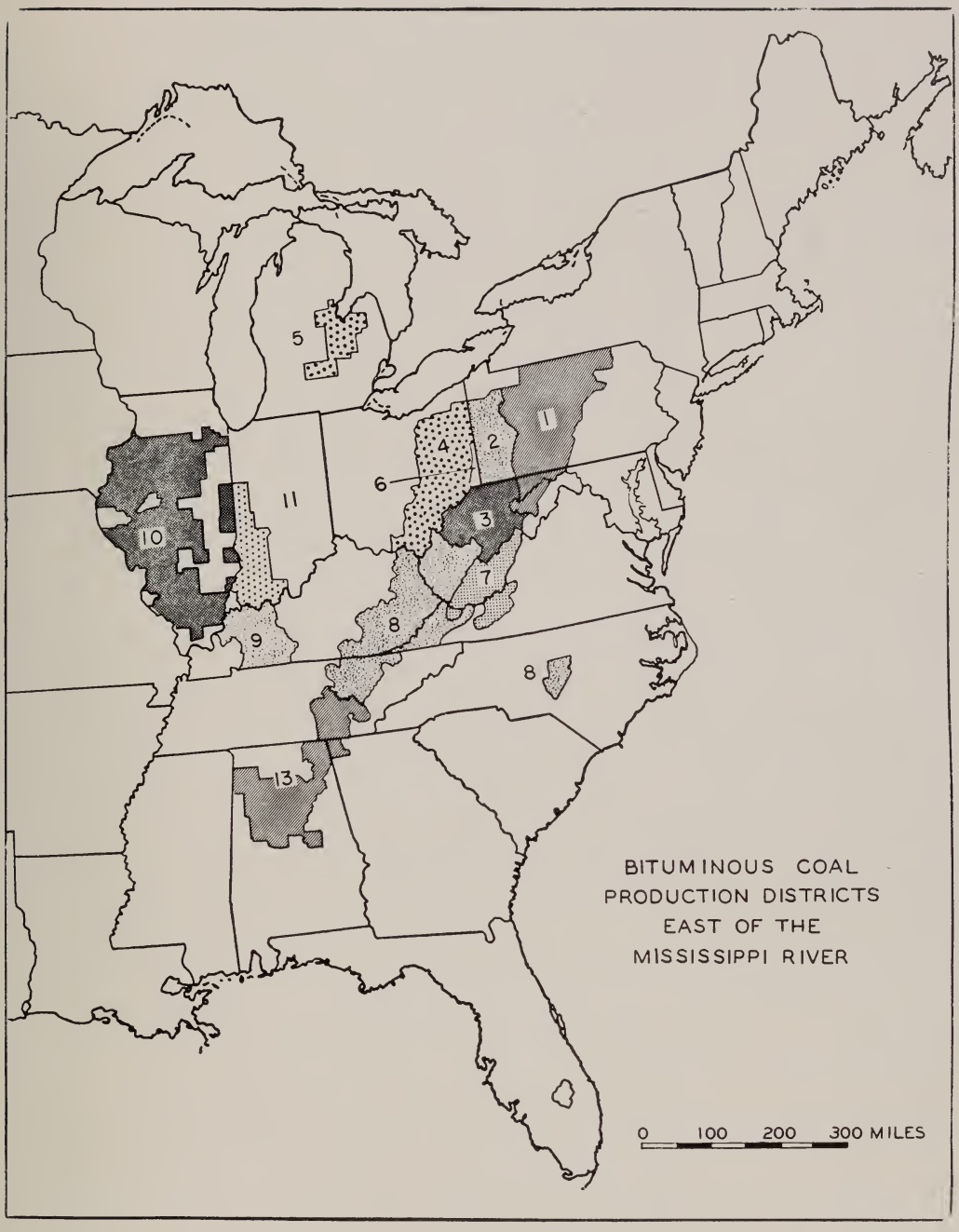

FIG. 2.

PRODUCTION BY DISTRICTS

Coal production by districts is shown in table 4 for three years. Of particular interest are districts east of the Mississippi River (fig. 2) which produce more than 90 percent of bituminous coal output.

Although competition among producing districts in price areas is keen, there is a

TABLE 5.—BITUMINOUS COAL AND LIGNITE PRODUCTION AND AVERAGE OUTPUT PER MAN, BY METHODS OF MINING AND LOADING IN THE UNITED STATES, BY DISTRICTS, 1945*
(Districts as defined in the Bituminous Coal Act of 1937 and modifications thereto)

District	Strip mines		UNDERGROUND MINES								Grand total all mines	
			Using Mechanical Loading Devices				With 100% of output hand loaded		Total			
			With 90% or more of output mechanically loaded		With less than 90% of output mechanically loaded							
	Production net tons	Average tons per man per day	Production net tons	Average tons per man per day	Production net tons	Average tons per man per day	Production net tons	Average tons per man per day	Production net tons	Average tons per man per day	Production net tons	Average tons per man per day
1. Eastern Pennsylvania	13,630,115	12.23	8,233,607	5.21	18,880,707	4.32	16,001,973	3.68	43,116,287	4.19	56,746,402	4.97
2. Western Pennsylvania	14,697,667	16.22	19,334,211	5.90	23,887,266	4.78	21,148,840	4.49	64,370,317	4.96	79,067,984	5.69
3. Northern West Virginia	10,810,908	15.67	21,714,594	7.38	5,783,095	5.04	6,657,622	4.79	34,155,311	6.23	44,966,219	7.29
4. Ohio	13,483,789	16.08	12,301,553	6.03	1,386,964	4.78	5,565,129	4.17	19,253,646	5.25	32,737,435	7.27
5. Michigan	—	—	—	—	[a]	[a]	[a]	[a]	125,704	2.71	125,704	2.71
6. Panhandle	949,818	17.36	1,251,965	5.93	1,987,588	4.69	419,668	4.32	3,659,221	5.00	4,609,039	5.86
7. Southern Numbered 1	1,706,468	12.44	9,475,030	5.25	25,723,440	4.57	19,101,593	3.98	54,300,063	4.44	56,006,531	4.53
8. Southern Numbered 2	1,691,068	12.37	36,811,221	6.01	43,936,885	4.54	34,309,594	4.29	115,057,670	4.83	116,748,738	4.88
9. West Kentucky	5,807,711	20.88	9,494,534	8.54	[a]	[a]	5,005,001	5.13	14,636,661	6.94	20,444,372	8.56
10. Illinois	16,909,100	18.52	48,359,032	8.75	1,808,274	4.61	5,934,786	4.57	56,102,092	7.85	73,011,192	9.06
11. Indiana	13,464,089	15.89	10,577,227	8.47	—	—	1,141,295	4.49	11,718,522	7.79	25,182,611	10.71
12. Iowa	521,058	8.28	[a]	[a]	—	—	1,258,103	3.22	1,524,542	3.39	2,045,600	3.99
13. Southeastern	1,988,928	8.38	5,753,938	2.91	7,645,533	3.23	4,162,838	2.80	17,562,309	3.01	19,551,237	3.22
14. Arkansas-Oklahoma	731,027	8.20	819,890	2.65	[a]	[a]	677,288	2.79	1,530,104	2.70	2,261,131	3.45
15. Southwestern	8,096,966	13.74	783,130	4.43	[a]	[a]	893,145	2.16	1,696,037	2.84	9,793,003	8.25
16. Northern Colorado	10,896	6.65	1,284,259	5.68	938,266	5.49	117,183	5.19	2,339,708	5.58	2,350,604	5.58
17 Southern Colorado	41,915	7.78	2,243,993	4.82	2,448,328	4.19	1,631,606	3.82	6,323,927	4.28	6,365,842	4.29
18 New Mexico	1,480	2.24	—	—	—	—	390,625	2.92	390,625	2.92	392,105	2.92
19. Wyoming	854,624	15.48	8,855,448	6.59	[a]	[a]	130,310	3.47	8,992,951	6.50	9,847,575	6.84
20. Utah	—	—	5,714,718	6.44	532,267	4.94	432,078	5.09	6,679,063	6.18	6,679,063	6.18
21. N.-S. Dakota (lignite)	1,881,086	18.66	[a]	[a]	[a]	[a]	[a]	[a]	665,678	8.96	2,546,764	14.54
22. Montana	2,556,341	78.92	1,784,152	7.35	[a]	[a]	101,117	4.16	1,910,437	7.04	4,466,788	14.70
23. Washington and Alaska	151,811	7.35	658,353	3.63	182,941	2.88	678,283	3.10	1,519,577	3.28	1,671,388	3.45
Undistributed	—	—	790,930	7.49	376,582	4.31	112,494	3.17	—	—	—	—
Total 1945	109,986,865	15.46	206,241,785	6.49	135,518,106	4.48	125,870,571	4.10	467,630,462	5.04	577,617,327	5.78

* U. S. Bur. Mines, Weekly Coal Report, No. W. C. R. 1540 Supplement, January 25, 1947.
[a] Included under "Undistributed."

TABLE 6.—PRODUCTION IN DISTRICTS WITH LARGE ALL-RAIL SHIPMENTS TO THE UPPER MISSISSIPPI VALLEY, 1941–1946[a]
(In thousands of tons)

	Districts 7 and 8 West Virginia, Kentucky, Virginia		Districts 9, 10, 11 Illinois, Indiana Western Kentucky		Illinois	
	Amount	Index	Amount	Index	Amount	Index
1941	168,515	100	88,767	100	54,703	100
1942	186,106	110	103,890	117	65,071	119
1943	185,074	110	112,865	127	72,631	133
1944	188,335	112	124,219	140	76,792	140
1945	172,756	102	118,638	134	73,011	133
1946	166,341	98	103,288	116	62,554	114

[a] Compiled from U. S. Bur. of Mines Weekly Coal Reports W. C. R. No. 1495 (Mar. 16, 1946) and W. C. R. No. 1545 (Mar. 1, 1947). Also from U. S. Bur. of Mines Mineral Market Report M. M. S. No. 1468 (Nov. 19, 1946). Does not include mines with annual production of less than 1000 tons each.

TABLE 7.—BITUMINOUS COAL PRODUCTION IN THE UNITED STATES, BY STATES, 1941–1946[a, b]
(In thousands of tons)

	1941	1942	1943	1944*	1945*	1946
Alabama	15,464	19,301	17,160	18,752	18,236	15,780
Alaska	239	261	289	348	298	368
Arkansas and Oklahoma	3,345	4,372	4,556	5,181	4,763	4,050
Colorado	6,949	8,086	8,324	8,167	7,621	5,915
Georgia and North Carolina	40	31	14	24	43	35
Illinois[a]	55,366	65,746	73,345	77,400	73,447	63,767
Indiana	22,484	25,388	25,065	27,962	25,183	21,818
Iowa	2,939	2,948	2,771	2,140	2,046	1,554
Kansas and Missouri	7,153	7,750	7,747	8,148	7,211	5,890
Kentucky:						
Eastern	42,130	48,800	48,042	51,890	49,149	47,840
Western	11,580	13,431	15,169	19,465	20,444	18,916
Maryland	1,701	2,001	1,933	1,870	1,763	2,010
Michigan	311	231	169	140	126	108
Montana	3,254	3,829	4,833	4,844	4,467	3,800
New Mexico	1,251	1,669	1,851	1,743	1,484	1,250
North and South Dakota	2,380	2,591	2,541	2,393	2,546	2,714
Ohio	29,319	32,764	32,255	33,877	32,737	32,848
Pennsylvania (bituminous)	130,240	144,073	141,050	146,052	132,965	125,155
Tennessee	7,045	8,158	7,179	7,266	6,271	6,150
Texas	353	304	153	109	80	80
Utah	4,077	5,517	6,666	7,119	6,679	5,990
Virginia	18,441	20,136	20,280	19,513	17,235	16,300
Washington	1,841	1,953	1,528	1,524	1,357	990
West Virginia:						
Southern	{140,250	{155,882	{158,804	{164,703	{152,035	{142,060
Northern						
Wyoming	6,646	8,133	9,155	9,540	9,847	7,805
Other States[c]	15	13	12	7	20	20
Total	514,813	583,368	590,891	620,177	578,053	533,213

[a] Compiled from the following sources:
For Illinois—Illinois Department of Mines and Minerals, Annual Coal Reports.
For all other states—U. S. Bur. of Mines, Weekly Coal Reports W.C.R. No. 1495 (Mar. 16, 1946) and W.C.R. No. 1545 (Mar. 1, 1947). Also U. S. Bur. of Mines, Mineral Market Report M. M. S. No. 1468 (Nov. 19, 1946).
Figures for Illinois include production of all mines. Those for other states exclude mines having annual production of less than 1,000 tons each. Production of small mines in Illinois is included in "Total" in this table.
[b] Includes lignite.
[c] The states reporting are not identical from year to year.
* Revised figures.

certain degree of market specialization among the several districts, based mainly on the characteristics of the product.

Districts 2, 7, and 8 (fig. 2) supply coking coal for the blast furnaces and also a high percentage of fuel used for domestic heating. These two markets are, in a sense, complementary. Coal suitable for coking is also excellent for domestic fuel. The small sizes and screenings are therefore absorbed by the coking coal market, and the prepared sizes find a ready outlet for domestic fuel over a large area.

Districts 3, 4, 6, and 9 (fig. 2) market one-third or more of their output as railroad fuel, whereas the remaining districts distribute their output among manufacturing industries, utilities, railroads, and retail yards.

Production by type of mine is given in table 5.

Shipments from principal competitive fields into the Illinois coal market area are shown in table 6.

Production by states, 1941–1946, is given in table 7.

Cumulative Coal Production

Table 8 gives cumulative coal production for Illinois, by counties, for the period 1882–1946, as compiled from the Annual Coal Reports of the Department of Mines

Table 8.—Total Production of Coal, by Counties, from 1882–1946[a]
(In tons)

County	Production	County	Production
Adams	46,186	Mercer	14,993,743
Bond	7,355,569	Monroe	8,284
Brown	56,937	Montgomery	74,474,338
Bureau	47,366,150	Morgan	177,223
Calhoun	96,247	Moultrie	2,032,236
Cass	212,477	Peoria	61,617,004
Christian	156,595,702	Perry	125,834,316
Clinton	36,556,816	Pike	5,081
Coles	198,932	Pope	1,562
Crawford	44,786	Putnam	10,071,893
Douglas	363	Randolph	53,201,367
Edgar	821,006	Richland	154
Effingham	796	Rock Island	3,845,113
Franklin	399,794,122	St. Clair	196,174,819
Fulton	126,649,800	Saline	159,913,480
Gallatin	3,829,759	Sangamon	223,985,667
Green	620,735	Schuyler	2,484,291
Grundy	39,544,962	Scott	612,476
Hamilton	22,097	Shelby	4,119,350
Hancock	372,410	Stark	1,226,364
Hardin	40	Tazewell	17,221,755
Henry	17,035,029	Vermilion	143,754,502
Jackson	72,448,902	Wabash	186,144
Jasper	23,739	Warren	669,538
Jefferson	4,645,402	Washington	16,742,583
Jersey	118,624	White	1,676,741
Johnson	242,109	Will	30,458,199
Kankakee	1,948,786	Williamson	258,625,638
Knox	17,431,617	Woodford	7,756,123
LaSalle	65,008,814		
Livingston	10,058,551	Total (1882–1946)	2,901,354,930
Logan	13,881,191	Estimated Production (1833–1881)	73,386,123
Macon	10,998,929		
Macoupin	238,950,972	Total Production (1833–1946)	2,974,741,053
McDonough	2,633,028		
McLean	5,544,139		
Madison	145,190,691		
Marion	37,471,370		
Marshall	12,512,407		
Menard	13,154,754		

[a] Illinois State Dept. of Mines and Minerals in conjunction with Illinois State Geological Survey.

Table 9.—Counties of More Than 100 Million Tons Output from 1882–1946

Franklin	399,794,122
Williamson	258,625,638
Macoupin	238,950,972
Sangamon	223,985,667
St. Clair	196,174.819
Saline	159,913,480
Christian	156,595,702
Madison	145,190,691
Vermilion	143,754,502
Fulton	126,649,800
Perry	125,834,316
Total, 11 counties	2,175,469,709
Total, all counties of the state	2,901,354,930
Percent produced by 11 counties	75.0

and Minerals with an estimate of total production in the State for the period 1833–1881. Sixty-nine counties have a recorded production during this period. Eleven of these counties produced more than 100 million tons each, the highest recorded production being from Franklin County with a total of 399,794,122 tons. The eleven leading counties, in order of output are given in table 9.

Coal in the Eastern Interior Basin

Table 10 shows coal production in the Eastern Interior coal basin (fig. 3) for the years 1939–1946 inclusive. The production history of these three competitive districts in Illinois, Indiana, and western Kentucky and the contribution of each to the total production of the Eastern Interior basin from 1913 to 1942 is shown in table 4 of Report of Investigations No. 94, page 17.

Although the war ended during 1945, Illinois coal output continued at high levels and increased its percentage of contribution to the Mississippi Valley market area.

Coal Distribution in the Upper Mississippi Valley

The Upper Mississippi Valley coal market area comprises Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, and the eastern Dakotas and Kansas.

In this area is marketed coal from the Eastern Interior coal field in the states of Illinois, Indiana, and western Kentucky, and coal from the Appalachian districts of Pennsylvania, West Virginia, Virginia, eastern Kentucky, and Ohio. Coal is distributed by rail, rail–lake, rail–river, and truck. The coal requirements of the Upper Mississippi Valley include fuel for domestic heating, fuel for general industrial purposes, fuel for rail transportation, and coal for the manufacture of metallurgical coke. Competitive conditions among coals from the several producing districts in the Appalachian fields and in the Eastern Interior districts of Illinois, Indiana, and western

Table 10.—Production of Bituminous Coal in the Eastern Interior Coal Field, 1939–1946[a]
(In thousands of tons)

Year	Illinois		Indiana		West Kentucky		Total
	Amount	Percent[b]	Amount	Percent[b]	Amount	Percent[b]	
1939	46,783	65.0	16,943	23.5	8,291	11.5	72,017
1940	50,610	64.7	18,869	24.1	8,795	11.2	78,274
1941	54,703	62.0	22,484	25.0	11,580	13.0	88,767
1942	65,071	62.6	25,388	24.4	13,431	13.0	103,890
1943	72,631	64.4	25,065	22.2	15,169	13.4	112,865
1944	76,792	61.8	27,962	22.5	19,465	15.7	124,219
1945	73,011	61.6	25,183	21.2	20,444	17.2	118,638
1946	62,554	60.6	21,818	21.1	18,916	18.3	103,288

[a] Revised figures compiled from U. S. Bur. of Mines Weekly Coal Reports W.C.R. No.1495 (Mar. 16, 1946) and W.C.R. No. 1545 (Mar. 1, 1947). Also from U. S. Bur. of Mines Mineral Market Report M. M. S. No. 1468 (Nov. 19, 1946).

[b] Percent of total in Eastern Interior coal field.

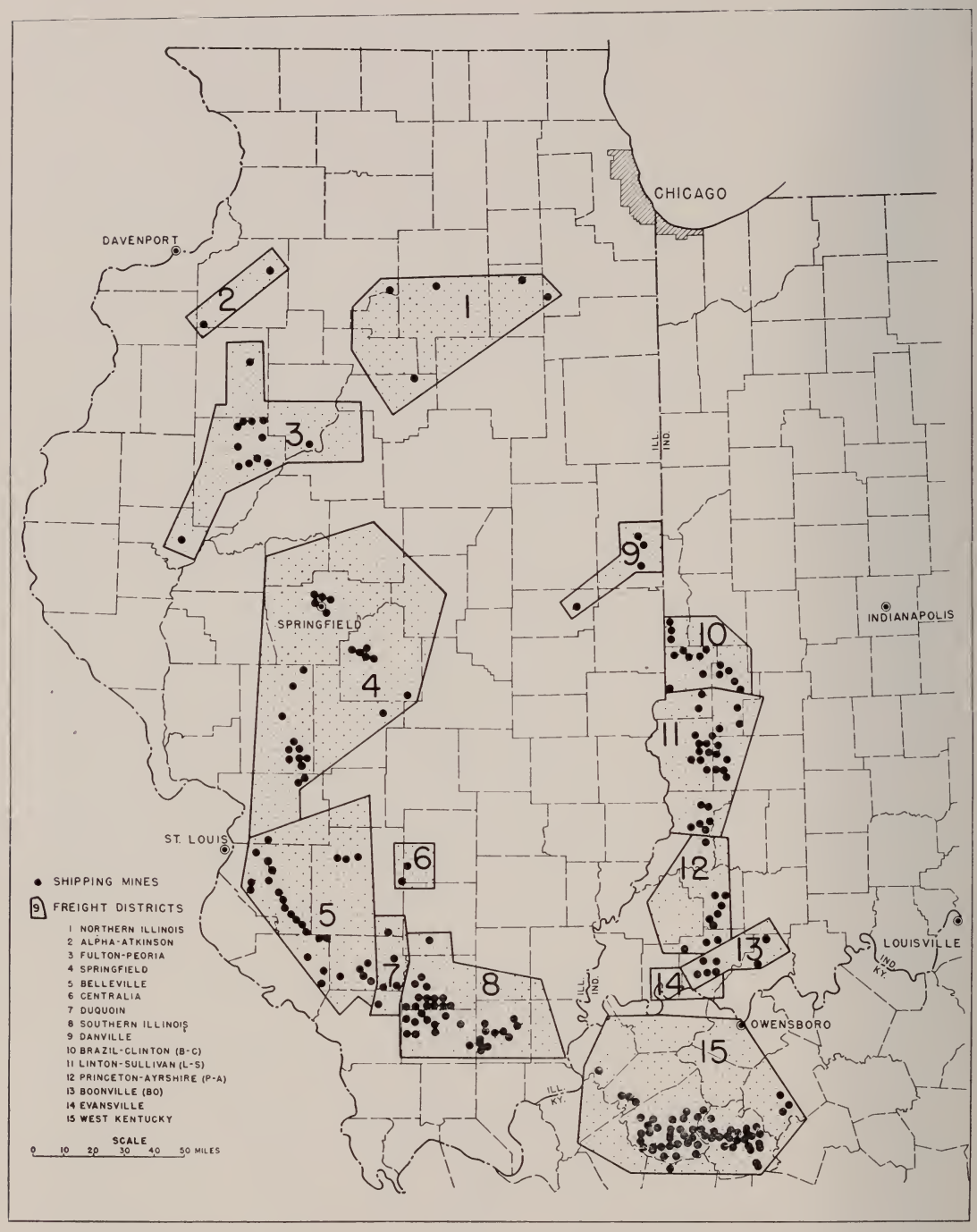

FIG. 3.—Location of principal coal mining districts and coal beds mined in Illinois, Indiana and western Kentucky. (Courtesy of the Paul Wier Company, Chicago.)

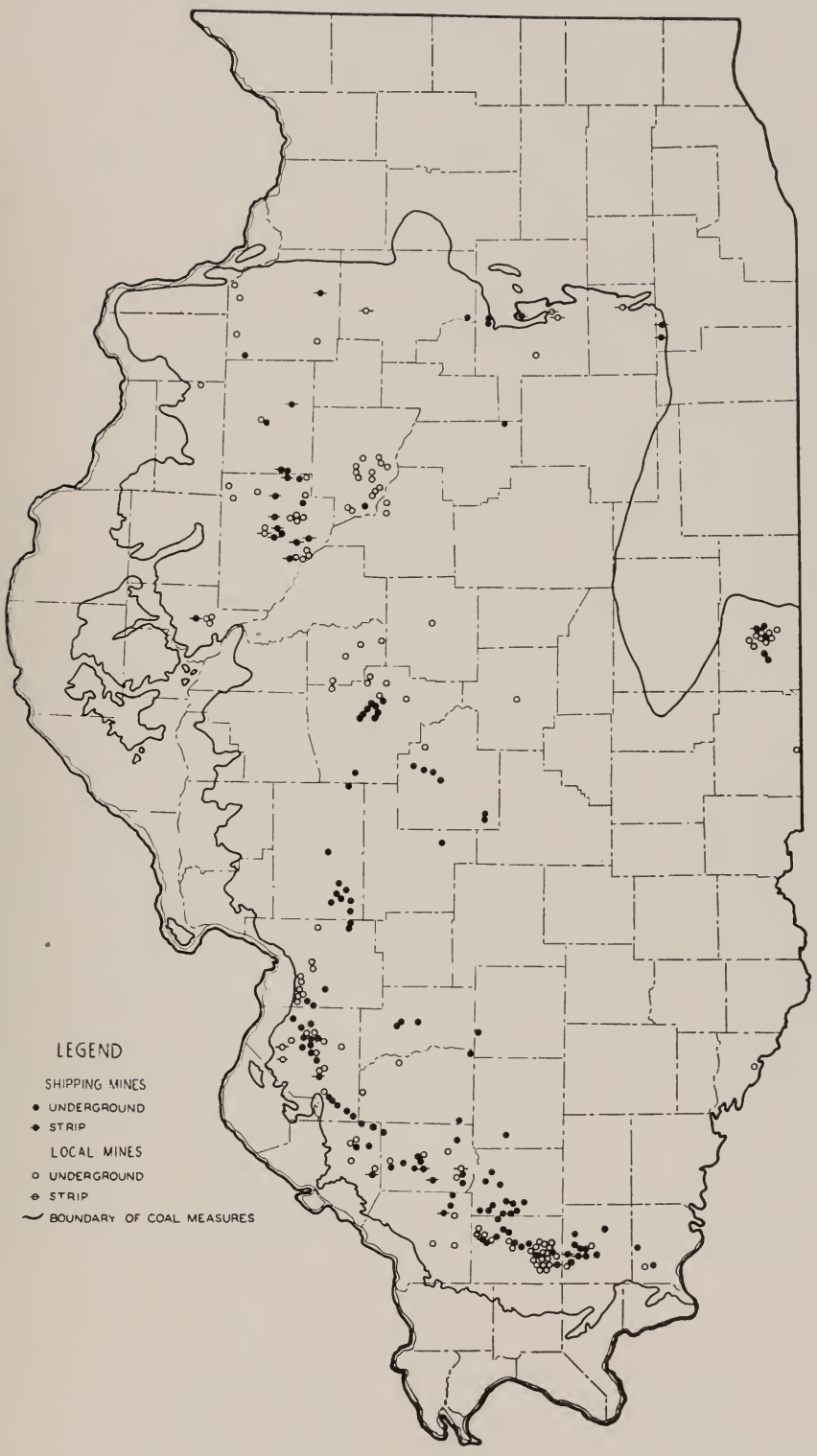

FIG. 4.—Location of shipping coal mines and local mines in Illinois having annual production of 5,000 tons or more.

TABLE 11.—ORIGIN AND DESTINATION OF REVENUE RAILROAD SHIPMENTS OF COAL FROM
(Exclusive of non-
(In

Origin	Destination:	Chicago District	Illinois[b] (other)	Milwaukee	Wisconsin (other)	Council Bluffs[c]	Iowa (other)
			1945				
Western Pennsylvania		65,540	26,331	—	—	—	—
Central Pennsylvania, Somerset-Meyersdale, Cumberland-Piedmont		17,574	4,955	101	8,499	450	11,105
Fairmont, West Virginia		44,136	5,520	468	4,016	—	1,145
Northern and Eastern Ohio		1,837	470	1,604	1,438	—	2,075
Southern Ohio		6,441	—	—	—	—	309
Kanawha, Logan, Kenova-Thacker		1,638,141	161,689	11,467	29,276	155	109,196
New River-Winding Gulf, Pocahontas-Tug River		6,348,962	392,730	112,820	488,894	—	60,440
Northeastern Kentucky and McRoberts		2,646,691	76,043	2,387	21,752	—	106,245
Virginia		282,071	32,095	734	50,431	49	8,671
Hazard, Harlan, Southern Appalachians		1,816,172	272,437	153	35,568	153	320,802
Ex-river coal		3,668	—	—	—	—	—
Northern Illinois		492,258	4,673,217	728	115,535	350	1,738,983
Central and Southern Illinois		6,669,932	13,928,379	147,308	1,651,220	64,495	2,757,236
Indiana		3,014,523	1,427,843	231,989	769,826	406	639,094
Western Kentucky		1,156,169	486,210	8,964	204,164	6,961	303,691
Grand Total		24,204,115	21,487,919	518,723	3,380,619	73,019	6,058,992
			1946				
Western Pennsylvania		95,074	21,187	—	2,751	—	—
Central Pennsylvania, Somerset-Myersdale, Cumberland-Piedmont		16,998	8,816	289	6,952	573	11,776
Fairmont, West Virginia		48,997	5,624	3,110	10,302	—	1,862
Northern and Eastern Ohio		4,277	2,704	—	—	—	—
Southern Ohio		9,412	49	—	—	—	—
Kanawha, Logan, Kenova-Thacker		1,520,324	128,760	9,798	51,979	196	148,611
New River-Winding Gulf, Pocahontas-Tug River		5,743,598	362,797	115,960	470,594	159	64,782
Northeastern Kentucky and McRoberts		2,374,112	96,688	15,022	28,267	—	130,903
Virginia		179,766	28,826	627	39,326	50	8,464
Hazard, Harlan, Southern Appalachian		1,839,152	351,793	10,024	54,599	308	454,688
Ex-river coal		9,333	—	—	—	—	—
Northern Illinois		396,714	3,697,193	473	101,363	154	1,677,308
Central and Southern Illinois		6,460,795	12,815,743	113,705	1,364,122	47,734	2,677,828
Indiana		2,859,757	1,448,233	207,027	620,636	706	599,195
Western Kentucky		1,590,043	795,035	44,100	308,934	7,695	373,267
Grand Total		23,148,352	19,763,448	520,135	3,059,825	57,575	6,148,684

[a] Data from U. S. Bur. of Mines, Monthly Coal Distribution Report, M. C. D. No. 184 (May 14, 1947).
[b] Includes Davenport, Iowa, for shipments from Ohio and the Crescent, and includes Davenport, Bettendorf, and Iowanna, Iowa, for shipments from Illinois, Indiana, and western Kentucky, excluding East St. Louis, Ill.
[c] Includes Omaha and South Omaha, Nebraska.

Kentucky vary from the keenly competitive struggle in the industrial and railroad fuel markets to the less competitive conditions in the domestic fuel trade and the limited competition in the byproduct coal demand.

The distribution of coal from ten coal-producing districts into the markets of the Upper Mississippi Valley is accomplished by all-rail, rail-lake, rail-river, and truck haul.

Illinois, Indiana, Western Kentucky, and the Appalachian Fields, in 1945 and 1946[a]
revenue railroad fuel)
tons)

St. Louis[d]	Kansas City[e]	St. Joseph[f]	Missouri (other)	Kansas	Nebraska	Minnesota	South Dakota	North Dakota	Total	Percent of total
				1945						
36	—	—	—	—	—	—	—	—	91,907	.14
40,334	842	316	1,078	1,130	894	7,543	741	—	95,562	.15
957	—	—	—	—	—	157	—	—	56,399	.09
127	—	—	—	—	—	257	—	—	7,808	—
—	—	—	—	—	—	—	—	—	6,750	—
306,862	—	—	156	109	339	7,250	344	—	2,264,984	3.45
510,973	—	—	354	52	115	79,897	4,851	—	8,000,088	12.20
888	—	—	—	—	336	12,330	1,541	—	2,868,213	4.37
106,943	—	—	—	—	—	5,951	507	—	487,452	.74
16,960	—	—	871	—	821	15,333	820	—	2,480,090	3.80
—	—	—	—	—	—	—	—	—	3,668	—
—	—	53	999	—	239	22,235	14,426	—	7,059,023	10 75
4,945,613	134,424	27,495	2,197,485	148,584	171,227	664,800	108,366	360	33,616,924	51.20
11,957	5,883	—	8,963	—	6,619	150,089	3,346	55	6,270,593	9.55
39,267	—	—	50,108	—	6,050	64,203	11,019	1,789	2,338,595	3.56
5,980,917	141,149	27,864	2,260,014	149,875	186,640	1,030,045	145,961	2,204	65,648,056	100 00
				1946						
50	—	—	43	34	—	613	—	—	119,752	.20
32,873	830	511	878	1,194	1,064	6,375	1,060	—	90,189	.15
1,232	—	—	—	—	—	56	—	—	71,183	.12
—	—	—	—	—	—	—	—	—	6,981	—
—	—	—	—	—	—	—	—	—	9,461	.01
232,196	—	49	355	—	162	10,345	317	—	2,103,092	3.44
523,511	61	—	195	46	58	73,202	5,139	—	7,360,102	12 04
174	—	—	—	—	1,067	9,607	3,222	—	2,659,062	4.35
92,687	—	—	—	—	—	5,670	530	—	355,946	.60
20,420	—	—	412	—	884	21,235	1,089	—	2,754,604	4.51
—	—	—	—	—	—	—	—	—	9,333	.01
—	—	—	1,320	31,400	48	48,948	11,545	—	5,966,466	9.76
4,134,616	31,224	21,897	1,863,679	120,529	89,856	547,510	82,670	509	30,372,417	49.70
13,663	105	—	3,091	—	1,134	117,764	2,142	—	5,873,453	9.61
71,661	—	100	64,471	600	7,356	81,692	15,606	360	3,360,920	5.50
5,123,083	32,220	22,557	1,934,444	153,803	101,629	923,017	123,320	869	61,112,961	100.00

[d] Includes East St. Louis, Illinois.
[e] Includes Kansas City, Kansas.
[f] Includes Atchison and Leavenworth, Kansas.

Appalachian Coal Movement

Coal from Appalachian producing districts is shipped to the Upper Mississippi Valley by all–rail haul and by rail–lake haul via lower Lake Erie ports. The heaviest contributors to the Upper Mississippi market are the fields in West Virginia and eastern Kentucky. Virginia, although a

TABLE 12.—ORIGIN OF LAKE CARGO COAL FROM APPALACHIAN FIELDS, 1943–1946
(In thousands of tons)

From	1943[a]	1944[b]	1945[b]	1946[c]
Ohio	4,682	4,995	4,322	4,379
Pennsylvania	8,409	10,568	9,601	8,581
Moundsville, West Virginia	406	395	357	294
Fairmont, Cumberland, Piedmont	2,357	3,283	3,288	2,860
Southern West Virginia—low volatile	14,256	10,797	10,021	9,769
Southern West Virginia—high volatile	8,653	13,902	12,281	12,778
Eastern Kentucky, Tennessee, Virginia	8,692	11,551	11,438	10,841
Total	47,455	55,491	51,308	49,502

[a] U. S. Bur. Mines Monthly Coal Distribution Report No. 147, June 13, 1944.
[b] U. S. Bur. Mines Monthly Coal Distribution Report No. 171, April 1, 1946.
[c] U. S. Bur. Mines Monthly Coal Distribution Report No. 183, April 14, 1947.

TABLE 13.—LAKE CARGO SHIPMENTS AND RECEIPTS OF COAL AT UPPER LAKE DOCKS, 1934–1946[a]
(In thousands of tons)

Year	Bituminous coal loaded into vessels at Lake Erie ports	Receipts at		Total receipts
		Lake Superior ports	Lake Michigan ports[b]	
1934	34,869	8,023	4,535	12,558
1935	34,730	6,829	4,043	10,872
1936	44,011	9,358	5,114	14,472
1937	43,645	9,115	4,822	13,937
1938	34,173	6,614	3,758	10,372
1939	39,837	6,515	4,229	10,744
1940	46,548	6,991	4,436	11,427
1941	49,733	8,356	4,830	13,186
1942	47,815	8,108	5,068	13,176
1943	46,059	9,455	4,982	14,437
1944	53,981	9,417	5,277	14,694
1945	49,901	8,316	5,242	13,558
1946	48,251	9,259	5,295	14,554

[a] U. S. Bur. Mines, Monthly Coal Distribution Reports.
[b] Ports on Lake Michigan north of Waukegan.

small producing state, ships considerable quantities into the Upper Mississippi Valley market. Shipments of coal from Pennsylvania and Ohio by all–rail routes are only minor, and by rail–lake are less important than the shipments from the West Virginia and eastern Kentucky fields. Coal production in Pennsylvania, northern West Virginia, the Panhandle and Ohio is used, in the main, in the industrial districts of western Pennsylvania and eastern Ohio and does not enter greatly into the markets of the Upper Mississippi Valley.

Shipments of coal by rail haul (exclusive

Table 14.—Lake Shipments of Coal from the Eastern Interior Basin, 1946[a]
(In tons)

Month	West Kentucky	Illinois	Indiana	Total
January	—	—	—	—
February	—	—	—	—
March	—	—	—	—
April	—	—	—	—
May	—	8,942	—	8,942
June	115,828	23,245	—	139,073
July	139,333	28,488	2,093	169,914
August	199,395	23,185	—	222,580
September	252,622	18,891	44,562	316,075
October	150,228	10,410	13,335	173,973
November	91,928	10,537	1,800	104,265
December	—	7,974	—	7,974
Total	949,334	131,672	61,790	1,142,796

[a] U. S. Bur. Mines Monthly Coal Distribution Reports Nos. 173 (June 13, 1946) to 184 (May 14, 1947) inclusive.

Table 15.—Coal Produced and Shipped from Mines in Illinois, Indiana, and Iowa for Specific Markets, for Year Ending June 30, 1946[a]
(In tons)

Market	From			
	Illinois	Indiana	Iowa	Total
Railroad fuel, U. S. and Canada	20,902,272	7,161,495	162,794	28,226,561
Truck	5,463,476	1,457,875	417,957	7,339,308
Estimated truck not reported	812,560	689,158	542,748	2,044,466
Destination and use unknown	112,879	69,214	11,711	193,804
Private railways	115,060	466,508	—	581,568
Used at the mine	997,039	125,096	14,121	1,136,256
Total	28,403,286	9,969,346	1,149,331	39,521,963

[a] Source: Bituminous Coal Distribution, Year Ended June 30, 1946, U. S. Bur. Mines, M. M. S., 1505, April 1947.

of railroad fuel), the origin and destination of coal shipped on the lakes, receipts of lake cargo coal, and shipments of coal from Illinois and western Kentucky to Chicago for lake shipments are shown in tables 11 to 14.

Tables 16 and 17 give the shipments of coal, in detail, from individual producing districts to states in the Illinois coal market area, for three principal groups of consumers.

TABLE 16.—SOURCES OF COAL SHIPPED TO THREE IMPORTANT CONSUMER GROUPS IN THE UPPER MISSISSIPPI VALLEY, FOR YEAR ENDING JUNE 30, 1946[a]
(In net tons)

Consuming Area	Producing Districts					
	1	2	3	4	5	7
Industrial						
Illinois	6,312	3,802	16,724	5,333	—	59,241
Indiana	810	4,327	23,955	66,764	—	32,065
Michigan	70,561	333,090	111,832	781,591	15,911	71,780
Wisconsin	55	2,111	2,729	4,508	—	5,207
Iowa	—	—	381	—	—	596
Minnesota	—	—	—	—	—	260
Missouri	2,185	—	946	—	—	487
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	—	—	—
Total	79,923	343,330	156,567	858,196	15,911	169,636
Retail yards						
Illinois	19,082	53	25,482	6,255	—	3,171,801
Indiana	361	—	27,400	42,638	—	798,783
Michigan	6,553	11,525	105,883	396,608	19,276	2,840,953
Wisconsin	—	—	7,360	2,311	—	509,452
Iowa	—	—	9,424	1,410	—	44,276
Minnesota	—	—	1,730	850	—	77,048
Missouri	12,998	—	—	—	—	237,338
Nebraska	—	—	—	—	—	733
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	—	—	5,517
Total	38,994	11,578	177,279	450,072	19,276	7,685,901
Byproduct coals						
Illinois	—	13,839	—	—	—	893,324
Indiana	—	71,776	—	—	—	1,913,693
Michigan	—	71,540	—	11,634	—	144,572
Wisconsin	—	—	—	—	—	—
Iowa	—	—	—	—	—	1,726
Minnesota	—	—	—	—	—	—
Missouri	—	—	—	—	—	108,091
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	—	—	—
Total	—	157,155	—	11,634	—	3,061,406

TABLE 16.—CONTINUED

Consuming Area	Producing Districts					
	8	9	10	11	12	13
Industrial						
Illinois	186,369	399,570	15,901,382	2,043,777	—	—
Indiana	1,182,936	199,532	1,757,239	5,652,213	—	1,469
Michigan	4,318,138	17,681	160,279	52,403	—	—
Wisconsin	9,772	194,024	1,344,816	683,983	—	—
Iowa	1,156	52,034	1,768,897	317,598	533,641	—
Minnesota	3,186	45,444	744,481	115,941	84	—
Missouri	17,826	56,022	1,573,359	2,501	—	382
Nebraska	—	4,752	25,009	—	—	—
North Dakota	—	71	53	—	—	—
South Dakota	100	10,082	67,044	2,619	—	—
Total	5,719,483	979,212	23,342,559	8,871,035	533,725	1,851
Retail yards						
Illinois	1,676,460	761,225	6,786,607	1,082,970	—	—
Indiana	3,110,785	168,132	194,139	1,385,647	—	—
Michigan	3,246,022	50,418	227,558	41,762	—	—
Wisconsin	165,570	60,052	530,819	61,721	—	—
Iowa	598,223	231,198	2,144,412	269,022	122,619	—
Minnesota	45,769	43,472	316,177	15,505	147	—
Missouri	97,750	7,231	1,884,818	3,255	6,220	1,440
Nebraska	1,999	6,820	131,047	6,842	—	—
North Dakota	—	312	439	—	—	—
South Dakota	1,438	5,162	45,398	121	—	—
Total	8,944,016	1,334,022	12,261,414	2,866,845	128,986	1,440
Byproduct coals						
Illinois	1,097,876	—	209,401	40,760	—	—
Indiana	2,606,475	—	10,741	62	—	—
Michigan	164,502	—	—	—	—	—
Wisconsin	10,450	—	—	34,069	—	—
Iowa	41,966	—	633	—	—	—
Minnesota	—	—	—	—	—	—
Missouri	202,637	—	—	—	—	—
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	1,549	—	—	—	—	—
Total	4,125,455	—	220,775	74,891	—	—

TABLE 16.—CONCLUDED

Consuming Area	Producing Districts					
	14	15	16–23	Total	Via Great Lakes	Grand Total
Industrial						
Illinois	1,813	812	—	18,625,135	47,745	18,672,880
Indiana	—	—	—	8,921,310	—	8,921,310
Michigan	—	—	—	5,933,358*	6,282,254	12,215,612*
Wisconsin	—	—	—	2,247,205	3,055,574	5,302,779
Iowa	24,610	99,656	—	2,798,569	966	2,799,535
Minnesota	7,861	2,829	99,940	1,020,026	1,251,539	2,271,565
Missouri	19,262	1,057,755	—	2,730,725	—	2,730,725
Nebraska	1,512	424,551	145,135	600,959	—	600,959
North Dakota	—	—	817,379	817,503	37,624	855,127
South Dakota	216	6,406	243,527	329,994	13,667	343,661
Total	55,274	1,592,009	1,305,981	44,024,784	10,689,369	54,714,153*
Retail yards						
Illinois	40,838	152	—	13,570,925	105,734	13,676,659
Indiana	—	—	—	5,727,885	—	5,727,885
Michigan	—	—	—	6,946,558	1,126,137	8,072,695
Wisconsin	—	—	—	1,337,285	3,358,501	4,695,786
Iowa	85,384	223,116	47,089	3,776,173	78,738	3,854,911
Minnesota	43,822	1,618	69,500	615,638	1,895,221	2,510,859
Missouri	491,471	976,206	3,468	3,722,195	—	3,722,195
Nebraska	167,446	355,711	584,807	1,255,405	7,431	1,262,836
North Dakota	—	—	926,654	927,405	153,245	1,080,650
South Dakota	25,266	7,397	173,750	264,049	289,770	553,819
Total	854,227	1,564,200	1,805,268	38,143,518	7,014,777	45,158,295
Byproduct coals						
Illinois	317	—	—	2,255,517	1,374,629	3,630,146
Indiana	—	—	—	4,602,747	3,137,923	7,740,670
Michigan	—	—	—	392,248	2,663,864	3,056,112
Wisconsin	—	—	—	44,519	1,528,065	1,572,584
Iowa	—	—	—	44,325	—	44,325
Minnesota	—	—	—	—	431,635	431,635
Missouri	—	—	—	310,728	—	310,728
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	1,549	—	1,549
Total	317	—	—	7,651,633	9,136,116	16,787,749

[a] U. S. Bur. of Mines, Distribution of Bituminous Coal, M. M. S. No. 1505, April 1947.
* Includes 92 tons from District 6.

TABLE 17.—SHIPMENTS OF COAL TO PRINCIPAL TYPES OF CONSUMERS IN THE ILLINOIS COAL MARKET AREA, VIA LAKE, FOR YEAR ENDING JUNE 30, 1946[a]
(In tons)

Receiving State	Producing Districts					
	1	2	3	4	6	7
Industrial fuel						
Illinois	—	—	—	—	—	—
Indiana	—	—	—	—	—	—
Michigan	171,421	1,279,860	202,156	200,189	1,002	361,898
Wisconsin	228,262	329,835	198,069	—	208	19,745
Iowa	—	—	—	—	—	—
Minnesota	—	17,735	—	—	—	—
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	—	—	—
Total	399,683	1,627,430	400,225	200,189	1,210	381,643
Retail yards						
Illinois	—	—	—	—	—	5,729
Indiana	—	—	—	—	—	—
Michigan	—	6,095	—	9,687	—	5,998
Wisconsin	—	—	—	—	—	13,858
Iowa	—	—	—	—	—	—
Minnesota	—	—	—	—	—	—
Nebraska	—	—	—	—	—	—
North Dakota	—	—	—	—	—	—
South Dakota	—	—	—	—	—	—
Total	—	6,095	—	9,687	—	25,585
Byproduct coal						
Illinois	—	234,781	—	—	—	388,718
Indiana	—	82,795	—	—	—	1,600,893
Michigan	—	331,089	278,374	117	—	618,516
Wisconsin	—	21,879	14,749	—	—	402,229
Minnesota	—	—	—	—	—	—
Total	—	670,544	293,123	117	—	3,010,356

TABLE 17.—CONCLUDED

Receiving state	Producing Districts				
	8	10	Total shipments to alongside consumers	Ex-dock shipments from commercial docks	Grand total
Industrial fuel					
Illinois	—	—	—	47,745	47,745
Indiana	—	—	—	—	—
Michigan	3,448,654	64,024	5,729,204	553,050	6,282,254
Wisconsin	86,860	3,686	866,665	2,188,909	3,055,574
Iowa	—	—	—	966	966
Minnesota	6,391	—	24,126	1,277,413	1,251,539
Nebraska	—	—	—	—	—
North Dakota	—	—	—	37,624	37,624
South Dakota	—	—	—	13,667	13,667
Total	3,541,905	67,710	6,619,995	4,069,374	10,689,369
Retail yards					
Illinois	23,921	—	29,650	76,084	105,734
Indiana	—	—	—	—	—
Michigan	280,536	5,032	307,348	818,789	1,126,137
Wisconsin	30,600	—	44,458	3,314,043	3,358,501
Iowa	—	—	—	78,738	78,738
Minnesota	—	—	—	1,895,221	1,895,221
Nebraska	—	—	—	7,431	7,431
North Dakota	—	—	—	153,245	153,245
South Dakota	—	—	—	289,770	289,770
Total	335,057	5,032	381,456	6,633,321	7,014,777
Byproduct coal					
Illinois	751,130	—	1,374,629	—	1,374,629
Indiana	1,454,235	—	3,137,923	—	3,137,923
Michigan	1,411,785	—	2,639,881	13,611	2,653,492
Wisconsin	882,548	—	1,321,405	206,546	1,527,951
Minnesota	—	—	—	426,181	426,181
Total	4,499,698	—	8,473,838	646,338	9,120,176

[a] Source: Bituminous Coal Distribution, Year Ended June 1946; U. S. Bur. Mines M. M. S. 1505, April 1947.

Metropolitan Markets

Sources of coal for Chicago and St. Louis, the two principal metropolitan markets for Illinois coal, are shown in tables 18 and 19.

Tables 20 to 26 present detailed data on production by mines and counties and destination by markets, by uses and by sizes, and prices of coal produced in Illinois.

Coal Prices in 1946

During 1946 coal prices were increased considerably (table 24) due to increased production costs and increased freight rates.

Table 18.—Sources of All-Rail Coal Destined for Chicago, 1943–1946[a]
(In tons)

Source	1943	1944	1945[b]	1946
Western Pennsylvania	115,385	779	65,540	95,074
Central Pennsylvania, Somerset-Myersdale, Cumberland-Piedmont	24,905	19,089	17,574	16,998
Fairmont, West Virginia	53,156	44,391	44,136	48,997
Northern and eastern Ohio	1,618	6,790	1,837	4,277
Southern Ohio	13,989	7,956	6,441	9,412
Kanawha, Logan and Kenova-Thacker	2,351,381	2,300,417	1,638,141	1,520,324
New River-Winding Gulf and Pocahontas-Tug River	9,439,189	7,687,840	6,348,962	5,743,598
Northeast Kentucky and McRoberts	3,376,031	3,124,223	2,646,691	2,374,112
Virginia	338,928	299,815	282,071	179,766
Hazard, Harlan and Southern Appalachian	2,698,608	2,677,139	1,816,172	1,839,152
Ex-river coal	12,617	13,276	3,668	9,333
Northern Illinois	933,613	760,017	492,258	396,714
Central and southern Illinois	7,266,187	7,498,802	6,669,932	6,460,795
Indiana	3,187,672	3,027,145	3,014,523	2,859,757
Western Kentucky	961,089	1,046,862	1,156,169	1,590,043
Total	30,774,368	28,514,541	24,204,115	23,148,352
Percent of Chicago total supplied by Illinois	26.6	28.9	29.6	29.6

[a] U. S. Bur. Mines Monthly Coal Distribution Reports, Nos. 160 (April 26, 1945) and 184 (May 14, 1947).
[b] Revised figures.

Table 19.—Sources of Coal Destined for St. Louis, 1943–1946[a]
(In tons)

Source	1943	1944	1945[b]	1946
Central Pennsylvania	53,181	50,305	40,334	32,873
Fairmont, Pennsylvania	968	758	957	1,232
Kanawha, West Virginia	328,877	312,888	306,862	232,196
New River, West Virginia	709,201	616,372	510,973	523,511
Virginia, Northeast Kentucky	206,734	128,993	107,831	92,861
Hazard, Harlan	28,482	23,029	16,960	20,420
Illinois	4,602,507	5,243,887	4,945,613	4,134,616
Indiana	14,428	13,977	11,957	13,663
Western Kentucky	81,765	37,474	39,267	71,661
Ohio	—	—	127	—
Total	6,026,143	6,427,683	5,980,881	5,123,033
Percent of St. Louis total received from Illinois	76.4	81.6	82.7	80.7

[a] U. S. Bur. Mines Monthly Coal Distribution Reports Nos. 160 (April 26, 1945), 174 (June 27, 1946), 184 (May 14, 1947).
[b] 1945 Revised figures from Coal Distribution Report No. 174 (June 27, 1946).

TABLE 20.—COAL PRODUCTION OF ALL ILLINOIS
(In

Mine inspection dist.	County	Shipping Mines			
		Strip (tons)	Underground (tons)	Total	
				No. of mines	Tons
14	Brown	—	—	—	—
1	Bureau	87,389	11,375	2	98,764
4	Christian	—	6,399,411	5	6,399,411
13	Clinton	—	228,315	3	228,315
5	Douglas	—	363	1	363
5	Edgar	—	—	—	—
10	Franklin	—	14,470,904	13	14,470,904
3	Fulton	4,847,000	122,259	10	4,969,259
11	Gallatin	—	49,678	1	49,678
7	Greene	—	—	—	—
1	Grundy	161,023	—	1	161,023
3	Henry	418,731	111,896	2	530,627
9	Jackson	493,527	1,872,897	4	2,366,424
13	Jefferson	—	493,400	1	493,400
3	Knox	1,440,921	62,688	4	1,503,609
1	LaSalle	74,519	60,251	3	134,770
1	Livingston	—	—	—	—
2	Logan	—	—	—	—
14	McDonough	—	—	—	—
4	Macon	—	—	—	—
6	Macoupin	—	4,985,062	10	4,985,062
7	Madison	—	1,940,799	6	1,940,799
13	Marion	—	177,335	1	177,335
1	Marshall	—	—	—	—
4	Menard	—	—	—	—
14	Mercer	—	—	—	—
6	Montgomery	—	842,210	1	842,210
2	Peoria	—	334,846	1	334,846
9	Perry	2,487,254	1,249,244	8	3,736,498
9	Randolph	938,685	1,300,785	4	2,239,470
14	Rock Island	—	—	—	—
8	St. Clair	190,227	1,931,205	15	2,121,432
11	Saline	699,629	3,514,139	14	4,213,768
4	Sangamon	—	1,960,464	5	1,960,464
14	Schuyler	128,296	—	1	128,296
4	Shelby	—	—	—	—
2	Stark	—	—	—	—
2	Tazewell	—	—	—	—
5	Vermilion	44,026	1,157,551	5	1,201,577
14	Warren	—	—	—	—
13	Washington	—	482,153	2	482,153
1	Will	1,416,726	—	2	1,416,726
12	Williamson	874,786	2,854,925	34	3,729,711
2	Woodford	—	15,891	1	15,891
	Total	14,302,739	46,630,046	160	60,932,785

MINES, BY TYPE OF MINE, AND BY COUNTIES, 1946[a]
tons)

Local Mines				County totals			Mine inspection dist.
Strip (tons)	Underground (tons)	Total		No. of mines	Tons	% of state total	
		No. of mines	Tons				
1,570	—	1	1,570	1	1,570	—	14
—	—	—	—	2	98,764	0.1	1
—	15,973	1	15,973	6	6,415,384	10.0	4
—	—	—	—	3	228,315	0.3	13
—	—	—	—	1	363	—	5
—	35,358	2	35,358	2	35,358	—	5
—	—	—	—	13	14,470,904	22.7	10
1,961	140,921	26	142,882	36	5,112,141	8.0	3
—	23,762	7	23,762	8	73,440	0.1	11
—	16	1	16	1	16	—	7
46,167	—	1	46,167	2	207,190	0.3	1
—	19,316	5	19,316	7	549,943	1.0	3
—	32,786	3	32,786	7	2,399,210	3.8	9
35	—	1	35	2	493,435	0.8	13
—	45,192	2	45,192	6	1,548,801	2.4	3
7,469	19,697	3	27,166	6	161,936	0.2	1
6,509	—	2	6,509	2	6,509	—	1
—	51,822	2	51,822	2	51,822	0.1	2
697	241	4	938	4	938	—	14
—	21,769	1	21,769	1	21,769	—	4
—	—	—	—	10	4,985,062	7.8	6
—	199,215	5	199,215	11	2,140,014	3.4	7
—	—	—	—	1	177,335	0.3	13
377	84	2	461	2	461	—	1
—	42,831	6	42,831	6	42,831	—	4
—	1,263	2	1,263	2	1,263	—	14
—	—	—	—	1	842,210	1.3	6
556	260,397	28	260,953	29	595,799	1.0	2
4,746	18,648	6	23,394	14	3,759,892	6.0	9
—	50,422	6	50,422	10	2,289,892	3.6	9
—	1,061	3	1,061	3	1,061	—	14
828,170	112,980	13	941,150	28	3,062,582	4.8	8
—	19,550	4	19,550	18	4,233,318	6.6	11
—	172,381	11	172,381	16	2,132,845	3.4	4
1,239	18,480	9	19,719	10	148,015	0.2	14
—	546	1	546	1	546	—	4
—	150	2	150	2	150	—	2
—	79,678	3	79,678	3	79,678	0.1	2
4,569	138,677	23	143,246	28	1,344,823	2.1	5
—	2,908	1	2,908	1	2,908	—	14
—	—	—	—	2	482,153	0.7	13
—	—	—	—	2	1,416,726	2.2	1
1,000	403,108	26	404,108	60	4,133,819	6.5	12
—	—	—	—	1	15,891	—	2
				(Less than 0.1% per mine)		0.2	
905,065	1,929,232	213	2,834,297	373	63,767,082	100.0	

SUMMARY OF TABLE 20[a]

Type of Mines	1945		1946	
	Number of mines[b]	Net tons produced	Number of mines[b]	Net tons produced
Strip mines				
Shipping	36	16,203,763	36	14,302,739
Local	15	2,341,637	24	905,065
Total	51	18,545,400	60	15,207,804
Underground mines				
Shipping	122	54,097,340	124	46,630,046
Local	207	3,145,827	189	1,929,232
Total	329	57,243,167	313	48,559,278
Grand Total	380	73,446,930	373	63,767,082

[a] Compiled from Ill. State Dept. Mines and Minerals, Sixty-fifth Annual Coal Report, 1946.
[b] Number of mines reporting production.

TABLE 21.—ILLINOIS COAL PRODUCTION, BY QUARTERS FOR THE YEARS 1942–1946[a]
(In thousands of tons)

	1942		1943		1944		1945		1946	
	Amount	Percent of total	Amount	Percent of total	Amount	Percent of total	Amount	Percent of total	Amount	Percent of total
January-March	16,783	25.8	18,819	25.9	20,850	27.1	19,966	27.3	19,768	31 6
April-June	15,343	23.6	15,755	21.7	19,037	24.8	17,532	24.0	9,557	15.3
July-September	15,438	23.7	19,405	26.7	18,130	23.6	16,820	23.1	17,477	27.9
October-December	17,507	26.9	18,652	25.7	18,775	24.5	18,693	25.6	15,752	25.2
Total	65,071	100.0	72,631	100.0	76,792	100.0	73,011	100.0	62,554	100.0

[a] Compiled from Minerals Yearbooks for 1943 and 1944, U. S. Bureau of Mines Mineral Market Reports M. M. S. No. 1359 (Nov. 19, 1945) and M. M. S. No. 1468 (Nov. 19, 1946) and Weekly Coal Report W. C. R. No. 1545 (Mar. 1, 1947). Does not include mines with annual production of less than 1,000 tons.

TABLE 22.—PRODUCTION OF BITUMINOUS COAL IN ILLINOIS AND THE UNITED STATES, BY MONTHS, 1946[a]
(In thousands of tons)

Month	United States	Illinois	
		Amount	Percent of U. S. production
January	54,433	6,710	12.3
February	50,248	6,188	12.3
March	56,849	6,870	12.1
April	3,506	1,207	34.4
May	19,695	2,542	12.9
June	50,579	5,808	11.5
July	51,350	5,491	10.7
August	54,686	6,138	11.2
September	51,922	5,848	11.3
October	57,485	6,660	11.6
November	37,501	4,010	10.7
December	43,746	5,082	11 6
Total	532,000	62,554	
Small mines, and undistributed in Illinois[b]	1,213	1,213	
Total	533,213	63,767	11.7[c]

[a] U. S. Bur. Mines, Weekly Coal Report No. W. C. R. 1545 (Mar. 1, 1947).
[b] Illinois State Dept. Mines and Minerals, Annual Coal Report, 1946, for mines with annual production of less than 1,000 tons each.
[c] Average.

TABLE 23.—AMOUNT AND VALUE OF COAL PRODUCED IN ILLINOIS, SHOWING NUMBER AND TYPE OF MINES, 1936–1946[a]
(In thousands of tons, and thousands of dollars)

Year	Number of Mines[b]							Production (thousands of tons)							Value at Mines[c]	
	Shipping		Local		Total			Strip			Underground					
	Strip	Underground	Strip	Underground	Strip	Underground	All	Shipping	Local	Total strip	Shipping	Local	Total underground	Total production	Total (thousands of dollars)	Average per ton
1936....	30	146	86	980	116	1,126	1,242	8,873	474	9,347	38,412	3,717	42,129	51,476	$79,788	$1.55
1937....	31	137	70	782	101	919	1,020	11,176	550	11,726	36,886	3,820	40,706	52,432	82,318	1.57
1938....	25	124	74	746	99	870	969	10,059	620	10,679	28,384	3,324	31,708	42,387	63,581	1.50
1939....	26	120	82	748	108	868	976	11,296	990	12,286	31,698	3,643	35,341	47,627	78,108	1.64
1940....	27	112	53	696	80	808	888	12,025	1,255	13,280	34,047	3,955	38,002	51,282	86,667	1.69
1941....	29	113	29	628	58	741	799	13,361	881	14,242	37,673	3,451	41,124	55,366	100,212	1.81
1942....	28	114	30	513	58	627	684	14,827	1,111	15,938	46,297	3,511	49,808	65,746	125,575	1.91
1943....	26	116	22	326	48	442	489	15,485	1,314	16,799	53,487	3,059	56,546	73,345	156,224	2.13
1944....	30	135	18	224	48	359	406	17,108	968	18,076	56,850	2,474	59,324	77,400	172,602	2.23
1945....	36	122	16	206	52	328	380	16,204	807	17,011	54,097	2,342	56,436	73,447	*171,866	*2 34
1946....	36	124	24	189	60	313	373	14,303	905	15,208	46,630	1,929	48,559	63,767	163,881	2.57

* Revised figures.
[a] Compiled from Illinois State Dept. Mines and Minerals, Annual Coal Reports.
[b] Number of mines reporting production during year indicated.
[c] Based on total production at average price for each year; Weekly Coal Report No. 1552, April 19, 1947, and U. S. Bureau of Mines, Minerals Yearbooks.

TABLE 24.—COAL MINE PRICES, PER TON, DECEMBER 1945 AND DECEMBER, 1946[a]

	December, 1945	December, 1946
Southern Illinois		
Freight rate[b] to Chicago, $2.30 a ton		
Lump	$ 3.40	$ 3.65
Egg	3.40	3.65
Nut	2.64–3.10	2.89– 3.35
Washed screenings	2.55	2.90
Screenings	2.25	2.60
Mine run	—	—
Central Illinois		
Freight rate to Chicago, $2.00 a ton		
Lump	2.55–2.75	2.80– 3.00
Egg	2.55–2.75	2.80– 3.00
Nut	2.45–2.65	2.70– 2.90
Washed screenings	2.20	2.55
Screenings	1.90–2.50	2.15– 2.70
Mine run	—	—
Indiana, No. 4		
Freight rates to Chicago, $1.90 and $2.00 a ton		
Lump	2.70–2.95	3.05– 3.30
Egg	2.60–2.85	2.95– 3.20
Stoker nut	1.95–2.40	2.30– 2.75
Nut	1.95–2.40	2.30– 2.75
Screenings	1.85–2.05	2.20– 2.40
Mine run	2.50–2.60	2.85– 2.95
Indiana, No. 5		
Freight rates to Chicago, $1.90, $2.00, $2.15 a ton		
Lump	2.55–3.00	2.90– 3.35
Egg	2.45–2.60	2.80– 2.95
Stoker nut	1.85–2.10	2.65– 2.80
Nut	2.30–2.45	2.70– 2.90
Screenings	1.75–1.90	2.10– 2.25
Mine run	2.40–2.45	2.75– 2.80
West Virginia Smokeless, New River and Pocahontas		
Freight rates to Chicago, $3.69 a ton		
Lump	3.91–4.61	4.79– 5.23
Egg	3.91–4.71	4.89– 5.33
Stove	4.36–4.41	4.94
Nut	3.66–3.81	4.43
Stoker pea	3.61–3.71	4.29– 4.33
Mine run (Dom.)	3.96–4.06	4.68
Straight mine run	3.71–3.91	4.64
Slack	2.96–3.16	4.08
Briquets	5.25	—

Table 24.—(Concluded)

	December, 1945	December, 1946
Eastern Kentucky Millers Creek—Great Heart		
Freight rate to Chicago, $3.49 a ton		
Block	$ 4.65	$ 5.11
Furnace	4.50–4.65	4.96– 5.11
Small egg	—	—
Stoker nut	4.20–4.40	4.66– 4.86
Nut	—	4.27
Screenings	3.05–3.40	3.51– 3.86
East Kentucky, West Virginia, High Volatile		
Freight rate to Chicago, $3.49 a ton		
Block	3.65–3.95	4.11– 4.41
Furnace	3.35–3.70	3.81– 4.16
Small egg	3.25	3.71
Stoker nut	3.55–3.95	3.66– 4.41
Screenings	—	—
West Kentucky, No. 9 and No. 11		
Freight rate to Chicago, $2.60 a ton		
Lump, 6″	2.25–2.40	2.55– 2.70
Egg, 6″x3″	2.20–2.40	2.50– 2.40
Stoker nut	1.85–2.50	2.15– 2.80
Screenings	1.65–1.95	1.95– 2.25
Mine run	2.10–2.30	2.40– 2.60
Western Kentucky, No. 6		
Freight rate to Chicago, $2.60 a ton		
Lump, 6″	2.70	3.00
Egg, 6″x3″	2.70	3.00
Stoker nut	3.10	3.40
Screenings	2.45	2.75
Western Kentucky, No. 14		
Freight rate to Chicago, $2.60 a ton		
Lump, 6″	2.51	(c)
Egg, 6″x3″	2.51	—
Nut, 3″x2″	2.51	2.81
Chestnut	2.26	2.56
Screenings, 2″	2.11	2.36
Anthracite		
Freight rate to Chicago from mines in Pennsylvania, $4.58 a ton		
Grate, egg, stove, chestnut	9.00	10.15
Pea	7.30	8.30
Buckwheat	5.25	5.95
Rice	4.30	4.90

[a] Chicago Journal of Commerce.
[b] Freight rates as of December 1946.
[c] Change in classification for Western Kentucky No. 14:

Lump, 6″ x 3″ washed furnace	$2.81.
Small washed egg, 3″ x 2″	2.81.
Washed nut, 2″ x 1½″	2.56.
Mesh Stoker, ¾″x10-mesh	2.56.

TABLE 25.—COAL CONSUMED IN THE ILLINOIS COAL MARKET AREA (EXCLUSIVE OF RAILROAD FUEL), 1945–1946[a]
(In tons)

Source	1945	1946
Distribution of total production (all rail) from mines in U. S.		
Illinois	38,200,066	35,387,957
Wisconsin	4,106,165	3,754,143
Iowa	7,122,466	6,720,991
Kansas	2,079,281	1,364,254
Minnesota	1,676,937	1,632,711
Missouri	7,854,271	6,467,394
Nebraska	2,108,321	1,661,327
North Dakota	61,102	93,573
South Dakota	470,687	466,293
Waterborne shipments via Lake and Tidewater, summaries by consumer states of destination		
Illinois	2,061,180	1,722,866
Wisconsin	8,889,006	8,702,343
Iowa	106,392	118,151
Kansas	—	—
Minnesota	3,910,221	3,915,591
Missouri	—	—
Nebraska	8,311	7,569
North Dakota	208,934	211,896
South Dakota	348,775	352,403
Total shipments to consumers—All movements and uses		
Illinois	40,261,246	37,110,823
Wisconsin	12,995,171	12,456,486
Iowa	7,228,858	6,839,142
Kansas	2,079,281	1,364,254
Minnesota	5,587,158	5,548,302
Missouri	7,854,271	6,467,394
Nebraska	2,116,632	1,668,896
North Dakota	270,036	305,469
South Dakota	819,462	818,696
Grand Total	79,212,115	72,579,462

[a] U. S. Bur. Mines Monthly Coal Distribution Reports, Nos. 172 (1945), 184 (1946).

TABLE 26.—SHIPMENTS OF BITUMINOUS COAL BY SIZES, FROM ILLINOIS, 1946[a]
(In tons)

Size	Amount	Percent
All lump coal and all double screened coal with top size over 2 inches	19,107,171	31.4
All double screened coal with top size not exceeding 2 inches	3,438,172	5.7
Modified mine-run, domestic mine-run, screened mine-run, and altered mine-run and minus resultant with top size over 2 inches	13,723,815	22.6
All minus resultant and dedusted screenings with top size over ¾ inch and not exceeding 2 inches	21,359,925	35.1
All minus resultant and dedusted screenings with top size not exceeding ¾ inch	3,151,683	5.2
Total	60,780,766	100.0
Size not reported	21,442	
Coal used at mines	948,815	
Net change in inventory	7,849	
Grand Total	61,758,872	

[a] Data compiled from U. S. Bureau Mines Monthly Coal Distribution Report No. 184 (May 14, 1947).

TABLE 27.—SOURCE OF BITUMINOUS COAL, SHIPPED TO ILLINOIS, BY ALL-RAIL, RIVER AND EX-RIVER (EXCLUSIVE OF RAILROAD FUEL), 1946[a]
(In tons)

District No.	Total
1	33,578
2	10,801
3	56,362
4	12,810
5	—
6	—
7	4,427,479
8	3,298,895
9	1,393,344
10	22,817,379
11	3,330,266
12	—
13	42
14	6,093
15	908
Total	35,387,957

[a] U. S. Bureau Mines Monthly Coal Distribution Report, No. 184 (May 14, 1947).

DEGREE–DAYS

Degree–days are the number of degrees of temperature that the average temperature for each day falls below 65° Fahrenheit.

These are totaled for each month and a cumulative total for the heating season through each month is determined. These data averaged over a long period of time give a reliable guide to the fuel needs of the locality in which the temperatures are recorded. This information is given in table 29.

Figure 5 shows the modified degree–day belts of the state numbered from 1 to 8. District 8 comprises St. Louis city and county and is included in the tabulations because of the interest of the Illinois coal industry in this large market.

In table 28 is shown the number of heating units by each type of fuel used, for each of the degree–day belts outlined on the map.

Because of the close relationship between the number of degree–days accumulated during the heating season and the quantity of fuels consumed, a degree–day map of Illinois and a table showing degree–day records for the past heating season compared with the normal is useful in estimating domestic fuel consumption. In this issue a modified degree–day map is given in which county boundaries are used to mark the boundaries of degree–day belts. Although this results in some inaccuracies, the purpose is to show the number and types of heating units in each degree–day belt. Since these latter are reported by county units only, it was necessary to prepare a map in which boundaries of degree–day belts conformed to the nearest county boundary.

TABLE 28.—TYPES OF HEATING EQUIPMENT, BY DEGREE-DAY DISTRICTS[a]

Units With Central Heating

District No.	Coal	Wood	Gas	Fuel oil	Total	Other fuel and not reported
1	60,076	1,250	1,166	5,820	68,312	685
2	807,045	1,099	30,100	46,366	884,610	12,138
3	101,484	841	1,435	3,301	107,061	872
4	140,604	535	5,420	3,109	149,668	2,741
5	55,464	680	804	854	57,802	783
6	36,169	163	127	720	37,179	240
7	9,426	34	13	40	9,513	82
8. St. Louis, Mo.						
St. Louis County	45,379	129	4,868	6,486	56,862	204
St. Louis City	134,419	56	3,650	4,802	142,927	1,399
Total	1,390,066	4,787	47,583	71,498	1,513,934	19,144

Units Without Central Heating

District No.	Coal	Wood	Gas	Fuel oil	Gas or Kero.	Total	Other fuel and not reported	None
1	19,753	3,002	117	3,958	152	26,982	96	26
2	224,896	3,991	5,529	87,642	581	322,639	1,235	318
3	57,043	4,319	238	3,008	294	64,902	319	69
4	112,727	8,847	864	2,168	357	124,963	495	79
5	90,881	28,595	1,641	1,712	858	123,687	581	105
6	78,043	14,895	704	636	278	94,556	258	48
7	48,115	7,777	26	126	102	56,146	162	87
8. St. Louis, Mo.								
St. Louis Co	13,422	1,671	130	656	136	16,015	62	25
St. Louis City	83,434	295	752	2,928	156	87,565	272	247
Total	728,314	73,392	10,001	102,834	2,914	917,455	3,480	1,004

[a] Source: U. S. Census, Housing, Illinois, 2nd Series, 1939.

FIG. 5.—Degree-day districts, with averages and ranges.

TABLE 29.—NUMBER OF DEGREE-DAYS FOR REPRESENTATIVE CITIES AND TOWNS IN ILLINOIS BY MONTHS, 1946-1947, COMPARED WITH THE AVERAGE FOR THE PERIOD IN WHICH RECORDS HAVE BEEN KEPT, TO THE CLOSE OF 1945[a, b]

Month	Aledo (Pop. 2,593)				Anna (Pop. 4,092)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	217	341	341	5.7	124	155	155	3.8
November	720	750	1,091	12.6	450	540	695	13.2
December	992	1,147	2,238	19.3	713	868	1,563	21.2
January	1,178	1,271	3,509	21.4	837	961	2,524	23.4
February	1,232	1,092	4,601	18.4	980	784	3,308	19.1
March	961	806	5,407	13.5	806	558	3,866	13.5
April	420	450	5,857	7.5	240	240	4,106	5.8
May	186	93	5,950	1.6	62	0	4,106	—
Total	5,906	(46 yrs.)	5,950	100.0	4,212	(62 yrs.)	4,106	100.0
Departure from normal	−44				+106			
	Aurora (Pop. 47,170)				Bloomington (Pop. 32,868)			
September	30	30	30	0.5	0	0	0	—
October	248	403	433	6.2	124	310	310	5.4
November	720	810	1,243	12.5	630	720	1,030	12.5
December	1,054	1,178	2,421	18.1	930	1,085	2,115	18.8
January	1,178	1,333	3,754	20.5	1,085	1,209	3,324	20.9
February	1,288	1,120	4,874	17.2	1,204	1,288	4,612	22.3
March	1,054	930	5,804	14.3	961	806	5,418	13.9
April	510	510	6,314	7.8	420	300	5,718	5.2
May	310	186	6,500	2.9	186	62	5,780	1.0
Total	6,392	(67 yrs.)	6,500	100.0	5,540	(55 yrs.)	5,780	100.0
Departure from normal	−108				−240			
	Cairo (Pop. 14,407)				Carbondale (Pop. 8,550)			
September	0	0	0	—	0	0	0	—
October	31	155	155	4.0	93	155	155	3.9
November	390	510	665	13.2	450	540	695	13.4
December	620	806	1,471	20.9	682	868	1,563	21.6
January	744	899	2,370	23.2	806	930	2,493	23.2
February	924	756	3,126	19.6	952	756	3,249	18.8
March	713	527	3,653	13.6	806	558	3,807	13.9
April	150	210	3,863	5.5	240	210	4,017	5.2
May	0	0	3,863	—	0	0	4,017	—
Total	3,572	(74 yrs.)	3,863	100.0	4,029	(42 yrs.)	4,017	100.0
Departure from normal	−291				+12			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

TABLE 29.—(CONTINUED)

Month	Carlinville (Pop. 4,965)				Charleston (Pop. 8,197)			
	Mean[e] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[e] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	155	248	248	5.0	124	279	279	5.4
November	570	630	878	12.7	570	660	939	12.8
December	837	992	1,870	20.0	868	992	1,931	19.4
January	961	1,116	2,986	22.6	961	1,116	2,047	21.6
February	1,064	924	3,910	18.6	1,120	952	3,999	18.4
March	930	682	4,592	13.8	930	713	4,712	13.8
April	360	330	4,922	6.7	360	360	5,072	7.0
May	0	31	4,953	0.6	155	93	5,165	1.8
Total	4,877	(56 yrs.)	4,953	100.0	5,088	(61 yrs.)	5,165	100.0
Departure from normal	−76				−77			

	Chicago (Pop. 3,396,808)				Danville (Pop. 36,919)			
September	0	0	0	—	0	0	0	—
October	155	341	341	5.5	155	279	279	5.2
November	630	750	1,091	12.0	570	690	969	12.9
December	1,023	1,116	2,207	17.9	899	1,054	2,023	19.7
January	1,085	1,271	3,478	20.4	992	1,147	3,170	21.5
February	1,232	1,064	4,542	17.1	1,148	980	4,150	18.3
March	1,023	899	5,441	14.4	961	744	4,894	13.9
April	540	540	5,981	8.7	420	390	5,284	7.3
May	372	248	6,229	4.0	217	62	5,346	1.2
Total	6,060	(76 yrs.)	6,229	100.0	5,362	(44 yrs.)	5,346	100.0
Departure from normal	−169				+16			

	Decatur (Pop. 59,305)				Dixon (Pop. 10,671)			
September	0	0	0	—	0	0	0	—
October	124	279	279	5.2	248	403	403	6.2
November	570	690	969	12.8	720	810	1,213	12.5
December	868	1,054	2,023	19.6	1,023	1,209	2,422	18.7
January	992	1,178	3,201	21.9	1,178	1,364	3,786	21.1
February	1,120	1,008	4,209	18.8	1,260	1,148	4,934	17.8
March	930	744	4,953	13.8	1,023	899	5,833	13.9
April	360	360	5,313	6.7	450	480	6,313	7.4
May	155	62	5,375	1.2	279	155	6,468	2.4
Total	5,319	(55 yrs.)	5,375	100.0	6,181	(56 yrs.)	6,468	100.0
Departure from normal	−56				−287			

TABLE 29.—(CONTINUED)

Month	DuQuoin (Pop. 7,515)				Effingham (Pop. 6,180)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	93	186	186	4.3	186	248	248	5.0
November	480	570	756	13.1	570	660	908	13.4
December	713	899	1,655	20.7	868	992	1,900	20.0
January	837	992	2,647	22.8	961	1,085	2,985	21.9
February	980	840	3,487	19.3	1,120	924	3,909	18.6
March	806	589	4,076	13.6	961	682	4,591	13.8
April	270	270	4,346	6.2	360	330	4,921	6.7
May	31	0	4,346	—	155	31	4,952	0.6
Total	4,210	(55 yrs.)	4,346	100.0	5,181	(46 yrs.)	4,952	100.0
Departure from normal	−136				+229			

	Fairfield (Pop. 4,008)				Flora (Pop. 5,474))			
September	0	0	0	—	0	0	0	—
October	124	186	186	4.2	155	248	248	5.2
November	450	570	756	13.0	510	630	878	13.2
December	744	930	1,686	21.1	806	961	1,839	20.2
January	837	992	2,678	22.5	899	1,054	2,893	22.1
February	1,008	840	3,518	19.0	1,036	896	3,789	18.8
March	837	620	4,138	14.1	868	651	4,440	13.6
April	270	270	4,408	6.1	300	300	4,740	6.3
May	62	0	4,408	—	62	31	4,771	0.6
Total	4,332	(52 yrs.)	4,408	100.0	4,636	(59 yrs.)	4,771	100.0
Departure from normal	−76				−135			

	Freeport (Pop. 22,366)				Galva (Pop. 2,812)			
September	120	60	60	0.9	0	0	0	—
October	310	434	494	6.4	217	341	341	5.6
November	780	840	1,334	12.3	690	780	1,121	12.6
December	1,085	1,240	2,574	18.2	1,023	1,178	2,299	19.2
January	1,240	1,426	4,000	20.8	1,147	1,302	3,601	21.2
February	1,344	1,176	5,176	17.2	1,232	1,120	4,721	18.3
March	1,054	961	6,137	14.1	1,023	837	5,558	13.6
April	540	510	6,647	7.4	480	450	6,008	7.3
May	310	186	6,833	2.7	279	124	6,132	2.2
Total	6,783	(40 yrs.)	6,833	100.0	6,091	(54 yrs.)	6,132	100.0
Departure from normal	−50				−41			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data.
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

TABLE 29.—(CONTINUED)

Month	Greenville (Pop. 3,391)				Griggsville (Pop. 1,266)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	124	248	248	5.0	124	248	248	4.8
November	510	660	908	13.4	600	660	908	12.9
December	775	992	1,900	20.2	837	1,023	1,931	19.9
January	899	1,085	2,985	22.0	1,023	1,147	3,078	22.4
February	1,036	924	3,909	18.8	1,064	980	4,058	19.1
March	868	682	4,591	13.9	899	713	4,771	13.9
April	300	300	4,891	6.1	390	330	5,101	6.4
May	93	31	4,922	0.6	155	31	5,132	0.6
Total	4,605	(68 yrs.)	4,922	100.0	5,092	(60 yrs.)	5,132	100.0
Departure from normal	−317				−40			

	Harrisburg (Pop. 11,453)				Havana (Pop. 3,999)			
September	0	0	0	—	0	0	0	—
October	124	155	155	3.9	186	279	279	5.1
November	390	510	665	12.8	630	690	969	12.6
December	682	837	1,502	21.0	930	1,054	2,023	19.3
January	775	930	2,432	23.4	1,085	1,178	3,201	21.6
February	952	784	3,216	19.7	1,148	1,008	4,209	18.4
March	775	527	3,743	13.2	930	744	4,953	13.6
April	210	240	3,983	6.0	390	360	5,313	6.6
May	31	0	3,983	—	186	155	5,468	2.8
Total	3,939	(47 yrs.)	3,983	100.0	5,485	(54 yrs.)	5,468	100.0
Departure from normal	−44				+17			

	Henry (Pop. 1,877)				Hillsboro (Pop. 4,514)			
September	0	0	0	—	0	0	0	—
October	186	341	341	5.7	124	248	248	5.0
November	660	750	1,091	12.5	540	630	878	12.8
December	961	1,116	2,207	18.7	806	992	1,870	20.2
January	1,116	1,271	3,478	21.3	930	1,085	2,955	22.0
February	1,176	1,148	4,626	19.2	1,036	924	3,879	18.8
March	961	837	5,463	14.0	899	682	4,561	13.9
April	420	420	5,883	7.0	330	330	4,891	6.7
May	217	93	5,976	1.6	93	31	4,922	0.6
Total	5,697	(58 yrs.)	5,976	100.0	4,758	(52 yrs.)	4,922	100.0
Departure from normal	−279				−164			

TABLE 29.—(CONTINUED)

Month	Hoopeston (Pop. 5,381)				Jacksonville (Pop. 19,844)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	155	341	341	6.1	155	279	279	5.3
November	600	690	1,031	12.3	570	660	939	12.5
December	930	1,085	2,116	19.4	837	1,054	1,993	19.9
January	1,054	1,178	3,294	21.2	1,023	1,147	3,140	21.7
February	1,176	1,008	4,302	18.0	1,092	980	4,120	18.5
March	961	775	5,077	13.8	930	744	4,864	14.1
April	450	420	5,497	7.5	360	360	5,224	6.8
May	217	93	5,590	1.7	124	62	5,286	1.2
Total	5,543	(43 yrs.)	5,590	100.0	5,091	(53 yrs.)	5,286	100.0
Departure from normal	−47				−195			

	Joliet (Pop. 42,365)				Kankakee (Pop. 22,241)			
September	30	0	0	—	0	0	0	—
October	248	372	372	6.2	186	341	341	5.8
November	720	750	1,122	12.4	630	720	1,061	12.3
December	1,054	1,036	2,158	17.1	961	1,116	2,177	19.0
January	1,178	1,271	3,429	21.0	1,116	1,240	3,417	21.2
February	1,260	1,120	4,549	18.5	1,204	1,008	4,425	17.2
March	1,023	868	5,417	14.3	992	806	5,231	13.7
April	540	480	5,897	7.9	480	480	5,711	8.2
May	341	155	6,052	2.6	279	155	5,866	2.6
Total	6,394	(55 yrs.)	6,052	100.0	5,848	(30 yrs.)	5,866	100.0
Departure from normal	+342				−18			

	LaHarpe (Pop. 1,322)				Lincoln (Pop. 12,752)			
September	0	0	0	—	0	0	0	—
October	155	310	310	5.4	155	310	310	5.7
November	630	720	1,030	12.6	570	690	1,000	12.6
December	930	1,116	2,146	19.4	899	1,054	2,054	19.3
January	1,085	1,209	3,355	21.0	1,054	1,178	3,232	21.5
February	1,148	1,064	4,419	18.6	1,148	1,008	4,240	18.4
March	961	806	5,225	14.1	961	775	5,015	14.2
April	390	420	5,645	7.3	390	390	5,405	7.2
May	186	93	5,738	1.6	155	62	5,467	1.1
Total	5,485	(51 yrs.)	5,738	100.0	5,332	(58 yrs.)	5,467	100.0
Departure from normal	−253				−135			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data.
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

TABLE 29.—(CONTINUED)

Month	McLeansboro (Pop. 2,528)				Marengo (Pop. 2,034)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	90	90	1.3
October	93	186	186	4.2	248	465	555	6.5
November	420	570	756	13.0	750	870	1,425	12.2
December	713	899	1,655	20.4	1,085	1,271	2,696	17.8
January	806	1,023	2,678	23.3	1,209	1,426	4,122	20.0
February	980	840	3,518	19.1	1,288	1,204	5,326	16.9
March	775	612	4,138	13.4	1,054	1,023	6,349	14.4
April	210	270	4,408	6.1	540	570	6,919	8.0
May	31	0	4,408	—	341	210	7,129	2.9
Total	4,028	(64 yrs.)	4,408	100.0	6,515	(86 yrs.)	7,129	100.0
Departure from normal	−380				−614			

	Mascoutah (Pop. 2,294)				Minonk (Pop. 1,897)			
September	0	0	0	—	0	0	0	—
October	124	217	217	4.7	186	341	341	5.7
November	540	630	847	13.7	660	750	1,091	12.5
December	744	930	1,777	20.3	961	1,147	2,238	19.2
January	868	1,023	2,800	22.3	1,147	1,271	3,509	21.3
February	980	868	3,668	18.9	1,204	1,092	4,601	18.3
March	837	620	4,288	13.5	992	837	5,438	14.0
April	270	300	4,588	6.6	480	450	5,888	7.5
May	31	0	4,588	—	248	93	5,981	1.5
Total	4,394	(56 yrs.)	4,588	100.0	5,878	(52 yrs.)	5,981	100.0
Departure from normal	−194				−103			

	Monmouth (Pop. 9,096)				Morrison (Pop. 3,187)			
September	0	0	0	—	0	0	0	—
October	186	341	341	5.8	248	372	372	6.0
November	690	750	1,091	12.7	720	780	1,152	12.6
December	961	1,147	2,238	19.5	1,023	1,209	2,361	19.5
January	1,147	1,302	3,540	22.1	1,178	1,209	3,570	19.5
February	1,204	1,092	4,632	18.6	1,260	1,148	4,718	18.6
March	992	806	5,438	13.7	992	868	5,586	14.1
April	450	420	5,858	7.1	480	480	6,066	7.8
May	248	31	5,889	0.5	279	120	6,186	1.9
Total	5,878	(54 yrs.)	5,889	100.0	6,180	(51 yrs.)	6,186	100.0
Departure from normal	−11				−6			

TABLE 29.—(CONTINUED)

Month	Mt. Carmel (Pop. 6,987)				Mt. Carroll (Pop. 1,845)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	30	60	60	0.9
October	93	186	186	4.2	279	434	494	6.4
November	420	600	786	13.4	750	840	1,334	12.4
December	713	930	1,716	20.8	1,054	1,240	2,574	18.4
January	837	992	2,708	22.3	1,209	1,364	3,938	20.2
February	980	868	3,576	19.4	1,316	1,176	5,114	17.5
March	837	589	4,165	13.2	1,023	930	6,044	13.8
April	240	300	4,465	6.7	510	510	6,554	7.6
May	31	0	4,465	—	310	186	6,740	2.8
Total	4,151	(44 yrs.)	4,465	100.0	6,481	(56 yrs.)	6,740	100.0
Departure from normal	−314				−259			

	Mt. Vernon (Pop. 14,724)				New Burnside (Pop. 299)			
September	0	0	0	—	0	0	0	—
October	155	217	217	4.8	93	155	155	3.8
November	510	600	817	13.2	450	540	695	13.3
December	775	930	1,747	20.4	713	868	1,563	21.3
January	899	1,023	2,770	22.4	837	930	2,493	22.8
February	1,036	868	3,638	19.0	980	756	3,249	18.5
March	868	620	4,258	13.6	837	558	3,807	13.7
April	270	300	4,558	6.6	240	270	4,077	6.6
May	62	0	4,558	—	62	0	4,077	—
Total	4,575	(51 yrs.)	4,558	100.0	4,212	(35 yrs.)	4,077	100.0
Departure from normal	+17				+135			

	Olney (Pop. 7,831)				Ottawa (Pop. 16,005)			
September	0	0	0	—	0	0	0	—
October	93	217	217	4.6	186	341	341	5.7
November	450	600	817	12.8	660	750	1,091	12.6
December	744	961	1,778	20.6	961	1,116	2,207	18.7
January	868	1,023	2,801	21.9	1,116	1,240	3,447	20.8
February	1,008	896	3,697	19.2	1,204	1,064	4,511	17.9
March	868	651	4,348	13.8	961	837	5,348	14.1
April	300	330	4,678	7.1	450	450	5,798	7.6
May	62	0	4,678	—	248	155	5,953	2.6
Total	4,393	(50 yrs.)	4,678	100.0	5,786	(58 yrs.)	5,953	100.0
Departure from normal	−285				−167			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data.
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

TABLE 29.—(CONTINUED)

Month	Palestine (Pop. 1,626)				Pana (Pop. 5,966)			
	Mean[e] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[e] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	0	0	—	0	0	0	—
October	155	248	248	5.1	124	279	279	5.4
November	510	660	908	13.5	570	660	939	12.7
December	806	961	1,869	19.6	837	1,023	1,962	19.7
January	899	1,085	2,954	22.2	961	1,147	3,109	22.1
February	1,092	896	3,850	18.3	1,064	952	4,061	18.3
March	868	682	4,532	13.9	899	713	4,774	13.7
April	300	330	4,882	6.8	330	360	5,134	6.9
May	93	31	4,893	0.6	124	62	5,196	1.2
Total	4,723	(64 yrs.)	4,893	100.0	4,909	57 yrs.)	5,196	100.0
Departure from normal	−170				−287			

	Paris (Pop. 9,281)				Peoria (Pop. 105,087)			
September	0	0	0	—	0	0	0	—
October	93	279	279	5.2	186	372	372	6.3
November	510	690	969	12.8	660	780	1,152	13.2
December	806	1,054	2,023	19.6	992	1,116	2,268	18.9
January	899	1,147	3,170	21.3	1,116	1,271	3,539	21.6
February	1,092	980	4,150	18.2	1,204	1,036	4,575	17.6
March	930	775	4,925	14.4	992	806	5,381	13.7
April	360	390	5,315	7.3	450	420	5,801	7.1
May	155	62	5,377	1.2	248	93	5,894	1.6
Total	4,845	(53 yrs.)	5,377	100.0	5,848	(91 yrs.)	5,894	100.0
Departure from normal	−532				−46			

	Pontiac (Pop. 9,585)				Quincy (Pop. 40,469)			
September	0	0	0	—	0	0	0	—
October	186	310	310	5.5	124	217	217	4.4
November	630	690	1,000	12.2	600	630	847	12.8
December	930	1,085	2,085	19.2	837	992	1,839	20.2
January	1,085	1,209	3,294	21.4	1,023	1,147	2,986	23.2
February	1,176	1,036	4,330	18.4	1,092	924	3,910	18.8
March	961	806	5,136	14.3	899	682	4,592	13.9
April	450	420	5,556	7.4	360	330	4,922	6.7
May	248	93	5,649	1.6	124	0	4,922	—
Total	5,666	(48 yrs.)	5,649	100.0	5,059	(25 yrs.)	4,922	100.0
Departure from normal	+17				+137			

TABLE 29.—(CONTINUED)

Month	Rockford (Pop. 84,637)				Rushville (Pop. 2,480)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	60	30	30	0.5	0	0	0	—
October	310	403	433	6.1	155	279	279	5.2
November	810	810	1,243	12.2	600	720	999	13.2
December	1,147	1,209	2,452	18.3	868	1,054	2,053	19 5
January	1,240	1,364	3,816	20.6	1,054	1,178	3,231	21.7
February	1,344	1,176	4,992	17.8	1,120	1,008	4,239	18.5
March	1,054	930	5,922	14.0	930	744	4,983	13.7
April	480	510	6,432	7.7	390	360	5,343	6.7
May	279	186	6,618	2.8	186	62	5,405	1.5
Total	6,724	(59 yrs.)	6,618	100.0	5,303	(55 yrs.)	5,405	100.0
Departure from normal	+106				−102			

	Sparta (Pop. 3,664)				Springfield (Pop. 75,503)			
September	0	0	0	—	0	0	0	—
October	62	186	186	4.3	93	279	279	5.3
November	450	570	756	13.1	570	690	969	13.0
December	713	899	1,655	20.7	868	1,023	1,992	19.4
January	837	992	2,647	22.8	992	1,147	3,139	21.7
February	952	840	3,487	19.3	1,092	980	4,119	18.5
March	806	589	4,076	13.6	899	744	4,863	14.1
April	240	270	4,346	6.2	360	360	5,223	6.8
May	31	0	4,346	—	124	62	5,285	1.2
Total	4,091	(60 yrs.)	4,346	100.0	4,998	(67 yrs.)	5,285	100 0
Departure from normal	−255				−287			

	Sycamore (Pop. 4,702)				Urbana (Pop. 14,064)			
September	30	60	60	0.9	0	0	0	—
October	279	434	494	6.4	155	310	310	5 5
November	750	840	1,334	12.4	600	720	1,030	12.7
December	1,085	1,209	2,543	17.7	899	1,116	2,146	19.7
January	1,209	1,364	3,907	20.0	1,023	1,178	3,324	20.7
February	1,288	1,176	5,083	17.3	1,148	1,008	4,332	17.7
March	1,054	961	6,044	14.1	961	775	5,107	13.6
April	540	540	6,584	8.0	420	450	5,557	7.9
May	341	217	6,801	3.2	186	124	5,681	2.2
Total	6,576	(66 yrs.)	6,801	100.0	5,392	(44 yrs.)	5,681	100 0
Departure from normal	−225				−289			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data.
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

(Table 29.—Concluded)

Month	Walnut (Pop. 961)				Waukegan (Pop. 34,241)			
	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total	Mean[c] 1946–47	Av.	Cum. Av.	Percent of average yearly total
September	0	30	30	0.5	30	30	30	0.5
October	217	341	371	5.5	248	403	433	6.1
November	690	780	1,151	12.6	720	780	1,213	11.8
December	992	1,178	2,329	19.1	1,054	1,147	2,360	17.4
January	1,147	1,302	3,631	21.2	1,147	1,302	3,662	19.7
February	1,232	1,120	4,751	18.2	1,260	1,092	4,754	16.6
March	1,023	868	5,619	14.1	1,054	961	5,715	14.6
April	450	450	6,069	7.3	600	600	6,315	9.1
May	248	90	6,159	1.5	403	279	6,594	4.2
Total	5,999	(55 yrs.)	6,159	100.0	6,516	(24 yrs.)	6,594	100 0
Departure from normal	−160				−78			

Month	White Hall (Pop. 3,025)			
September	0	0	0	—
October	155	279	279	5.5
November	540	660	939	13.0
December	806	1,023	1,962	19.7
January	961	1,147	3,109	22.5
February	1,036	924	4,033	18.1
March	899	713	4,746	14.1
April	330	330	5,076	6.5
May	93	31	5,107	0.6
Total	4,820	(56 yrs.)	5,107	100.0
Departure from normal	−287			

[a] Compiled from U. S. Dept. Commerce, Weather Bureau, Climatological Data.
[b] Population from Sixteenth Census of the United States, 1940.
[c] Mean—Monthly totals for heating season; Av.—Monthly average over total period for which records have been kept.

TABLE 30.—COKE AND BYPRODUCTS, PRODUCED, SOLD

	1943		
	Quantity	Value at plants	
		Thousands of dollars	Av.
Coal used (M tons)	5,170	$29,059	$5.62
Coal per ton of coke (tons)	1.43		8.04
Coke produced (M tons)	3,625	29,379	8.10
Yield of coke (percent of coal used)	70.15		
Plants in operation	10		
Ovens in existence Dec. 31	963		
Capacity (M tons)	4,547		
New ovens	49		
Abandoned	1		
Under construction	75		
Source of coal used (M tons)			
Illinois	218		
Indiana	69		
Kentucky	1,505		
Pennsylvania	457		
West Virginia	2,765		
Other	0		
Total (M tons)	5,017		
Coke sold or used by producer			
Used by producer in blast furnace	1,826	14,204	7.78
Sold for furnace use	1,060	8,829	8.33
Sold for foundry use	318	[b]	[b]
Sold for domestic use	343	2,281	6.65
Sold for industrial and other use	112	[b]	—
Coke breeze produced (M tons)	344	954	2.77
Coke oven byproducts			
Ammonia produced (sulfate equiv.)	97,070		
Per ton of coal coked	19.61		
Sulfate equivalent sold (M lbs.)	97,836	983	0.010
Coke oven gas produced (Millions cu. ft.)	49,870		
Used	14,233		
Sold	32,988	5,283	0.160
Light oil and derivatives sold (M gal.)	6,879	1,070	0.156
Tar produced (M. gal.)	39,435		
Per ton of coal coked (gal.)	7.63		
Tar and derivatives sold (M gal.)	37,251	2,048	0.055
Total byproducts used or sold		$94,090	

OR USED BY PRODUCERS IN ILLINOIS, 1943–1946[a]

1944			1945			1946			Percent change in amount from 1945
Quantity	Value at plants		Quantity	Value at plants		Quantity	Value at plants		
	Thousands of dollars	Av.		Thousands of dollars	Av.		Thousands of dollars	Av.	
5,482	$33,110	$6.04	5,198	$32,034	$6.16	4,505	$30,196	$ 6.70	−13.3
1.41		8.52	1.41		8.69	1.41		9.46	
3,879	34,074	8.78	3,682	32,378	8.79	3,192	32,242	10.10	−13.3
70.75			70.83			70.86			
9			9			9			
992			882			856			
4,475			4,005			3,899			
75			0			0			
0			110			26			
0			0			0			
141			246			215			
16			51			37			
1,899			1,792			1,481			
515			438			390			
2,858			2,718			2,326			
0			0			0			
5,430			5,247			4,449			
1,871	15,686	8.38	1,742	14,167	8.13	1,532	15,135	9.88	−12.0
1,107	9,400	8.49	1,218	10,558	8.67	949	9,072	9.56	−22.0
285	3,461	12.14	314	3,815	12.10	314	4,179	13.28	—
506	4,662	9.21	356	3,415	9.57	239	2,470	10.32	−32.8
106	852	8.05	84	731	8.70	81	772	9.56	− 3.5
374	1,162	3.11	346	1,004	2.90	292	806	2.76	−15.6
102,909			92,942			79,057			−15.0
18.77			17.88			19.34			
100,728	1,217	0.012	97,612	1,199	0.012	79,585	1,105	0.014	−18.4
54,864			50,638			45,246			−10.6
17,351			15,555			13,653			−12.2
36,465	5,442	0.149	34,457	4,983	0.145	31,062	4,524	0.146	− 9.8
6,992	1,058	0.151	7,455	1,102	0.149	6,894	927	0.134	− 7.5
38,099			35,547			30,225			−15.0
6.95			6.84			6.71			
37,810	2,023	0.054	35,635	1,892	0.053	30,606	1,646	0.054	−14.1
	$112,147			$107,278			$103,074		− 3.9[c]

[a] U. S. Bur. Mines Minerals Yearbooks and Mineral Market Report No. 1537, July 10, 1947.
[b] Not available.
[c] Percent change in value from 1945.

TABLE 31.—CRUDE OIL PRODUCTION IN THE UNITED STATES, BY DISTRICTS AND STATES, 1939–1946[a]
(In thousands of barrels)

Districts and States	1939		1940		1941		1942		1943		1944		1945		1946	
	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]	Quantity	Per-cent[b]
Midcontinent:																
Arkansas	21,238		25,775		26,327		26,628		27,600		29,418		28,613		28,375	
North Louisiana	25,403		24,406		24,991		29,310		27,398		24,012		23,670		30,768	
Kansas	60,703		66,139		83,242		97,636		106,178		98,762		96,415		97,218	
New Mexico	37,637		39,129		39,569		31,544		38,411		39,555		37,351		36,860	
Oklahoma	159,913		156,164		154,702		140,690		123,152		124,616		139,299		134,497	
Texas (except Gulf)	361,005		371,043		370,840		348,077		393,392		486,998		501,741		517,403	
Total	665,899	52.6	682,656	50.5	699,671	49.9	673,885	48.6	716,131	47.6	803,361	47.8	827,089	48.1	845,121	48.5
California:																
California	224,354	17.7	223,881	16.5	230,263	16.4	248,326	17.9	284,235	18.9	311,793	18.6	326,482	19.1	315,179	18.3
Gulf Coast:																
Louisiana Gulf	68,243		79,178		90,217		86,475		96,194		105,195		107,381		112,535	
Texas Gulf	122,523		122,166		134,732		135,020		200,128		261,124		252,969		243,102	
Mississippi	107		4,400		15,327		28,833		18,807		16,337		19,062		24,216	
Total	190,873	15.1	205,744	15.2	240,976	17.2	250,328	18.0	315,129	20.9	382,656	22.8	379,312	22.2	379,858	21.7
Rocky Mountain:																
Colorado	1,404		1,626		2,150		2,199		2,320		2,944		5,036		12,016	
Montana	5,960		6,728		7,526		8,074		7,916		8,627		8,420		8,801	
Wyoming	21,454		25,711		29,878		32,812		33,077		32,388		36,219		38,304	
Total	28,818	2.3	34,065	2.5	39,554	2.8	43,085	3.1	48,313	2.9	43,959	2.6	49,675	2.8	59,121	3.4
Central:																
Illinois	94,912		147,647		132,393		106,391		82,260		77,413		75,094		75,297	
Indiana	1,711		4,978		7,411		6,743		5,283		5,118		4,868		6,726	
Kentucky	5,621		5,188		4,762		4,534		7,883		9,621		10,325		10,578	
Ohio	3,156		3,159		3,510		3,543		3,222		2,937		2,828		2,908	
Michigan	23,462		19,753		16,359		21,754		20,768		18,490		17,267		17,074	
Total	128,862	10.2	180,725	13.3	164,435	11.8	142,965	10.4	119,516	10.4	113,579	6.6	110,372	6.4	112,583	6.5

Eastern:																
Pennsylvania	17,382		17,353		16,750		17,779		15,757		14,118		12,515		12,996	
New York	5,098		4,999		5,185		5,421		5,059		4,697		4,648		4,863	
West Virginia	3,580		3,444		3,433		3,574		3,349		3,070		2,879		2,929	
Total	26,060	2.1	25,796	2.0	25,368	1.8	26,774	1.9	24,165	1.7	21,885	1.3	20,042	1.1	20,788	1.2
Other:	96		347		1,961	0.1	1,282	0.1	687	0.4	520	0.3	683	0.3	779	0.4
Total United States	1,264,962	100.0	1,353,214	100.0	1,402,228	100.0	1,386,645	100.0	1,503,176	100.0	1,677,753	100.0	1,713,655	100.0	1,733,424	100.0
Illinois	94,912	7.5	147,647	10.9	132,393	9.4	106,391	7.7	82,260	5.5	77,413	4.6	75,094	4.4	75,297	4.3

[a] U. S. Bur. Mines, Minerals Yearbooks and Monthly Petroleum Statement No. P 270, March 11, 1946, and No. P 283, March 10, 1947.
[b] Percent of total U. S. production.
[c] The states reporting are not identical from year to year.
[d] Included in "Other."

TABLE 32.—CRUDE OIL AND RELATED PRODUCTS, PRODUCED, SOLD, OR USED BY PRODUCERS IN ILLINOIS, 1944–1946[a]

	1944[b]			1945			1946		
	Production	Value at Wells		Production	Value at Wells		Production	Value at Wells	
		Total	Average		Total	Average		Total	Average
Crude oil (barrels)	77,413,000	$107,500,000	$1.39	75,094,000	$104,380,660	$1.40	75,297,000	$118,216,290	$1.57
Natural gas (M cu. ft.)									
Marketed as gas	18,137,000	906,850	.05	16,663,000	1,016,000	.06	[c]	[c]	—
Used in fields	15,546,000	778,300	.05	15,544,000	838,000	.05	[c]	[c]	—
Total	33,683,000	$ 1,785,150	.05	32,207,000	$ 1,854,000	.058	22,170,000	$ 1,108,500	.05
Returned to underground formations (M cu. ft.)	8,882,000	—	—	[c]	[c]	—	[c]	—	—
Natural gasoline (gallons)	61,351,000	3,870,000	.063	55,233,000	3,330,000	.061	51,200,000	3,070,000	.06
Liquefied petroleum gases (gals.)	133,018,000	4,130,000	—	120,638,000	3,980,000	.038	109,834,000	4,173,692	.038
Total value	—	$117,285,150	—	—	$114,190,660	—	—	$126,568,482	—

[a] U. S. Bureau of Mines Monthly Petroleum Statements.
[b] Revised.
[c] Not available.

PETROLEUM AND NATURAL GAS

Petroleum

U. S. production

Petroleum production in the United States in 1946 (table 31) reached a total of 1,733,424,000 barrels as compared with 1,711,103,000 barrels in 1945. This is an increase of 1.3 percent, continuing the upward trend which has been constant since 1938. The percentage coming from Illinois fields has gradually decreased from 10.9 percent in 1940 to 4.3 percent in 1946. Table 32 shows the crude oil and related products produced, sold, or used by producers in Illinois, 1944–1946.

Development in Illinois[2]

Illinois in 1946 produced a total of 75,297,000 barrels of oil, or 4.3 percent of the total United States production, thus ranking sixth in national output for the fourth consecutive year. This was a slight increase over the 1945 production of 75,094,000 barrels.

During the year, 2,362 wells were drilled for oil or gas as compared with 1,763 in 1945, which was an increase of approximately 34 percent. Of these 1,364 were oil wells, 6 were gas wells, and 1,002 were dry holes.

Thirty oil fields and one gas field, 58 extensions to fields, and 33 new producing zones in fields were discovered in 22 counties in Illinois in 1946. Altogether 93 wells were producing in the new fields at the end of 1946, as compared with 96 wells producing at the close of 1945 from the 26 new fields discovered during that year.

Wildcat drilling accounted for 633 (or 27 percent) of the wells drilled in 1946, of which number 89 (or 14 percent) were successful.

Wells were drilled in 47 counties in Illinois in 1946 as compared with 42 counties in 1945. Ninety-two percent of the wells were concentrated in 17 counties. Nearly 75 percent (1,024 from 1,370 successful wells drilled) were concentrated in the following six counties in order of number of producing wells: Coles, White, Wayne, Wabash, Clay and Richland.

The number of producing wells completed monthly with the total production by months from 1937–1946 is shown in figure 6.

The average depth of wells drilled for oil or gas in the state in 1946 was 2,508 feet as compared with the 2,637 foot average for 1945. Distribution of Illinois produced oil is shown in figure 7.

Estimated reserves

Estimated petroleum reserves in the oil producing states adjacent to Illinois, or mainly supplying its refineries, remained practically unchanged in 1946 (table 33).

[2] Oil and Gas Development in Illinois in 1946, Ill. Pet. No. 56, Alfred H. Bell and Virginia Kline.

Table 33.—Estimates of Proved Oil Reserves in the States Serving the Illinois Area, January 1, 1937 to January 1, 1947[a]
(Millions of barrels)

As of January 1	Oklahoma	Kansas	Illinois	Arkansas	Kentucky	Indiana	Nebraska	Michigan
1947	898	545	351	267	59	44	1	69
1946	890	542	350	304	57	41	1	64
1945	970	602	321	293	41	31	1	65
1944	909	646	295	297	35	31	1	55
1943	969	687	307	300	35	32	2	64
1942	1,036	690	334	295	36	23	—	56
1941	1,002	692	315	306	41	14	—	35
1940	1,063	726	382	320	44	14	—	51
1939	1,162	613	243	188	38	6	—	43
1938	1,212	601	41	192	38	3	—	49
1937	1,141	568	28	84	39	3	—	44

[a] From reports of Committee on Petroleum Reserves, American Petroleum Institute.

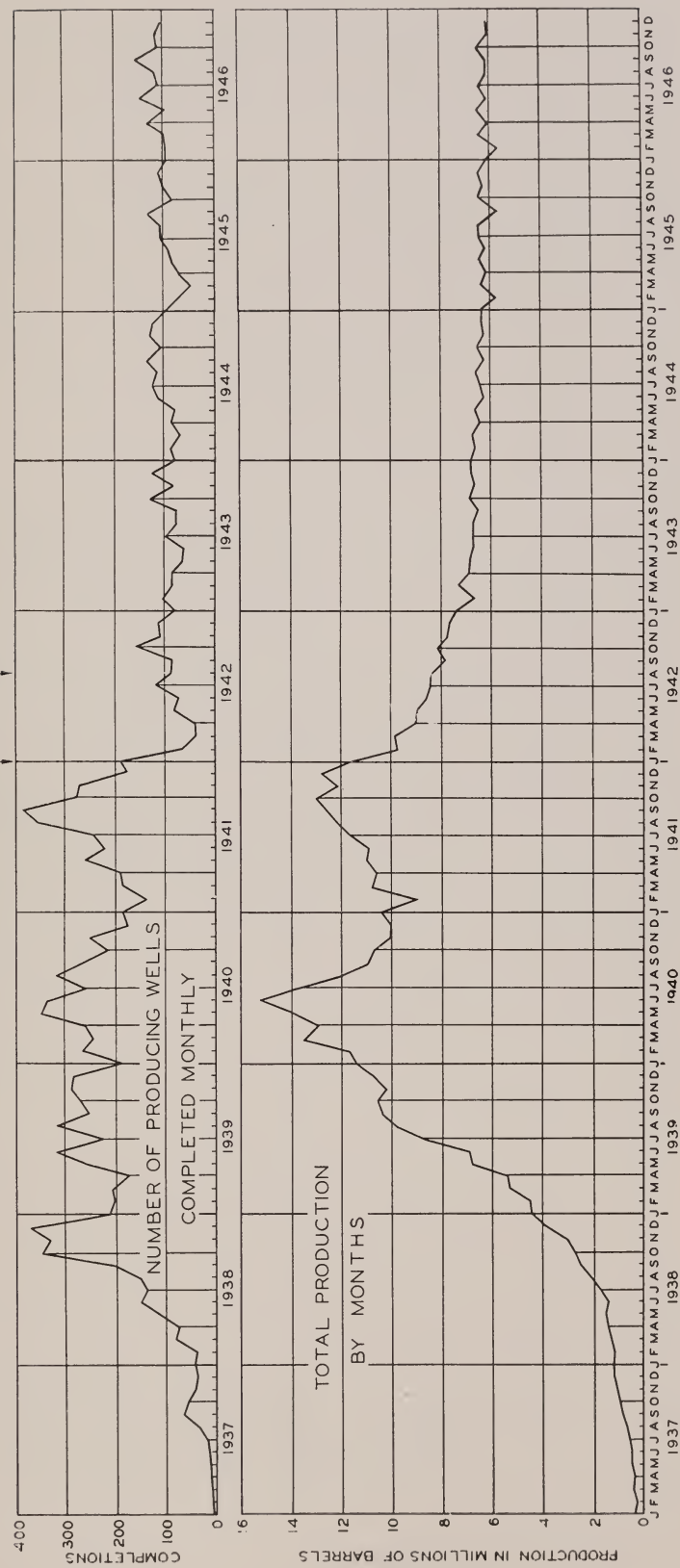

FIG. 6.—Number of producing wells completed monthly with total Illinois production by months, 1937–1946.

TABLE 34.—ESTIMATED PROVED RESERVES IN THE UNITED STATES, DECEMBER 31, 1946[a]
(Barrels of 42 U. S. gallons)

	Estimates of proved reserves of crude oil plus condensate (Dec. 31, 1945) as indicated in Committee's report of Feb., 1946	PROVED RESERVES OF CRUDE OIL (Condensate not included)				
		Proved reserves as of Dec. 31, 1945	Changes in proved reserves due to extensions (new oil) and revisions during 1946	Proved reserves in new pools discovered in 1946*	Production during 1946	Proved reserves as of Dec. 31, 1946 (Cols. 2+3+4 less col. 5)
	(1)	(2)	(3)	(4)	(5)	(6)
Alabama	785,000	785,000	109,000	—	382,000	512,000
Arkansas	303,674,000	287,623,000	4,172,000	1,764,000	26,501,000	267,058,000
California	3,409,948,000	3,318,006,000	276,787,000	13,876,000	315,178,000	3,293,491,000
Colorado	259,830,000	259,830,000	51,265,000	800,000	12,025,000	299,870,000
Illinois	349,620,000	349,620,000	72,432,000	4,606,000	75,414,000	351,264,000
Indiana	41,243,000	41,243,000	7,878,000	1,633,000	6,684,000	44,070,000
Kansas	541,846,000	541,846,000	87,319,000	12,629,000	96,478,000	545,316,000
Kentucky	56,721,000	56,721,000	13,066,000	88,000	10,687,000	59,188,000
Louisiana	1,689,781,000	1,558,891,000	207,018,000	25,857,000	139,969,000	1,651,797,000
Michigan	64,186,000	64,186,000	21,576,000	415,000	17,000,000	69,177,000
Mississippi	267,160,000	257,363,000	34,939,000	1,790,000	23,871,000	270,221,000
Montana	108,474,000	108,474,000	2,576,000	2,000,000	8,804,000	104,246,000
Nebraska	500,000	500,000	665,000	—	290,000	875,000
New Mexico	512,373,000	512,373,000	65,000,000	2,871,000	36,791,000	543,453,000
New York	81,189,000	81,189,000	—	—	4,900,000	76,289,090
Ohio	29,681,000	29,681,000	3,047,000	—	3,508,000	29,220,000
Oklahoma	889,639,000	888,839,000	98,423,000	47,731,000	136,807,000	898,186,000
Pennsylvania	110,601,000	110,601,000	—	—	13,100,000	97,501,000
Texas	11,470,294,000	10,835,257,000	1,441,158,000	126,594,000	756,649,000	11,646,360,000
West Virginia	38,630,000	38,630,000	—	—	2,975,000	35,655,000
Wyoming	600,131,000	599,881,000	25,919,000	1,780,000	38,222,000	589,358,000
Miscellaneous†	307,000	307,000	259,000	—	113,000	453,000
Total United States	20,826,813,000	19,941,846,000	2,413,628,000	244,434,000	1,726,348,000	20,873,560,000

* Only a limited area is assigned to each new discovery, even though the committee may believe that eventually a much larger area will produce, for, in this report, the concern is only with actually proved reserves.
† Includes Florida, Missouri, Tennessee, Utah, and Virginia.
[a] American Petroleum Institute, American Gas Association.

A more detailed study of reserves in 1945–1946, by states, with totals for the country as a whole, is found in table 34.

It is estimated that 53,900,000 barrels of oil reserves were discovered in Illinois in 1946. Of this amount 11,100,000 barrels were produced during the year, leaving 42,800,000 barrels of new reserves added as of January 1, 1947.

The reduction in total reserves during 1946 (total production minus new oil discovered, 75,297,000 – 53,900,000) was approximately 21,400,000 barrels.

The State Geological Survey estimates the total proved reserves on January 1, 1947, as 501,800,000 barrels. This represents future recovery by production methods now in use in each area.

This estimate is based on a recent review of production records and other pertinent data, by pools, by members of the Survey's oil and gas division. For several years the Survey has changed reserve estimates only with regard to new drilling without revising older estimates proved by previous drilling. As compared with the figure of 340,000,000 barrels used last year, the new estimate includes a net upward revision of approximately 172,000,000 barrels, an addition of more than 10,000,000 barrels made available by extensions of secondary recovery methods, and the net reduction during 1946 of 21,400,000 barrels. These revisions are not included in the A. P. I. estimate of 351,000,000 barrels (table 33).

FIG. 7.—Distribution of crude oil produced in Illinois (in millions of barrels), by states, 1946.

PRICES OF CRUDE OIL IN 1946

At the beginning of 1946, prices for crude oil in Illinois were $1.22 per barrel in the old southeastern Illinois field and $1.37 in the rest of the State. During the year there were three price increases: (1) 10 cents per barrel on April 1; (2) 25 cents on July 25; and (3) 10 cents on November 15 (table 35). The value (at the wells) of the crude oil produced in Illinois in 1946 was $116,735,000.

This was exclusive of premium payments paid by the Reconstruction Finance Corporation for crude oil produced from stripper wells in 69 pools in Illinois. These premium payments amounted to 20 cents, 25 cents and 35 cents per barrel, depending upon the average production per well per day by pools. Table 36 shows the average value of crude oil in Illinois since 1937.

STOCKS

Stocks of crude petroleum (table 37) on hand in Illinois were 15,958,000 barrels on December 31, 1946, as compared with 16,066,000 barrels on hand on December 31, 1945.

Stocks of refined products in the Central Refining District (Illinois, Indiana, Kentucky, Michigan, western Ohio and Wisconsin) on December 31, 1945 and 1946, as reported by the U. S. Bureau of Mines are also found in table 37.

REFINERIES

Refineries in Illinois in March 1946 are listed in table 38. No new refineries were constructed in Illinois during the year and two small refineries were abandoned. The total operating capacity by the end of 1946 was approximately 304,000 barrels of crude oil. Figure 8 shows the sources of oil in Illinois refineries with receipts in 1946.

TABLE 35.—CRUDE OIL PRICE CHANGES FOR ILLINOIS, INDIANA, KENTUCKY, AND OHIO, 1944–1946[a]

	December 27, 1944	December 26, 1945	December 25, 1946
Posted by Sohio Corp., (May 21, 1941)			
Illinois basin,[b] including Griffin pool	$1.37	$1.37	$1.82
Carmi, Storms (Illinois) area	1.37[c]	1.37	1.82
Birk City (Kentucky) area	1.37	1.37	1.82
Corydon (Kentucky) area, Henderson	1.37	1.37	1.82
Posted by Ohio Oil Co., (May 21, 1941)			
Illinois basin	1.37	1.37	1.82
Eastern Illinois and Western Indiana	1.22	1.22	1.67
Plymouth, Illinois	—	—	1.60
Posted by Carter Oil Co., (May 21, 1941)			
Louden, Fayette County, Illinois	1.37	1.37	1.82
Hitesville, Robards and St. Vincent pools, Kentucky, (July 1, 1944)	1.37	1.37	1.82
Posted by Mohawk Oil Lines, Inc., (May 21, 1941)			
Southern Illinois	1.37	1.37	1.82
Posted by Ashland Oil and Transportation Co., (June 19, 1941)			
Somerset Oil in Ashland Lines, Ky.			
Big Sandy River	1.38	1.43	—
Kentucky River	1.43	1.43	—
Western Kentucky	—	—	1.82
Clinton Co., Kentucky	—	—	1.65
Posted by Owensboro-Ashland Co., (May 21, 1941)			
Owensboro (Kentucky) area	1.37	1.37	1.82
Bowling Green area	—	—	1.62
Posted by Sohio Corp., (Sept. 1, 1941)			
Lima, Ohio	1.50	1.50	1.85
Cleveland, Lodi & Chatham (Ohio) areas	1.30	1.30	1.66

[a] National Petroleum News, Dec. 27, 1944, Dec. 26, 1945, and Dec. 25, 1946.
[b] Also posted by the Texas Company.
[c] Posted Jan. 24, 1944.

TABLE 36.—AVERAGE VALUE OF CRUDE OIL IN ILLINOIS, 1937–1946[a]
(Per barrel at wells)

1937	$1.33
1938	1.25
1939	1.07
1940	1.06
1941	1.30
1942	1.36
1943	1.37
1944	1.39
1945	1.39
1946	[b]1.57

[a] U. S. Bur. Mines, Minerals Yearbooks, and American Petroleum News, Dec. 5, 1946.
[b] Jan.-Mar., $1.37; April-July, $1.47; Aug.-Nov. 15, $1.72; Nov. 15-Dec., $1.82.

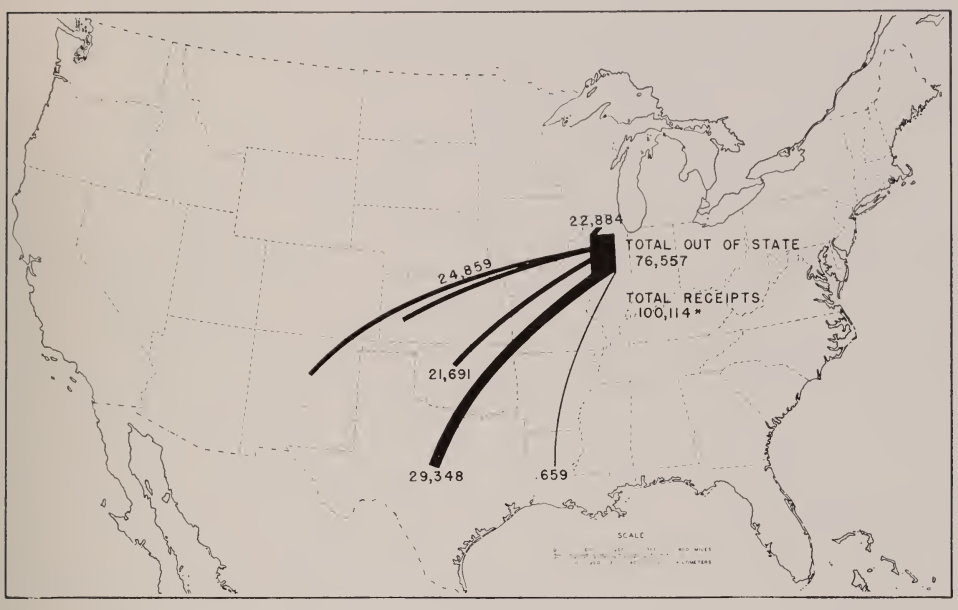

FIG. 8.—Sources of oil in Illinois refineries (in thousands of barrels), 1946.

TABLE 37.—STOCKS OF CRUDE OIL AND REFINED PRODUCTS IN THE UNITED STATES, IN ILLINOIS, AND IN THE CENTRAL REFINING DISTRICT, BY MONTHS, 1945 AND 1946[a]
(In thousands of barrels)

	Total crude stocks		Stocks of refined products			
			Central refining district[b]			United States
	United States	Illinois	Gasoline	Distillate fuel oil	Residual fuel oil	Gasoline
1945						
January 31	221,737	13,894	21,545	4,928	2,563	91,666
February 28	220,221	13,922	23,940	3,734	2,153	97,457
March 31	223,988	13,768	23,569	3,382	1,801	97,447
April 30	224,229	13,903	22,268	4,008	1,688	90,904
May 31	223,151	13,793	21,476	3,878	2,048	88,330
June 30	218,218	14,136	19,955	4,257	2,361	86,128
July 31	216,638	14,116	18,791	4,919	2,813	85,582
August 31	215,135	13,933	17,787	5,642	3,052	84,003
September 30	220,642	15,011	16,326	6,368	3,285	74,574
October 31	221,246	15,080	16,311	6,745	3,406	76,805
November 30	218,916	15,228	18,169	6,762	3,022	86,540
December 31	218,763	16,066	20,720	5,773	2,587	97,676
1946						
January 31	223,442	17,141	22,087	4,284	2,569	102,394
February 28	227,220	17,298	23,804	3,348	2,985	104,336
March 31	221,400	17,811	24,250	3,695	3,086	104,161
April 30	222,480	16,868	21,853	4,427	3,173	98,744
May 31	221,592	16,227	19,716	4,962	3,396	93,960
June 30	223,140	16,394	18,475	5,667	3,879	91,971
July 31	224,351	15,987	17,241	7,178	4,767	87,778
August 31	224,157	15,895	15,813	8,033	5,092	86,745
September 30	222,417	15,619	16,289	8,775	5,457	87,021
October 31	222,177	15,219	15,516	9,111	5,768	85,952
November 30	226,453	15,643	16,109	8,256	5,180	88,587
December 31	224,473	15,958	17,832	6,114	4,200	92,742

[a] U. S. Bur. Mines, Monthly Petroleum Statements, 1945 and 1946.
[b] Includes refinery and bulk stocks.

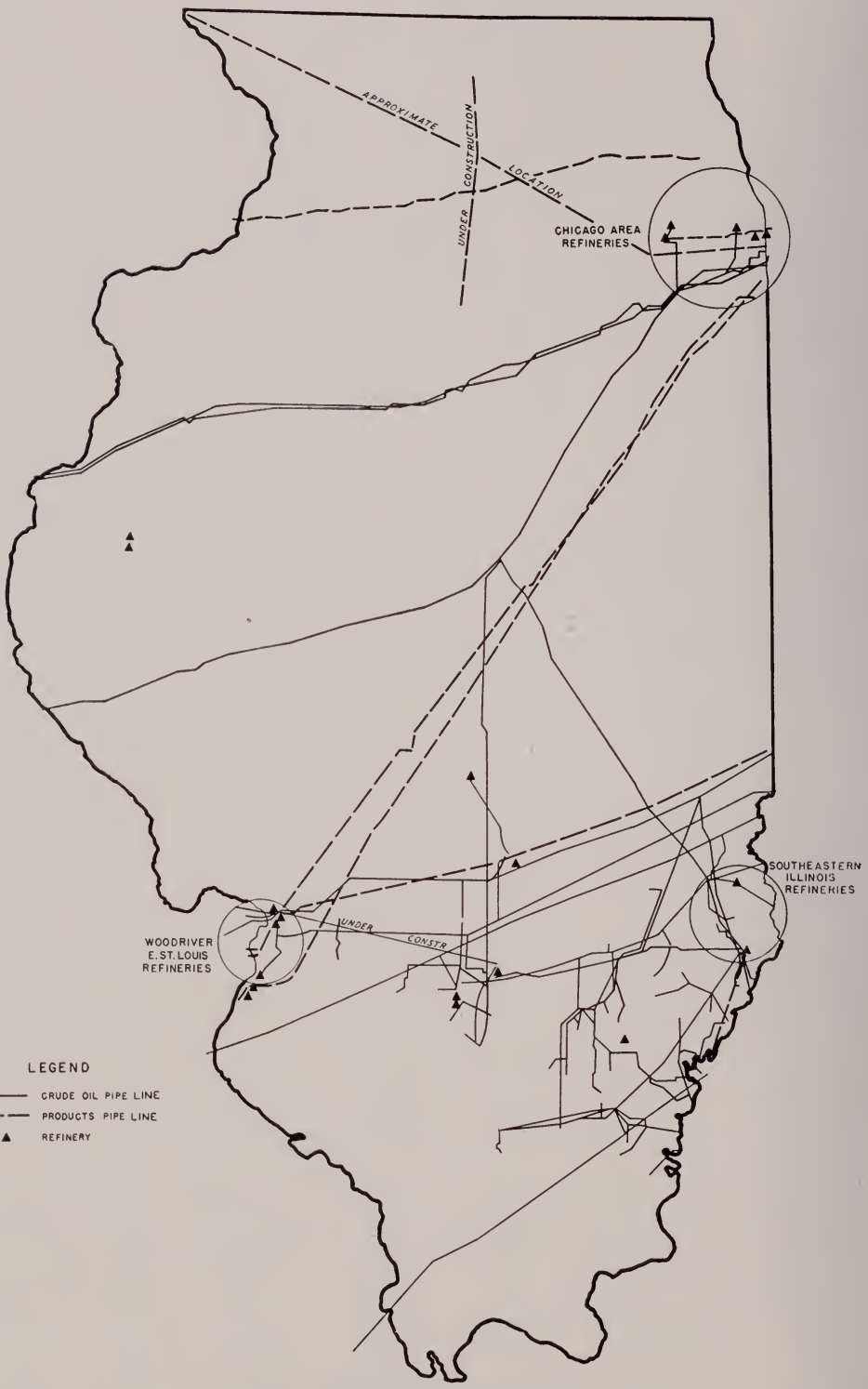

FIG. 9.—Pipe lines in Illinois, 1946.

TABLE 38.—REFINERIES OPERATING IN ILLINOIS, MARCH, 1946[a]

Refineries	Capacity (bbls.)		Type of refineries[d]
	Crude oil	Cracked gasoline	
Advance Ref. Co., Centralia	2,800	—	S
Allied Oil Corp., St. Elmo	5,000	2,200	SC
Arrow Petroleum Co., Centralia	3,500	—	S
Calumet Refining Co., Burnham	1,200	—	L
Cascade Ref. Co., Salem	2,600	590	SC
Cross, Henry H., Co., Colmar	1,000	—	S
Cross, Henry H., Co., Dupo	1,000	—	S
Globe Oil & Ref. Co., Lemont	27,000	5,500	SC
Ohio Oil Co., The, Robinson	15,000	[b]9,000	SCA
Pana Refining Co., Pana	4,000	1,600	SC
Red River Ref. Co., Burnham	1,100	—	S
S and D Refinery, Dupo	2,300	—	S
Shell Oil Co., Inc., Wood River[c]	80,000	[b]45,000	Comp.
Socony-Vacuum Oil Co., Inc., East St. Louis[c]	20,000	25,000	SC
Standard Oil Co., (Ind.), Wood River[c]	31,000	27,200	Comp.
Texas Co., The, Lawrenceville	30,000	[b]19,000	SCLA
Texas Co., The, Lockport[c]	50,000	[b]52,000	SCLA
Wireback, B. F., Plymouth	600	—	S
Wood River Oil & Ref. Co., Hartford	16,000	5,000	SC
Worth Refining Co., Blue Island	7,000	—	S
Total	301,100	192,090	

[a] Oil and Gas Journal, Mar. 30, 1946.
[b] Under construction Jan. 1946.
[c] Refinery not operating Jan. 1946.
[d] Explanation of symbols: S—skimming; C—cracking; L—lubricants; A—asphalt; Comp.—complete.

PIPE LINES

Two major refined products pipe lines were under construction in northern Illinois during the latter part of 1946 (figure 9). Completions during 1946 consisted of very short lines connecting new fields with those already in existence. An extension to the distributing system for natural gas within the Chicago metropolitan area and three miles of 6–inch gas lines from Storms pool to Carmi, in White County, were also completed in 1946.

SECONDARY RECOVERY

The increasing age of producing wells in Illinois and the downward trend in the discovery of new wells have brought increased attention to the importance of secondary recovery. The continued success of major water–flooding operations, two pressure–maintenance operations using gas injection, and numerous repressuring operations by air and gas injection are encouraging to future extensions of all these methods.

The three major water–flooding projects which were begun in 1942 and 1943 had a total cumulative production due to flooding of approximately 6,000,000 barrels of oil up to the end of 1946, of which approximately 2,600,000 barrels were produced in 1946.[3]

[3] Illinois Geol. Survey Ill. Pet. 56, 1947.

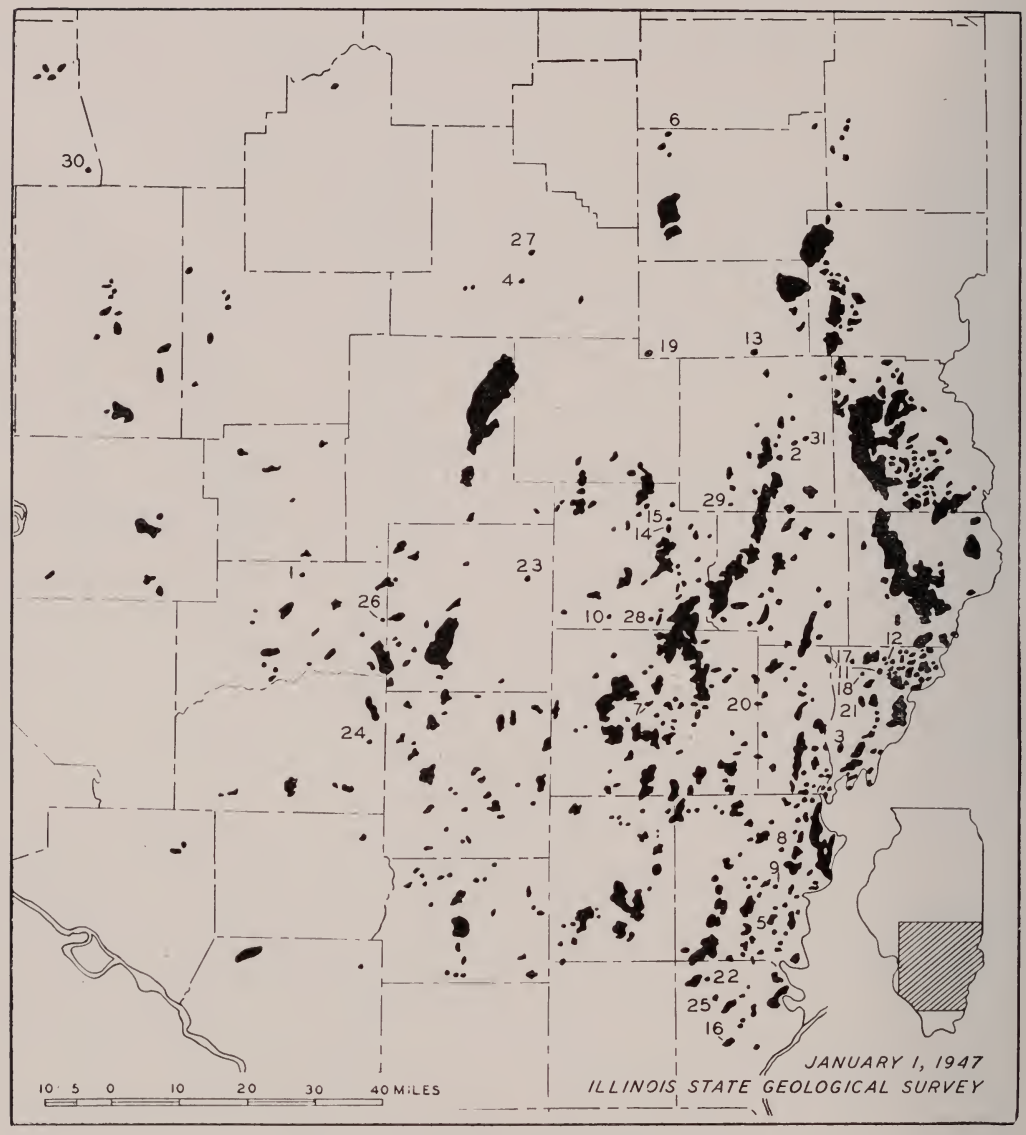

FIG. 10.—Oil fields in Illinois, January 1, 1947.

A map showing Illinois oil fields at the close of 1946 is shown in figure 10.

GASOLINE CONSUMPTION

Gasoline consumption in Illinois in 1946 reached the highest peak since 1941 (table 39). This was an increase of 370,675,000 gallons over 1945 consumption or approximately 33.5 percent.

NATURAL GAS[1]

JOINT REPORT OF A. G. A. AND A. P. I.

The joint report of the Committees on Reserves of the American Gas Association and the American Petroleum Institute, issued on March 6, 1947, is significant be-

[1] From a review prepared by Nina T. Hamrick, Research Assistant, of the joint report of the American Gas Association and the American Petroleum Institute, March 6, 1947.

TABLE 39.—GASOLINE SOLD IN ILLINOIS, BY MONTHS, 1941–1946
(Thousands of gallons)

	1941[a]	1942[a]	1943[b]	1944[b]	1945[b]	1946[b]
January	111,386	116,305	75,700	84,769	83,261	103,791
February	105,883	96,237	74,851	80,818	76,261	100,392
March	127,451	114,387	92,646	93,186	100,746	127,569
April	140,940	131,138	101,313	87,619	98,374	152,952
May	162,605	138,072	98,034	121,048	115,713	146,592
June	148,451	132,000	119,149	119,005	114,060	148,328
July	155,021	131,683	110,791	97,928	114,127	159,696
August	155,969	127,469	101,957	97,616	116,585	144,439
September	145,618	125,830	95,369	99,257	118,034	135,004
October	143,406	125,274	100,486	102,465	115,822	153,289
November	134,510	139,732	100,494	94,873	114,817	138,305
December	135,538	63,479	93,793	87,741	105,424	133,562
Total	1,666,778	1,441,606	1,164,583	1,166,325	*1,273,244	1,643,919

[a] Illinois Gasoline Tax Data: Illinois Gasoline Tax Evasion Committee, Monthly reports.
[b] American Petroleum Institute.
* Revised figures.

cause it marks a new method of estimating the nation's petroleum sources and is the first such joint report.

RESERVES

According to this report the proved natural gas reserves in continental United States were 160.6 trillion cubic feet on December 31, 1946, or 12.8 trillion cubic feet greater than the estimate on December 31, 1945 (table 40). This is an increase of approximately 8 percent. The estimated net production of natural gas during 1946 is 4.9 trillion cubic feet (also table 40) after deducting the amount of gas returned to reserves. This table further shows that there are ten states which have reserves estimated at more than a trillion cubic feet each.

Proved liquid hydrocarbon reserves were estimated to be 24,227,447,000 barrels on December 31, 1946 (table 41). Of this amount 3,353,887,000 barrels are natural gas liquids (see table 42 also), and 20,873,560,000 barrels are crude oil, according to the report. Comparable data for the preceding year are not available, but estimates show that known crude oil reserves increased 931,714,700 barrels or about 5 percent during the year (table 43).

Additions, by five–year periods, to crude oil reserves since 1901 versus production are shown (table 44) to have a ratio of 1.58 for the entire period.

All of these estimates, the committee reports, refer to blocked–out reserves recoverable under existing economic and operating methods.

This joint report has been the result of recognizing that natural gas and liquid hydrocarbons have grown to such importance that it is essential to have the facts concerning their proved reserves available to the public.

F. P. C. STAFF REPORT

A staff report of the Federal Power Commission investigation of the natural gas industry (Document No. G-580) was released in March, 1947. This is a timely report in view of the tremendous increase in the use of both oil and natural gas resources. Although estimates of local areas have been made from time to time, no comprehensive estimate on a national scale had been made until the last few years.

According to the recent investigation on natural gas by the Federal Power Commission, the prospects for future discovery of gas may be judged by (1) periodic esti-

TABLE 40.—ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS IN THE UNITED STATES, AS OF DECEMBER 31, 1945 AND 1946[a]
(Millions of cubic feet)

	Reserves as of Dec. 31, 1945	Changes in reserves during 1946			Reserves as of December 31, 1946			
		Discoveries, extensions, and revisions	Net production	Net increase	Total	Non-associated	Associated	Dissolved
Alabama	23	75	1	74	97	0	0	97
Arkansas	869,686	54,171	52,195	1,976	871,662	447,651	162,276	261,735
California	10,855,707	803,056	532,462	270,594	11,126,301	3,687,430	3,198,714	4,240,157
Colorado	396,282	(−) 70,905	9,614	(−) 80,519	315,763	155,440	41,075	119,248
Illinois	268,000	33,500	33,500	0	268,000	3,000	55,000	210,000
Indiana	17,000	3,200	3,200	0	17,000	4,000	8,000	5,000
Kansas	13,250,605	636,771	206,532	430,239	13,680,844	13,257,617	212,310	210,917
Kentucky	1,436,800	44,200	95,000	(−) 50,800	1,386,000	1,299,000	0	87,000
Louisiana	19,849,393	3,170,050	607,932	2,562,118	22,411,511	18,323,314	2,697,126	1,391,071
Michigan	8,931	148,069	26,000	122,069	131,000	76,200	0	54,800
Mississippi	2,007,859	383,842	21,188	362,654	2,370,513	1,731,821	446,098	192,594
Montana	1,202,521	(−) 319,521	29,599	(−) 349,120	853,401	853,401	0	0
Nebraska	375	(−) 374	0	(−) 374	1	0	0	1
New Mexico	5,190,309	899,737	185,260	714,477	5,904,786	3,079,900	2,132,911	691,975
New York	76,000	900	7,000	(−) 6,100	69,900	69,000	0	900
Ohio	626,800	46,200	59,000	(−) 12,800	614,000	573,000	0	41,000
Oklahoma	10,079,938	1,311,816	655,908	655,908	10,735,845	7,572,279	1,589,538	1,574,028
Pennsylvania	520,000	61,000	78,000	(−) 17,000	503,000	453,000	0	50,000
Texas	78,306,676	10,154,021	2,097,238	8,056,783	86,363,459	62,345,192	15,282,025	8,736,242
West Virginia	1,928,300	116,700	205,000	(−) 88,300	1,840,000	1,739,000	0	101,000
Wyoming	816,763	252,379	33,545	218,834	1,035,597	693,191	235,176	107,230
Miscellaneous*	81,399	265	4,443	(−) 4,178	77,221	76,900	0	321
Total	147,789,367	17,729,152	4,942,617	12,786,535	160,575,901	116,440,336	26,060,249	18,075,316

* Includes Florida, Missouri, and Utah.
Notes: Volumes are reported at a pressure base of 14.65 psi, absolute, and at a standard temperature of 60 deg. F.
Net production equals estimated gross withdrawals, less gas reinjected into underground reservoirs.
Reserves of dissolved gas were estimated jointly with the API Committee on Petroleum Reserves
[a] American Gas Association, American Petroleum Institute.

TABLE 41.—ESTIMATED PROVED RESERVES OF LIQUID HYDROCARBONS IN THE UNITED STATES AS OF DECEMBER 31, 1946
(Barrels of 42 U. S. gallons)
(Compiled by API Department of Statistics from API Crude-Oil and AGA Natural-Gas Liquids Reserve Reports)

	Proved reserves of crude oil (API)	Proved reserves of natural gas liquids[a] (AGA)	Proved reserves of liquid hydrocarbons December 31, 1946
Alabama	512,000	[b]	512,000
Arkansas	267,058,000	61,600,000	328,658,000
California	3,293,491,000	308,272,000	3,601,763,000
Colorado	299,870,000	2,377,000	302,247,000
Illinois	351,264,000	34,200,000[c]	385,464,000
Indiana	44,070,000	85,000	44,155,000
Kansas	545,316,000	82,492,000	627,808,000
Kentucky	59,188,000	16,071,000	75,259,000
Louisiana	1,651,797,000	419,396,000	2,071,193,000
Michigan	69,177,000	655,000	69,832,000
Mississippi	270,221,000	243,901,000	514,122,000
Montana	104,246,000	8,534,000	112,780,000
Nebraska	875,000	—	875,000
New Mexico	543,453,000	73,609,000	617,062,000
New York	76,289,000	[b]	76,289,000
Ohio	29,220,000	1,714,000	30,934,000
Oklahoma	898,186,000	68,317,000	966,503,000
Pennsylvania	97,501,000	2,309,000	99,810,000
Texas	11,646,360,000	1,985,606,000	13,631,966,000
West Virginia	35,655,000	19,285,000	54,940,000
Wyoming	589,358,000	25,458,000	614,816,000
Miscellaneous	453,000[d]	6,000[e]	459,000
Total United States	20,873,560,000	3,353,887,000[c]	24,227,447,000

Notes: [a] Includes condensate, natural gasoline, and liquid petroleum gases.
[b] Included in miscellaneous.
[c] Figure revised by AGA Mar. 11, 1947.
[d] Includes Florida, Missouri, Tennessee, Utah, and Virginia.
[e] Includes Alabama, Florida, New York, and Utah.

TABLE 42.—ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS LIQUIDS IN THE UNITED STATES AS OF DECEMBER 31, 1946[a]
(Thousands of barrels)

	Reserves as of December 31, 1946				1946 Production
	Nonassociated	Associated	Dissolved	Total	
Arkansas	41,071	8,306	12,223	61,600	3,457
California	40,328	107,300	160,644	308,372	21,885
Colorado	775	410	1,192	2,377	200
Illinois	—	—	34,200[b, c]	34,200[c]	3,900
Indiana	—	—	85[b]	85	16
Kansas	80,202	1,140	1,150	82,492	1,991
Kentucky	16,071[b]	—	—	16,071	1,310
Louisiana	330,466	75,019	13,911	419,396	13,500
Michigan	—	—	655[b]	655	309
Mississippi	17,212	34,095	192,594	243,901	108
Montana	8,534	0	0	8,534	108
New Mexico	27,697	30,950	14,962	73,609	2,818
Ohio	1,714[b]	—	—	1,714	143
Oklahoma	45,597	10,020	12,700	68,317	9,875
Pennsylvania	2,309[b]	—	—	2,309	262
Texas	1,292,177	296,072	397,357	1,958,606	66,134
West Virginia	19,285[b]	—	—	19,285	2,400
Wyoming	458	9,400	15,600	25,458	846
Miscellaneous[d]	—	—	6[b]	6	—
Total	1,923,896[c]	572,712[c]	857,279[c, e]	3,353,887[c]	129,262

[a] American Gas Association, American Petroleum Institute.
[b] Not allocable by types, but occurring principally in the column shown.
[c] Approximate total; see footnote (a).
[d] Includes Alabama, Florida, New York, and Utah.
[e] Figure revised Mar. 11, 1947.

TABLE 43.—SUMMARY OF COMMITTEE'S ANNUAL REPORTS COVERING PERIOD 1937–1946[a]
(Barrels of 42 U. S. gallons)

Year	New oil blocked out during year			Production during year	Estimated proved reserves as of end of year	Increase over previous year
	Through revisions of previous estimates and extensions to known fields	Through new pools discovered during year	Total through new discoveries, extensions, and revisions			
1936	—	—	—	—	13,063,400,000	—
1937	2,792,790,000	928,742,000	3,721,532,000	1,277,664,000	15,507,268,000	2,443,868,000
1938	2,243,571,000	810,493,000	3,054,064,000	1,213,186,000	17,348,146,000	1,840,878,000
1939	2,058,455,000	340,667,000	2,399,122,000	1,264,256,000	18,483,012,000	1,134,866,000
1940	1,607,012,000	286,338,000	1,893,350,000	1,351,847,000	19,024,515,000	541,503,000
1941	1,538,989,000	429,974,000	1,968,963,000	1,404,182,000	19,589,296,000	564,781,000
1942	1,618,925,000	260,051,000	1,878,976,000	1,385,479,000	20,082,793,000	493,497,000
1943	1,202,368,000	282,418,000	1,484,786,000	1,503,427,000	20,064,152,000	(−) 18,641,000
1944	1,556,192,000	511,308,000	2,067,500,000	1,678,421,000	20,453,231,000	389,079,000
1945	1,690,315,000	419,984,000	2,110,299,000	1,736,717,000	20,826,813,000	373,582,000
[b]December 31, 1945 estimated proved reserves of crude oil only					19,941,846,000	—
1946	2,413,628,000	244,434,000	2,658,062,000	1,726,348,000	20,873,560,000	931,714,000

[a] American Petroleum Institute, American Gas Association.

[b] Note: Up to and including its figures on proved reserves of petroleum as of Dec. 31, 1945, the Committee combined under that heading the estimated proved reserves of cycle-plant and lease condensate. As of Dec. 31, 1945, the reserves so included totaled 884,967,000 bbl., and as of Dec. 31, 1944 there were 668,701,000 bbl. included. Beginning with this report, the figures in this table are for crude oil only. If comparison is made between new oil reported in 1946 with new oil reported in earlier years, it should be remembered that the 1946 figures for new oil do not include new condensate which is estimated to be approximately 205,000,000 bbl.

TABLE 44.—ADDITIONS TO CRUDE OIL RESERVES VS. PRODUCTION, 1901–1946[a] (Five-year periods)

Five-year period	Thousands of bbls.		Ratio of added reserves to production
	Gross additions	Production	
1901–1905	1,410,415	510,415	2.77
1906–1910	1,563,844	863,844	1.81
1911–1915	2,238,697	1,238,697	1.81
1916–1920	3,513,307	1,813,307	1.94
1921–1925	4,539,804	3,239,804	1.40
1926–1930	9,578,811	4,478,811	2.14
1931–1935	3,246,557	4,446,557	0.73
1936–1940	12,832,893	6,208,378	2.07
1941–1945	9,485,640	7,683,342	1.23
Total 45-year period	48,409,968	30,483,155	1.58

[a] Based on data for oil reserves and production given in American Petroleum Institute QUARTERLY, April 1946, p. 26.

mates of proved reserves and of production, (2) analysis of statistical data tending to show discovery trends, and (3) indications of land areas available for further exploration.

Available estimates of proved reserves of both oil and gas have shown a constant increase, and it is reasonable to suppose that they may continue to do so for some time before a decline sets in, although recent exploratory efforts indicate a possible condition of diminishing returns.

It is a significant factor economically that twelve fields account for more than half of the proved reserves of natural gas (table 45). In size, the two outstanding gas fields in the United States are the Panhandle (with reserves of nearly 25 trillion cubic feet) and the Hugoton (with reserves estimated at more than 20 trillion cubic feet) extending into three states, Kansas, Oklahoma, and Texas.

Advancing technological knowledge of the characteristics of both gas and oil has resulted in a new concept of reservoir management which is gradually displacing the earlier practice of uncontrolled competitive production and unrestricted supply, according to the Federal Power Commission report.

In cases involving the production of both oil and gas from the same well it is essential to establish a price for gas at the well which will give producers an economic incentive to conserve as much as possible of the gas. Much of the waste in the past has been due to the fact that it was not considered economically profitable either to confine and sell the gas produced with the oil or to return it to the reservoir.

Gas so produced is less desirable as a source for pipe line markets than that produced in dry gas fields, where the entire production may be regulated according to demand and piped without processing.

Contrasting with this, approximately one-third of the natural gas marketed for commercial purposes is produced in conjunction with oil and its production must therefore be geared to the rate of oil production. This type of gas is known as casinghead gas and constitutes a large and important source of supply for the domestic and industrial market.

Records, available from the U. S. Bureau of Mines since 1906, show that there has been an almost constant increase in production (table 46), averaging approximately 8 percent per year since 1920. Table 47 gives a more detailed history since 1935.

TABLE 45.—THE 12 LARGEST GAS PRODUCING FIELDS LISTED IN RANKING ORDER OF VOLUME OF RESERVES, TOGETHER WITH THEIR APPROXIMATE DATES OF DISCOVERY[a]

Panhandle (Texas)	1918
Hugoton (Kansas, Okla. and Texas)	1922
Carthage (Texas)	1936
Katy (Texas)	1935
Old Ocean (Texas)	1934
Rio Vista (Calif.)	1936
Seeligson (Texas)	1937
Agua Dulce-Stratton (Texas)	1929
Kettleman North Dome (Calif.)	1928
Sheridan (Texas)	1940
Pledger (Texas)	1925
Monroe (La.)	1916

[a] Ranking order of fields, DeGolyer, Tr. 12569; dates of discovery, Hugh D. Miser, Chief of Fuel Section, Geological Survey, U. S. Department of the Interior, Tr. 9559. The next 12 ranking fields are: Erath (La.), Paradis (La.), Wasson (Texas), LeGloria (Texas), Keystone (Texas), Bateman Lake (La.), Tom O'Connor (Texas), Gwinville (Miss.), East Texas (Texas), Slaughter (Texas), Paloma (Calif.), Ventura (Calif.). These top ranking 24 fields account for between 90 and 95 percent of the total gas reserves. Exhibit 445, Docket G-580.

TABLE 46.—MARKETED PRODUCTION OF NATURAL GAS IN THE UNITED STATES, BY REGIONS, 1906–1944[a]
(Billions of cubic foot)

Year	Appalachian	Central	Gulf	Mountain	Pacific	Total
1906	306	81	1	—	—	388
1907	315	89	1	1	—	406
1908	296	103	2	1	—	402
1909	354	118	4	2	2	480
1910	373	122	8	3	3	509
1911	372	117	15	2	6	512
1912	418	111	22	2	9	562
1913	424	106	39	1	11	581
1914	425	107	40	1	18	591
1915	446	120	40	—	22	628
1916	510	161	50	—	32	753
1917	522	168	54	2	49	795
1918	461	158	57	5	40	721
1919	420	185	77	7	56	745
1920	437	180	104	11	66	798
1921	320	143	107	16	76	662
1922	360	165	128	24	85	762
1923	389	239	210	37	131	1,006
1924	354	245	305	47	190	1,141
1925	342	282	329	47	188	1,188
1926	352	330	376	50	205	1,313
1927	337	376	471	49	212	1,445
1928	341	375	550	56	246	1,568
1929	363	408	746	58	342	1,917
1930	334	396	815	63	335	1,943
1931	292	310	708	70	306	1,686
1932	251	304	677	60	263	1,555
1933	250	295	691	59	260	1,555
1934	285	311	844	62	268	1,770
1935	308	342	907	75	284	1,916
1936	352	364	1,045	86	320	2,167
1937	385	395	1,192	105	330	2,407
1938	332	354	1,191	103	315	2,295
1939	367	348	1,298	115	348	2,476
1940	385	373	1,427	123	352	2,660
1941	422	374	1,513	128	375	2,812
1942	444	419	1,642	143	405	3,053
1943	471	464	1,869	152	459	3,415
1944	430	515	2,109	155	502	3,711

[a] U. S. Department of the Interior, Bureau of Mines.
Note: Appalachian includes: Kentucky, New York, Ohio, Pennsylvania and West Virginia.
Central includes: Colorado, Illinois, Indiana, Kansas, Michigan, Missouri and Oklahoma.
Gulf includes: Arkansas, Louisiana, Mississippi and Texas.
Mountain includes: Montana, New Mexico and Wyoming.
Pacific includes: California.
Small adjustments made to include states not listed separately in Bureau of Mines Minerals Yearbooks.

TABLE 47.—NATURAL GAS PRODUCTION IN THE UNITED STATES, 1935–1946[a]
(Millions of cubic feet)

Year	Gross production			Returned to formation	Net production	Losses and waste	Marketed production (Incl. field use)	Field use	Net marketed production (Less field use)
	Gas wells	Oil wells	Total						
1935	1,493,005	1,005,000	2,498,005	101,584	2,396,421	479,826	1,916,595	580,414	1,336,181
1936	1,483,595	1,161,240	2,644,835	84,505	2,560,330	392,528	2,167,802	618,468	1,549,334
1937	1,613,780	1,325,630	2,939,410	98,631	2,840,779	526,159	2,407,620	651,320	1,756,300
1938	1,566,975	1,494,225	3,061,200	116,532	2,944,668	649,106	2,295,562	659,203	1,636,359
1939	1,832,820	1,500,680	3,333,500	179,433	3,154,067	677,311	2,476,756	680,884	1,795,872
1940	2,095,180	1,598,920	3,694,100	377,911	3,316,189	655,967	2,660,222	711,861	1,948,361
1941	2,490,590	1,612,910	4,103,500	660,630	3,442,870	630,212	2,812,658	686,158	2,126,500
1942	2,885,090	1,568,810	4,453,900	773,643	3,680,257	626,782	3,053,475	721,063	2,332,412
1943	3,208,780	1,733,780	4,942,560	843,756	4,098,804	684,115	3,414,689	780,986	2,633,703
1944	*	*	*	*	*	*	3,711,039	855,180	2,855,859
1945[b]	3,887,727	2,014,453	5,902,180	1,087,286	4,814,894	896,208	3,918,686	916,952	3,001,734
1946[c]	*	*	*	*	4,942,617	*	*	*	*

* Data not available.
[a] F. P. C. Staff Report (Docket No. G-580), March 1947.
[b] U. S. Bureau of Mines, Mineral Market Report, No. 1504, March 21, 1947.
[c] Joint report A. G. A. and A. P. I., March 1947.

Table 48.—Losses and Waste Compared with Gross Production, 1935–1943
(Millions of cubic feet)

Year	Reported losses and waste	Gross production	Percent waste to production
1935	429,826	2,396,421	20.0
1936	392,528	2,560,330	15.3
1937	433,159	2,840,779	15.3
1938	636,106	2,944,668	21.6
1939	677,311	3,154,067	21.5
1940	655,967	3,316,189	19.8
1941	630,212	3,442,870	18.3
1942	626,782	3,680,257	17.1
1943	684,115	4,098,804	16.7

Production has more than trebled during the past twenty years, reaching 3.92 trillion cubic feet in 1945 and 4.94 trillion cubic feet in 1946 (table 40). It is especially significant that more than half of the entire marketed production now comes from the Gulf Coast area which includes Arkansas, Louisiana, Mississippi, and Texas.

This, however, represents more nearly the total consumption than total production because even now a substantial part of the gas produced with oil is not metered. The increase in the amount of gas returned to formations during the past ten to fifteen years is also noteworthy (table 46).

Economic factors of supply and demand, as well as conservation rules and regulations, in many states have done much to eliminate or curb the physical waste of gas. It has been practically eliminated in the Panhandle since 1935.

Most of the waste is accounted for in the flush regions of the southwest, according to the report, where it is estimated the loss was as much as 730 billion cubic feet in 1945 (table 48 for percentage loss 1935–1943) which is comparable to 20 percent of the total marketed production in the entire United States and about equal to the amount moving in interstate commerce. A certain loss of casinghead gas is probably unavoidable, yet no effort should be spared to reduce this to a minimum. The Staff reports that the most effective means of conservation is through efficient operation of the individual pools or reservoirs.

CONSUMPTION

The following consumption was reported for 1945 in millions of cubic feet (1946 data are not yet available): domestic 607,400; commercial 230,099; oil and gas–field 916,952; carbon black 431,830; petroleum refineries 338,458; portland–cement plants 38,349; and miscellaneous industrial, including electric public–utility power plants, 1,337,391.

Gas is sold on the basis of fuel value, which is stated in therms. As a therm is equal to 100,000 British thermal units, one ton of coal having an average heat value of 12,500 B.t.u. per pound is equivalent in fuel value to 250 therms of gas. Heat value of gas available in Illinois ranges from 480 B.t.u. per cubic foot for manufactured gas to as high as 1,030 B.t.u. for natural gas.

Table 49.—Natural Gas Produced in Illinois and Marketed in 1946[a]

Field	County	Where marketed	Amount marketed M cu. ft.
Russellville (gas)	Lawrence	Illinois, Indiana, Kentucky	336,000
Ayers (gas)	Bond	Greenville, Illinois	16,000
Louden (residue)	Fayette	Vandalia, St. Elmo, Brownetown, Illinois	288,000
Storms (casinghead)	White	Carmi	10,000

[a] Bell, A. H., and Kline, Virginia, Oil and Gas Development in Illinois in 1946: Illinois Geol. Survey Ill. Pet. 56, 1947.

TABLE 50.—SURVEY OF NATURAL GASOLINE PLANTS IN ILLINOIS, 1946[a]

	Approx. capacity natural gasoline	Gals. per day Liq. pet. gases
Arkansas Fuel Oil Co. (Illinois field), Crawford County)	500	—
Brenneman & MacDonnell (Condry), Crawford	1,500	—
Carter Oil Co. (Louden), Fayette	30,000	30,000
Engle Petrol., Inc. (Benton), Franklin	25,000	25,000
Engle Petrol., Inc. (Salem), Marion	72,000	50,000
Ohio Oil Co., Casey	1,200	—
Texas Co. (Hoodville), Hamilton	90,000	—
Texas Co. (Salem), Marion	190,000	—
Warren Petrol. Corp. (Crossville 23), White	60,000	50,000
Warren Petrol. Corp. (Salem 21), Marion	60,000	5,000
Miscl. (incl. 2 vacuum plants operated by Cheuvront Oil Co.), Crawford	6,400	—
Total	536,600	160,000

[a] Oil and Gas Journal, April 20, 1946, p. 131.

NATURAL GAS IN ILLINOIS

Approximately 21,670,000,000 cubic feet of casinghead gas from Louden, Salem. Dale–Hoodville, Benton and New Harmony–Griffin pools plus an additional estimated 500,000,000 cubic feet from the old Southeastern Illinois oil field was processed in extraction plants and yielded 109,834,000 gallons of liquefied petroleum gases and an estimated 51,200,000 gallons of natural gasoline during 1946. Approximately 8,000,000,000 cubic feet of the residue gas from these plants was injected into producing formations, 288,000,000 cubic feet was marketed, less than 100,000,000 cubic feet was flared, and the remaining eight or nine billion cubic feet was used as plant fuel.[5] Natural gas produced in Illinois and marketed in 1946 is shown in table 49.

The natural gasoline plants in Illinois are listed in table 50.

[5] Illinois Geol. Survey Ill. Pet. 56, 1947.

MARKET FOR COKE-OVEN GAS

Disposal of coke–oven gas in Illinois, by uses, since 1935 is given in table 51.

According to the U. S. Bureau of Mines,[6] "the development of Diesel engines which are convertible under full load from oil to gaseous fuel, with a claimed efficiency about 30 percent higher than older engines operating on gas, may lead to a broader use of gas for power generation. This type of prime mover would be valuable at locations where natural gas is available at low cost, except during periods of peak demand, when a stand–by oil supply could be substituted."

CARBON BLACK

A recent issue of Chemical and Engineering News[7] carries a staff report concerning a new process for making carbon black which has been developed through a long period of research by the Columbian Carbon Company at Monroe, Louisiana. According to this report, the new product, which is known as Statex K, has important economic significance because of its greater efficiency in utilizing natural gas.

The object of the research has been to combine the good points of the channel methods with the greater efficiency of the newer furnace processes, whose products have lacked some important qualities found in those of the channel process.

Because Statex K has proved capable of equaling or surpassing channel blocks in road tests, in both synthetic and natural tires, more than 1,000,000 lbs. of it have been sold to the rubber industry alone since production started last year.

According to this report, the Statex K process represents a distinct departure from previous methods of production.

"Essentially, it consists of introducing relatively cold hydrocarbon 'make' gas by means of several jets into a furnace containing turbulent blast gases already burning at a temperature of upwards of 2,400°F. The rapid intermingling of the hot and cold streams results in almost instant heat transfer and the formation

[6] U. S. B. M. Minerals Yearbook, 1944.
[7] Vol. 25, No. 16, April 21, 1947.

of Statex K particles. Because the reaction conditions of the blast gas, blast air make gas, temperature, and condition of furnace atmosphere are under precise control, the particle size, structure, and surface activity are all predeterminable. Actual collection of the carbon particles is effected by clustering with a Cottrell precipitator and final separation from the gases by means of centrifugal 'cyclones'.

"It was also indicated that the Statex process results in a sizable saving of plant area and building materials. A single Statex K furnace occupying 400 square feet produces as much carbon black as 35 of the conventional channel houses spread over 42,000 square feet."

According to the Bureau of Mines, carbon black production and sales reached new high levels in 1946. Production of 1,244,421,000 pounds was 18 percent above 1945 production. Sales increased 24 percent amounting to 1,269,740,000 pounds in 1946. As a result producers' stocks declined to 76,228,000 pounds on December 31, 1946, as compared with 102,005,000 pounds at the close of 1945.

The average yield per thousand cubic feet of gas used increased from 2.32 pounds in 1945 to 2.44 pounds in 1946. The average value of carbon black at plants increased from 4.02 cents in 1945 to 4.82 cents in 1946.

TABLE 51.—DISPOSAL OF SURPLUS COKE-OVEN GAS IN ILLINOIS, 1935–1946[a]

Year	Used by producer						Sold					
	Under boilers			In steel or other affiliated plant			Distributed through city mains			For industrial purposes		
	M cubic feet	Value		M cubic feet	Value		M cubic feet	Value		M cubic feet	Value	
		Total	Average		Total	Average		Total	Average		Total	Average
1946	4,731,035	$476,692	$.101	6,010,401	$ 981,924	$.163	19,901,882	$3,014,656	$.151	418,556	$ 50,287	$.120
1945	5,826,787	576,989	.099	7,208,475	1,077,620	.149	20,696,942	3,271,352	.158	724,789	[b]	[b]
1944	2,786,038	278,535	.100	10,248,744	1,423,879	.139	21,938,084	3,603,627	.164	1,493,020	135,659	.091
1943	2,561,927	256,456	.100	5,702,003	952,340	.167	21,383,169	3,705,434	.173	3,340,881	368,938	.110
1942	2,631,427	209,466	.080	5,855,471	903,274	.154	23,015,131	3,108,250	.135	2,878,647	287,077	.100
1941	3,538,465	270,458	.076	5,228,752	760,655	.145	22,524,787	4,001,383	.178	3,010,463	287,845	.096
1940	2,388,517	197,526	.083	4,210,996	528,450	.125	20,189,646	4,499,480	.223	1,823,786	168,018	.092
1939	617,125	49,643	.080	2,074,026	265,701	.128	17,554,864	4,386,825	.250	394,359	38,068	.097
1938	195,868	19,778	.101	1,752,254	154,657	.145	18,304,603	4,246,432	.232	26,855	2,726	.102
1937	2,790,802	243,768	.087	4,573,953	665,157	.145	19,568,662	4,051,776	.207	933,027	40,529	.043
1936	1,219,819	82,310	.067	3,083,794	431,685	.140	18,253,042	4,055,029	.222	—	—	—
1935	458,851	30,388	.066	2,264,235	313,425	.138	17,163,133	4,141,051	.241	—	—	—

[a] U. S. Bur. Mines, Minerals Yearbooks and Mineral Market Reports, No. 1428, July 18, 1946, and No. 1537, July 10, 1947.
[b] Statistics not available.

TABLE 52.—SALIENT STATISTICS OF CARBON BLACK PRODUCED FROM NATURAL GAS IN THE UNITED STATES, 1945–1946[a]

		1945	1946
Number of producers reporting		21	22
Number of plants		59	60
Quantity produced:			
By States and districts:			
Louisiana	pounds	168,229,000	191,857,000
Texas:			
Panhandle district	Do.	[b] 541,464,000	[b] 596,678,000
Rest of State	Do.	179,974,000	234,172,000
Total Texas	Do.	721,438,000	830,850,000
Other States (Calif., Kans., N. Mex., Okla.)	Do.	163,131,000	221,714,000
Total United States	Do.	[b]1,052,798,000	[b]1,244,421,000
By processes:			
Contact processes	Do.	538,539,000	619,109,000
Furnace processes	Do.	[b] 514,259,000	[b] 625,312,000
Quantity sold:			
Domestic:			
To rubber companies	Do.	804,386,000	941,464,000
To ink companies	Do.	22,824,000	29,561,000
To paint companies	Do.	7,421,000	9,312,000
For miscellaneous purposes	Do.	11,631,000	18,318,000
Total	Do.	846,262,000	998,655,000
Exports	Do.	173,773,000	271,085,000
Total sales	Do.	1,020,035,000	1,269,740,000
Losses	Do.	1,000	458,000
Stocks held by producers Dec. 31:			
Contact types	Do.	64,956,000	17,006,000
Furnace types	Do.	37,049,000	59,222,000
Total	Do.	102,005,000	76,228,000
Value at plants of carbon black produced:			
Total		$42,323,000	$59,988,000
Average per pound	cents	4 02	4 82
Estimated quantity of natural gas used:			
M cu. ft.		431,830,000	478,349,000
Average yield per M cu. ft.	pounds	2 32	2 44
Average value per M cu. ft.	cents	2 28	3 02

[a] U. S. Bur. Mines, Mineral Market Report No. 1522, June 17, 1947.
[b] Includes carbon black produced from liquid hydrocarbons.

STONE, ROCK PRODUCTS

Limestone, Dolomite, and Marl

In 1946 the limestone, dolomite, and marl, which was sold or used by producers in Illinois amounted to 15,243,000 tons, valued at the plants at $16,610,000. This was an increase of 37 percent in amount and 46 percent in value over the previous year, and marks an all-time high record for the production of this mineral material. Details by kind and use are given in tables 53 and 54, and are shown graphically in figure 11.

Limestone whiting, concrete and paving, and flagging showed marked increases over 1945 in both tonnage and value, while railroad ballast declined in quantity and value, and riprap declined in amount but increased in value.

A large majority of the producers reported that the demand, especially for agstone, far exceeded the supply. This situation was due not to lack of available stone, but because of labor shortage and the difficulty of securing new equipment and necessary replacements and repairs. Under these conditions a few of the smaller plants went out of business, and some others were idle during the year. Several new operations were reported and a number of plants, idle for some time, were reopened under new ownership.

COMMERCIAL AND NONCOMMERCIAL OPERATIONS

Commercial operations are shown separately from noncommercial operations, which include the following: State of Illinois, counties, townships, municipalities, and other government agencies. Purchases by government agencies from commercial producers are included in commercial operations.

Noncommercial operations in 1946 showed an increase of 178 percent over the previous year, and accounted for about 4 percent of the total tonnage of stone produced in Illinois. Practically all of this stone was used for concrete and paving, and, with the large increase in the production of stone for concrete and paving by commercial operators, it indicated the trend toward increased building and highway construction.

AGSTONE USED IN ILLINOIS IN 1946

Reports of producers to the Illinois State Geological Survey show that the amount of agstone (ground limestone, dolomite, and marl) used for soil improvement in Illinois during 1946 amounted to more than 5,350,000 tons. This was 1,068,000 tons more than that used in 1945, and establishes again a new all-time high record. With this large increase in the production and use of agstone, Illinois continues to rank first among all the states in the amount of liming material used for soil treatment.

The value of agstone for improving soil fertility is so firmly established that the demand for this product has resulted in the Illinois stone industry producing an enormous tonnage of this material. The total quantity of agstone used in Illinois during 1946 amounted to 24.9 percent over the record made in 1945. That produced in Illinois and marketed in other states declined 19 percent, while the amount produced in other states and used in Illinois increased 115 percent (table 55).

The progressive increase in the use of agstone on Illinois farms during the years for which figures are available is shown in table 56. During the ten–year period from 1927 to 1936, the amount used annually increased 72 percent; during the following ten–year period from 1937 to 1946, the increase was 408 percent. This remarkable growth is shown graphically in figure 12.

In 1946 agstone was produced in 47 of the 102 counties of the State. Of the total amount used during the year, 92.7 percent was produced in Illinois.

Table 57 gives the use of agstone by counties in Illinois during 1946, showing the amount produced in Illinois and in other states. It also shows the arable land and plowable pasture in each county and the average quantity of agstone used, in pounds

TABLE 53.—LIMESTONE, DOLOMITE, AND MARL, BY USES, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1945 AND 1946[a]

Use	Type of operation	1945*				1946				Percent change in amount from 1945
		Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		
				Total	Av.			Total	Av.	
Industrial										
Agstone	Commercial	130	4,296,588	$4,656,869	$1.08	135	5,116,684	$5,801,827	$1.13	+ 19.1
Agstone	Noncomm	—	—	—	—	1	2,740	1,918	.70	—
Metallurgical and flux[c]	Commercial	6	801,349	810,537	1.01	8	952,771	1,121,745	1.18	+ 18.9
Chemical uses[d]	"	2	64,247	73,395	1.14	2	76,692	120,854	1.57	+ 19.4
Limestone whiting[e]	"	2	9,065	35,404	3.91	2	11,895	57,984	4.87	+ 31.2
Miscellaneous filler–asphalt	"	—	[f]	[f]	—	5	122,484	382,089	3.12	+ 7.1
Miscellaneous filler–other[g]	"	7	136,061	460,496	3.38	5	24,300	56,411	2.32	
Other industrial uses[h]	"	7	89,748	268,576	3.00	5	101,023	393,746	3.90	+ 12.6
Total industrial uses	Both	131	5,397,058	6,305,277	1.17	137	6,408,589	7,936,574	1.24	+ 18.7
Construction										
Concrete and paving	Commercial	66	4,001,090	3,667,872	.91	91	7,134,679	7,110,854	1.00	+ 70.8
Concrete and paving	Noncomm	9	210,130	180,741	.86	14	582,778	476,882	.82	+177.3
Railroad ballast	Commercial	15	1,080,162	837,680	.78	15	731,234	615,388	.84	− 32.3
Riprap	"	15	248,995	166,021	.67	20	154,555	188,296	1.22	− 38.0
Rough construction and rubble	"	4	605	995	1.64	5	15,599	25,143	1.61	—
Rough construction and rubble	Noncomm	—	—	—	—	1	125	100	.80	—
Flagging	Commercial	5	511	1,643	3.21	5	859	2,731	3.18	+ 68.1
Other construction uses[i]	"	5	184,128	180,112	.98	4	214,440	253,753	1.14	+ 16.5
Total construction uses	Both	79	5,725,621	5,035,064	.88	109	8,834,269	8,673,147	.98	+ 54.3
Total operations	Commercial	137	10,912,549	11,159,600	1.02	145	14,657,215	16,130,821	1.10	+ 34.3
Total operations	Noncomm	9	210,130	180,741	.86	15	585,643	478,900	.82	+178.7
Total stone	Both	146	11,122,679	$11,340,341	$1.02	160	15,242,858	$16,609,721	$1.09	+ 37.0

* Revised figures.
[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Includes stone for aluminum refining, refractory dolomite, and flux for open-hearth and blast furnaces.
[d] Includes stone for glass factories, paper mills, and tanning.
[e] Includes limestone whiting for kalsomine, pottery, tooth paste, and for paint, putty, rubber, and other fillers.
[f] Included in miscellaneous filler—other.
[g] Includes pulverized stone for asphalt (1945), explosives, fertilizer, grease, insecticides, dye, enamel ware, picture frame moulding, and other fillers.
[h] Includes stone for mineral food, poultry grit, regrinding, and dust for coal mines.
[i] Includes building stone, chips for driveways, stone sand, stone for filling, filter beds, and unspecified uses.

TABLE 54.—LIMESTONE, DOLOMITE, AND MARL, BY KINDS AND BY USES, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1946[a]

Use	Type of Operation	Limestone[n]				Dolomite			
		Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants	
				Total	Av.			Total	Av.
Industrial									
Agstone	Commercial	70	2,895,627	$3,401,694	$1.17	63	2,215,597	$2,392,998	$1.08
Agstone-marl	"	2	5,460	7,135	1.31	—	—	—	—
Agstone	Noncomm.	—	—	—	—	1	2,740	1,918	.70
Metallurgical and flux	Commercial	3	[c] 232,956	[c] 266,092	1.14	5	[d] 719,815	[d] 855,653	1.19
Chemical uses	"	2	[e] 76,692	[e] 120,854	1.57	—	—	—	—
Limestone whiting	"	2	[f] 11,895	[f] 57,984	4.87	—	—	—	—
Miscellaneous filler	"	5	[g] 48,122	[g] 136,346	2.09	3	[h] 98,662	[h] 302,154	3.06
Other industrial uses	"	3	[i] 69,804	[i] 365,011	5.23	2	[j] 31,219	[j] 28,735	.90
Total industrial uses	Both	72	3,340,556	4,355,116	1.30	65	3,068,033	3,581,458	1.17
Construction									
Concrete and paving	Commercial	46	2,559,921	2,643,882	1.03	45	4,574,758	4,466,972	.98
Concrete and paving	Noncomm.	4	25,799	23,182	.90	10	556,979	453,700	.81
Railroad ballast	Commercial	6	102,198	103,251	1 01	9	629,036	512,137	.81
Riprap	"	17	130,574	164,310	1.26	3	23,981	23,986	1.00
Rough construction and rubble	"	—	[k]	[k]	—	—	[k]	[k]	—
Rough construction and rubble	Noncomm.	1	125	100	.80	—	—	—	—
Flagging	Commercial	4	3,702	6,257	1.69	3	12,756	21,617	1.69
Other construction uses	"	2	[l] 175,489	[l] 210,678	1.20	2	[m] 38,951	[m] 43,075	1.11
Total construction uses	Both	53	2,997,808	3,151,660	1.05	56	5,836,461	5,521,487	95
Total operations	Commercial	75	[n]6,312,440	[n]7,483,494	1.19	70	8,344,775	8,647,327	1.04
Total operations	Noncomm.	5	25,924	23,282	.90	10	559,719	455,618	.81
Total Stone	Both	80	[n]6,338,364	[n]$7,506,776	$1.18	80	8,904,494	$9,102,945	$1.02

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Includes stone for aluminum refining and flux for blast furnaces.
[d] Includes refractory dolomite for open-hearth and flux for blast furnaces.
[e] Includes stone for glass factories and paper mills.
[f] Includes limestone whiting for kalsomine, pottery, tooth paste, and for paint, putty, rubber and other fillers.
[g] Includes pulverized stone for asphalt, fertilizer, dye, dynamite, enamel ware, insecticides, picture frame moulding, and other fillers.
[h] Includes pulverized stone for asphalt and fertilizer.
[i] Includes stone for mineral food, poultry grit, and dust for coal mines.
[j] Includes stone for regrinding and dust for coal mines.
[k] Included in flagging.
[l] Includes building stone and stone for unspecified uses.
[m] Includes chips for driveways, stone for filling and filter beds, and stone sand.
[n] Includes a small amount of marl, see Agstone-marl.

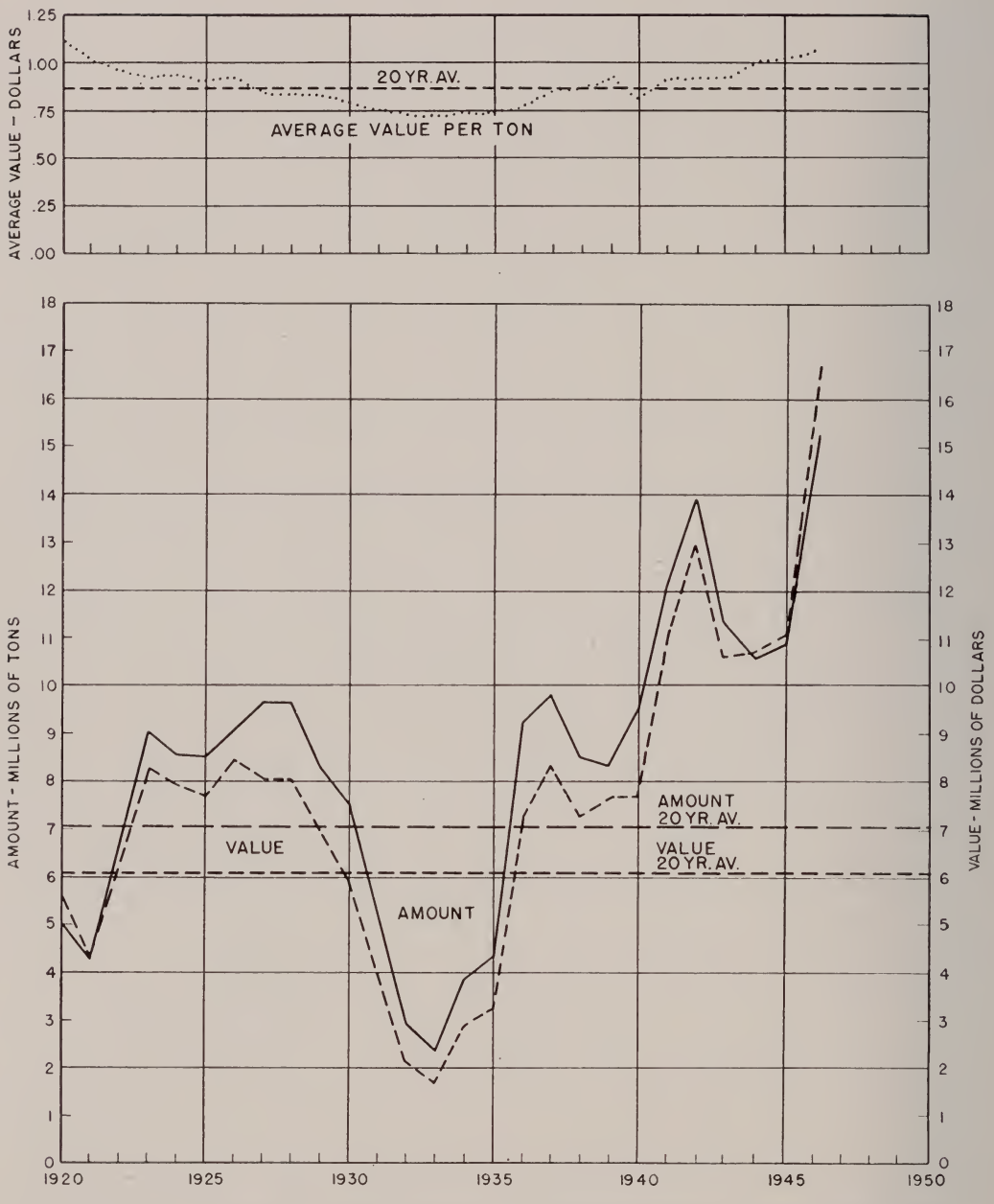

FIG. 11.—Annual production of stone (limestone, dolomite, and marl) in Illinois, 1920–1946.

TABLE 55.—AGSTONE USED IN ILLINOIS, 1945 AND 1946[a]

	1945*				1946				
	Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		Percent change in amount from 1945
			Total	Av.			Total	Av.	
Produced in Illinois									
Limestone	63	2,322,240	$2,639,769	$1.14	70	2,895,627	$3,401,694	$1.17	+ 24.7
Dolomite	64	1,966,821	2,009,636	1.02	64	2,218,337	2,394,916	1.08	+ 12.8
Marl	3	7,527	7,464	.99	2	5,460	7,135	1.31	− 27.5
Total produced in Illinois	130	4,296,588	4,656,869	1.08	136	5,119,424	5,803,745	1.13	+ 19.1
Less marketed in other states	11	190,280	197,580	1.04	13	154,648	167,531	1.08	− 18.7
Produced and used in Illinois	130	4,106,308	4,459,449	1.08	136	4,964,776	5,636,214	1.13	+ 20.9
Produced in other states and used in Illinois	11	181,260	168,452	.93	11	390,879	347,182	.89	+115.6
Total agstone used in Illinois	141	4,287,568	$4,627,901	$1.08	147	5,355,655	$5,983,396	1.12	+ 24.9

* Revised figures.
[a] Summary of canvass made by Illinois Geological Survey, in cooperation with Illinois Agricultural Association and Midwest Agricultural Limestone Institute.
[b] Number of plants reporting production.

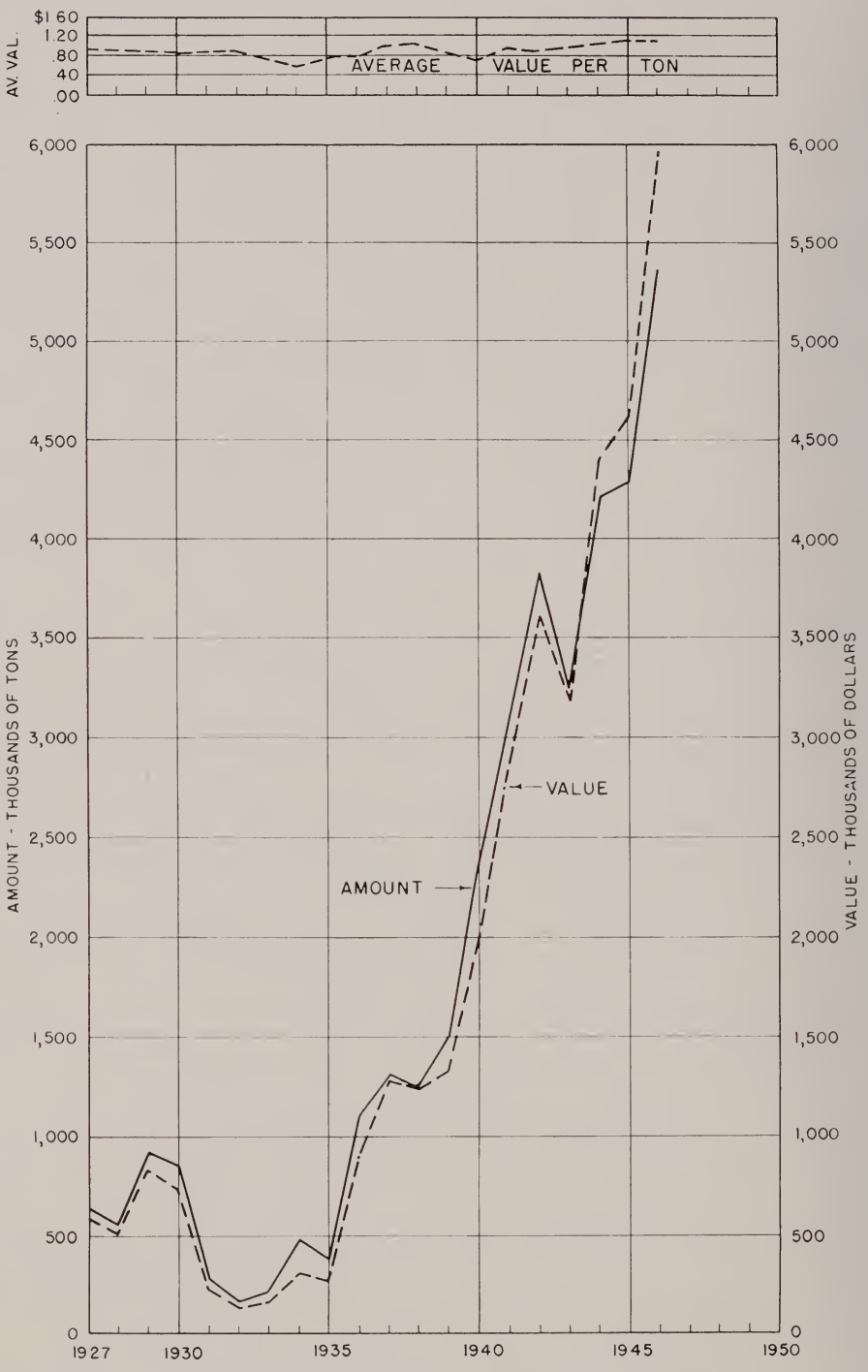

FIG. 12.—Annual use of agstone in Illinois, 1927–1946.

TABLE 56.—AGSTONE USED IN ILLINOIS ANNUALLY, 1927-1946[a]

Year	Tons	Value	Av.
1927....	647,155	$ 579,639	$0.90
1928....	565,001	511,005	.91
1929....	947,798	843,693	.89
1930....	868,426	740,785	.86
1931....	268,874	241,376	.90
1932....	164,933	140,969	.86
1933....	227,466	165,667	.73
1934....	491,644	319,604	.65
1935....	379,555	268,139	.71
1936....	1,114,466	871,862	.78
1937....	1,310,513	1,279,981	.97
1938....	1,251,263	1,247,150	1.00
1939....	1,497,458	1,318,173	.88
1940....	2,365,663	1,999,850	.84
1941....	3,084,855	2,873,536	.93
1942....	3,866,568	3,600,313	.93
1943....	*3,236,477	*3,175,108	.98
1944....	4,214,600	4,388,886	1.04
1945....	*4,287,568	*4,627,705	1.08
1946....	5,355,655	5,983,396	1.12

* Revised figures.
[a] U. S. Bureau of Mines, 1927-29; canvass by Illinois Agricultural Association, 1930; canvass by Illinois Geological Survey, 1931-46.

per acre of such land in each county. These data are from producers who reported sales of agstone in specific counties, or are estimates by county farm advisers. Production not accounted for in the county totals is given at the bottom of the table and is marked "county not specified." The total amount used in Illinois is the actual deliveries in Illinois reported by producers. Eighty-three percent of the counties showed an increase in the average number of pounds of agstone per acre spread during 1946; 14 percent showed a decrease and 3 percent, no change.

Table 58 gives the total amount of agstone produced in other states and used in Illinois. Table 59 gives the total amount produced in Illinois and marketed in other states.

The map (fig. 13) shows the average amount of agstone used in each county in pounds per acre of arable land and plowable pasture.

CEMENT

Production, shipments, and consumption of cement in Illinois increased in percentages ranging from 43 to 63 in 1946 over 1945. Production was unable to keep up with consumption and stocks were drawn upon very heavily. The details are shown in table 60.

LIME

During 1946, sales of lime by producers in Illinois amounted to 273,600 tons, valued at the plants at $2,243,400, as shown in table 62. Of this quantity 86 percent was quicklime and sintered dolomite, and 14 percent was hydrated lime.

Total lime decreased 5 percent in amount from 1945, but increased 1 percent in value. The average price per ton increased 45 cents. Quicklime and sintered dolomite declined 7.4 percent in amount and 2.7 percent in value, while hydrated lime increased 13.4 percent in amount and 12.5 percent in value.

Sales of both quicklime and hydrated lime for building uses showed increases in amount of over 70 percent in 1945, reflecting the upward trend in the construction industry. Sintered dolomite and metallurgical lime dropped 10.5 percent in amount and 9.5 percent in value from 1945. Quicklime sales for chemical and industrial uses decreased 1.3 percent in amount but increased 4.7 percent in value; sales of hydrated lime for these same uses increased 8 percent in amount and 20.7 percent in value. Under chemical and industrial uses is included lime for water purification and softening, sewage and trade–waste treatment, insecticides, fungicides, and disinfectants, petroleum refining, tanneries, paper manufacturing, and for other similar purposes.

Annual shipments of lime by producers in Illinois are shown graphically in figure 14, beginning with 1920, compared to the 20–year average, which is based on shipments for 1920–1939 inclusive.

GANISTER

Ganister is a siliceous material found in Union and Alexander counties of southern

TABLE 57.—AGSTONE USED IN ILLINOIS, BY COUNTIES, 1945 AND 1946[a]

County	Total used in 1945 (tons)	Tons used in 1946			Acres of arable land and plowable pasture (1940 census)	Average No. pounds per acre[b]	
		Total used in Illinois	Produced in Illinois	Produced in other states		1945	1946
Adams	50,000	65,000	58,905	6,095	328,009	305	399
Alexander	3,200	12,250	12,250	—	58,779	108	417
Bond	35,000	35,000	30,603	4,397	168,876	414	414
Boone	16,900	46,164	46,164	—	139,691	241	661
Brown	12,000	13,600	13,600	—	119,648	200	227
Bureau	100,000	120,000	117,118	2,882	440,808	454	544
Calhoun	18,000	16,500	16,500	—	70,886	507	466
Carroll	36,000	49,000	49,000	—	200,264	360	489
Cass	30,000	45,873	44,097	1,776	157,002	382	580
Champaign	80,000	100,000	100,000	—	560,583	285	357
Christian	75,000	110,973	106,236	4,737	373,342	402	594
Clark	58,500	74,875	74,875	—	217,376	539	689
Clay	24,600	32,426	28,079	4,347	201,735	243	321
Clinton	37,400	48,833	43,282	5,551	210,349	356	464
Coles	40,000	45,000	45,000	—	254,255	315	354
Cook	25,000	25,000	25,000	—	199,206	251	251
Crawford	30,000	25,375	24,663	712	193,868	309	262
Cumberland	25,000	34,000	33,622	378	157,832	316	431
DeKalb	75,000	70,000	70,000	—	349,131	429	401
DeWitt	13,200	21,500	21,500	—	211,909	124	203
Douglas	20,000	25,633	25,633	—	231,817	172	221
DuPage	46,600	33,800	33,800	—	116,731	796	579
Edgar	30,000	40,000	40,000	—	307,538	195	260
Edwards	13,400	21,576	11,735	9,841	108,888	247	396
Effingham	38,000	49,827	47,044	2,783	213,369	309	467
Fayette	27,200	40,024	38,513	1,511	275,732	*198	290
Ford	25,000	28,000	27,996	4	280,058	178	200
Franklin	29,100	36,906	34,276	2,630	146,843	395	503
Fulton	40,000	50,000	38,762	11,238	338,466	236	295
Gallatin	20,000	25,000	23,849	1,151	127,951	312	390
Greene	17,700	32,000	31,802	198	226,052	157	283
Grundy	20,000	34,670	34,670	—	218,241	183	318
Hamilton	14,700	25,200	14,655	10,545	179,698	135	280
Hancock	21,800	74,000	73,404	596	340,637	128	434
Hardin	13,600	10,000	10,000	—	50,649	533	395
Henderson	41,400	25,000	23,380	1,620	156,071	531	320
Henry	90,000	66,000	54,778	11,222	423,236	425	312
Iroquois	65,000	82,177	54,964	27,213	611,482	213	269
Jackson	16,300	38,000	38,000	—	188,088	173	404
Jasper	37,800	40,000	35,431	4,569	240,290	315	333
Jefferson	46,000	50,000	29,046	20,954	242,802	379	412
Jersey	35,000	25,273	25,273	—	134,766	518	375
Jo Daviess	25,000	35,000	34,500	500	225,208	223	311
Johnson	14,000	22,000	22,000	—	112,452	250	391
Kane	60,100	86,814	86,814	—	255,882	469	678
Kankakee	77,000	76,000	76,000	—	348,647	441	436
Kendall	25,000	39,780	39,780	—	168,326	298	473
Knox	65,500	87,289	51,850	35,439	317,827	412	549
Lake	12,000	14,000	14,000	—	140,960	170	192
LaSalle	128,000	135,000	135,000	—	585,735	437	461
Lawrence	10,500	23,000	21,054	1,946	165,983	126	217
Lee	130,700	180,795	180,795	—	385,196	680	939
Livingston	196,900	134,466	134,466	—	595,765	661	451
Logan	46,300	78,974	75,342	3,632	346,615	267	456
McDonough	25,000	67,345	55,457	11,888	270,917	185	497

TABLE 57.—(CONCLUDED)

County	Total used in 1945 (tons)	Tons used in 1946			Acres of arable land and plowable pasture (1940 census)	Average No. pounds per acre[b]	
		Total used in Illinois	Produced in Illinois	Produced in other states		1945	1946
McHenry	39,900	24,251	24,251	—	262,434	305	184
McLean	110,000	112,000	112,000	—	656,782	*320	326
Macon	27,000	45,369	44,678	691	305,531	176	297
Macoupin	29,600	45,000	36,938	8,062	342,781	172	263
Madison	39,000	64,948	62,811	2,137	307,651	253	422
Marion	36,900	50,000	43,069	6,931	239,131	309	418
Marshall	36,700	21,307	21,307	—	189,489	384	225
Mason	38,800	55,000	53,142	1,858	248,797	312	442
Massac	12,100	19,150	19,150	—	89,357	272	429
Menard	20,000	27,000	26,859	141	154,392	259	349
Mercer	20,000	30,000	28,245	1,755	251,449	159	239
Monroe	40,000	60,000	60,000	—	155,971	513	769
Montgomery	70,700	112,000	102,148	9,852	322,306	437	695
Morgan	35,200	55,000	53,867	1,133	261,346	266	421
Moultrie	24,000	30,000	30,000	—	178,794	268	335
Ogle	73,700	100,000	100,000	—	383,404	385	522
Peoria	75,000	100,000	99,696	304	243,380	616	822
Perry	22,900	35,000	24,741	10,259	156,265	293	448
Piatt	45,000	50,000	50,000	—	246,223	366	403
Pike	40,000	40,000	40,000	—	341,756	235	235
Pope	5,000	10,000	10,000	—	92,321	108	216
Pulaski	5,100	12,277	12,277	—	68,920	148	356
Putnam	20,100	21,386	21,386	—	66,867	600	639
Randolph	55,000	75,000	71,066	3,934	227,475	484	659
Richland	20,000	28,675	19,541	9,134	186,383	215	308
Rock Island	40,000	60,000	59,927	73	156,111	512	769
St. Clair	75,000	88,913	87,238	1,675	258,552	579	688
Saline	19,300	38,200	30,924	7,276	145,818	264	524
Sangamon	65,000	76,660	70,536	6,124	425,644	305	360
Schuyler	7,400	12,000	11,713	287	144,306	103	166
Scott	21,000	20,152	20,152	—	103,624	404	389
Shelby	46,100	63,856	59,201	4,655	374,712	246	341
Stark	28,900	24,000	21,188	2,812	148,213	391	324
Stephenson	75,400	90,000	90,000	—	283,408	533	635
Tazewell	40,000	45,000	44,880	120	304,959	262	295
Union	20,800	35,854	35,854	—	123,799	335	579
Vermilion	70,000	80,000	79,559	441	451,146	310	355
Wabash	16,600	23,095	—	23,095	103,459	322	446
Warren	60,000	77,204	77,010	194	271,171	442	569
Washington	20,200	33,000	23,474	9,526	242,105	166	273
Wayne	44,300	60,000	21,933	38,067	330,724	267	363
White	55,000	62,650	31,300	31,350	240,726	458	521
Whiteside	100,000	127,000	126,640	360	350,544	569	724
Will	47,500	100,000	100,000	—	396,213	239	505
Williamson	15,300	26,732	19,104	7,628	128,514	237	417
Winnebago	30,000	40,412	40,412	—	219,494	274	368
Woodford	29,400	32,666	32,666	—	258,560	227	253
County not specified	* 109,268	89,980	79,330	10,650	—	—	—
Total	*4,287,568	5,355,655	4,964,776	390,879	25,133,474	*351 (Av.)	426 (Av.)

* Revised figures.

[a] Summary of canvass made by Illinois Geological Survey, in cooperation with Illinois Agricultural Association and Midwest Agricultural Limestone Institute.

[b] Calculated from columns 2 and 6.

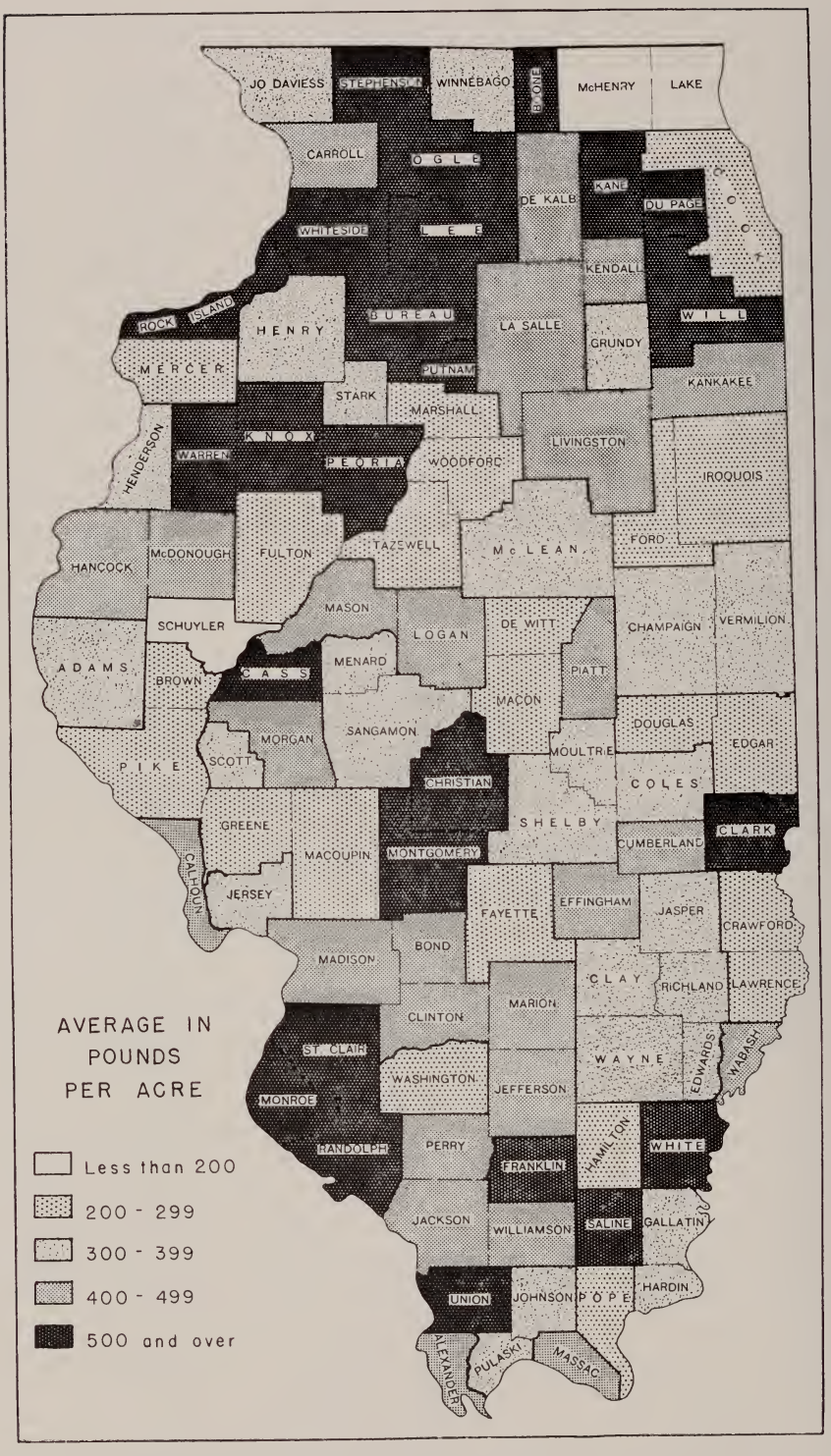

FIG. 13.—Agstone used in Illinois in 1946, showing county averages in pounds per acre of arable land and plowable pasture.

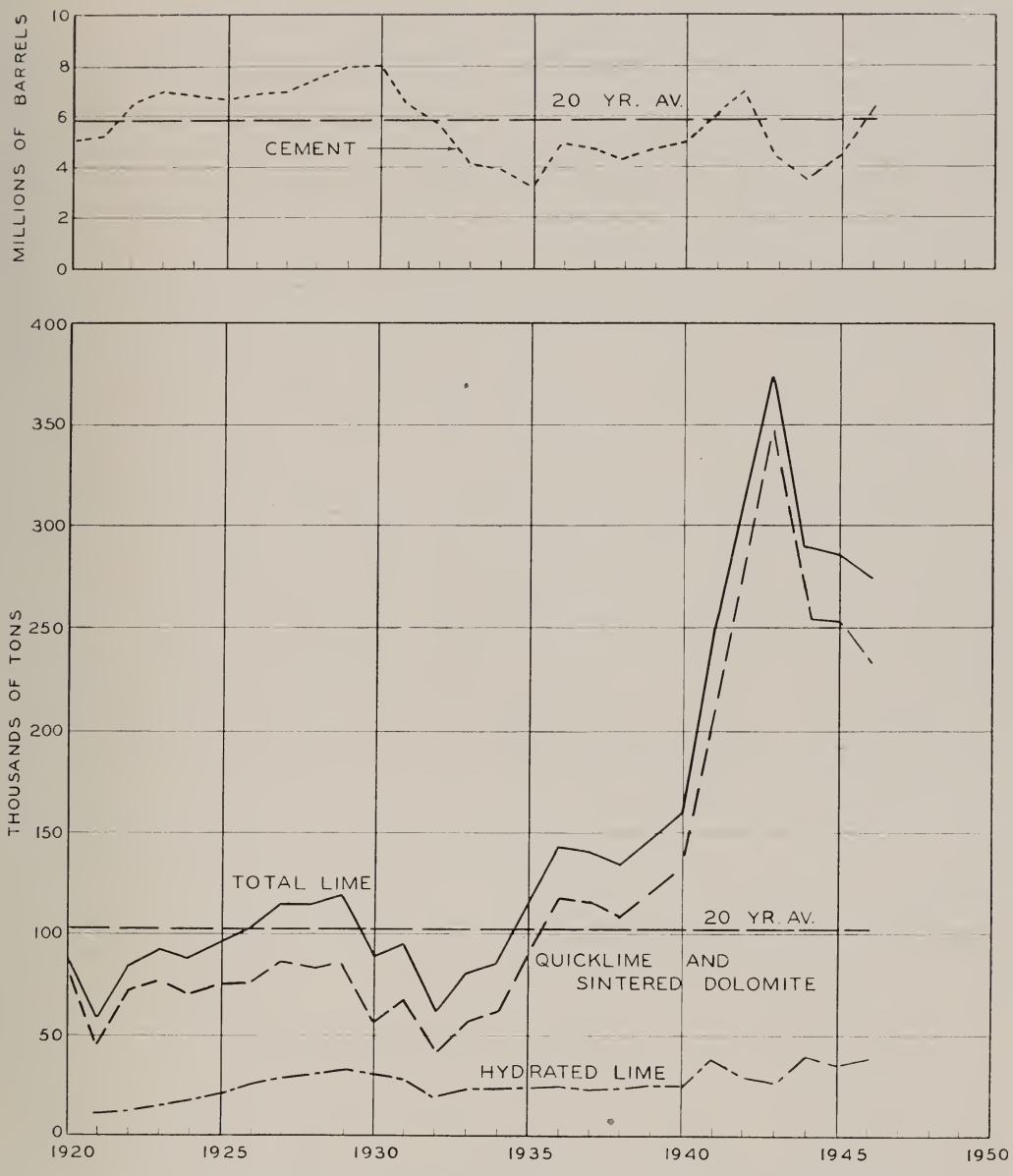

FIG. 14.—Annual shipments of cement and lime by producers in Illinois, 1920–1946.

TABLE 58.—AGSTONE PRODUCED IN OTHER STATES AND USED IN ILLINOIS, 1942–1946[a]

Year	Tons sold in Illinois	Percent of total Illinois consumption
1942	171,035	4.5
1943	166,518	5.3
1944	314,800	7.5
1945	181,200	4.3
1946	390,879	7.3

[a] Summary of canvass made by Illinois Geological Survey.

Illinois. It is used for refractory purposes. Sales of this material in 1946 declined 29 percent in amount and 12 percent in value from 1945.

Sandstone and miscellaneous stone are produced in various parts of the State for road work, and for foundations, riprap, and rubble, mostly by noncommercial operations. During 1946 sales decreased 13 percent in amount from 1945, and increased 8 percent in value.

Total sales and uses of ganister, sandstone, and miscellaneous stone by producers in Illinois are given in table 61. They show a decrease of 2.8 percent in amount from 1945 and an increase of 1 percent in value.

TABLE 59.—AGSTONE PRODUCED IN ILLINOIS AND MARKETED IN OTHER STATES, 1942–1946[a]
(In tons)

Year	Wisconsin	Iowa	Missouri	Kentucky	Indiana	Other states[b]	Total
1942	450	—	203	9,700	28,811	19,853	59,017
1943	—	11,000	1,192	1,000	34,579	28,200	75,971
1944	—	7,683	8	8,900	46,302	110,318	173,211
1945	—	—	2,700	23,600	46,000	117,900	190,200
1946	5,140	5	208	—	46,495	102,800	154,648

[a] Summary of canvass made by Illinois Geological Survey.
[b] Marketed outside Illinois, destination seldom specified.

TABLE 60.—PORTLAND CEMENT, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1945 AND 1946
(In thousands of barrels of 376 pounds each)

	1945	1946	
		1946	Percent change from 1945
Production of finished Portland cement	* 4,382	6,270	+43
Value of cement produced (in thous. of dollars)	*$7,089	$11,600	+64
Shipments of finished Portland cement from mills	4,193	6,664	+59
Stocks of finished Portland cement, Dec. 31	821	431	−50
Cement used in Illinois	5,355	8,753	+63

* Revised figures.

TABLE 61.—GANISTER AND SANDSTONE, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1942–1946[a]

Year	Amount[b] tons	Value at plants	
		Total	Av.
1942	2,948	$ 9,376	$3.18
1943	1,045	6,557	6.27
1944	548	4,774	8.71
1945	8,573	10,791	1.26
1946	8,336	10,900	1.30

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Includes ganister for refractory purposes and sandstone for road work, and for foundations, riprap, and rubble.

TABLE 62.—LIME SOLD OR USED BY PRODUCERS IN ILLINOIS, 1945 AND 1946[a]

Kind and use	1945				1946				
	Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		Percent change in amount from 1945
			Total	Av.			Total	Av.	
Quicklime and sintered dolomite									
Building lime	3	4,248	$ 49,519	$11.66	3	7,382	$ 60,974	$8.26	+73.8
Sintered dolomite and metallurgical lime	6	201,533	1,582,040	7.85	6	180,316	1,502,323	8.33	−10.5
Water and sewage treatment	3	16,552	118,974	7.19	4	15,660	118,954	7.60	− 5.4
Paper manufacturing	3	15,929	104,927	6.59	—	[c]	[c]	—	—
Other chemical and industrial uses	2	14,565	105,191	7.22	3	30,806	225,604	7.32	+ 1.0
Total	7	252,827	1,960,651	7.75	6	234,164	1,907,855	8.15	− 7.4
Hydrated lime									
Building lime	4	2,936	30,626	10.43	4	5,042	48,650	9.65	+71.7
Water treatment	4	18,906	138,795	7.34	4	20,046	169,150	8.44	+ 6.0
Other chemical and industrial uses	3	12,938	98,837	7.64	3	14,364	117,783	8.20	+11.0
Total	5	34,780	268,258	7.71	4	39,452	335,583	8.51	+13.4
Total lime	7	287,607	$2,228,909	$7.75	6	273,616	$2,243,438	$8.20	− 4.9

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Included in "Other chemical and industrial uses."

CLAYS, CLAY PRODUCTS

Clays and clay products (including fuller's earth and silica refractories), sold and shipped by producers in Illinois in 1946, were valued at $33,062,000 and replaced stone and rock products as the third largest mineral industry in Illinois, ranking next to coal and petroleum.

The sales of clays and clay products during 1946 showed an increase of $13,570,000 in value over those for 1945. This increase amounted to 70 percent, which was the largest total increase in value as well as the largest proportional increase, for any mineral group in Illinois for 1946.

Clays Including Fuller's Earth

Clays (including fuller's earth) which were sold and shipped as such, amounted to 206,000 tons, valued at the mines or pits at $865,000, a decrease of 5 percent in value from the previous year (table 63). Clays used by their producers in the manufacture of clay products at their own plants are not included, but are reported in the resultant clay products in table 64.

Total clays (except fuller's earth) which were sold and shipped as such, increased 2 percent in amount and 11 percent in value from the previous year. Of the several kinds of clay, stoneware clay showed the greatest increase. Sales and shipments of this type of clay by producers in 1946 amounted to 24,800 tons and were valued at the mines or pits at $42,800, showing increases of 307 percent in amount and 225 percent in value from 1945. This large increase is reflected in the products for which this material was used—whiteware and pottery, which increased 363 percent in amount and 257 percent in value.

Fuller's earth, sold and used by producers in Illinois in 1946 amounted to 33,134 tons, and was valued at the plants at $296,637, a decrease of 24 percent in amount and 26 percent in value from the previous year. This material is used for oil refining and cleaners and as an oil absorbent.

Ceramic uses of clays sold and shipped as such in 1946 amounted to 140,000 tons, valued at the mines or pits at $325,000, an increase of 26 percent in amount and 36 percent in value from 1945. The largest ceramic use was for whiteware and pottery. Other uses were for refractories and structural clay products.

Nonceramic uses of clays in 1946 amounted to 66,000 tons, valued at the plants at $540,000, a decrease of 35 percent in amount and 20 percent in value from the previous year. Nonceramic uses comprised 32 percent in amount and 62 percent in value of all clays sold or shipped as such during 1946, and included mortar mix, bonding foundry sands, and fillers.

Clay Products, Including Silica Refractories

Clay products (including silica refractories), sold and shipped by producers in Illinois in 1946 were valued at the plants at $32,197,000, an increase of 73 percent from 1945, and the highest value since 1927 when total sales of clay products amounted to $34,452,600. Each classification of clay products contributed to this outstanding figure as each showed a large increase in value of sales for 1946. Refractories represented 16 percent of the value of clay products sold; whiteware and pottery sales amounted to 38 percent, and structural clay products led the group with 46 percent of the total sales (table 64).

REFRACTORIES

Refractories, clay and silica, amounted to 208,800 tons, valued at the plants at $5,170,800. This was a decrease of 8 percent in amount, and an increase of 24 percent in value from the previous year, an average rise of $6.50 per ton.

STRUCTURAL CLAY PRODUCTS

Structural clay products amounted to 1,752,400 tons, valued at the plants at $14,752,200. These totals showed the remarkable increase of 56 percent in amount and 97 percent in value from 1945. Building operations, which were stimulated by

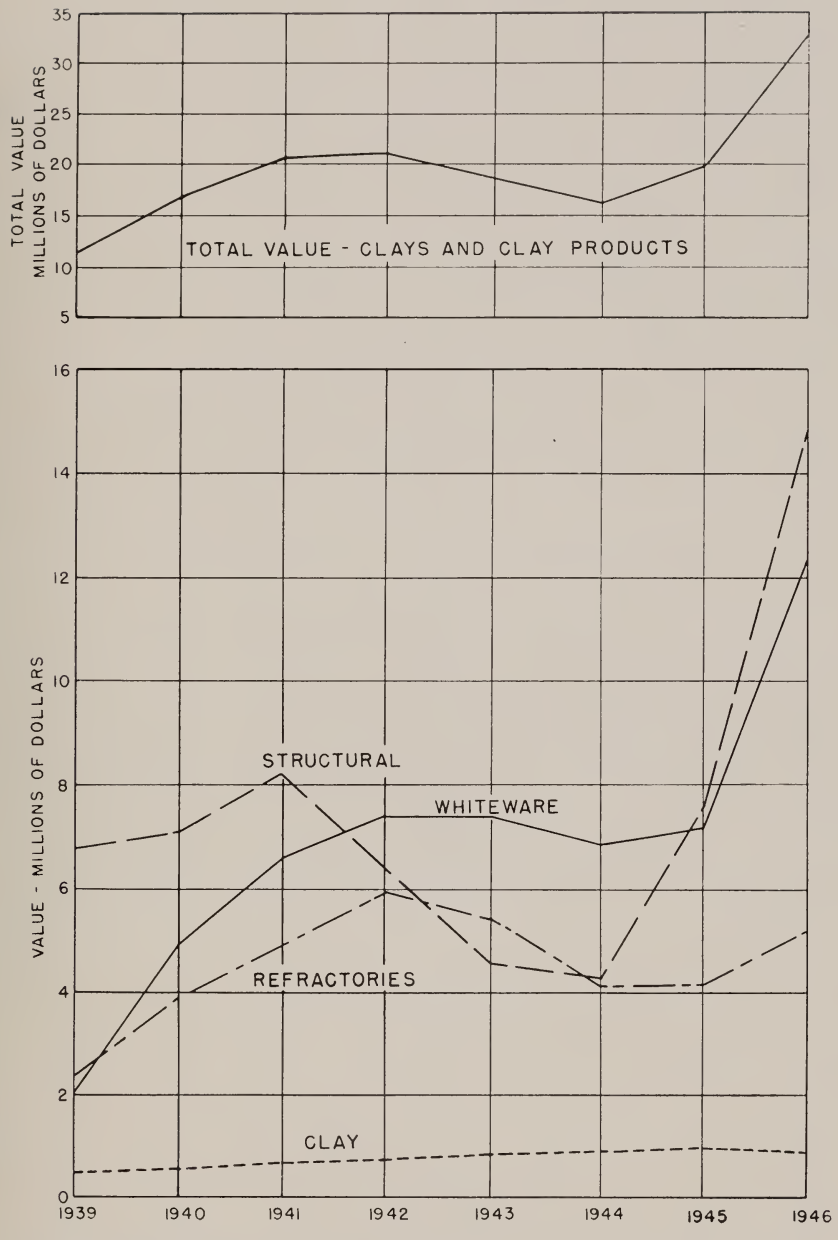

FIG. 15.—Value of annual sales of clays and clay products by producers in Illinois, 1939–1946.

TABLE 63—CLAYS (INCLUDING FULLER'S EARTH), SOLD AND SHIPPED BY PRODUCERS IN ILLINOIS, BY KINDS AND BY USES, 1945 AND 1946[a]

	1945				1946					
	Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		Percent change in amount from 1945	Percent change in value from 1945
			Total	Av.			Total	Av.		
Kind										
Fire clay	5	152,204	$461,421	$3.03	5	144,236	$508,787	$3.53	− 5.2	+ 10.3
Stoneware clay	3	6,089	13,157	2.16	5	24,801	42,845	1.73	+307.3	+225.6
Kaolin	2	183	1,492	8.15	5	[c] 3,857	[c] 16,752	4.34	− 65.4	− 54.0
Shale and surface clay	2	10,953	34,909	3.19	—	—	—	—	—	—
Total clays (except Fuller's earth)	12	169,429	510,979	3.02	13	172,894	568,384	3.29	+ 2.0	+ 11.2
Fuller's earth	1	43,664	403,085	9.23	1	33,134	296,637	8.95	− 24.1	− 26.4
Total clays sold and shipped	13	213,093	914,064	4.29	14	206,028	865,021	4.20	− 3.2	− 5.4
Use										
Ceramic										
Refractories: laying and daubing	3	101,454	215,180	2.12	3	91,652	200,969	2.20	− 9.7	− 6.6
Mfg. fire brick, retorts, crucibles, etc.	4	372	5,867	15.77	3	17,667	73,056	4.13	—	—
Structural products	1	3,675	4,144	1.13	2	3,078	4,121	1.34	− 16.2	− 0.6
Whiteware and pottery	4	5,969	13,047	2.19	5	27,611	46,539	1.69	+362.6	+256.7
Total ceramic uses	10	111,470	238,238	2.14	11	140,008	324,685	2.32	+ 25.7	+ 36.3
Nonceramic										
Bonding foundry sands	3	35,969	157,711	4.38	—	[d]	[d]	—	—	—
Fillers and other nonceramic uses	4	21,990	115,030	5.23	3	32,886	243,699	7.41	− 43.3	− 10.7
Oil refining, cleaners	1	43,664	403,085	9.23	1	33,134	296,637	8.95	− 24.1	− 26.4
Total nonceramic uses	6	101,623	675,826	6.67	4	66,020	540,336	8.18	− 35.2	− 20.0
Total clays sold and shipped	13	213,093	$914,064	$4.29	14	206,028	$865,021	$4.20	− 3.2	− 5.4

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Includes shale and surface clay.
[d] Included in fillers and other nonceramic uses.

TABLE 64.—CLAY PRODUCTS (INCLUDING SILICA REFRACTORIES), SOLD AND SHIPPED BY PRODUCERS IN ILLINOIS, 1945 AND 1946[a]

Kind	1945				1946					
	Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		Percent change in amount from 1945	Percent change in value from 1945
			Total	Av.			Total	Av.		
Refractories, clay and silica										
Firebrick and shapes	7	197,971	$3,426,008	$17.31	7	178,135	$ 4,277,938	$24.02	− 10.0	+ 24.9
Plastic and castable refractories	5	10,725	324,188	30.23	4	11,671	465,080	39.84	+ 8.8	+ 43.5
Cements and mortars	6	8,722	330,075	37.84	6	7,089	313,052	44.16	− 18.7	− 5.2
Other refractories	5	10,337	90,706	8.77	5	11,907	114,718	9.63	+ 15.1	+ 26.5
Total refractories	11	227,755	4,170,977	18.31	10	208,802	5,170,788	24.81	− 8.3	+ 24.0
Structural clay products		thous.				thous.				
Common brick	23	310,537	4,614,749	14.86	29	459,700	8,164,736	17.76	+ 48.3	+ 76.9
Face brick	16	48,302	1,012,147	20.95	16	128,604	3,048,626	23.71	+166.2	+201.2
Paving block	1	472	14,978	31.73	1	206	6,239	30.29	− 56.4	− 58.3
		tons				tons				
Total (in equivalent tons)	28	898,753	5,641,874	6.28	34	1,470,750	11,219,601	7.63	+ 63.6	+ 98.9
Drain tile	11	69,115	599,304	8.67	16	88,669	831,729	9.38	+ 28.3	+ 38.8
Structural tile	16	62,580	388,622	6.21	12	80,276	696,015	8.67	+ 28.3	+ 79.4
Sewer pipe, flue lining, wall coping	3	19,371	478,715	24.71	3	26,752	726,025	27.14	+ 13.8	+ 51.7
Terra cotta and glazed block[c]	—	—	—	—	—	—	—	—	—	—
Other structural products	5	73,956	377,538	5.10	4	85,981	1,278,884	14.87	+ 11.6	+238.7
Total structural clay products	38	1,123,775	7,486,053	6.66	50	1,752,428	14,752,254	8.42	+ 55.9	+ 97.0
Whiteware and pottery										
Flowerpots	2	—	111,494	—	2	—	174,000	—	—	+ 56.0
Stoneware and Kitchenware	4	—	1,160,663	—	4	—	1,463,820	—	—	+ 26.1
Garden Pottery	—	—	—	—	1	—	1,260,000	—	—	—
Dinnerware and art china	3	—	422,200	—	3	—	470,300	—	—	+ 11.4
Art Pottery	5	—	1,566,683	—	5	—	2,697,917	—	—	+ 72.2
Vitreous-china plumbing fixtures	3	—	2,886,253	—	3	—	5,013,504	—	—	+ 73.7
Porcelain and other whiteware	3	—	773,590	—	3	—	1,194,783	—	—	+ 54.4
Total whiteware and pottery	15	—	6,920,883	—	16	—	12,274,324	—	—	+ 77.4
Total clay products	63	—	18,577,913	—	75	—	32,197,366	—	—	+ 73.3
Total clays and clay products (Tables 63 and 64)	70	—	$19,491,977	—	82	—	$33,062,387	—	—	+ 69.6

[a] Summary of canvass made by Illinois Geological Survey. [b] Number of plants reporting production. [c] Included in "Other structural products."

the resumption of civilian construction in 1945, continued on the up–grade. Many plants which had been closed during the war years reopened as soon as machinery could be put in working order, and labor obtained. Other plants which had continued to operate under a greatly curtailed schedule, stepped up production as rapidly as possible in an endeavor to meet the demand. This resulted in the great increase in tonnage of structural clay products sold and shipped in 1946. The large increase in value, 97 percent from 1945, indicated the trend toward rising prices of building materials.

Common brick sold were valued at $8,164,700 and showed an increase of 77 percent from 1945, an average increase of $2.90 per thousand.

Face brick sold in 1946 increased 166 percent in amount and 201 percent in value showing a total value of $3,048,600.

Drain tile and structural tile sold in 1946 each showed an increase of 28 percent in amount. Drain tile valued at $831,720 increased 39 percent in value from 1945, and structural tile, valued at $696,000 showed an increase of 79 percent.

Other structural products included facing block, haydite, roofing granules, terra cotta, and glazed block. These products were valued at $1,278,900 and showed an increase of 239 percent from the previous year.

Paving block sold or shipped in 1946 was the only structural clay product to show a decrease. It dropped 58 percent in value from 1945.

WHITEWARE AND POTTERY

Whiteware and pottery sold and shipped by producers in Illinois in 1946 were valued at $12,274,300, an increase of 77 percent from 1945. This large increase was due, in part, to the return to peace–time production of plants which had been engaged in war work.

Flowerpots, valued at $174,000 showed an increase of 56 percent.

Stoneware and kitchenware were valued at $1,463,000, a gain of 26 percent over 1945.

Dinnerware and art china, which for 3 consecutive years had shown little change in value, increased 11 percent in value from 1945, and were valued $470,300.

Art pottery sold in 1946 was valued at $2,697,900, an increase of 72 percent from the previous year.

Vitreous–china plumbing fixtures, valued at $5,013,500 showed the largest increase in the whiteware and pottery group. This amounted to 74 percent gain over 1945.

Other whiteware and porcelain included saggers, electric porcelain and miscellaneous products. Valued at $1,194,800, these showed an increase of 54 percent from 1945.

SAND AND GRAVEL

Silica Sand

Silica sand sold or used by producers in Illinois in 1946 amounted to 2,256,500 tons, and was valued at the plants at $3,407,500, as shown in table 65. This was a decrease of 13 percent in amount and 8.4 percent in value from 1945. Silica sand is used almost entirely for industrial purposes, and in 1946 only 1 percent of that sold or used by producers in Illinois was for construction work.

Other Sand and Gravel

Other sand and gravel sold or used by producers in Illinois in 1946, amounted to 15,043,300 tons, and was valued at the plants at $8,621,900. This was an increase of 60 percent in amount and 84 percent in value from the previous year. Of this quantity almost 13 percent came from government–and–contractor operations, which includes the State of Illinois, counties, townships and municipalities, produced either by themselves or by contractors expressly for their use. Purchases by government agencies from commercial producers are included in commercial operations.

Other sand amounted to 4,810,600 tons, and was valued at the plants at $2,829,100, an increase of 45 percent in amount and 65 percent in value from 1945. Structural sands showed the largest increase in tonnage, 1,010,700 tons, whereas paving sands showed the highest proportional increase, 147 percent.

Gravel comprised 68 percent of the total quantity of other sand and gravel sold or used by producers in Illinois in 1946. It amounted to 10,232,700 tons and was valued at the pits at $5,792,700, showing an increase of 68 percent in amount and 94 percent in value from the previous year. Railroad–ballast gravel decreased 35 percent in amount and 32 percent in value, but gravel for all other uses increased both in quantity and value. Structural gravel and paving gravel showed outstanding increases for both commercial and government–and–contractor operations (table 66).

Total sand (including silica sand) and gravel, amounted to 17,299,800 tons, valued at $12,029,500, an increase of 44.5 percent in amount and 43 percent in value from 1945.

This exceeds in value the previous high record of 1928 when sand and gravel sold or used by producers in Illinois were valued at $10,243,500.

Annual production and value of sand (including silica sand) and gravel in Illinois is shown graphically in figure 16 for each year since 1920. The average value per ton for each year is also given.

TABLE 65.—SILICA SAND, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1945 AND 1946[a]

Use	Type of operation	1945				1946				Percent change in amount from 1945
		Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		
				Total	Av.			Total	Av.	
Industrial Sands										
Glass sand	Commercial	4	969,321	$1,461,958	$1.51	3	937,809	$1,516,202	$1.62	− 3.3
Steel molding sand	"	12	1,311,579	1,612,858	1.23	13	1,071,021	1,264,706	1.18	−18.3
Blast, grinding and polishing sands	"	3	125,541	398,370	3.17	3	106,654	357,847	3.36	−15.0
Fire or furnace sand	"	3	63,893	59,404	.93	—	[c]	[c]	—	—
Engine and filter sands	"	3	11,933	30,837	2.58	2	34,971	71,358	2.04	−53.9
Other silica sand[d]	"	4	80,193	138,702	1.73	3	84,047	171,644	2.04	+ 4.8
Total	Commercial	13	2,562,460	3,702,129	1.44	13	2,234,502	3,381,757	1.51	−12.8
Construction Sands										
Structural and paving sands	Commercial	2	14,000	21,602	1.54	2	22,001	25,790	1.17	+57.2
Total silica sand	Commercial	13	2,576,460	$3,723,731	$1.45	13	2,256,503	$3,407,547	$1.51	−12.8

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Included in "Engine and filter sands."
[d] Except sand ground for silica flour, which is given in table 67, "Ground Silica."

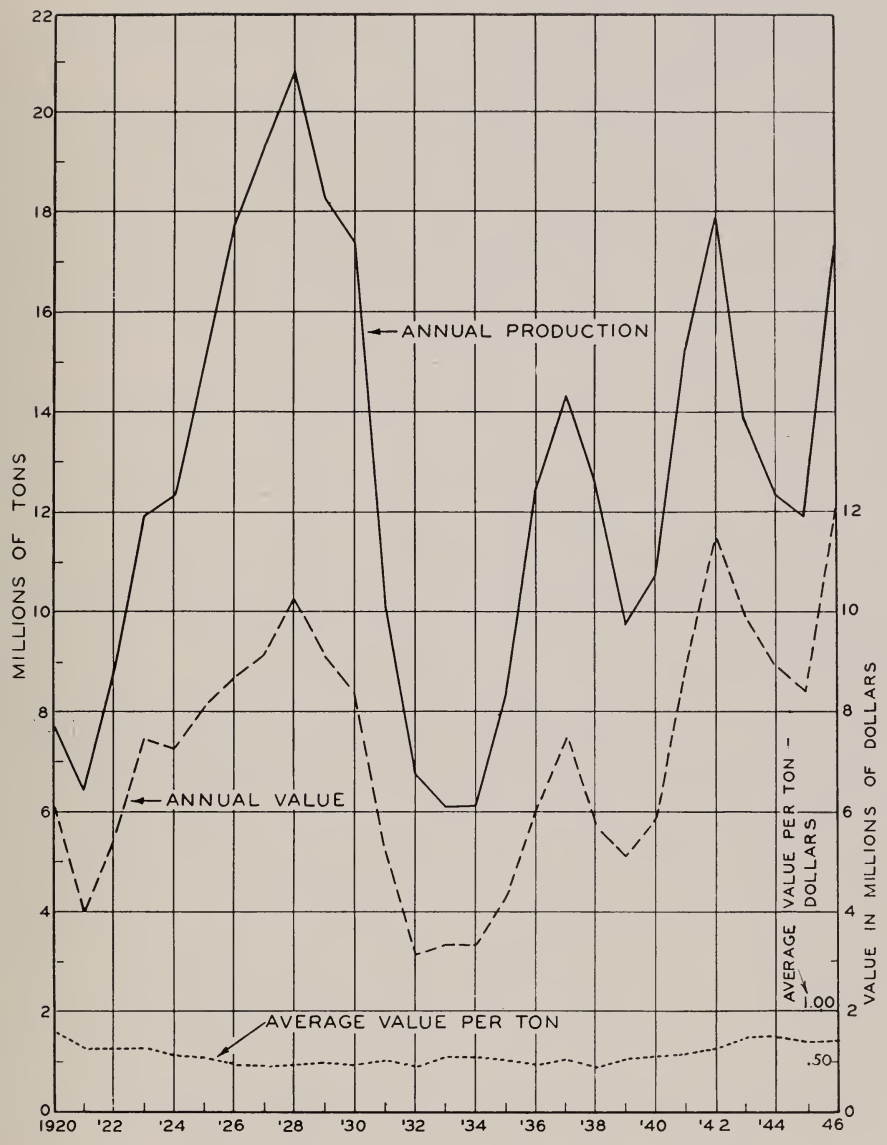

FIG. 16.—Annual production and value of sand (including silica sand) and gravel in Illinois, 1920–1946.

TABLE 66.—SAND (OTHER THAN SILICA SAND) AND GRAVEL, SOLD OR USED BY PRODUCERS IN ILLINOIS, 1945 and 1946[a]

Kind and use	Type of operation	1945				1946				Percent change in amount from 1945
		Plants[b]	Amount tons	Value at plants		Plants[b]	Amount tons	Value at plants		
				Total	Av.			Total	Av.	
Sand (other than silica sand)										
Industrial Sands										
Natural-bonding molding sand	Commercial	7	114,860	$ 136,516	$1.19	8	118,163	$ 211,254	$1.79	+ 2.9
Engine sand	"	11	163,222	86,765	.53	11	166,333	86,958	.52	+ 1.9
Total	Commercial	18	278,082	223,281	.80	19	284,496	298,212	1.05	+ 2.3
Construction Sands										
Structural sands[c]	Commercial	53	1,799,162	833,995	.46	57	2,809,908	1,511,851	.53	+ 56.2
Paving and highway-structures sand	"	36	507,002	292,499	.58	39	1,252,880	771,387	.62	+147.1
Paving and highway-structures sand	Gov.-contr.	5	271,990	176,715	.65	5	50,850	27,500	.54	− 81.3
Railroad-ballast sand	Commercial	7	342,165	105,825	.39	7	163,384	57,683	.35	− 52.3
Other construction sands	"	9	107,982	76,403	.71	11	249,086	162,515	.65	+130.7
Total	Both	73	3,028,301	1,485,437	.49	77	4,526,108	2,530,936	.56	+ 49.5
Total sand (other than silica sand)	Commercial	73	3,034,393	1,532,003	.50	81	4,759,754	2,801,648	.59	+ 56.9
Total sand (other than silica sand)	Gov.-contr.	7	271,990	176,715	.65	5	50,850	27,500	.54	− 81.3
Total sand (other than silica sand)	Both	80	3,306,383	1,708,718	.49	86	4,810,604	2,829,148	.59	+ 45.5
Gravel										
Structural gravel[c]	Commercial	64	1,808,800	967,177	.53	67	3,240,357	2,002,301	.62	+ 79.1
Structural gravel[c]	Gov.-contr.	—	[d]	[d]	—	—	[d]	[d]	—	—
Paving and highway-structures gravel	Commercial	*75	*2,103,555	*1,101,547	.52	85	3,919,993	2,146,739	.55	+ 86.3
Paving and highway-structures gravel	Gov.-contr.	37	465,330	251,483	.54	41	1,864,446	1,155,446	.62	+300.7
Railroad-ballast gravel	Commercial	15	1,640,566	614,512	.37	17	1,061,038	419,721	.40	− 35.3
Other gravel	"	9	74,809	41,086	.55	14	146,835	68,550	.47	+ 96.3
Total	Both	141	6,093,060	2,975,805	.49	158	10,232,669	5,792,757	.57	+ 67.9
Total gravel	Commercial	104	5,627,730	2,724,322	.48	117	8,368,223	4,637,311	.55	+ 48.7
Total gravel	Gov.-contr.	37	465,330	251,483	.54	41	1,864,446	1,155,446	.62	+300.7
Total gravel	Both	141	6,093,060	2,975,805	.49	158	10,232,669	5,792,757	.57	+ 67.9

Total sand (other than silica sand) and gravel	Commercial...	118	8,662,123	4,256,325	.49	133	13,127,977	7,438,959	.57	+ 51.6
Total sand (other than silica sand) and gravel	Gov.-contr....	39	737,320	428,198	.58	43	1,915,296	1,182,946	.62	+159.8
Total sand (other than silica sand) and gravel	Both.....	157	9,399,443	4,684,523	.50	78	15,043,273	8,621,905	.57	+ 60.0
Summary–Sand (including silica sand) and gravel (Tables 65 and 66)										
Total industrial sands (including silica sand)	Both.....	31	2,840,542	3,925,410	1.38	32	2,540,999	3,705,759	1.46	− 10.5
Total construction sands and gravel...	Both.....	151	9,135,361	4,482,844	.49	167	14,758,777	8,323,693	.57	+ 61.5
Total sand (including silica sand) and gravel (Tables 65 and 66)	Both.....	170	11,975,903	$8,408,254	$0 70	189	17,299,776	$12,029,452	$0.70	+ 44.5

* Revised figures.
[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Number of plants reporting production.
[c] Excludes highway structures.
[d] Included in "Paving and highway-structures gravel, Gov.-contr. operations."

SILICA AND TRIPOLI

Ground Silica

During 1946 the amount of ground silica or silica flour, made by fine grinding of washed silica sand, which was sold or used by producers in Illinois, amounted to 138,000 tons, valued at the plants at $1,002,800, as shown in table 67. This was a decrease of 1.7 percent in amount and an increase of 7.2 percent in value from 1945. Silica sand is used in the abrasive, foundry, filler, ceramic, and other fields. In the ceramic industry, ground silica is known as "silica flour" or "potter's flint."

Table 67.—Ground Silica, Sold or Used by Producers in Illinois, 1945 and 1946[a]

Use	1945			1946			
	Amount tons	Value at plants		Amount tons	Value at plants		Percent change in amount from 1945
		Total	Av.		Total	Av.	
Abrasive	47,839	$296,740	$6.20	45,036	$ 304,152	$6.75	− 5.9
Enamel and glass	7,018	54,315	7.74	10,029	74,944	7.47	+ 42.9
Foundry and filler	56,276	385,719	6.85	27,377	187,627	6.85	− 51.4
Pottery, porcelain and tile	13,318	88,334	6.63	19,166	148,615	7.75	+ 43.9
Other uses	15,925	110,281	6.93	36,415	287,498	7.90	+128.7
Total	140,376	$935,389	$6.66	138,023	$1,002,836	$7.27	− 1.7

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.

Table 68.—Tripoli ("Amorphous" Silica), Sold or Used by Producers in Illinois, 1942–1946[a]

Year	Amount tons	Value at plants		Percent change in amount from previous year
		Total	Av.	
1942	12,575	$203,390	$16.17	+ 9.1
1943	10,203	168,758	16.54	−18.9
1944	12,031	205,732	17.02	+17.9
1945	11,144	184,189	16.53	− 7.4
1946	[b]	[b]	—	—

[a] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.
[b] Not available.

FLUORSPAR[8]

Production

Fluorspar production, shipments, and consumption in the U. S. in 1946, according to the Bureau of Mines, U. S. Department of the Interior, although smaller than during the years of World War II, were greater than any year in World War I. The various causes contributing to this decrease were a lessened demand, the coal strikes, and a prolonged strike at one of largest fluorspar producing mines.

[8] Prepared by Nina T. Hamrick, Research Assistant.

Production of finished fluorspar from domestic ore was 277,300 net tons in 1946, as compared with 325,200 tons in 1945. Although the output of metallurgical–grade and acid–grade was ample for requirements throughout the year, there was a shortage in the supply of ceramic–grade at times during 1946.

The 1946 shipments from mines (tables 69 and 70) aggregated 277,940 net tons in comparison with 323,961 tons in 1945. This was a decrease of 33 percent from the

Table 69.—Fluorspar Shipped from Mines in the United States, by States, 1945 and 1946[a]

State	1945			1946		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Arizona	1,126	$ 21,016	$18.66	389	$ 7,959	$20.46
Colorado	52,437	1,333,735	25.43	32,539	925,867	28.45
Illinois	147,251	5,014,807	34.06	154,525	5,493,642	35.55
Kentucky	95,142	2,832,945	29.78	63,143	1,889,454	29.92
New Mexico	14,449	390,331	27.01	17,584	489,607	27.84
Nevada	7,038	304,045	22.43	6,234	232,440	23.82
Texas	3,413			1,118		
Utah	2,973			2,370		
Washington	132			38		
Total	323,961	$9,896,879	$30.55	277,940	$9,038,969	$32.52

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.

Table 70.—Fluorspar Shipped from Mines in the United States, by Uses, 1945 and 1946[a]

Use	1945			1946		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
Steel	186,073	$5,182,059	$27.85	134,295	$3,843,038	$28.62
Iron foundry	3,422	94,852	27.72	4,855	137,507	28.32
Glass	32,300	1,033,737	32.00	39,837	1,306,005	32.78
Enamel	3,660	128,612	35.14	7,540	262,530	34.82
Hydrofluoric acid	80,155	2,896,267	36.13	79,047	3,111,291	39.36
Miscellaneous	7,482	254,560	34.02	6,730	221,001	32.84
Government stock pile	9,449	260,853	27.61	3,907	93,800	24.01
Foreign consumption	1,420	45,939	32.35	1,729	63,797	36.90
Total	323,961	$9,896,879	$30.55	277,940	$9,038,969	$32.52

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.

TABLE 71.—FLUORSPAR SHIPPED FROM MINES IN THE UNITED STATES, BY GRADES AND INDUSTRIES, IN SHORT TONS, 1945 AND 1946[a]

Grade and industry	1945	1946	Grade and industry	1945	1946
Fluxing gravel and foundry lump:			Ground and flotation concentrates:		
Ferrous	[b]184,645	[b]134,822	Ferrous	[c,d]6,791	[c,d]5,939
Nonferrous	1,170	1,410	Nonferrous	2,211	2,231
Cement	326	661	Glass and enamel	35,960	47,377
Miscellaneous	158	175	Hydrofluoric acid	79,562	78,780
Government stock pile	7,225	3,907	Miscellaneous	1,638	625
			Government stock pile	2,224	—
Total	[b]193,524	[b]140,975	Exported	1,420	1,729
			Total	[d]129,806	[d]136,681
Acid lump:					
Ferrous	36	15	Total:		
Nonferrous	2	2	Ferrous	191,472	140,776
Hydrofluoric acid	593	267	Nonferrous	3,383	3,643
			Cement	326	661
Total	631	284	Glass and enamel	35,960	47,377
			Hydrofluoric acid	80,155	79,047
			Miscellaneous	1,796	800
			Government stock pile	9,449	3,907
			Exported	1,420	1,729
			Total	323,961	277,940

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.
[b] Includes 4,182 and 9,129 tons, respectively, of flotation concentrates, which were blended with fluxing gravel in 1945 and 1946.
[c] Includes pelletized gravel.
[d] Excludes 4,182 and 9,129 tons, respectively, of flotation concentrates, which were blended with fluxing gravel in 1945 and 1946.

TABLE 72.—FLUORSPAR (DOMESTIC AND FOREIGN), CONSUMED AND IN STOCK IN THE UNITED STATES, BY INDUSTRIES, IN SHORT TONS, 1945 AND 1946[a]

Industry	1945			1946		
	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31	Consumption	Stocks at consumers' plants Dec. 31	In transit to consumers' plants Dec. 31
Basic open-hearth steel	176,488	67,800	5,871	145,631	65,341	3,005
Electric-furnace steel	20,873			14,898		
Bessemer steel	555			220		
Iron foundry	3,877	1,082	51	4,925	1,165	66
Ferro-alloys	2,909	1,013	—	2,044	927	—
Hydrofluoric acid	109,315	20,757	506	83,901	17,431	1,810
Primary aluminum	1,190	665	—	1,417	1,182	—
Primary magnesium	811	757	—			
Glass	31,874	5,962	681	39,852	7,136	1,414
Enamel	3,695	1,433	101	6,739	1,946	283
Welding rod	1,457	257	—	417	181	—
Cement	365	1,214	—	608	1,262	—
Miscellaneous	2,681	2,208	12	2,538	2,092	125
Total	356,090	103,148	7,222	303,190	98,663	6,703

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.

TABLE 73.—SALIENT STATISTICS OF FINISHED FLUORSPAR IN THE UNITED STATES, 1943–1945, AND JANUARY–DECEMBER 1946, IN NET TONS[a]

Date	Production	Shipments from mines	General imports (receipts)	Consumption	Stocks at end of period			
					Consumers' plants	Domestic mines	Office of metals reserve	Total[b]
1943	405,600	406,016	43,769	388,885	105,933	19,026	36,223	161,182
1944	413,700	413,781	92,499	410,170	98,446	19,021	129,885	247,352
1945	325,200	323,961	100,726	356,090	103,148	20,249	198,856	322,253
1946:								
January	19,380	12,191	3,238	18,155	101,395	26,904	178,553	306,852
February	17,425	13,181	2,773	13,767	100,930	31,148	178,339	310,417
March	20,267	20,666	1,333	25,492	96,832	30,749	153,700	281,281
April	19,819	24,894	3,028	25,257	96,598	25,674	77,595	199,867
May	13,248	17,257	1,140	20,872	99,165	21,665	77,595	198,425
June	21,519	21,913	1,941	25,239	93,681	21,271	77,595	192,547
July	24,010	23,285	2,797	27,888	93,247	21,996	77,125	192,368
August	24,450	24,923	2,213	28,435	91,687	21,523	77,125	190,335
September	25,914	27,484	1,431	29,130	89,093	19,953	77,125	186,171
October	29,220	32,732	914	30,086	89,376	16,441	29,254	135,071
November	30,581	30,756	3,129	29,476	93,163	16,266	29,254	138,683
December	31,153	27,278	2,863	28,260	97,269	20,141	29,254	146,664
Total	276,986	276,560	26,800	302,057	—	—	—	—

[a] U. S. Bureau of Mines, Monthly Fluorspar Report No. 34, February 11, 1947.
[b] Excludes stocks held by Treasury Procurement Division.

all–time high of 413,781 net tons in 1944 and a decrease of 14 percent from 1945 shipments. A further division of shipments from mines by grades and industries is given in table 71. Shipments by river or river–rail were 51,428 tons in 1946 as compared with 52,718 tons in 1945.

Illinois maintained its rank as the chief producing state in 1946 by supplying 56 percent of the total shipments. This is a 10 percent higher percentage of the national total than in 1945. Illinois and New Mexico were the only producing states to record increases in shipments in 1946.

STOCKS

Stocks of fluorspar at consumers' plants, table 72, amounted to 98,663 net tons on December 31, 1946, which was 4 percent less than stocks on hand on December 31, 1945, but slightly more than those on hand at the close of 1944. Stocks of finished fluorspar at the mines were 18,957 net tons, a decline of 5 percent from the 20,249 tons on hand at the close of 1945.

Stocks of finished fluorspar held by the Office of Metals Reserve on December 31, 1946, totaled 29,254 tons (table 73) and comprised 27,591 tons of metallurgical grade and 1,663 tons of acid grade.

TABLE 74.—FLUORSPAR IMPORTED FOR CONSUMPTION IN THE UNITED STATES, BY COUNTRIES, 1945 AND 1946[a]
(Source: U. S. Department of Commerce)

Country	1945		1946	
	Short tons	Value	Short tons	Value
Canada	[b] 2,361	[b]$ 75,085	310	$ 8,934
Mexico	62,575	1,054,692	24,063	384,757
Newfoundland	[b] 10,875	[b] 332,556	2,688	80,640
Spain	27,322	694,125	2,791	82,484
Total	103,133	$2,156,458	29,852	$ 516,815

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.
[b] Bureau of Mines has determined that 1,691 tons valued at $56,918 credited to Canada by the U. S. Department of Commerce, originated in Newfoundland.

IMPORTS

There was a decided decrease in fluorspar imported for consumption in the United States. Imports, which amounted to 103,133 net tons in 1945, suddenly dropped to 29,852 tons in 1946 (table 74), according to final data from U. S. Bureau of Mines.

The amount of imported fluorspar delivered to consumers in the United States, 1945–1946, by uses, is shown in table 75, whereas table 76 gives a detailed report, by months, for 1946.

Although the United States had become practically independent of foreign fluorspar during the 1930's, the war years found the government encouraging Mexico to develop large deposits, with the result that in both 1944 and 1945 Mexico exported approximately 60,000 tons to the United States. This was largely a low-grade ore which had to undergo processing in flotation mills after it reached this country. However, 1946 found the fluorspar industry rapidly adjusting from the heavy demands of the war years and foreign fluorspar again playing a minor part in fluorspar consumption in this country.

CONSUMPTION

Consumption of fluorspar (table 77) showed a further decline to 303,190 net tons in 1946 from 356,090 tons in 1945 and from the all-time high of 410,170 net tons

TABLE 75.—IMPORTED FLUORSPAR DELIVERED TO CONSUMERS IN THE UNITED STATES, BY USES 1945 AND 1946[a]

Use	1945			1946		
	Short tons	Selling price at tidewater, border, or f.o.b. flotation mill in United States, including duty		Short tons	Selling price at tidewater, border, or f.o.b. flotation mill in United States, including duty	
		Total	Average		Total	Average
Steel	21,027	$ 555,530	$26.42	20,319	$485,592	$23 90
Hydrofluoric acid	22,579	811,025	35.92	5,143	163,659	31.82
Magnesium	60	2,100	35.00	—	—	—
Ferro-alloys	193	5,769	29.89	309	10,700	34.63
Glass and enamel	548	18,110	33.05	106	3,384	31.92
Other	125	4,625	37.00	186	4,238	22.78
Total	44,532	$1,397,159	$31.37	26,063	$667,573	$25.61

[a] U. S. Bureau of Mines, Mineral Market Report No. 1508, April 25, 1947.

TABLE 76.—GENERAL IMPORTS (RECEIPTS) OF FLUORSPAR INTO THE UNITED STATES, 1943–1945 AND JANUARY–DECEMBER 1946, IN SHORT TONS
(Source: U. S. Department of Commerce)[a]

Date	Containing more than 97 percent calcium fluoride				Containing not more than 97 percent calcium fluoride					Total
	Mexico	Newfoundland	Spain	Canada	Mexico	Newfoundland	Spain	Union of South Africa	United Kingdom	
1943	1,854	—	—	—	18,661	7,144	15,540	570	—	43,769
1944	2,779	2,352	—	70	60,843	13,720	9,177	3,557	1	92,499
1945	5,480	7,683	2,272	2,361	56,591	1,288	25,051	—	—	100,726
1946:										
January	169	—	—	—	3,078	—	—	—	—	3,238
February	221	—	—	—	2,552	—	—	—	—	2,773
March	272	—	—	—	1,061	—	—	—	—	1,333
April	523	—	—	—	2,505	—	—	—	—	3,028
May	126	—	—	—	1,014	—	—	—	—	1,140
June	338	—	—	75	1,528	—	—	—	—	1,941
July	150	—	—	58	1,824	—	765	—	—	2,797
August	588	—	—	—	1,625	—	—	—	—	2,213
September	479	—	—	—	952	—	—	—	—	1,431
October	245	—	—	—	669	—	—	—	—	914
November	421	—	—	120	1,486	—	1,102	—	—	3,129
December	409	—	—	57	1,473	—	924	—	—	2,863
Total	3,932	—	—	310	19,767	—	2,791	—	—	26,800

[a] U. S. Bureau of Mines, Monthly Fluorspar Report No. 34, February 11, 1947.

TABLE 77.—CONSUMPTION OF FLUORSPAR (DOMESTIC AND FOREIGN) IN THE UNITED STATES, BY INDUSTRIES 1943–1945, AND JANUARY–DECEMBER 1946[a]
(In net tons)

Date	Steel	Hydrofluoric acid	Glass	Enamel	Aluminum and Magnesium	Other	Total
1943	234,148	113,614	20,592	1,726	5,783	13,022	388,885
1944	230,201	129,553	27,315	2,547	7,081	13,473	410,170
1945*	197,916	109,315	31,874	3,695	[b]	13,290	356,090
1946:							
January	9,853	4,227	2,739	366	—	970	18,155
February	4,242	5,256	2,848	491	—	930	13,767
March	14,711	5,801	3,760	524	—	696	25,492
April	14,488	6,257	3,017	519	—	976	25,257
May	11,001	5,986	2,809	550	—	526	20,872
June	13,826	6,849	3,246	479	—	839	25,239
July	15,681	7,667	3,366	554	—	620	27,888
August	15,345	8,321	3,294	602	—	873	28,435
September	15,354	9,087	3,169	663	—	857	29,130
October	16,242	8,085	4,099	669	—	991	30,086
November	16,210	8,273	2,933	729	—	1,331	29,476
December	15,645	8,526	2,673	655	—	761	28,260
Total	162,598	84,335	37,953	6,801	—	10,370	302,057

* Revised figures.
[a] U. S. Bureau of Mines, Monthly Fluorspar Report No. 22, March 7, 1846 and No. 34, February 11, 1947.
[b] Included with "Other."

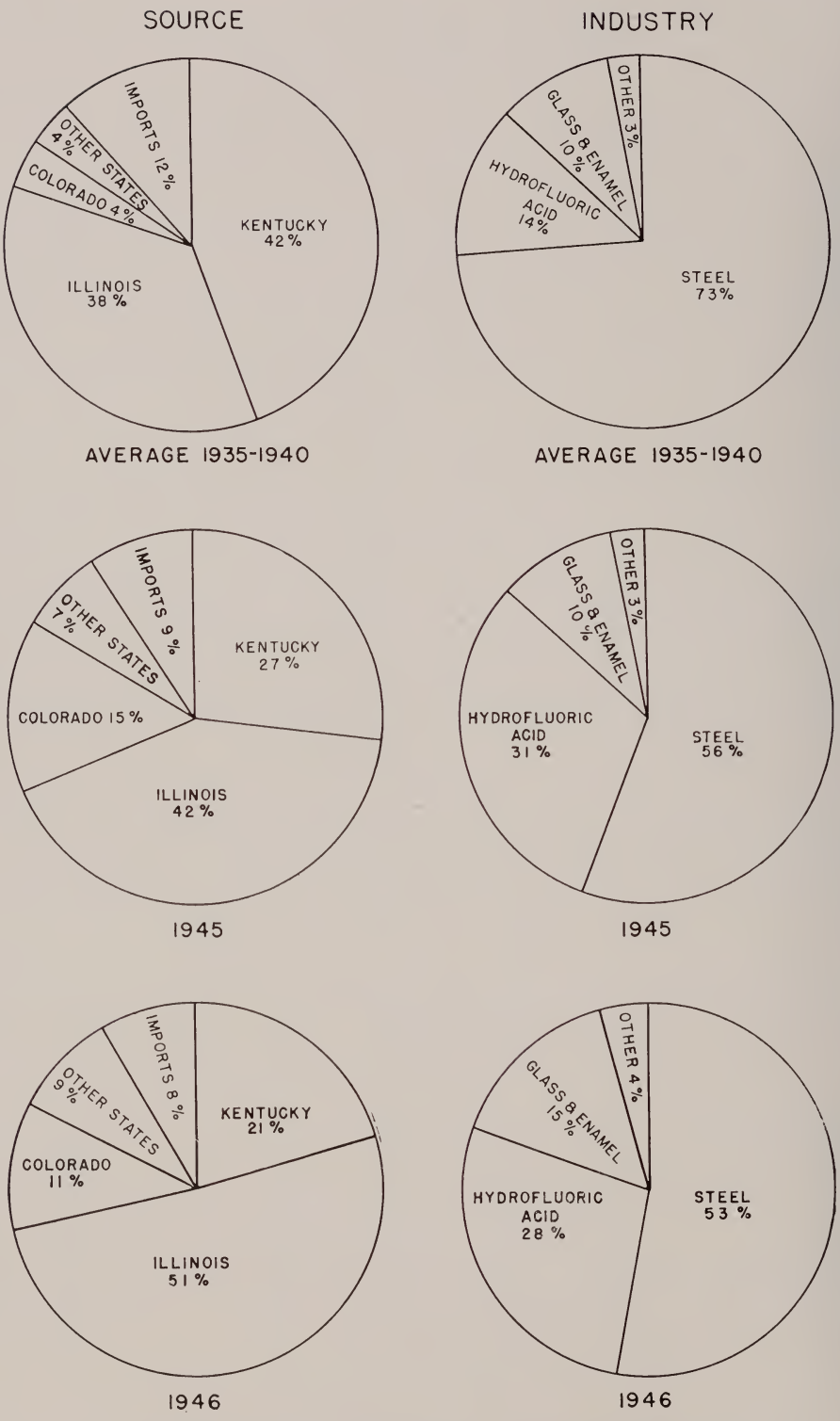

FIG. 17.—Average annual fluorspar consumption (of both domestic and foreign fluorspar) in the United States, 1935–1940, compared with 1945 and 1946, by sources and consuming industries.

in 1944. This is a decrease of more than 26 percent in the two-year period. The steel industry continued to be the principal consumer of fluorspar and accounted for 53 percent of the total in 1946 (figure 17). The average consumption of fluorspar per ton of basic open-hearth steel declined for the fourth consecutive year. It was reduced from 5.5 pounds in 1945 to 5.4 pounds in 1946. Consumption of fluorspar in the manufacture of hydrofluoric acid, still the second largest user, also declined. However, these losses were partially offset by gains in usage at glass and enamel plants. The use of fluorspar by manufacturers of glass established an all-time high of 39,852 net tons in 1946.

Figure 17 shows the comparative consumption, by industries and by sources, for 1945 and 1946 and the comparison between these years and the average for the six-year period, 1935–1940.

Table 78 presents a summary of the fluorspar shipped from mines by uses, since 1939 for the United States with comparative figures for Illinois since 1942, which is the earliest year for which these data are available. A graphic summary of this table is presented in figure 18. A close correlation may be noted between these percentages and those of actual consumption shown in figure 17.

Fluorspar was reported consumed in 38 states and the District of Columbia in 1946,

Table 78.—Fluorspar Shipped from Mines in Illinois and the United States, by Uses, 1939-1946[a]*

	Steel	Hydrofluoric Acid	Ceramics	All others	Total
1939					
Illinois	[b]	[b]	[b]	[b]	75,257
United States	125,371	27,463	21,884	5,077	179,795
1940					
Illinois	[b]	[b]	[b]	[b]	104,698
United States	162,772	33,608	20,269	8,469	225,118
1941					
Illinois	[b]	[b]	[b]	[b]	133,333
United States	214,120	52,674	32,051	9,640	308,485
1942					
Illinois	77,947	62,573	7,520	6,754	154,794
United States	225,233	68,083	22,813	15,171	351,300
1943					
Illinois	89,789	89,599	6,741	10,327	196,456
United States	220,809	123,680	21,059	23,354	388,902
1944					
Illinois	71,516	81,493	14,058	8,184	175,251
United States	219,361	121,084	29,859	17,101	387,604
1945					
Illinois	65,440	55,688	19,182	6,166	146,476
United States	186,073	80,155	35,960	10,904	313,092
1946					
Illinois	67,079	54,898	26,196	5,252	153,425
United States	134,295	79,047	47,377	11,585	272,304

* Does not include government stock piles and foreign consumption.
[a] U. S. Bureau of Mines; Minerals Yearbooks 1940-1945: M.M.S. 1508, April 25, 1947.
[b] Statistics not available by uses until 1942.

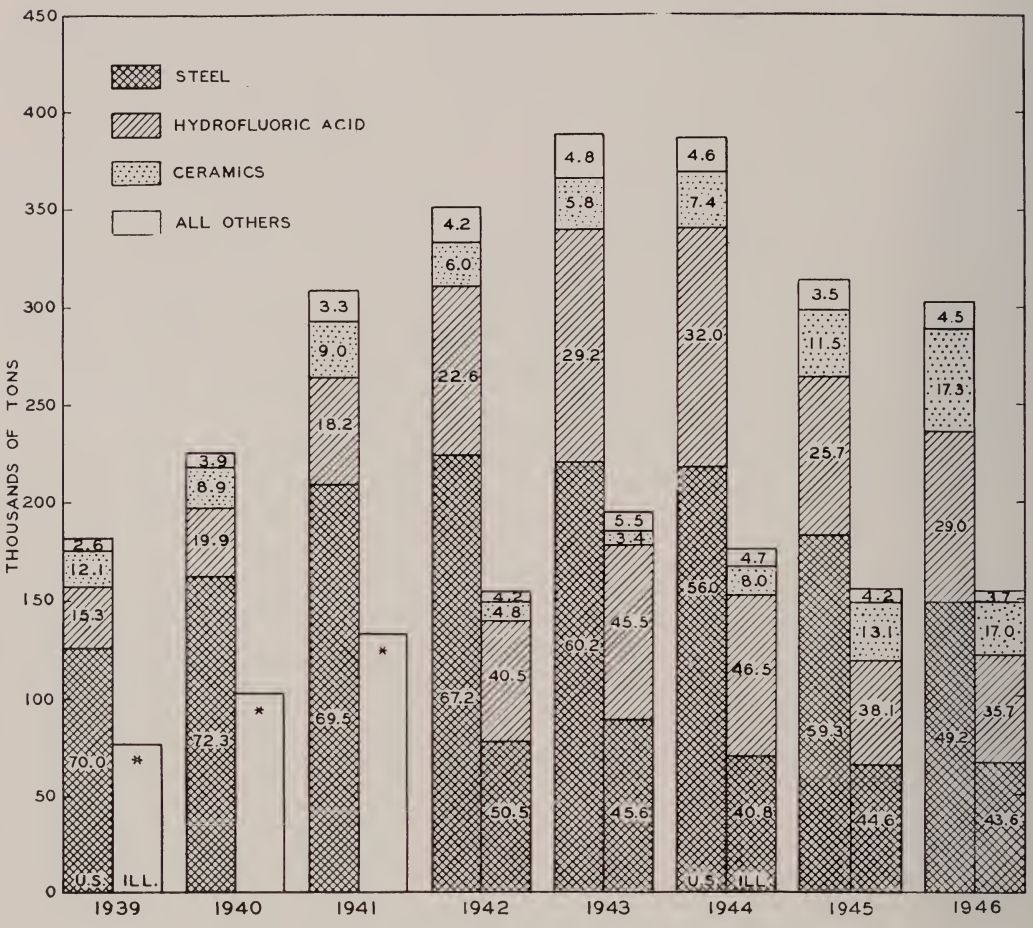

FIG. 18.—Fluorspar shipped from mines, by uses, United States and Illinois, 1939–1946.

according to the Bureau of Mines, but three States—Illinois, Ohio, and Pennsylvania—used 166,465 tons or 55 percent of the total consumption. Pennsylvania was again the chief consuming state, ranking first in consumption of fluorspar in both steel and glass. Illinois maintained its rank as the largest consumer of fluorspar in hydrofluoric acid in 1946 and second place in total consumption of fluorspar, although the tonnage dropped from 54,397 net tons in 1945 to 49,311 tons in 1946.

A history of the fluorspar consumption, both domestic and foreign, by industries, is presented graphically for the period, 1927–1946, in figure 19. This shows the marked increase in the consumption of fluorspar for the manufacture of hydrofluoric acid during the war period. It is noteworthy that the post–war months of 1945 showed a sudden drop in consumption for this purpose almost immediately following the end of the war, as fluorspar consumption shifted from almost entirely military purposes to a resumption of civilian uses. As the monthly consumption figures (table 77) show, January, 1946, marked the turning point in this period of decrease in consumption of fluorspar in the manufacture of hydrofluoric acid (4,227 tons) and by December consumption had again reached 8,526 tons, making a total for the year of 84,335 tons as compared with 109,315 tons in 1945.

Fluorine Compounds

During the war years the manufacture of hydrofluoric acid, used in the manufacture of artificial cryolite and aluminum fluoride, high octane gasoline, refrigerating mediums (the freons), insecticides, and other chemical products necessary for the successful prosecution of the war, required large tonnages of fluorspar. Anhydrous hydrofluoric acid, the largest single use of which was as a catalyst in the production of aviation alkylate used in the manufacture of high–octane gasoline during the war, has relinquished its place to sulphuric acid. By 1946 it had largely reverted to use in chemistry where it appears to have a bright future. Its use in freons as refrigerants and as the propellent in insecticidal bombs continued to be important, representing the consumption of approximately 20,000 tons of acid–grade fluorspar in the production of freons. The market for hydrofluoric acid and its compounds was marked by a rapid expansion of civilian uses during 1946.

Although almost 90 percent of aqueous hydrofluoric acid is used in the production of fluorine chemicals, some is used directly in such processes as pickling stainless steel and in cleaning sand from metal casings.

Fluorine compounds are important sand agents in the casting of aluminum. These agents fill the voids in sand molds by volatilizing when heated, thus preventing oxidation of the metal. Roughly 1 to 5 percent, by weight, of either ammonium fluosilicate or ammonium bifluoride and fluoborate is used in the sand mixture. Lithium fluoride

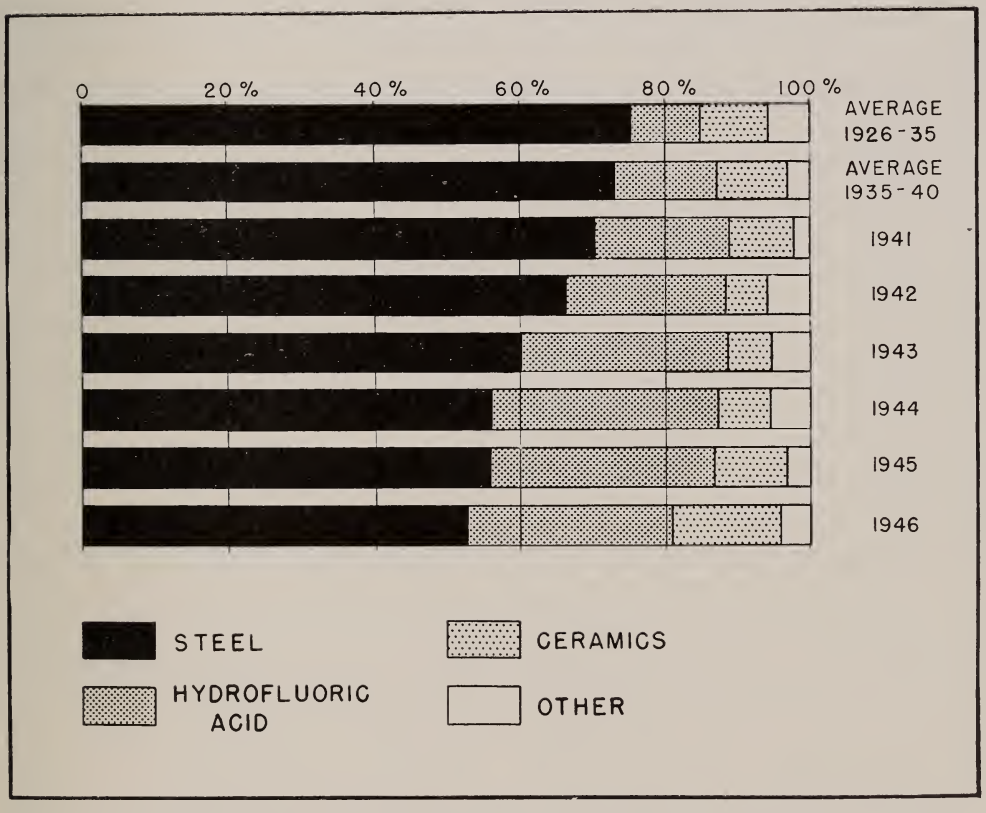

Fig. 19.—Percentage consumption of fluorspar (domestic and foreign), by industries, 1926–1946.

has made aluminum welding practical because it serves as a powerful fluxing agent, is non-hygroscopic and highly insoluble. Sodium fluoride is used in the production of rimmed steel to promote soundness in the outer layer of the ingot. Potassium fluoride, bifluoride, and fluoborate have become important as fluxes in silver soldering. Metal fluoborates, of which lead is best known, are used in electroplating.

As the fluorspar industry shifted its attention from military to civilian needs, it found itself confronted with supplying less fluorspar on the whole but a larger percentage of acid grade spar. Thus it became concerned primarily with flotation mills and the recovery of high-grade concentrates rather than with mining.

Fluorspar, which is a non-metallic crystalline mineral, is technically pure calcium fluoride, CaF_2, containing 48.7 percent fluorine and 51.3 percent calcium by weight. However, the term fluorspar is generally used to designate the ore from which the mineral is obtained, and is graded according to its calcium fluoride content, as metallurgical, acid, or ceramic grade (table 79).

The ceramic industry again ranked third in fluorspar consumption with a still increasing percentage, the manufacture of glass consuming an all-time high of 39,852 net tons of fluorspar.

Fluorspar is used in the manufacture of opal, opaque, and colored glass to be used in such finished commodities as lamp globes, bulbs, soda fountains, containers for food, toilet, and medicinal preparations, and lavatory fixtures. From 50 to 500 pounds of fluorspar are used per 1000 pounds of sand in the manufacture of glass, depending upon the type of product desired. Substitutes for fluorspar have been tried but offer little competition either because of higher cost or lower efficiency. An even higher grade of fluorspar is required for the manufacture of vitreous enamel than for opaque or colored glass. These commodities include sinks, bathtubs, stove parts, refrigerators,

Table 79.—Specifications of Chief Commercial Grades of Fluorspar[a]

Standard

	CaF_2	SiO_2	S	Fe_2O_3
Metallurgical	85.5	5.0	0.3	—
Acid	98.0	1.0	0.03	—
Ceramic	95.0	2.5	—	0.12

Presently Accepted

	CaF_2	SiO_2	S	Fe_2O_3
Metallurgical	[b]	—	0.3	—
Acid	97.5	1.0	0.05	—
Ceramic	—	—	—	—

Effective CaF_2 Content

	Base price per ton
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

[a] Howard G. Hymer, Fluorspar, Chem. & Met. Eng., August, 1945.
[b] Effective CaF_2 content is determined by deducting 2.5 times the silica content from the CaF_2 content.

toilet fixtures, etc., where vitreous enamel coatings are applied to iron or steel. Similar coatings are also applied to pottery, brick, and tile. Since civilian consumption of such products was so drastically curtailed during the war, production during 1946 was able to meet the extraordinary demands.

A new dupont product, tetrafluoroethylene, known by the trade name "Teflon," was produced for war purposes as early as 1943 and by 1946 was finding a ready, although limited, civilian market in the field of plastics. The properties upon which many important uses are based are its extreme resistance to heat, its excellent electrical properties, and its chemical inertness. Its chemical resistance is unequalled by any other plastic. "Teflon" in thin sections is transparent but in larger pieces is waxy in appearance and white or gray in color. It can be machined by sharp wood–working or metal-working tools and sheet stock can be worked on a punch press. Its application in the generation and handling of fluorine has been especially successful.

By 1946 practically all government war contracts had been cancelled and research had again resolved itself to a private competitive basis. Most companies began extensive research programs, and as they did so, it became more and more evident that chemistry would in the future utilize an increasingly large percentage of fluorspar in the various fluorine compounds. It is in the field of chemistry that the demand for fluorspar is most diversified.

Fluorine

The year 1946 marked the first commercial production of fluorine. Up to that time, from June 26, 1886, when Henri Moissan, a French inorganic chemist, first produced fluorine by the electrolysis process, it had remained little more than a laboratory curiosity. Not only its manufacture, but particularly its shipping after it is manufactured, presents a real problem. It is shipped in steel and copper cylinders, which resist corrosion at normal temperatures and hold approximately ½ pound at 400 p. s. i., the limit being utilized in a cylinder with 2,015 p. s. i. pressure specification.[9] The connections to the cylinder valve are made with a Monel adapter using a lead washer and needle valves are recommended to control the gas flow. Present prices are approximately $20.00 per pound to consumers.

Fluorine gas is produced in an especially designed electrolytic cell containing a solution of potassium fluoride in anhydrous hydrogen fluoride at approximately 100° C. The products are hydrogen and fluorine which must be prevented from combining explosively by a special diaphragm extending into the electrolyte. The anodes, where fluorine is generated, are made of carbon and the cathodes where the hydrogen is generated are of steel.

Relatively little work was done in the field of fluorine chemistry until the beginning of World War II, although fluorine is the seventeenth most plentiful element in the earth's crust.[10]

This is not surprising when we realize that fluorine is the most chemically reactive of all elements. "It is so active that solid fluorine and liquid hydrogen explode upon contact at temperatures as low as —252° C. The free gas at room temperature, causes massive chunks of wood to burst into flame and will cause steel wool to burn."[11] Research on the atomic bomb during the war speeded research in fluorine chemistry because quantities of the inert liquid "fluorocarbons" were used in the gaseous diffusion process for the separation of uranium isotopes. As a result of this research program, fluorine is now available at less than one-tenth of its former price, and a far wider knowledge of its usefulness has accumulated.

Although fluorine chemistry has been slow in getting a start, because of the technical difficulties involved, all indications at present point toward its becoming a significant factor in the field of science both from its theoretical importance and commercial application.[12]

[9] Staff report, Chemical and Engineering News, February 17, 1947.
[10] Fluorine Chemistry Achieves Commercial Stature, Chemical Industries, p. 1006, December, 1946.
[11] Ibid. Chemical Industries, December, 1946.
[12] Simons, J. H., Scientific and Utilitarian Value of Fluorine Chemistry, p. 241, Indus. & Eng. Chem., March, 1947.

"Fluorine compounds are of chief interest in the extremes of properties of chemical substances. On the one side there are compounds of great inertness and stability, on the other, compounds of great reactivity. Certain compounds of fluorine are among the most nontoxic of substances, others are among the most poisonous substances known. Both inorganic and organic compounds in enormous numbers will be prepared with all conceivable gradation or properties. Many fluorine compounds are and will be utilized as end products, others are finding use in small quantities in mixtures. Some are useful as powerful catalysts and others serve or will serve as intermediates. Fluorine compounds are certain to find application or eventual use in all ramifications of chemical production, theory and utilization."[13]

Peacetime Products

Some of the peacetime products containing fluorine are expected to include new and useful dyes, plastics, pharmaceuticals, lubricants, tanning agents, metal fluxes, fumigants, insecticides, fungicides, germicides, fire extinguishers, solvents, fireproofing compounds, heat transfer media, and other products of benefit to society.[14]

Sulphur hexafluoride, although known for several years has only recently come into commercial importance because fluorine is necessary for its production. This compound is now being used successfully as an insulator in high voltage electrical and x-ray work.

Hydrofluoric acid is used in the etching of glass. Sodium fluoroacetate is an effective rodenticide. New types of engines will undoubtedly be produced to operate at high temperatures with fluorocarbon lubricants. The new polytetrafluoroethylene polymer known as "Teflon" is being used extensively because of its resistance to boiling acids such as nitric, sulphuric, hydrochloric and aqua regia and because it remains stable at temperatures as high as 300° C.

A new hydrogen–fluorine torch, which burns with an intense bluish–white flame, has been produced with which copper can be welded easily because the copper fluoride formed melts at a lower temperature than copper so that the welding process becomes self–refluxing. It can be used effectively in welding steel, Monel and nickel, but will not weld aluminum.[15]

Most of the interest in fluorine and fluorine compounds, however, lies in their chemical properties and their value to research in both organic and inorganic chemistry.

Fluorspar in Illinois

Illinois and New Mexico were the only producing states to record increases in shipments during 1946. Illinois shipments increased from 147,251 net tons in 1945 to 154,525 tons in 1946 (table 80). Illinois, as for several years, again maintained its rank as the chief producing state, supplying 56 percent of the total U. S. production of 276,986 net tons.

The total dollar value of fluorspar produced in Illinois increased from $5,014,807 in 1945 to $5,493,642 in 1946. The aver-

[13] Idem.
[14] McBee, E. T., Fluorine Chemistry, p. 236, Indus. & Eng. Chem., March, 1947.
[15] Priest, Homer F., and Grosse, Aristid V., Hydrogen-Fluorine Torch, p. 432, Industrial and Engineering Chemistry, March, 1947.

Table 80.—Fluorspar Shipped from Illinois Mines, by Tonnage and Value, 1939–1946[a]

Year	Tons	Value at mines		Year	Tons	Value at mines	
		Total	Average			Total	Average
1939	75,257	$1,638,693	$21.77	1943	198,789	$6,292,789	$31.66
1940	104,698	2,313,747	22.10	1944	176,259	5,954,991	33.79
1941	133,333	3,047,247	22.85	1945	147,251	5,014,807	34.06
1942	161,949	4,306,750	26.59	1946	154,525	5,493,642	35.55

[a] Compiled from canvass made by the U. S. Bur. of Mines.

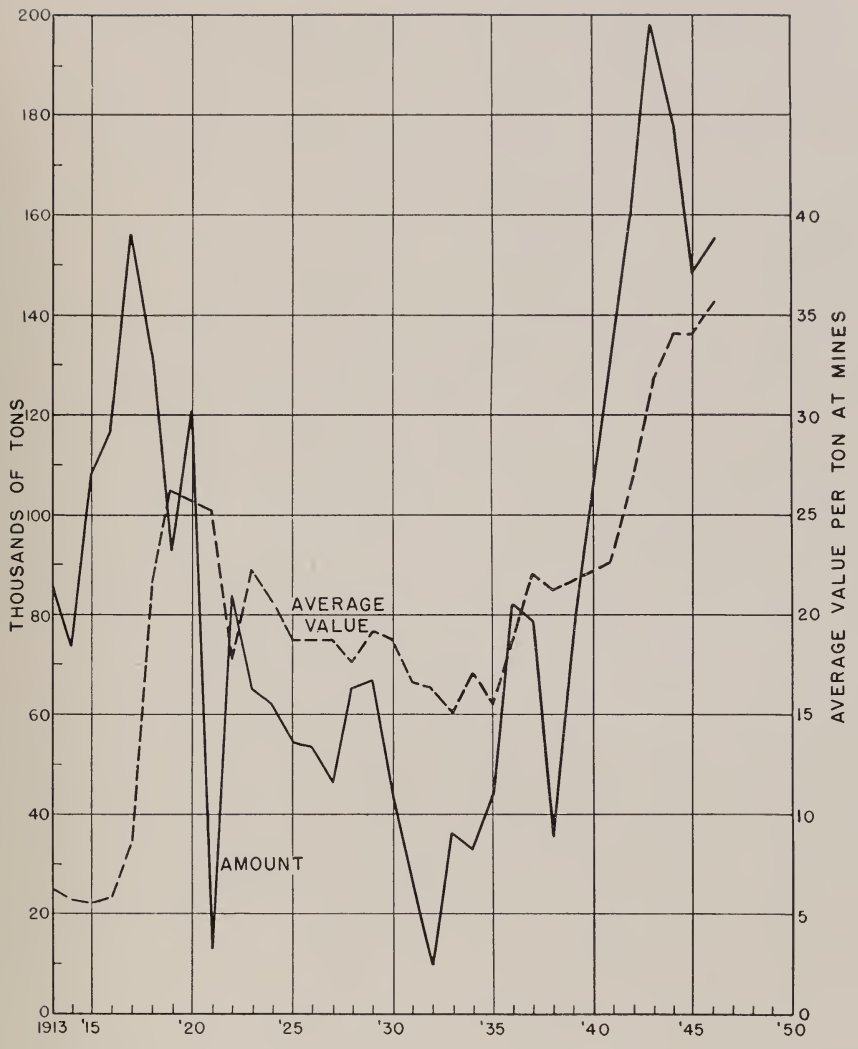

FIG. 20.—Fluorspar, annual shipments and average value, from Illinois mines, 1913-1946

age price per ton increased from $34.06 to $35.55 also.

Steel maintained its rank as chief consumer of fluorspar, accounting for 43.6 percent of the total consumption in Illinois (fig. 18) as compared with 44.6 percent in 1945. The tonnage used in the steel industry in 1945 was 65,440 net tons while, in spite of the decrease in percentage, the 1946 tonnage amounted to 67,079 net tons (fig. 19). The ceramic industry (same figure) has shown a steady increase from 1943 when consumption amounted to 6,741 net tons to 1946 when consumption reached 26,196 net tons.

Annual shipments and average value of fluorspar from Illinois since 1913 are presented graphically in figure 20, showing the effect of two world wars on the industry. Although 1945 showed a decrease in production and consumption following World War II, 1946 again showed an upward trend in Illinois although the national trend was still downward. Because of the rapidly increasing demand for fluorspar in civilian industry—particularly in chemical indus-

Table 81.—Principal Mills in Illinois Equipped to Produce Acid or Ceramic Grade Fluorspar[a]

Aluminum Ore Co.	Rosiclare
Mahoning Mining Co.	Rosiclare
Rosiclare Lead & Fluorspar Mining Co.	Rosiclare
Hillside Fluorspar Mines	Rosiclare
Victory Fluorspar Mining Co.	Elizabethtown
Cave-in-Rock Spar Co.	Elizabethtown
Jas. W. Patton & Sons	Elizabethtown
Crystal Fluorspar Co	Elizabethtown
Minerva Oil Co.	Cave-in-Rock

[a] Howard G. Hymer, Fluorspar, Chemical & Metallurgical Engineering, August, 1945.

tries—this downward trend is not likely to continue nationally.

The principal mills in Illinois which are equipped to produce acid or ceramic grade fluorspar are listed in table 81.

Some months before our entry into the war it was realized that the fluorspar deposits of Illinois were to play an increasingly important part in national affairs. Recognizing the desirability of increasing and bringing up–to–date the knowledge of the fluorspar producing district in Illinois, the Illinois State Geological Survey began a general survey of the mines and prospects of the district, noting location and principal features of each, as well as a revision of the geologic map of that section. This study has resulted in the accumulation of a sizable body of additional geologic knowledge of the fluorspar district. When this knowledge is made generally available to the public, it will constitute a valuable compilation of geologic data and an accurate record of the character of the ore bodies in the various mines for future use. In years to come, prospective mine operators or investors will have more than local, and possibly biased, reports on which to base their decisions, and in case of another national emergency, the data now on hand may be of considerable time– and money–saving value.

The various branches of the Armed Services of the U. S. Government are interested in chemical research in fluorine compounds to the extent that they are spending considerable money in cooperative projects.

The Office of Naval Research is cooperating with the State Geological Survey in an extensive program of chemical research in fluorine compounds.

Prices

Fluorspar, f. o. b. mines, bulk, Kentucky and Illinois, 70 percent, all–rail movement, per ton is listed at $33.00, whereas the acid 98 and 1 percent, bulk, per ton is $37.00.[16] The average price for Illinois fluorspar in 1946 was $35.55 (table 82), a gain of $1.49 per ton over the 1945 average of $34.06.

[16] Engineering and Mining Journal, Vol. 148, No. 7, July 1947, p. 100.

TABLE 82.—FLUORSPAR SHIPPED FROM MINES, IN ILLINOIS BY KINDS AND BY USES, 1944-1946[a]

Fluorspar	1944			1945			1946		
	Amount tons	Value at mines		Amount tons	Value at mines		Amount tons	Value at mines	
		Total	Av.		Total	Av.		Total	Av.
Kind									
Metallurgical	64,072	$1,925,399	$30.05	63,909	$1,951,087	$32.46	66,182	$2,025,874	$30.61
Flotation concentrates	101,105	4,029,592	35.98	83,342	3,063,720	36.76	88,343	3,467,768	39.25
Ground	11,082								
Total	176,259	$5,954,991	$33.79	147,251	$5,014,807	$34.06	154,525	$5,493,642	$35.55
Use									
Steel	71,516	$2,143,780	$29.97	65,440	$1,998,012	$30.38	67,079	$2,034,151	$30.32
Foundry	856	23,571	27.42	648	20,971	32.36	1,079	32,738	30.34
Glass and enamel	14,058	512,420	36.45	19,182	679,056	34.88	26,196	944,204	36.04
Hydrofluoric acid	81,493	2,974,892	36.55	55,688	2,101,722	37.56	54,898	2,297,450	41.85
Other industries	7,328	262,353	35.80	5,518	196,745	35.65	4,173	144,399	34.63
Total	175,251	$5,917,016	$33.76	146,476	$4,986,706	$30.63	153,425	$5,452,942	$35.54
Exported	1,008	34,975	37.67	775	28,301	36.55	1,100	40,700	37.00
Total	176,259	$5,954,991	$33.79	147,251	$5,014,807	$34.06	154,525	$5,493,642	$35.55

[a] Compiled from canvass made by the U. S. Bur. of Mines.

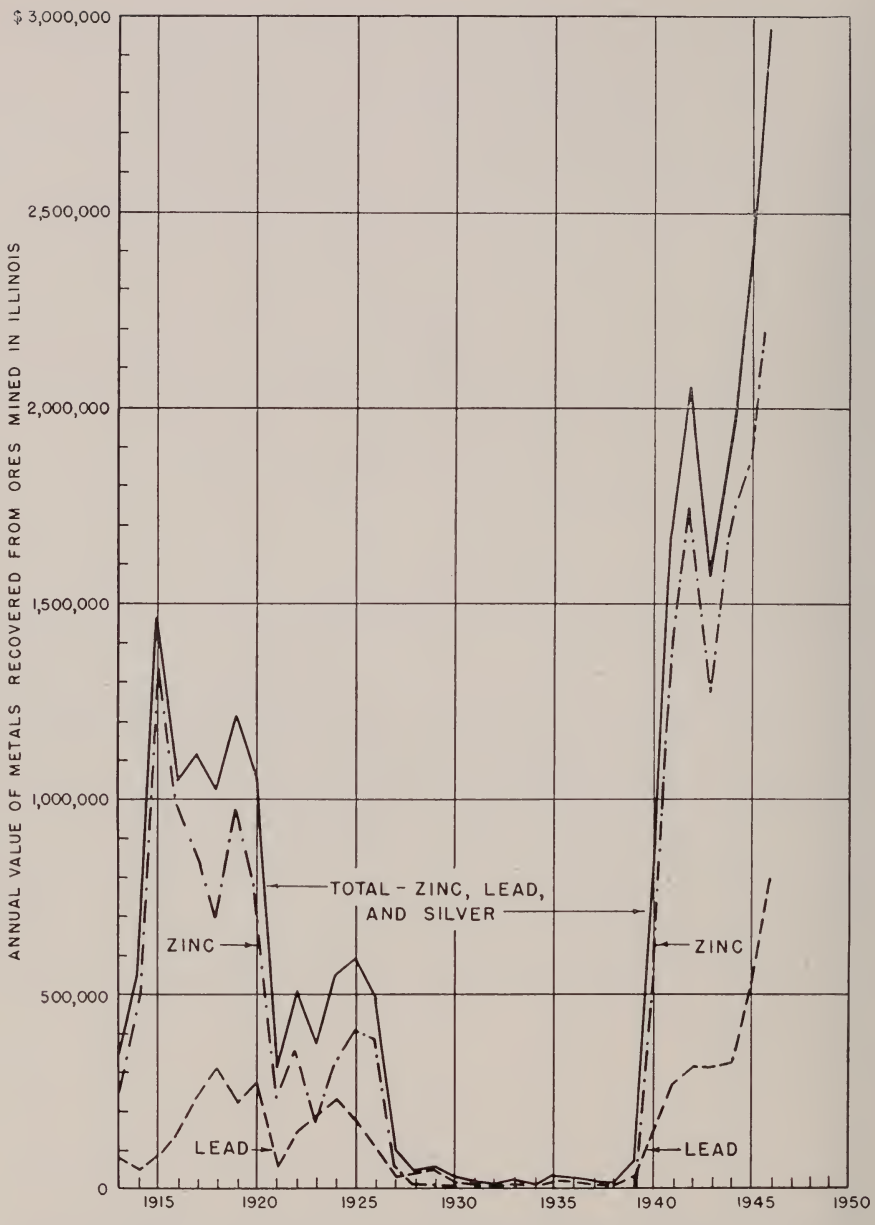

FIG. 21.—Annual value of metals recovered from ores mined in Illinois, 1913–1946.

ZINC, LEAD AND SILVER

Production of metallic ores in Illinois established a new all-time high record for value in 1946, when zinc and lead recovered from ores in the State, had a value of $2,971,316, as determined by the U. S. Bureau of Mines. This is an increase of 22 percent over the 1945 value. Data for 1945 and 1946 are given in table 83.

Hardin and Pope counties, in extreme southern Illinois, produced the greater part of lead and zinc and all the silver. Other production of lead and zinc occurs in Jo Daviess County in the northwestern corner of the State.

TABLE 83.—ZINC, LEAD, AND SILVER RECOVERED FROM ORES MINED IN ILLINOIS, 1945 AND 1946[a]

Metal	Unit	1945*			1946			
		Amount	Value[b]		Amount	Value[b]		Percent change in amount from 1945
			Total	Av.		Total	Av.	
Zinc	Tons	8,310	$1,911,300	$230.00	8,771	$2,175,208	$248.00	+ 4.3
Lead	"	3,005	516,860	172.00	3,931	794,062	202.00	+30.8
Silver	Troy ozs.	2,198	1,563	0.711	2,532	2,046	.808	+15.2
Total	—	—	$2,429,723	—	—	$2,971,316	—	[c]+22.3

* Revised figures
[a] U. S. Bureau of Mines, Minerals Yearbooks, and Mineral Market Reports.
[b] Value for zinc and lead based on yearly average price received by producers, including bonus payments by Metals Reserve Co. for overquota production, as determined by U. S. Bureau of Mines.
Value for silver based on U. S. Treasury buying price for newly mined silver.
[c] Percent change in value from 1945.

MISCELLANEOUS MINERALS

Included in this group are several mineral materials produced in Illinois by less than three producers for each material, so that details of production cannot be published without revealing individual operations.

Peat is produced in northern Mason County for mixed fertilizer and other purposes. Illinois ranks third among the states in the production of peat.

Pyrites (coal brasses) are produced in Henry County from coal-cleaning operations.

Sulfur, as elemental sulfur, is recovered as a byproduct in the liquid purification of gas.

The annual total amount and value of these mineral materials, which were sold or used by producers in Illinois for 1942–1945, are given in table 84. Total figures for 1946 are not available at this time.

TABLE 84.—MISCELLANEOUS MINERALS,[a] SOLD OR USED BY PRODUCERS IN ILLINOIS, 1942–1945[b]

Year	Amount tons	Value at plants	
		Total	Av.
1942	34,179	$149,327	$4.37
1943	28,199	117,895	4.18
1944	*19,192	*84,856	*4.43
1945	*17,846	83,814	*4.70

* Revised figures.
[a] Minerals included: peat, pyrites, and sulfur from gas.
[b] Summary of joint canvass made by Illinois Geological Survey and U. S. Bureau of Mines.

MINERALS PROCESSED, BUT MOSTLY NOT MINED, IN ILLINOIS

Included in this group are mineral materials which are processed in Illinois, but mostly are mined in other states. The amount and value of these materials, sold or used by processors in Illinois for 1943–1946, are given in table 85, as far as the data are available.

Coke and byproducts produced in Illinois are made in the byproduct ovens, most of it from coal mined in the eastern bituminous fields. Coke produced from Illinois coal is not differentiated from the other, so table 85 gives the entire amount of coke made in Illinois. Details of coke products are given in this report in table 30, page 56.

Pig iron, a basic product in the steel industry, is produced in Illinois from iron ore mined in the Lake Superior district and shipped in by water.

Sulfuric acid is a material produced in Illinois as a byproduct of the smelting of zinc ores and is also produced from sulfur at zinc plants.

Slab zinc, a basic product in the zinc industry, is produced in Illinois from ores mined in Illinois and from ores mined in other states. Zinc recovered from Illinois ores is included in table 83. That recovered from out–of–state ores is included in "Total minerals processed" in table 85.

Ground feldspar is made in Illinois from crude feldspar which is mined in South

TABLE 85.—MINERALS PROCESSED, BUT MOSTLY NOT MINED IN

Kind	Unit	1944		
		Amount	Value at plants	
			Total	Av.
Coke and byproducts[b]	—	—	$ 47,330,798	$ —
Packaged fuel	Tons	1,837	23,037	12.54
Pig iron	"	5,686,397	118,953,078	20.92
Sulfuric acid[f]	"	234,245	2,328,395	10.00
Slab zinc[g]				
From Illinois ore[h]	"	7,262	1,655,736	228.00
From out-of-state ore	"	148,100	33,766,764	228.00
Total zinc smelted in Illinois	"	155,362	35,422,500	228.00
Miscellaneous minerals processed[i]	—	—	* 4,431,111	—
Total minerals processed[b] but mostly not mined in Illinois[h]	—	—	*$206,833,183	—

Dakota. It is used in the manufacture of whiteware and enamels and for other purposes. Data cannot be published on feldspar grinding in Illinois without revealing individual operations, but are included in "Miscellaneous minerals processed," table 85.

Magnesium compounds are processed in Illinois from out-of-state dolomite. Data on these are included in "Miscellaneous minerals processed," table 85, to avoid revealing individual operations.

Mineral pigments are produced in Illinois from crude mineral earth pigments and iron oxide pigments from various sources. Data on these are included in "Miscellaneous minerals processed," table 85.

Mineral wool is processed in Illinois from materials mined both in Illinois and in other states. The raw materials used are woolrock, limestone, slag, and other rock products. Data on this material are included in "Miscellaneous minerals processed," table 85.

Pig lead is made in Illinois by smelting lead ores; that obtained from ores mined in Illinois is given in table 83. Data on pig lead produced in Illinois from ores mined in other states are not available.

Expanded vermiculite is produced in Illinois by heat-treating crude vermiculite which is mined in the West. Production figures are not available.

Alumina, phosphates, and other processed mineral materials are produced in Illinois in large amounts, but data for them are not available.

The values of pig lead, expanded vermiculite, alumina, phosphates, and other mineral materials, if known, would greatly increase the total given in table 85.

ILLINOIS, SOLD OR USED BY PROCESSORS IN ILLINOIS, 1944–1946[a]

1945			1946			
Amount	Value at plants		Amount	Value at plants		Percent change in amount from 1945
	Total	Av.		Total	Av.	
—	$ 44,642,444	—	—	$43,191,213	—	[e] — 3.3
16,690	186,593	$ 11.20	[e]	[e]	—	—
5,061,368	116,303,897	22.98	[e]	[e]	—	—
216,482	2,186,468	10.10	[e]	[e]	—	—
* 8,310	* 1,911,300	230.00	8,771	2,175,208	$248.00	+ 4.3
116,669	26,833,850	230.00	[e]	[e]	—	—
* 124,979	* 28,745,150	230.00	[e]	[e]	—	
—	* 3,505,218	—	—	3,599,238	—	—
—	*$193,658,470	—	—	$46,790,451	—	—

* Revised figures.
[a] Summary of canvass made by U. S. Bureau of Mines.
[b] See table 30.—Coke and byproducts.
[c] Percent change in value from 1945.
[e] Not available.
[f] 60° Baume—from zinc smelting and sulfur.
[g] Value for zinc based on yearly average price received by producers, including bonus payments by Metals Reserve Co. for overquota production, as determined by U. S. Bureau of Mines.
[h] Figures for zinc smelted from Illinois ore are not included in "Total minerals processed" in this table, but are included in table 83.
[i] Includes ground feldspar, magnesium compounds, metallic abrasives, mineral pigments, and mineral wool.

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