MINERAL PRODUCTION IN IOWA FOR 1939 AND 1940

by

H. GARLAND HERSHEY

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INTRODUCTION

In this report the Iowa Geological Survey presents a detailed record of developments and trends of the mineral industries in the State for the years 1939 and 1940. Statistical summaries of this type have been published periodically by the Survey for the past 45 years. Their primary function is to supply producers and consumers of mineral products, as well as the general public, with as much factual information as possible, chiefly in the form of tables. With the greatly increased interest in minerals and mineral production brought about by national defense and war activities, reports of this type have been useful in evaluating the role that Iowa can play in the total war effort.

All minerals produced in Iowa at the present time fall in the class of nonmetallics. The leading products are coal, cement, gypsum, limestone, clay and clay products, and sand and gravel. Of less importance are sandstone, peat, and woolrock. None of the minerals defined as strategic or critical to the war effort are produced in the State.

Lead, zinc, and iron have been mined profitably in Iowa in the past. The reserves are known to be small, but economic conditions resulting from the war may again make it practicable to bring these ores into production.

Iowa contains large quantities of dolomite which is relatively high in magnesium, a metal of importance in the national defense and war program because of its use in airplane motors and incendiary bombs. The source of magnesium produced in the United States until now has been from brine pumped from deep wells and from sea water. Plans were under way in late 1940 to utilize magnesite and brucite as ores. From this it appears possible that dolomite may become a source of raw material for magnesium production, although extraction is a costly and intricate process.

ACKNOWLEDGMENTS

Collection of the information which forms a basis of this report was carried on by the U. S. Bureau of Mines in cooperation with

TABLE 1

Summary of mineral production of Iowa, 1938-40

	1938		1939		1940	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (shipments)—bbls	4,759,390	$7,327,048	4,717,295	$7,771,503	4,597,781	$7,641,163
Clay						
Products	.....	2,868,233a	.....	3,698,611a	.....	3,649,000
Raw	6,828	45,759	5,615	50,939	10,005	51,267
Coal—tons	3,103,187b	7,963,000c	2,947,557d	7,189,245c	3,231,177d	8,060,587
Gypsum (e)—tons	364,920	495,856	430,712	510,120	487,379	587,223
Limestone—tons	3,369,750f	3,782,480f	6,400,590f	4,385,234f	4,013,740	3,832,070
Sand and gravel—tons	6,994,286g	2,299,682g	5,789,687	1,540,029	6,451,845	2,156,594
Miscellaneous	.....	1,142,004	.....	1,935,549	.....	1,140,666
Total (h)	.....	$24,794,058g	.....	$25,170,181	.....	$26,006,904

a. Figures obtained from Bureau of the Census.
b. According to the Bituminous Coal Commission (Revised).
c. Value is estimated from several sources and includes selling expense (Revised).
d. According to Bituminous Coal Division (Preliminary).
e. Crude mined.
f. Includes sandstone and miscellaneous stone, tonnage approximate.
g. Revised.
h. After eliminating duplications.

the State Survey except for the canvasses of clay products and coal. The data on clay products were furnished by the U. S. Bureau of the Census for 1939 and 1940 supplemented by material from the Bureau of Mines in 1940. Statistics on coal are based on data published by the National Bituminous Coal Commission and its successor the Bituminous Coal Division, U. S. Department of the Interior. Material published by the Bureau of Mines, particularly that from the Minerals Yearbooks, was drawn on freely for this review.

In addition to acknowledging the cooperation and assistance of the Federal agencies, it is a pleasure to express appreciation to the mineral producers in Iowa for furnishing their individual reports which make this summary possible. The writer also wishes to acknowledge the assistance of the staff of the Iowa Geological Survey in preparing this material for publication.

GENERAL STATEMENT

Total value of mineral production in Iowa for 1939 was $25,170,181, an increase of 1.5 percent over the $24,794,058 of 1938. Production values of cement, clay, gypsum, and limestone increased in 1939 while those for coal and sand and gravel fell below 1938 levels. In 1940 the total value of mineral production advanced to $26,006,904, or 3.3 percent above 1939. The values of coal, gypsum, and sand and gravel were greater than the 1939 figures for those commodities although the values of cement, clay, and limestone declined (see table 1).

For more than 50 years coal had ranked first among the mineral products of Iowa in annual value of production, but in 1939 it dropped to second place by a small margin. In 1940, however, coal was again in first ranking position with cement second. Limestone ranked third in both years followed by clay and clay products, commercial sand and gravel, and gypsum. The true value of gypsum, however, is not apparent from the data available. Only the quantity and value of crude gypsum mined have been reported in the past few years. The unreported annual values of calcined gypsum are estimated to be such that they would place gypsum in third ranking position as a state mineral resource for the period covered by this report.

From a national viewpoint gypsum remained the most important Iowa mineral product, owing to the fact that this State is the third largest producer of crude gypsum in the nation. It is outranked only by New York and Michigan.

Detailed statistics for sandstone and peat are not published in order that confidential information will not be revealed. Data are not available on the production of the one rock wool plant operating in the State.

Trends in the mineral industries of Iowa did not follow the general tendencies of mineral production of the country as a whole. After a general decline in production values of mineral industries in the United States in 1938, almost all branches recovered after the first five months of 1939 and continued to advance through 1940 when the physical volume of production was greater than for any previous year in the history of the nation. In 1939 metals as a group advanced 44.7 percent in value, nonmetals other than fuels 21.2 percent and fuels 0.5 percent over 1938. Total value of mineral production in 1940 was 14.3 percent above 1939, for nonmetallics alone 8.6 percent. It was the highest total value since 1926 and more than double that of each of the depression years of 1932 and 1933. Table 2 outlines mineral production in the United States for the period of this report.

Mineral production did not advance as rapidly in 1939 as business in general. The Federal Reserve Board index of industrial production (1935-39 average = 100), accepted as a reliable business indicator, was 86 for industrial activity and 99 for minerals in 1938. In 1939 the figure for industrial activity rose to 106 while that for minerals increased only to 108.

In 1940 the average index for industrial activity advanced to a new high of 122. After a decline in the early months of 1940 it began to rise and by December it had reached 139. A precise index for mineral consumption is not available but it did not reach the record high of business in general. This was probably due to the low rate of building activity. The index of construction contract awards was 72 in 1939 and 81 in 1940 (value basis 1923-25 = 100).

TABLE 2

Value of mineral products of the United States, 1938-40

Year	Metallic	Nonmetallic			Grand Total
		Fuels (a)	Other	Total	
1938b	$ 892,600,000	$2,820,300,000	$650,300,000	$3,470,600,000	$4,363,200,000
1939b	1,291,700,000	2,834,300,000	788,200,000	3,622,500,000	4,914,200,000
1940b	1,679,500,000	3,116,500,000	818,800,000	3,935,300,000	5,614,800,000

a. Coal, natural gas, natural gasoline, petroleum.
b. All figures revised.

CEMENT

The value of shipments from the five active portland cement plants in Iowa amounted to $7,771,503 in 1939 (see table 3). This represented an increase of more than 6 percent over 1938 and was the highest value recorded since 1930. By virtue of this value, cement became the leading mineral product of Iowa for 1939. In 1940 it dropped to second ranking position when the value of shipments declined to $7,641,163. The value of cement shipped from the mills in Iowa represented 30.5 percent of the total mineral production of the State in 1939 and 29.4 percent in 1940.

Volume of shipments in 1939 was 0.9 percent below the 1938 level and in 1940 showed a 2.5-percent decline from 1939. The apparent discrepancy between the figures for value and volume of shipments is readily explained by price. The average price per barrel (376 lbs.) advanced from $1.54 in 1938 to $1.65 in 1939 and in 1940 to $1.66, higher than the mill price in any other state.

Production of cement decreased from 4,762,517 barrels in 1938 to 4,718,024 barrels in 1939, a drop of 0.9 percent, and in 1940 decreased 2.4 percent below the 1939 level to 4,605,886 barrels. As a consequence the amount of electrical energy used by the industry was reduced in 1940, although the amount purchased increased 36 percent.

Iowa produces more cement than is used within the State. Apparent consumption (shipments plus imports minus exports) amounted to 2,994,325 barrels in 1939 and 2,933,570 barrels in 1940. Comparing these figures with those for total production in table 3 it is seen that the apparent exports amounted to about 36 percent of total production for both years. These figures indicate that the per capita consumption of cement in Iowa was 1.17 barrels in 1939 and 1.16 barrels in 1940, which ranked this State the seventh and eighth largest cement consumer on the per capita basis in the respective years.

TABLE 3

Salient features of the cement industry in Iowa, 1938-40

	1938	1939	1940a
Production, bbls.	4,726,517	4,718,024	4,605,886
Shipments, bbls.	4,759,390	4,717,295	4,597,781
Shipments, value	$ 7,327,048	$ 7,771,503	$ 7,641,163
Average factory value per bbl.	$1.54	$1.65	$1.66
Stock, Dec. 31, end of year	1,541,951b	1,542,680	1,550,802
Annual capacity		9,455,710	9,411,534
Electrical energy generated		97,754,900c	89,926,500c
Electrical energy purchased		9,057,272c	12,343,603c
Electrical energy used		106,812,172c	102,270,103c
Number of producers	5d	5d	5d

a. Subject to revision.
b. Revised.
c. Kilowatt hours.
d. One plant idle.

Iowa ranked seventh among the cement producing states on the basis of value of shipments. However, production of cement in Iowa has not followed the trends of the industry as a whole. This was particularly striking in 1939 when all leading states except Iowa showed increases over 1938 averaging 16 and 15 percent in quantity and shipments respectively. In 1940 Iowa was one of the two states in which the production and shipments of cement did not increase. The average factory value per barrel for the United States was $1.47 in 1939 and $1.46 in 1940, or 18 and 20 cents per barrel lower than the Iowa averages for those years. A summary of cement production in the United States is shown in table 4.

Varied demands of construction during recent years have led to the development of several distinct types of portland cements adaptable to specialized uses. These include high-early-strength, masonry, low-heat and oil-well cements. United States shipments in 1939 included 3,693,460 barrels of high-early-strength cement valued at $6,964,608 (average price $1.89 a barrel). In 1940 shipments of the same type amounted to 4,401,274 barrels valued at $8,241,879 or an average price of $1.87 a barrel. In 1939 natural, masonry (natural), and puzzolan cements advanced as a group 29 percent in quantity and 23 percent in value of shipments over 1938. They advanced 5 percent in quantity and 0.7 percent in value of shipments in 1940.

TABLE 4

Statistics on the portland cement industry in the United States, 1938-40

	1938	1939	1940a
Production, bbls.	105,357,000	122,259,154	130,216,511
Shipments, bbls.	106,324,127	125,056,594	132,864,383
Shipments, value	$153,977,226	$184,254,932	$193,464,869
Average factory value per bbl.	$1.45	$1.47	$1.46
Stocks, (b) Dec. 31, end of year	23,992,939c	23,645,583c	23,364,657
Number of producers	151	150	152

a. Subject to revision.
b. Stock at mills.
c. Revised.

CLAY

The value of sales of clay and clay products in Iowa amounted to $3,749,550 in 1939, an increase of 29 percent over the recession year of 1938 (see table 5). In 1940 the value declined slightly to $3,700,267.

The chief value of the clays (including shales) in Iowa is their use for making clay products. This branch of the industry nor-

mally accounts for approximately 98 percent of the total production. Unglazed structural tile, drain and sewer tile, and red and buff burning building brick are the leading products although numerous other types of brick and tile are made. Clay products have shown a steady increase in production values since 1932 except for 1938, and the value in 1939 was higher than in any other year since 1930. The value for 1940 was second to 1939 for the 1930-1940 period and was more than four times the value of production for 1932 and for 1933.

In 1939 the value of structural tile sold was $1,088,553 as compared with $1,157,948 in 1938 and $1,225,425 in 1940. The combined value of drain tile and sewer tile was over 1 million dollars in 1939 and almost 1.5 million dollars in 1940. Total value of all types of building brick advanced from $648,356 in 1938 to $937,416 in 1939 but dropped to $767,472 in 1940.

TABLE 5

Value of clay products and raw clay in Iowa, 1938-40

	1938	1939	1940
Clay products	$ 2,868,233	$ 3,698,611	$ 3,649,000
Clay, raw	45,759	50,939	51,267
Total	$ 2,913,992	$ 3,749,550	$ 3,700,267

Sales of raw and prepared clays and shales in Iowa recovered in 1939 from the slight decline in 1938, and advanced again in 1940 (see table 6). The increase amounted to 11.3 percent in value in 1939 and about 0.6 percent in 1940. In 1939 sales of both fire clay and miscellaneous clays increased. In 1940, however, sales of fire clay dropped but the increase in the sales of miscellaneous clays was sufficient to bring the total to the highest value since 1930. Shale used for mortar mix is the leading product in the category of miscellaneous clays.

TABLE 6

Sales of clay in Iowa, 1938-40

	1938	1939	1940
Fire Clay			
Short tons	773	960	(b)
Value	$ 9,034	$ 10,858	(b)
Active producers	3	3	(b)
Miscellaneous Clay(a)			
Short tons	6,828	5,615	10,005
Value	$ 36,725	$ 40,081	$ 51,267
Active producers	8	7	10
Total Clay			
Short tons	6,828	5,615	10,005
Value	$ 45,759	$ 50,939	$ 51,267
Active producers	10	10	10

a. Chiefly mortar mix.
b. Small amount of fire clay included in miscellaneous for concealment purposes.

The salient features of the potteries industry in the United States for 1939 were the new high records attained by the sales of domestic china and paper clay, ball clay and bentonite; the decline in the consumption of natural bleaching clays or fuller's earth; the partial recovery of fire clay sales; and the slight advance in the tonnage of miscellaneous clay sold. In 1940 shipments of china clay, ball clay, and bentonite increased notably over the highs attained in 1939. Shipments of fire clay rose sharply but consumption of natural bleaching clays fell below expectations.

COAL

The Iowa coal mining industry suffered a decline in 1939 when the production was 2,947,557 tons (see table 7) valued at $7,189,-245 as compared to the output of 3,103,187 tons valued at $7,963,-000 in 1938. Production recovered in 1940 to 3,231,177 tons with a value of $8,060,587. These figures indicate a decrease in production of 5.0 percent in 1939 and an increase of 9.6 percent in 1940. Records of coal production for the United States as a whole show an increase in output over the preceding year of 13 percent in 1939 and 17 percent in 1940.

Variations in the annual production of coal in Iowa did not have a proportional effect on the employment of workmen as shown by table 8. Fewer men were employed in each successive year from 1937 to 1939. In 1940, when production increased 9.6 percent the number of men employed decreased 0.5 percent although the man-shifts of labor increased 7.1 percent.

Detailed statistics for coal for 1938 were not available when data on other mineral commodities were published for that year. Records for 1938 are therefore included in this report. All data on coal include only those mines producing 1000 tons or more a year.

Details of the coal mining industry in Iowa by counties are presented in tables 9 to 11. They show that Marion County was the leading producer in each of the years covered by this report. The leading coal-producing counties are listed below in order of rank by years.

1938	1939	1940
Marion	Marion	Marion
Lucas	Dallas	Appanoose
Appanoose	Appanoose	Polk
Boone	Polk	Mahaska
Dallas	Mahaska	Dallas
Polk	Boone	Boone

TABLE 7

Estimated monthly production of coal in Iowa, 1938-40 in thousands of net tons

Month	1938	1939	1940
January	368	323	422
February	294	316	328
March	270	321	256
April	197	259	203
May	193	114	200
June	181	116	189
July	160	151	193
August	202	208	230
September	250	244	272
October	298	309	261
November	342	285	324
December	348	302	353
Total	3103	2948	3231

Most of the coal recovered in Iowa is from underground mines, but an increasingly larger proportion has been obtained from strip pits in the past few years (see table 12). Of the total output from underground a very large proportion is either shot off the solid or cut by machines, very little is mined by hand. In 1938 there were 104 coal-cutting machines in use in the State, 3 of which were track mounted. The average output of these machines was 10,569 net tons. In 1939 an average production of 9,093 tons was obtained from 103 cutting machines 6 of which were track mounted and in 1940 an average of 10,863 tons was cut by 93 machines.

In recent years there has been a decided increase in the use of power drills for shot-hole drilling. In 1936 in the area including Iowa, Kansas and Missouri, operations where shot holes were power drilled produced 80,000 tons of coal. In 1938 production from mines of this type in the same area had increased to 164,084 tons. By 1940 in Iowa alone total production from mines using power drills was 334,268 tons. All drills in Iowa were electrically driven.

Mechanical loading of coal underground has increased in Iowa. In 1939 a total of 66,422 tons were produced from three mines using 6 hand-loaded conveyors. A production of 132,947 tons was obtained from 11 conveyors in 4 Iowa mines in 1940.

TABLE 8

Number of mines, production, men employed, days operated, man-days of labor, and output per man per day in Iowa, 1937-40

	1937	1938	1939	1940
Number of active mines	340	261	271	276
Loaded at mines for shipment by rail, net tons	1,731,173	1,642,445	1,408,854	1,424,398
Shipped by truck or wagon, net tons	1,833,005	1,412,311	1,478,839	1,755,138
Coal used by employees or taken by locomotives at tipple or other uses at mines, net tons	45,237	31,853	43,383	37,736
Used for power and heat, net tons	25,922	16,578	11,649	13,905
Total production, net tons	3,637,054	3,103,187	2,947,557a	3,231,177
Average value per ton	.....	$2.57	$2.44	$2.49
Number of employees:				
Underground	(b)	6,234	5,220	5,061
Surface				
In strip pits	(b)	322	322	370
All others	(b)	816	709	790
Total	8,720	7,372	6,251	6,221
Average number of days mine operated	146	136	147	158
Man-days of labor	1,267,270c	1,000,795	920,226	985,478
Average tons per man per day	2.87	3.10	3.20	3.28

a. Includes increase of 4,832 tons to stock of coal at mines.
b. Not available.
c. Calculated.

TABLE 9

Production of coal, men employed, days operated and output per man per day by counties in Iowa, 1938

County	Net Tons					Number of employees				Average number of days mines operated	Man-days of labor	Average tons per man per day
	Loaded at mines for shipment by rail	Shipped by truck or wagon	Coal used by employees or taken by locomotives at tipple or other uses at mines	Used for power and heat	Total quantity	Under ground	Surface: In strip pits	Surface: All others	Total			
Adams	.....	21,341	100	105	21,546	117	.....	10	127	146	18,579	1.16
Appanoose	284,829	106,606	1,985	83	393,503	1,403	.....	190	1,593	113	179,447	2.19
Boone	289,930	77,843	5,663	2,082	375,518	773	.....	89	862	162	139,695	2.69
Dallas	280,350	78,352	6,130	1,302	366,134	613	.....	48	661	152	100,220	3.65
Davi and Taylor	202	24,027	529	16	24,774	39	14	5	58	158	9,158	2.71
Greene	.....	19,001	.....	5	19,006	48	15	5	68	68	4,612	4.12
Guthrie	.....	18,462	118	25	18,605	79	.....	8	87	161	13,998	1.33
Jasper	.....	27,841	486	262	28,589	93	.....	12	105	72	7,581	3.77
Jefferson and Keokuk	.....	12,692	203	51	12,946	21	11	6	38	117	4,462	2.90
Lucas	415,432	13,369	4,893	2,135	435,829	672	.....	63	735	148	108,819	4.01
Mahaska	91,466	111,043	2,908	1,391	206,808	81	107	39	227	173	39,380	5.25
Marion	112,468	326,871	2,375	1,264	442,978	659	107	121	887	130	114,884	3.86
Monroe	75,169	59,446	2,693	1,292	138,600	289	3	41	333	133	44,276	3.13
Page	.....	32,247	225	15	32,487	94	.....	13	107	186	19,896	1.63
Polk	62,128	223,043	2,781	2,048	290,000	738	.....	68	806	124	99,889	2.90
Van Buren	64	18,613	223	35	18,935	28	13	9	50	170	8,521	2.22
Wapello	30,407	116,358	160	1,992	148,917	190	12	5	237	161	38,186	3.90
Warr n	.....	79 132	40	2,422	81,594	171	23	35	229	105	23,963	3.40
Wayne	.....	18,426	310	.....	18,736	82	.....	10	92	154	14,177	1.32
Webster	.....	27,598	31	53	27,682	44	17	9	70	158	11,052	2.50
Total Iowa, 1938	1,642,445	1,412,311	31,853	16,578	3,103,187	6,234	322	816	7,372	136	1,000,795	3.10
Total Iowa, 1937	1,731,173	1,833,005	45,237	25,922	3,637,054	8,720	.....	.....	.....	146	.....	2.87

TABLE 10

Production, value, employment, days active, and output per man-shift at bituminous coal mines in Iowa in 1939 by counties

County	Disposition of coal produced (net tons)						Average value per ton (c)	Average number of employees				Average number of full days mines were active	Tons of coal produced on active days per man-shift
	Loaded for shipment by rail (a)	Shipped by truck or wagon (excluding coal used by mine employees)	Used by mine employees, taken by locomotive tenders at tipple, or other uses at mines (b)	Used at mine for power and heat	Net changes in stocks of coal at mines Jan. 1, 1939 to Jan. 1, 1940	Total quantity		Underground	Surface: In strip pits	Surface: All others	Total		
Adams	.....	17,493	60	8	.....	17,561	$2.63	78	.....	12	90	136	1.44
Appanoose	207,041	134,656	2,745	309	—696	344,055	2.49	1,197	.....	141	1,338	118	2.19
Boone	169,233	63,325	14,796	1,433	—179	248,608	3.00	540	.....	66	606	149	2.76
Dallas	319,238	62,363	6,883	1,273	—120	389,637	2.69	596	.....	43	639	196	3.12
Greene	.....	20,554	124	130	.....	20,808	2.69	43	11	12	66	87	3.61
Guthrie	.....	24,185	15	.....	+138	24,338	2.99	98	.....	10	108	153	1.47
Jasper	.....	26,699	740	114	+239	27,792	2.70	68	6	15	89	84	3.72
Mahaska	122 147	143,045	1,810	1,151	+2,628	270,781	2.04	87	135	63	285	163	5.84
Marion	158,762	365,913	3,921	1,556	—466	529,686	2.11	536	95	92	723	183	4.01
M nroe	53,480	47,706	1,571	944	—89	103,612	2.12	256	7	38	301	111	3.11
Page	.....	35,230	381	.....	.....	35,611	2.73	88	.....	10	98	177	2.05
Polk	74,031	228,158	3,877	1,350	+1,504	308,920	2.71	654	5	56	715	137	3.15
Van Buren	.....	18,114	224	17	.....	18,355	2.63	26	7	6	39	189	2.49
Wapello	53,118	123,111	907	834	+2,960	180,930	2.14	25	24	54	336	140	3.84
Warren	3,753	61,266	1,181	1,882	—1,067	67,015	2.60	112	21	27	160	108	3.88
Wayne	.....	24,028	202	.....	.....	24,230	2.31	89	.....	13	102	168	1.41
Webster	.....	35,979	100	.....	.....	36,079	2.73	59	5	9	73	147	3.35
Other counties (Davis, Jefferson, Lucas, and Taylor)	248,051	47,014	3,846	648	—20	299,539	2.33	435	6	42	483	163	3.80
Total quantity, 1939	1,408,854	1,478,839	43,383	11,649	+4,832	2,947,557	2.44	5,220	322	709	6,251	147	3.20
Total quantity, 1938	1,642,445	1,412,331	31,853	16,578	.....	3,103,187	2.57	6,234	322	816	7,372	136	3.10

a. Includes coal loaded at mine directly into railroad cars and hauled by truck to railroad siding for shipment by rail.
b. Includes coal transported from mines to points of use by conveyor, chute, or aerial tramway.
c. Value of all coal produced, f.o.b. mine, excluding selling cost.

TABLE 11

Production, value, employment, days active, and output per man-shift at bituminous coal mines in Iowa in 1940 by counties

County	Disposition of coal produced (net tons)					Average value per ton (c)	Average number of employees				Average number of full days mines were active	Number of man-days worked	Average tons per man per day
	Loaded for shipment by rail (a)	Shipped by truck or wagon (excluding coal used by mine employees)	Used by mine employees, taken by locomotive tenders at tipple, or other uses at mines (b)	Used at mine for power and heat	Total quantity		Underground	Surface: In strip pits	Surface: All others	Total			
Adams	.....	19,148	30	82	19,260	$3.29	105	.....	15	120	150	17,950	1.07
Appanoose	240,854	181,762	4,134	252	427,002	2.49	1,223	.....	154	1,382	132	182,755	2.34
Boone	216,690	83,709	6,286	2,159	308,844	3.05	540	.....	49	589	195	114,759	2.69
Dallas	256,692	85,094	6,268	1,305	349,359	2.64	661	.....	41	702	159	111,912	3.12
Greene	.....	19,235	259	537	20,031	3.09	39	7	5	51	109	5,550	3.61
Guthrie	.....	25,376	215	15	25,606	3.68	137	.....	14	151	140	21,143	1.21
Jasper	.....	46,050	778	150	46,978	2.71	60	12	20	92	149	13,733	3.42
Lucas	167,062	23,197	2,970	1,219	194,448	2.22	256	.....	24	280	165	46,305	4.20
Mahaska	179,533	171,117	1,362	1,617	353,629	2.05	67	159	78	304	170	51,773	6.83
Marion	131,351	403,535	3,252	235	538,373	2.08	481	97	112	690	173	119,638	4.50
Monroe	87,015	104,204	1,349	1,534	194,102	2.63	267	6	54	327	171	55,796	3.48
Page	.....	40,136	433	30	40,599	2.98	129	.....	19	148	143	21,230	1.91
Polk	88,285	261,310	8,135	1,610	359,340	2.89	585	5	64	654	179	117,065	3.07
Van Buren	.....	23,699	140	87	23,926	2.70	23	19	13	55	149	8,176	2.93
Wapello	53,983	121,011	1,000	1,098	177,092	2.02	172	29	54	255	166	42,373	4.18
Warren	2,731	72,705	911	1,952	78,299	2.92	105	15	38	158	116	18,292	4.28
Wayne	.....	24,295	99	.....	24,394	2.32	98	.....	14	112	132	14,805	1.65
Webster	.....	22,818	55	5	22,878	2.77	58	4	13	75	119	8,920	2.56
Other counties (Davis, Jefferson, Keokuk, and Taylor)	202	26,737	60	18	27,017	2.77	50	17	9	76	175	13,303	2.03
Total quantity, 1940	1,424,398	1,755,138	37,736	13,905	3,231,177	2.49	5,061	370	790	6,221	158	985,478	3.28
Total quantity, 1939	1,408,854	1,478,839	43,383	11,649	2,947,557	2.44	5,220	322	709	6,251	147	920,226	3.20

a. Includes coal loaded at mine directly into railroad cars and hauled by truck to railroad siding for shipment by rail.
b. Includes coal transported from mines to points of use by conveyor, chute, or aerial tramway.
c. Value received or charged for coal f.o.b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked (not coke) as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

TABLE 12

Bituminous coal mined by different methods in Iowa, 1938-40

	1938	1939	1940
From underground workings			
Mined by hand			
Net tons	341,061	450,186	282,315
Percent of total underground	12.9	19.0	11.3
Shot off the solid			
Net tons	1,182,356	975,117	1,212,723
Percent of total underground	44.8	41.3	48.4
Cut by machines			
Net tons	1,099,182	936,578	1,010,227
Percent of total underground	41.7	39.7	40.3
Not specified			
Net tons	14,733	0	0
Percent of total underground	0.6	0	0
Total underground			
Net tons	2,637,332	2,361,881	2,505,265
Percent of total underground	100.	100.	100.
From strip pits			
Net tons	465,855	585,676	725,912
Percent of grand total	15.0	19.9	22.5
Grand total production (net tons)	3,103,187	2,947,557	3,231,177

Stripping operations, begun on a large scale in 1932, increased steadily during the period of this report. Each year after 1937 established a new record high production from operations of this type (see table 12). Some of the salient features of stripping operations in the State for the period of this report are shown in table 13.

Reports are available on some of the truck mines in the State producing less than 1000 tons a year. Complete coverage was not possible. In 1938 a total production of 79,212 tons was obtained from 176 mines averaging 90 days of operation. These mines employed 745 men who put in 66,731 man-days of labor at an average output of 1.19 tons per man per day. These figures are not included in any other part of this report.

The output of soft coal in the United States was 394,855,325 tons in 1939 an increase of 13.3 percent over the 348,544,764 tons for 1938. Production increased 16.7 percent in 1940 to 460,771,500 tons (see table 14). Although the estimated average value per ton decreased 5.7 percent from $1.955 in 1938 to $1.850 in 1939, the calculated total value of production at mines increased 6.9 percent. An increase in average value to $1.913 in 1940 along with the increased production resulted in a gain of 20.7 percent in value over 1939.

During the first quarter of 1939 production was high because many consumers required excess storage to carry them over the

TABLE 13

Stripping operations in coal fields in Iowa, 1938-40 by counties

County	Number of strip pits	Number of power shovels			Coal produced (net tons)		Number of employees				Average number of days mines operated	Percent of county total mined by stripping	Man-days of labor	Average tons per man per day
		Steam	Electric	All others	Mined by stripping	Total at same mines	Underground	Surface, In strip pits	Surface, All others	Total				
1938:														
Davis, Greene, Keokuk, Monroe Wapello, and Warren	7	.....	2	6	88,042	88,042	.....	78	18	96	110	21.5	10,558	8.34
Mahaska	10	.....	.....	11	172,364	172,364	.....	107	25	132	182	83.3	24,063	7.16
Marion	11	.....	.....	15	190,360	190,360	.....	107	29	136	197	43.0	26,750	7.12
Van Buren	3	.....	.....	2	10,384	10,384	.....	13	3	16	200	54.8	3,200	3.25
Webster	3	.....	.....	4	4,705	4,705	.....	17	2	19	66	17.0	1,258	3.74
Total, 1938	34	.....	2	38	465,855	465,855	.....	322	77	399	165	42.1a	65,829	7.08
1939:														
Davis, Greene, Jasper, Monroe, Polk, Van Buren, Warren, and Webster	11	1	2	6	70,331	70,331	.....	68	28	96	130	.....	12,510	5.62
Mahaska	11	2	1	16	227,874	227,874	.....	135	49	184	162	84.2	29,744	7.66
Marion	9	.....	.....	18	215,023	215,023	.....	95	19	114	215	40.6	24,496	8.78
Wapello	3	.....	.....	7	72,448	72,448	.....	24	12	36	198	40.0	7,134	10.16
Total, 1939	34	3	3	47	585,676	585,676	.....	322	108	430	172	.....	73,884	7.93
1940:														
Davis, Greene, Jasper, Monroe, Polk, Van Buren, Warren, and Webster	14	.....	2	13	79,008	79,008	.....	85	41	126	104	.....	13,139	6.01
Mahaska	13	.....	2	19	315,159	315,159	.....	159	63	222	180	89.1	39,870	7.90
Marion	13	.....	.....	21	252,095	252,095	.....	97	39	136	228	46.8	30,976	8.14
Wapello	4	.....	.....	8	79,650	79,650	.....	29	21	50	192	45.0	9,612	8.29
Total, 1940	44	.....	4	61	725,912	725,912	.....	370	164	534	175	.....	93,597	7.76

a. Percent of county totals, not state.

anticipated suspension of mining on March 31 when the wage contract expired. Production declined sharply during April and May when mining was greatly curtailed pending the signing of a new wage contract. Output increased materially in the last quarter when general business picked up as a result of the outbreak of war in Europe and in 1940 exports increased 42 percent over 1939.

TABLE 14

Summary of bituminous-coal industry in the United States, 1938-40

	Production	Value at mines (calculated)	Average value per ton (a)	Stocks (b)		Consumption (c) (calculated)
				January 1	December 31	
1938	348,544,764	$681,405,014	$ 1.955d	47,074,000	40,720,000	344,649,800
1939	394,855,325	728,348,366e	1.850	40,720,000	44,571,000	379,768,962
1940	460,771,500	879,327,227e	1.913	44,571,000	50,998,000	438,250,143

a. F.O.B. mine, excluding selling expense except as noted.
b. Commercial consumers and retail yards.
c. Production plus imports minus exports plus or minus changes in consumers stock.
d. Average gross realization including selling expense.
e. Includes selling expenses.

An important event in the coal-mining industry was the establishment in 1940 of the minimum prices of bituminous coal f. o. b. mine by the Bituminous Coal Division to become effective October 1, 1940. This was made possible by the Coal Act of 1937 which was due to expire in April 1941, but which was extended 2 years by the Congress.

In recent years there has been a definite trend toward more complete mechanization by bituminous coal producers. In 1939 and 1940 there was a sharp increase in mechanical loading of coal in the United States and there were indications that the proportion of coal mechanically cleaned also increased substantially.

Tables 15, 16 and 17 present a summary of the production and employment features of the bituminous coal industry in the United States from 1938 to 1940.

GYPSUM

Iowa maintained the rank of third largest gypsum-producing state in the union by virtue of yielding 430,712 tons of crude gypsum valued at $510,120 from 9 mines in 1939 and 487,379 short

TABLE 15

Production, men employed, days operated, man-days of labor, and output per man per day at coal mines in the United States in 1938, by states

	Total quantity net tons	Number of employees				Average number of days mines operated	Man days of labor	Average tons per man per day
		Under ground	Surface		Total			
			In strip pits	All others				
Alabama	11,061,493	18,339	91	2,680	21,110	180	3,795,822	2.91
Alaska	154,682	100	.....	44	144	204	29,413	5.26
Arizona, Georgia, Idaho, and Oregon	34,043	82	.....	17	99	122	12,059	2.82
Arkansas	1,197,047	3,215	65	541	3,821	112	429,619	2.79
Colorado	5,663,144	6,897	10	1,378	8,285	169	1,400,088	4.04
Illinois	41,912,085	29,217	1,698	7,448	38,363	149	5,704,535	7.35
Indiana	14,758,484	6,244	1,935	2,350	10,529	149	1,570,984	9.40
Iowa	3,103,187	6,234	322	816	7,372	136	1,000,795	3.10
Kansas	2,654,141	1,861	680	545	3,086	170	525,115	5.05
Kentucky	38,545,218	45,096	60	7,007	52,163	160	8,351,492	4.62
Maryland	1,281,413	2,083	.....	288	2,371	171	405,209	3.16
Michigan	494,481	1,099	.....	106	1,205	163	195,825	2.53
Missouri	3,436,118	3,677	750	786	5,213	151	787,220	4.36
Montana (a)	2,732,050	1,126	40	359	1,525	174	265,784	10.28
New Mexico	1,239,037	1,968	.....	506	2,474	153	378,011	3.28
North Dakota (a)	2,050,099	667	344	359	1,370	174	237,751	8.62
Ohio	18,590,618	23,306	920	3,167	27,393	145	3,984,353	4.67
Oklahoma	1,244,732	1,756	200	373	2,329	139	323,471	3.85
Pennsylvania	77,704,537	99,067	613	13,819	113,499	156	17,679,250	4.40
South Dakota (a)	48,058	18	23	9	50	170	8,507	5.65
Tennessee	4,472,403	7,094	4	1,168	8,266	167	1,383,487	3.23
Texas (a)	878,685	645	22	109	776	1.5	151,050	5.82
Utah	2,946,951	2,338	.....	738	3,076	156	479,733	6.14
Virginia	12,283,036	14,559	.....	2,202	16,761	174	2,918,100	4.21
Washington	1,566,973	1,990	.....	601	2,591	163	423,119	3.70
West Virginia	93,288,172	87,852	56	15,131	103,039	175	18,082,703	5.16
Wyoming	5,203,877	3,474	44	905	4,423	181	801,879	6.49
Total quantity, 1938	348,544,764	370,004	7,877	63,452	441,333	162	71,325,374	4.89
Total quantity, 1937	445,531,449	.....	.....	.....	491,864	193	.....	4.69

a. Includes figures on lignite compiled by L. Mann, Bureau of Mines.

TABLE 16

Production, men employed, days operated, man-days of labor, and output per man per day at coal mines in the United States in 1939, by states

	Total quantity net tons	Average value per ton (a)	Number of employees				Average number of days mines operated	Man days of labor	Average tons per man per day
			Under-ground	Surface		Total			
				In strip pits	All others				
Alabama	12,046,675	$2.30	17,943	90	2,851	20,884	183	3,961,624	3.16
Arkansas	1,152,038	3.17	3,362	45	597	4,004	107	445,592	2.70
Colorado	5,923,210	2.47	6,782	.....	.....	8,161	176	1,526,292	4.12
Illinois	46,782,691	1.64	27,198	1,761	6,935	35,894	163	6,289,257	7.98
Indiana	16,942,772	1.48	5,338	2,140	2,288	9,766	177	1,856,838	9.79
Iowa	2,947,557	2.44	5,220	322	709	6,251	147	940,568	3.20
Kansas	2,674,691	1.89	1,772	525	561	2,858	178	530,905	5.25
Kentucky	42,556,568	1.74	43,881	93	6,667	50,641	180	9,375,987	4.68
Maryland	1,442,728	2.04	2,057	.....	294	2,351	178	430,949	3.44
Michigan	456,754	3.77	1,038	.....	116	1,154	155	188,396	2.55
Missouri	3,273,550	1.88	3,135	672	686	4,493	158	726,644	4.60
Montana	2,756,036	1.46	1,034	.....	.....	1,383	168	248,413	11.87
New Mexico	1,230,060	2.85	1,799	.....	400	2,199	166	384,551	3.37
Ohio	20,289,553	1.63	17,657	1,050	2,935	21,642	175	3,898,899	5.35
Oklahoma	1,187,562	2.11	1,510	144	378	2,032	133	285,001	4.39
Pennsylvania	92,584,113	2.03	96,732	1,219	12,395	110,346	176	20,079,080	4.77
Tennessee	5,185,481	1.95	6,777	.....	.....	7,925	178	1,459,603	3.68
Utah	3,284,904	2.14	1,861	.....	.....	2,544	171	501,773	7.53
Virginia	13,530,974	1.85	13,814	.....	1,811	15,625	186	3,021,200	4.66
Washington	1,690,442	3.11	1,755	.....	.....	2,275	191	450,202	3.90
West Virginia	108,361,934	1.76	88,410	289	14,554	103,233	190	20,280,013	5.51
Wyoming	5,373,289	2.00	2,947	53	757	3,757	207	811,855	6.92
Arizona, Georgia, Idaho, Oregon, and Texas	55,280	2.96b	297	.....	96	393	88	36,309	1.59
Total quantity, 1939	394,855,325c	$1.850	353,476c	8,791c	59,521c	421,788c	178c	77,729,951	5.25c
Total quantity, 1938	348,544,764	.....	370,004	7,877	63,452	441,333	162	71,325,374	4.89

a. Value of all coal produced, f.o.b. mine, excluding selling cost.
b. Texas (value $1.12 per ton) not included.
c. Includes lignite in Montana, North Dakota, South Dakota and Texas.

TABLE 17

Production, men employed, days operated, man-days of labor, and output per man per day at coal mines in the United States in 1940, by states

	Total quantity net tons	Average value per ton (a)	Number of employees				Average number of days mines operated	Man days of labor	Average tons per man per day
			Underground	Surface		Total			
				In strip pits	All others				
Alabama	15,324,163	$2.33	20,068	94	3,314	23,476	219	5,136,191	2.98
Alaska	173,844	3.49	70	.....	28	98	322	31,541	5.51
Arizona, Idaho, and Oregon	16,902	3.32	37	.....	9	46	210	9,663	1.75
Arkansas	1,453,611	3.36	3,194	58	623	3,875	136	527,621	2.76
Colorado	6,588,742	2.53	6,463	23	1,350	7,836	188	1,473,647	4.47
Georgia	42,307	2.38	96	.....	34	130	217	28,248	1.50
Illinois	50,610,430	1.69	27,067	1,729	7,362	36,158	169	6,119,358	8.27
Indiana	18,868,572	1.53	5,085	1,751	2,819	9,655	188	1,815,165	10.39
Iowa	3,231,177	2.49	5,061	370	790	6,221	158	985,478	3.28
Kansas	3,578,952	1.88	1,601	474	739	2,814	196	550,869	6.50
Kentucky	49,140,904	1.85	47,442	100	7,254	54,796	200	10,986,433	4.47
Maryland	1,503,433	2.11	2,054	.....	285	2,339	182	424,936	3.54
Michigan	410,169	3.88	773	.....	97	870	187	163,091	2.51
Missouri	3,096,741	2.04	2,920	618	684	4,222	170	718,755	4.31
Montana (b)	2,867,200	1.45c	995	56	360	1,411	188	264,911	10.82
New Mexico	1,110,615	2.97	1,562	.....	396	1,958	168	328,416	3.38
North Dakota (lignite)	2,218,434	1.17c	654	371	352	1,377	182	251,216	8.83
Ohio	22,771,552	1.71	16,893	1,227	3,054	21,174	193	4,076,578	5.59
Oklahoma	1,645,981	2.44	1,471	183	394	2,048	176	359,675	4.58
Pennsylvania	116,602,999	2.04	102,996	1,685	13,739	118,420	212	25,115,380	4.64
South Dakota (lignite)	66,085	1.33c	12	39	12	63	168	10,577	6.25
Tennessee	6,008,456	2.00	7,413	3	1,150	8,566	208	1,779,057	3.38
Texas (b)	620,555	1.10c	543	16	68	627	160	100,618	6.17
Utah	3,575,586	2.20	1,882	.....	708	2,590	182	471,606	7.58
Virginia	15,348,075	1.95	14,793	5	2,222	17,020	199	3,391,223	4.53
Washington	1,650,352	3.16	1,838	5	482	2,325	188	436,530	3.78
West Virginia	126,437,621	1.83	88,684	127	15,924	104,735	215	22,560,069	5.60
Wyoming	5,808,042	2.06	3,346	49	830	4,225	173	733,036	7.92
Total quantity, 1940	460,771,500	$1.913	365,013	8,983	65,079	439,075	202	88,849,888	5.19
Total quantity, 1939	394,855,325	$1.850	353,476	8,791	59,521	421,788	178	77,729,951	5.25

a. Value received or charged for coal f.o.b. mine, including selling cost (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked (not coke) as estimated by producer at average prices that might have been received if such coal had been sold commercially.)
b. Includes lignite. All lignite figures collected by Bureau of Mines.
c. Lignite figures exclude selling cost.

tons valued at $587,223 from 8 mines in 1940 (see table 18). These productions represent an increase over the preceding year of 18 percent in volume and 3 percent in value in 1939 and 13 percent in volume and 15 percent in value in 1940. They made up about 13 percent of the total volume and over 11 percent of the value of crude gypsum mined in the United States in the two-year period.

The average price of run-of-mine gypsum in Iowa which was $1.36 a ton in 1938, dropped to $1.18 in 1939 but advanced to $1.20 in 1940. These prices were somewhat below the average for the United States which was $1.37 in 1939 and $1.41 in 1940. The price and value of run-of-mine gypsum is estimated by producers since there is no open market for this material. The basis of estimates may vary greatly.

Calcined gypsum, used chiefly for making gypsum products, was produced in Iowa by 6 firms employing 20 kettles in 1939 and by 5 firms utilizing 18 kettles in 1940. Neither beehive nor rotary kilns are used for calcining purposes in Iowa. No figures are available on the amount of gypsum calcined in the State.

Gypsum products form the backbone of the gypsum industry. The tendency to develop the field of products rather than to increase the sales of crude or raw gypsum has met with success. Following the trend of the country as a whole, Iowa production recovered in 1939 from the decline in 1938 and a further increase occurred in 1940.

Of the 9 companies reporting in 1939 in Iowa, 7 were utilizing underground mines and 2 were using quarries to obtain their raw gypsum.

In 1939 crude gypsum mined in the United States advanced 20 percent in quantity and 3.7 percent in value over 1938. Gains in 1940 over 1939 amounted to 14.6 percent in quantity and 18 percent in value.

From a national viewpoint the most striking feature of the gypsum industry in 1939 was the gain of 43 percent in the sale of laths (see table 19). Gypsum laths are now the dominant lathing material. Consumption of gypsum tile, block and plank increased 51 percent over 1938. These increases were brought about largely by the high level of building construction, particularly residential building. The great improvement over 1938 did not apply to all parts of the industry. Sales of uncalcined gypsum, although the highest in recent years, did not keep pace with other products.

TABLE 18

Crude gypsum mined in the United States, 1938-40, by states (a)

	1938			1939			1940		
	Active mines	Short tons	Value	Active mines	Short tons	Value	Active mines	Short tons	Value
California	5	162,056	$ 334,208	5	188,364	$ 306,350	6	259,321	$ 437,504
Colorado	3	21,591	41,080	3	24,013	40,694	3	24,641	36,787
Iowa	8	364,920	495,856	9	430,712	510,120	8	487,379	587,223
Michigan	5	483,324	775,908	5	643,180	834,856	5	746,982	1,017,126
Nevada	3	168,515	366,869	4	205,762	484,621	4	250,632	618,050
New York	10	601,394	941,744	9	709,495	971,229	9	798,229	1,037,181
Oklahoma	3	141,341	231,910	3	161,748	207,503	3	176,166	227,534
Texas	5	246,990	260,094	6	283,912	266,265	7	328,261	368,882
Utah	3	43,144	45,823	4	58,146	65,269	4	45,421	60,055
Other states (b)	11	450,930	778,182	12	521,405	744,098	10	581,983	837,568
Total	56	2,684,205	$4,271,674	60	3,226,737	$4,431,005	59	3,699,015	$5,227,910

a. Moyer, Forrest T., Gypsum, Minerals Yearbook, Review of 1940, p. 1200, 1941.
b. 1938: 1 active mine each in Idaho, South Dakota, and Wyoming; 2 each in Kansas, Montana, Ohio and Virginia. 1939: 1 active mine each in Arizona and South Dakota; 2 each in Kansas, Montana, Ohio, Virginia, and Wyoming. 1940: 1 active mine each in South Dakota and Wyoming; 2 each in Kansas, Montana, Ohio, and Virginia.

TABLE 19

Gypsum products (made from domestic imported, and byproduct crude gypsum) sold or used in the United States, 1938-40, by uses

Uses	1938		1939		1940	
	Short tons	Value	Short tons	Value	Short tons	Value
Uncalcined:						
Portland-cement retarder	674,062	$ 1,238,715	774,982	$ 1,406,129	820,828	$ 1,599,511
Agricultural gypsum	68,470	318,620	75,091	364,711	92,232	502,298
Other uses (a)	14,033	124,036	17,709	156,575	16,059	149,048
Total uncalcined	756,565	1,681,371	867,782	1,927,415	929,119	2,250,857
Calcined:						
For building uses:						
Plasters:						
Base-coat	1,161,762	10,400,557	1,413,291	12,768,526	1,475,033	13,012,665
Sanded	106,355	606,060	116,459	662,211	132,306	732,503
To mixing plants	16,917	102,821	19,485	119,391	17,456	107,671
Gauging and molding	120,933	1,442,511	150,175	1,923,109	163,650	2,036,150
Prepared finishes	26,424	488,307	14,136	491,788	12,455	344,908
Insulating and roof-deck	16,233	143,877	24,798	214,397	18,561	162,100
Other (b)	12,843	359,309	14,169	486,710	16,104	513,621
Keene's cement	23,496	366,813	27,191	424,341	26,962	419,177
Lath (c)	594,659	10,287,935	850,768	14,598,868	1,072,555	18,189,358
Wallboard (d)	269,949	7,921,400	303,472	8,766,184	380,125	10,595,245
Sheathing board (e)	.....	.....	5,097	105,649	86,945	1,632,688
Tile (f)	112,477	1,300,830	174,780	2,066,086	178,315	1,962,963
Total for building uses	2,462,048	$ 33,420,420	3,113,821	$ 42,627,260	3,580,467	$ 49,709,049
For industrial uses:						
To plate-glass and terra-cotta works	21,918	144,845	35,777	242,671	40,741	276,891
To pottery works	16,981	219,071	18,121	234,725	20,138	264,975
Orthopedic and dental plasters	8,114	270,691	9,586	313,930	9,787	324,567
Other industrial uses (g)	47,235	519,910	46,911	582,238	52,977	666,305
Total for industrial uses	94,248	$ 1,154,517	110,395	$ 1,373,564	123,643	$ 1,532,738
Total calcined	2,556,296	$ 34,574,937	3,224,216	$ 44,000,824	3,704,110	$ 51,241,787
Grand total value	.....	$ 36,256,308	.....	$ 45,928,239	.....	$ 53,492,644

a Includes uncalcined gypsum sold for use as filler and rock dust, in paint manufacturing, and for minor purposes.
b Includes joint filler, patching and painter's plaster, and unclassified building plasters.
c 1938: 809,471 M square feet; 1939: 1,137,415 M square feet; 1940: 1,450,069 M square feet
d 1938: 371,767 M square feet; 1939: 405,655 M square feet; 1940: 491,291 M square feet.
e 1939: 5,221 M square feet; 1940: 89,631 M square feet.
f 1938: 19,942 M square feet; 1939: 30,191 M square feet; 1940: 30,026 M square feet.
g Includes statuary, industrial casting and molding plasters, dead-burned filler, and miscellaneous sales.

Stimulated by the advanced rates of building activity and industrial production in 1940, the total volume of sales of gypsum products increased 16 percent over 1939 and compared favorably with the peak year of 1925. Sales of gypsum laths increased over the high figure for 1939. The most outstanding increase, however, was that of sheathing board which jumped from 5¼ million square feet in 1939 to more than 89½ million square feet in 1940. This increase is explained by rapid construction of housing facilities for industrial defense workers and selective service draftees. These new markets created a shortage and rise in price of normal sheathing materials to the advantage of the gypsum industry.

LIMESTONE

Limestone production in Iowa increased greatly in 1939 and established a record high of 6,400,590 tons valued at $4,385,234; an advance of 90 percent in volume and 15.9 percent in value over 1938 (see table 20). Production dropped sharply in 1940, but in spite of this the output of 4,013,740 tons valued at $3,832,070 was higher than for any previous year in the history of the industry except 1939 and 1937.

Total production of building stone and crushed or broken stone in Iowa is derived almost exclusively from limestones (including dolomites). Comparatively small quantities of sandstone are produced for these uses, but normally they make up much less than 1 percent of the total stone output.

The chief use of limestone in Iowa is for concrete and road metal. The quantity of stone used for these purposes in 1939 was over 100 percent more than for 1938. Because of a sharp decline in average price per ton in 1939 the value of concrete and road metal produced did not increase in proportion to quantity. In 1940, however, the price again increased and although the quantity produced dropped 43.3 percent the value declined only 19.5 percent.

Of secondary importance in Iowa are the uses of limestone for agricultural purposes and for riprap. Limestone used in agriculture did not follow the trend of mineral production in general in the State; it declined slightly in 1939 but increased to a record high in 1940 when the quantity sold or used was 391,820 tons valued at $350,282. Stone used for riprap increased in quantity and value in 1939 and although the quantity of production decreased slightly in 1940 the value increased 42 percent due to a rise in average price.

Other uses of stone in Iowa include: railroad ballast, rubble,

TABLE 20

Production of limestone in Iowa, 1938-40

	Building stone (a)	Riprap	Concrete and road metal	Railroad ballast	Agri-culture	Other limestone (b)	Total
1938							
Short tons	3,240	182,180	2,899,890c	.....	236,300	48,140	3,369,750d
Value	$3,007	113,089	3,353,223c	.....	207,883	105,278	$3,782,480d
Producers	4	18	69	2	46	17	85
1939							
Short tons	3,320	219,440	5,847,660e	79,860	214,620	35,690	6,400,590
Va ue	$4,794	139,136	3,899,875e	46,010	186,431	108,988	$4,385,234
Producers	5	10	31	3	34	5	114
1940							
Short tons	1,830	204,090	3,330,850	40,160	391,820	44,990	4,013,740
Value	$2,499	197,594	3,136,167	27,980	350,282	117,548	$3,832,070
Producers	5	8	32	4	42	6	74

a Includes rough construction, rubble, flagging, and curbing.
b Includes fluxing stone, sugar factories, coal dust, asphalt filler, poultry grit, mineral food and other uses.
c Includes railroad ballast and sandstone.
d Revised.
e Includes 11,920 short tons sandstone valued at $11,141.

TABLE 21

Production of limestone in the United States, 1938-40

	Building stone (a)	Flagging	Fluxing stone	Riprap	Concrete and road metal	Railroad ballast	Agriculture	Other (b)	Total
1938									
Short tons	694,080	10,000	9,692,130	2,590,770	54,357,130	3,187,770	4,367,410	6,780,400	81,679,690
Value	$4,862,117	74,560	6,933,621	3,107,511	52,387,376	2,210,881	5,637,485	7,073,004	82,286,555
1939									
Short tons	1,043,730	16,940	17,271,560	2,237,990	61,304,670	4,389,120	5,459,260	9,122,820	100,846,090
Value	$6,592,277	85,565	12,618,938	2,039,877	54,965,364	2,924,840	6,592,827	8,997,793	94,817,481
1940									
Short tons	1,063,060	19,070	22,856,910	3,243,360	60,934,100	5,085,410	8,724,160	10,731,990	112,658,060
Value	$4,181,816	78,149	15,738,887	3,536,325	55,585,581	3,346,614	9,910,373	10,629,560	103,007,305

a Includes rough and finished construction stone and rubble.
b Includes stone used in sugar factories, glass factories, paper mills, and other uses.

flagging, curbing, flux, sugar manufacture, coal dust, asphalt filler, poultry grit, and mineral food.

In the United States the quantity and value of limestone sold or used increased in 1939 and again in 1940 (see table 21). In 1939 all branches of the industry showed decisive gains over 1938 except riprap. In 1940 the value of limestone used as building stone suffered a decline largely because of lower unit prices of this commodity. Sales of crushed or broken limestone advanced, particularly in the metallurgical, refractory, and agricultural fields. Agricultural lime made a 60-percent advance over 1939.

SAND AND GRAVEL

Total production of sand and gravel in Iowa declined in 1939 but recovered in 1940 (see table 22) with an output of 6,451,845 tons, the second largest in the history of the industry in the State. The 1938 production broke all previous records in Iowa for quantity and value of sand and gravel produced. In 1939 the quantity of production dropped 32 percent and the value 33 percent below the figures for 1938. In 1940, however, there was a 35-percent increase in quantity and, aided by a slight increase in average price, an advance of 40 percent in value.

These wide variations were due chiefly to the fluctuation of government-and-contractor output. Government-and-contractor producers, formerly classified as "noncommercial", include: 1. Those of federal, state, county, or municipal agencies such as state highway commissions, county road supervisors and engineers, W. P. A., etc. which obtain sand and gravel from the source with their own crews; 2. Contractors who produce directly for local or federal government agencies. Prior to 1929 only a small proportion of the total sand and gravel production was from these operations. Apparently they are a development of the depression.

Iowa production in this category for 1938 accounted for 57 percent of the quantity and 32.9 percent of the total value of sand and gravel produced. In 1939 the respective percentages were 47.7 and 15.6, and in 1940 they were 46.3 and 14.1. The chief product of these operators for the period of this report was paving and road gravel.

Commercial production of sand and gravel was more stable than government-and-contractor output. There was a decline of 16.7 percent in quantity and 15.8 percent in value in 1939 but in 1940 a recovery of 38 percent in quantity and 43 percent in value, to 3,464,803 tons valued at $1,853,285 established a high for the years after 1930.

The leading commercial products for the period of this report were paving and road gravel and structural sand.

In the United States the quantity and value of production of sand and gravel sold or used increased substantially in 1939 (see table 23). Futher advances in 1940 brought production to a new peak. Commercial operations accounted for most of the gains in both years although government-and-contractor output increased slightly.

The largest advances in 1939 were in railroad ballast, filter, molding, fire and furnace sand, and railroad ballast gravel. The only decline was in the output of paving gravel. In 1940 the chief advance was in the production of molding sand, probably due to defense activity, and all other uses showed gains except sand for filtering and railroad ballast.

TABLE 22

Summary of sand and gravel production in Iowa, 1938-40

	Molding and filter sand	Structural sand	Paving and road sand	Cutting, grinding, polishing, and blast sand	Engine sand	Railroad ballast sand	Other sands	Total sand	Structural gravel	Paving and road gravel	Railroad ballast gravel	Other gravel	Total gravel	Grand total sand and gravel
1938														
Commercial and Railroads														
Short tons	35,066	398,025	622,169	10,095	37,885	18,594	10,410	1,132,244	355,624	1,308,040	152,600	59,090	1,875,354	3,007,598
Value	$ 38,810	234,268	279,129	9,759	20,282	11,308	2,642	596,198	291,231	586,234	31,062	37,722	946,249	1,542,447
Government and Contractors														
Short tons	.....	17,588	1,400	.....	.....	.....	.....	18,988	456,841	3,510,819	.....	.....	3,967,660	3,986,648
Value	$.....	2,289	500	.....	.....	.....	.....	2,789	65,195	689,251	.....	.....	754,446	757,235
Total: Short tons	35,066	415,613	623,569	10,095	37,885	18,594	10,410	1,151,232	812,465	4,818,859	152,600	59,090	5,843,014a	6,994,246a
Value	$ 38,810	236,557	279,629	9,759	20,282	11,308	2,642	598,987	356,426	1,275,485	31,062	37,722	1,700,695a	2,299,682a
1939														
Commercial and Railroads														
Short tons	57,843	494,149	368,522	(b)	32,919	5,649	10,828	969,910	273,194	1,061,374	177,333	22,177	1,534,078	2,503,988
Value	$ 61,748	253,211	147,534	(b)	17,547	1,014	7,593	488,647	227,107	507,109	59,490	17,096	810,802	1,299,449
Government and Contractors														
Short tons	.....	3,352	8,508	.....	.....	.....	.....	11,860	289,342	1,984,497	.....	.....	2,273,839	2,285,699
Value	$.....	493	6,407	.....	.....	.....	.....	6,900	27,872	205,808	.....	.....	233,680	240,580
Total: Short tons	57,843	497,501	377,030	(b)	32,919	5,649	10,828	981,770	562,536	3,045,871	177,333	22,177	3,807,917	4,789,687
Value	$ 61,748	253,704	153,941	(b)	17,547	1,014	7,593	495,547	254,979	712,917	59,490	17,096	1,044,482	1,540,029
1940														
Commercial and Railroads														
Short tons	54,480	795,494	398,586	(b)	35,814	(b)	25,255	1,309,629	356,567	1,541,238	(c)	257,369	2,155,174	3,464,803
Value	$ 59,307	472,689	159,378	(b)	19,941	(b)	14,389	725,704	276,538	737,427	(c)	112,616	1,126,581	1,852,285
Government and Contractors														
Short tons	.....	6,066	98,865	.....	.....	.....	.....	104,931	6,357	2,875,754	.....	.....	2,882,111	2,987,042
Value	.....	853	7,699	.....	.....	.....	.....	8,552	1,452	293,305	.....	.....	294,757	303,309
Total: Short tons	54,480	801,560	497,451	(b)	35,814	(b)	25,255	1,414,560	362,924	4,416,992	(c)	257,369	5,037,285	6,451,845
Value	$ 59,307	473,542	167,077	(b)	19,941	(b)	14,389	734,256	277,990	1,030,732	(c)	112,616	1,421,338	2,155,594

a Revised figure.
b Included under other sands.
c Included under other gravels.

TABLE 23

Sand and gravel industry in the United States, 1938-40

	Glass sand	Molding sand	Building sand	Paving sand	Grinding, polishing, and blast sand	Fire or furnace sand	Engine sand	Filter sand	Railroad ballast	Other sand	Total sand	Building gravel	Paving gravel	Railroad ballast	Other gravel	Total gravel	Grand total sand and gravel
1938																	
Short tons.	2,109,462	2,319,902	25,097,184	23,378,707	502,328	108,093	1,378,450	93,711	786,435	1,339,556	57,113,828	26,314,759	88,660,248	8,194,244	1,037,154	124,206,405	181,320,233
Value.....	$3,601,734	2,651,779	13,779,047	10,762,421	754,805	124,343	786,639	137,283	212,935	1,124,739	33,935,725	15,737,827	33,579,665	2,255,355	414,275	51,987,122	85,922,847
1939																	
Short tons.	2,468,290	3,728,389	30,589,828	24,749,699	668,027	172,348	1,469,562	173,013	1,259,367	1,799,537	72,542,000a	30,925,560	84,528,806	9,972,259	2,313,848	153,466,000a	226,008,000a
Value.....	$4,280,936	4,039,082	15,731,724	11,616,694	895,989	197,500	854,939	195,142	332,715	1,417,617	41,608,000a	18,691,362	32,951,198	3,094,013	925,136	64,458,000a	106,066,000a
1940																	
Short tons.	2,759,544	5,004,807	34,740,644	30,407,866	856,309	270,715	1,634,968	118,600	957,745	1,923,042	78,674,240	33,295,541	112,750,100	10,880,779	2,707,607	159,634,027	238,308,267
Value.....	$4,881,508	5,268,974	17,282,151	13,697,249	915,925	325,713	1,069,630	164,061	256,439	1,469,979	45,331,629	20,127,100	40,569,012	3,627,796	1,032,597	65,356,505	110,688,134

a Revised figures.