MINERAL PRODUCTION OF IOWA

IN 1901

BY

S. W. BEYER.

VALUE OF MINERAL PRODUCTION.

1900.

Coal	$6,977,466
Clay	2,395,488
Stone	604,886
Gypsum	393,750
Lead and zinc	22,194
Iron ore	2,139
Total	$10,401,661

1901.

Coal	$8,051,806
Clay	2,774,200
Stone	781,756
Gypsum	562,500
Lead and zinc	16,500
Iron ore	4,876
Total	$12,204,160

MINERAL PRODUCTION IN IOWA FOR 1901.

BY S. W. BEYER.

The year 1901 shows a splendid increase in mineral production for Iowa over preceding years, both in quantity and price. This increase is not confined to any one department but every department save that of lead and zinc shared in the prosperity. Coal alone shows an advance in total value of over a million of dollars or a net increase of about fifteen per cent. Clay shows almost the same percentage of increase, while the value of stone advanced thirty per cent and the iron ore production more than doubled. The statistics for gypsum were not complete for 1900 and comparisons cannot be made in detail. The output for 1901, however, shows a fair increase over 1900. The total number of producers increased about five per cent, chiefly due to the more complete returns from the stone producers.

The number of producers in the various mineral industries of the state may be viewed in parallel columns for the years 1900 and 1901 in the table below.

	1900.	1901.
Coal	231	242
Clay	381	349
Stone	170	229
Gypsum	7	7
Lead and zinc	6	10
Iron ore	1	1
Total	796	838

As during the preceding years the gathering of mineral statistics was carried on jointly by the State and Federal Surveys. The original requests were sent out from Washington, while the task of looking up the delinquents devolved largely upon the local office.

Full acknowledgment is due the producers for the promptness shown by the great majority in answering the communications sent them and for the painstaking completeness of their reports.

The value of the total mineral production is shown in table I

TABLE I.

VALUE OF TOTAL MINERAL PRODUCTION BY COUNTIES.

COUNTIES.	Number of Producers.	Total coal.	Total clay.	Total stone	Miscellaneous.	Total.
Adair	4		$ 8,700			$ 8,700
Adams	17	$ 28,113	13,350	$ 875		42,338
Allamakee	4			11,425	$ 4,876	16,301
Appanoose	54	1,336,662	17,650	163		1,344,475
Audubon	2		13,950			13,950
Benton	9		16,528	7,830		24,358
Black Hawk	13		15,495	11,651		27,146
Boone	21	421,179	50,275			471,454
Bremer	3		5,061			5,061
Buena Vista	2		22,467			22,467
Buchanan	1					
Butler	1					
Calhoun	4		19,925			19,925
Carroll	1					
Cass	5		14,412			14,412
Cedar	4			71,720		71,720
Cerro Gordo	10		162,225	19,250		181,475
Cherokee	1					
Chickasaw	1					
Clarke	5			1,457		1,459
Clayton	13		11,626	11,463		23,088
Clinton	16		14,400	7,877		22,277
Crawford	2		10,720			10,720
Dallas	10	30,524	63,660	150		94,334
Davis	4	2,357	1,597			3,954
Decatur	9		7,237	1,593		8,830
Delaware	3		5,100	30		5,130
Des Moines	16		29,030	25,417		54,447
Dubuque	24		34,150	69,058	16,500	119,708
Fayette	7		16,020	4,800		20,820
Floyd	5		3,989	5,150		9,139
Fremont	6		13,300			13,300
Franklin	1					
Greene	6	29,893				29,893
Grundy	2			640		640
Guthrie	5		30,606			30,606
Hamilton	5		75,910	1,800		77,710
Hancock	1					
Hardin	10		47,970	13,105		61,075
Harrison	7		16,200			16,200
Henry	8		15,330	14,650		29,980
Howard	4			1,981		1,981
Humboldt	3			1,520		1,520
Ida	1					
Iowa	4		29,612			29,612
Jackson	5			162,205		162,205
Jasper	16	267,393	27,150			294,543
Jefferson	7	2,748	17,846	125		20,719
Johnson	7		25,600	3,480		29,080
Jones	10		7,300	96,171		103,471
Keokuk	32	527,527	30,215	3,548		561,290

TABLE I—CONTINUED.

VALUE OF TOTAL MINERAL PRODUCTION BY COUNTIES.

COUNTIES.	Number of Producers.	Total coal.	Total clay.	Total stone.	Miscellaneous.	Total.
Kossuth	1					
Lee	25		$ 13,339	$54,005		$ 67,344
Linn	17		43,428	23,133		66,561
Louisa	13		8,700	3,907		12,607
Lucas	2	$ 266,916				266,916
Madison	11			16,508		16,508
Mahaska	35	1,332,691	73,132	1,305		1,407,128
Marion	21	185,744	12,715			198,459
Marshall	9		36,450	47,900		84,350
Mills	3		18,200			18,200
Mitchell	2			4,093		4,093
Monona	2		2,665			2,665
Monroe	12	1,480,917	912	457		1,482,286
Montgomery	6		39,190	1,182		40,372
Muscatine	8		28,270			28,270
O'Brien	2		3,035			3,035
Page	5	17,050	32,700			49,750
Plymouth	2		6,600			6,600
Pocahontas	1					
Polk	41	1,378,125	426,978			1,805,103
Pottawattamie	9		71,350			71,350
Poweshiek	4		15,940			15,940
Ringgold	3		14,038			14,038
Sac						
Scott	23	22,303	57,450	56,992		136,745
Shelby	4		13,360			13,360
Sioux	2		9,875			9,875
Story	6	900	30,193			31,093
Tama	8		63,500	325		63,825
Taylor	7	50,098	13,492			63,590
Union	2		16,860			16,860
Van Buren	11	18,993	5,375	395		24,763
Wapello	24	325,653	64,093	14,757		404,503
Warren	8	56,858				56,858
Washington	14		29,175	12,404		41,579
Wayne	7	32,544	10,390	41		42,975
Webster	36	236,618	201,075	9,475	$562,500	1,009,668
Winneshiek	2		4,950			4,950
Woodbury	6		227,154			227,154
Wright	3		6,372			6,372
Single producers			132,241	5,458		137,699
Unclassified	16		146,900			146,900
Total	838	$8,051,806	$2,774,200	$781,756	$583,876	$ 12,204,160

COAL.

The price of coal was strong and on the advance during the entire year. This advance in price was in part due to the increased cost of mining owing to the wage scale adopted by the joint committee or scale committee of the miners and operators of the district, generally known as the "Ottumwa Agreement," and effective between April 1, 1901, and March 31, 1902. This agreement was also responsible in large part for the increase in the number of men employed. Table II shows that while the tonnage production increased only about ten per cent the number of employes increased almost twenty per cent. The "Ottumwa Agreement" established the eight-hour day and hence the change in number of men employed. The average price per ton advanced five cents, or a little less than four per cent over the preceding year.

During the year work in exploration was pushed vigorously in Monroe, Polk and Marion counties. No less than twelve drill rigs were operating in Monroe county alone. Good results were reported from all of these counties and important developments may be expected in the near future, particularly in the first two counties mentioned.

Table II gives the total tonnage, average price per ton, total value, number of mines producing, average number of days worked and number of men employed, arranged by counties. No attempt was made to keep separately the various sizes of coal put upon the market. Mine run, steam coal, nut and slack are included in the total. This fact must be kept in mind if an analysis by counties be attempted. The Centerville and Boone districts mine "longwall" largely and produce almost no slack and the average price per ton given would be for lump coal, while the districts which "shoot from the solid" produce at least thirty per cent fine coal sold as "steam," "nut," "pea" or "slack." The statistics are also incomplete as to distribution. A considerable number of the coal companies do not keep a separate record for coal sold to employes or locally and the great majority keep no record of the amount consumed at the mines; at least few return amounts so consumed. The amounts shipped or sold locally vary greatly for the different coal producing counties. In Adams

county the mines are small and the entire output is sold locally, while in Monroe county the large railway mines prevail and scarcely more than one per cent is consumed at home. In Appanoose county between five and six per cent of the output is sold at home while in Polk where the urban population is greatest the home consumption exceeds twenty-five per cent. The first two counties represent the extremes in the distribution of the coal output while the two last mentioned counties more nearly represent the average for country and city districts respectively. The average for the entire state, barring coal used for steam and heat at the mines, would be not far from fifteen per cent sold at home to eighty-five per cent shipped.

TABLE II.

COAL OUTPUT BY COUNTIES FOR 1901.

COUNTIES.	Number of mines.	Tonnage.	Value.	Average price per ton.	Aver'ge number men employed.	Aver'ge number days worked.
Adams	12	12,953	$ 28,113	$ 2.17	98	147
Appanoose	47	868,967	1,336,662	1.54	2,566	196
Boone	11	257,033	421,179	1.64	791	215
Dallas	3	16,988	30,524	1.79	56	182
Davis	2	1,364	2,357	1.73	18	92
Greene	5	16,450	29,893	1.82	60	154
Jasper	8	183,500	267,393	1.45	375	239
Jeffeeson	2	1,248	2,748	2.20	6	145
Keokuk	11	366,915	527,527	1.44	989	234
Lucas	2	216,058	266,916	1.23	417	210
Mahaska	29	899,618	1,332,691	1.49	1,695	215
Marion	17	149,917	185,744	1.24	371	188
Monroe	8	1,237,332	1,480,917	1.20	2,515	275
Page	3	6,820	17,050	2.50	20	248
Polk	23	954,112	1,378,125	1.44	1,914	225
Scott	7	13,857	22,303	1.61	72	190
Story	1	300	900	3.00	6	75
Taylor	3	23,499	50,098	2.13	80	232
Van Buren	5	12,572	18,993	1.51	37	182
Wapello	14	249,880	325,653	1.31	529	227
Warren	8	26,261	56,858	2.17	108	147
Wayne	2	19,478	32,544	1.67	71	197
Webster	19	127,894	236,618	1.85	238	228
Total	242	5,663,016	$ 8,051,806	$ 1.42	13,032	223

The average number of days worked shows a falling off in Keokuk, Lucas, Mahaska, Marion and Wapello counties; a falling

off great enough to affect the entire state, notwithstanding the marked increase in the number of days worked in Monroe county. The average number of days worked and the number of men employed during the past ten years, according to the best information available, was as follows:

YEARS.	AVERAGE NUMBER OF DAYS WORKED.	NUMBER OF MEN EMPLOYED.
1892	236	8,170
1893	204	8,863
1894	170	9,995
1895	189	10,066
1896	178	9,672
1897	201	10,703
1898	218	10,256
1899	229	10,268
1900	228	11,601
1901	223	13,032

According to the authority of the United States Geological Survey, Iowa ranked ninth in tonnage and sixth in the value of coal produced for 1900. The ten leading producers for that year tabulated in the order of their importance as to tonnage were:

	TONS.	VALUE.
Pennsylvania (bituminous only)	79,842,326	$ 77,438,545
Illinois	25,767,981	26,927,185
West Virginia	22,647,207	18,416,871
Ohio	18,988,150	19,292,246
Alabama	8,394,275	9,793,785
Indiana	6,484,086	6,687,137
Kentucky	5,328,964	4,881,577
Colorado	5,244,364	5,858,036
Iowa	5,105,151	6,977,466
Kansas	4,467,870	5,454,691

Iowa's increase in production over preceding years is made more manifest by an inspection of the comparative table below:

YEARS.	SHORT TONS.	AVERAGE PRICE PER TON.	VALUE.	AUTHORITY.
1894	3,967,253	$1.26	4,999,939	U. S. G. S.
1895	4,156,074	1.20	4,982,102	U. S. G. S.
1896	3,954,028	1.17	4,628,022	U. S. G. S.
1897	4,611,865	1.13	5,219,503	U. S. G. S.
1898	4,618,842	1.14	5,260,716	U. S. G. S.
1899	5,177,479	1.24	6,399,338	U. S. G. S.
1900	5,105,151	1.37	6,977,466	Iowa Geol. Sur.
1901	5,663,016	1.42	8,051,806	Iowa Geol. Sur.

According to the Tenth Biennial Report of the State Mine Inspectors the output of coal for the year ending June 30, 1901, was 5,441,863 tons.

CLAY.

The clay production for 1901 was the greatest in the history of the state. There was an increase in both price and production. The returns show a falling off in the number of producers, chiefly small concerns using the loess and other surface clays. Several large factories were opened during the year, notably at Boone and Lehigh, and several others have made the necessary preparations to begin active operations in 1902, the most important of which are located at Des Moines, Iowa Falls and Marshalltown. As yet but feeble attempts have been made to manufacture high grade and ornamental wares. The chief staples are common brick and tile, face brick and paving brick. The pottery production shows a falling off of more than forty per cent over the preceding year. The increase in paving brick both in price and number manufactured is gratifying and warrants the hope that Iowa may again regain her importance as a producer in that line. The clay goods marketed during 1901 were distributed as follows:

	THOUSANDS.	VALUE.
Common Brick	254,432	$ 1,651,926
Front Brick	8,577	85,330
Paving Brick	22,530	227,378
Hollow Brick	400	3,000
Ornamental Brick	.....	2,229
Fire Brick	.....	803
Drain Tile	.....	516,714
Sewer Pipe	.....	53,500
Sidewalk Blocks	.....	1,570
Hollow Blocks	.....	59,270
Burnt Clay Ballast	.....	101,500
Pottery	.....	26,200
Miscellaneous	.....	14,780
Total	.....	$ 2,774,200

The most important increase of 1901 over 1900 was in the manufacture of drain tile, an increase of nearly thirty-five per cent in value. The increase in this department is even a better

index of the prosperous condition of the rural population than is the increase in the production of common brick and paving brick, a measure of the thriftiness of the urban communities. The price of common brick did not change materially as compared with the preceding year, the average being about $6.49 per thousand as compared with $6.47 for 1900. Nearly all of the other products increased in price and the amount produced. Clay ballast dropped from nearly $200,000 to scarcely more than half the amount. Hollow building blocks are rapidly gaining favor both with producer and consumer. They can be manufactured more cheaply than ordinary brick, can be shipped greater distances at the same expense and are more economical to put in the wall, aside from possessing certain sanitary advantages. The outlook in this field is especially inviting.

The distribution of clay products by counties is contained in table III, herewith appended:

TABLE III.

CLAY PRODUCTION BY COUNTIES FOR 1901.

COUNTIES.	Number of producers.	THOUSANDS.		VALUE.		
		Common brick.	*Total brick.	Common brick.	Total brick.	Total clay.
Adair	4	1,250	1,300	$ 8,000	$ 8,500	$ 8,700
Adams	4	1,951	1,951	13,050	13,050	13,350
Appanoose	4	1,875	2,375	12,650	17,650	17,650
Audubon	2	1,950	1,950	13,650	13,650	13,950
Benton	5	1,675	1,775	10,638	11,638	16,528
Black Hawk	3	2,432	2,432	15,495	15,495	15,495
Boone	10	4,904	5,854	35,050	44,675	50,275
Bremer	3	723	723	5,061	5,061	5,061
Buena Vista	3	550	550	4,400	4,400	22,467
Buchanan	1	.....	.....	.....	.....	.....
Butler	1	.....	.....	.....	.....	.....
Calhoun	4	1,075	1,075	5,925	5,925	19,925
Carroll	1	.....	.....	.....	.....	.....
Cass	5	2,039	2,039	14,412	14,412	14,412
Cedar	1	.....	.....	.....	.....	.....
Cerro Gordo	3	6,647	6,647	39,982	39,982	162,225
Chickasaw	1	.....	.....	.....	.....	.....
Cherokee	1	.....	.....	.....	.....	.....
Clarke	1	.....	.....	.....	.....	.....
Clayton	5	1,960	1,962	11,080	11,116	11,626
Clinton	4	1,950	1,950	11,200	11,200	14,400
Crawford	2	1,400	1,420	10,500	10,720	10,720
Dallas	6	3,277	4,270	22,128	33,142	63,660

*Not including fire and ornamental brick.

TABLE III—CONTINUED.

CLAY PRODUCTION BY COUNTIES FOR 1901.

COUNTIES.	Number of producers.	THOUSANDS.		VALUE.		
		Common brick.	*Total brick.	Common brick.	Total brick.	Total clay.
Davis	2	222	222	$ 1,597	$ 1,597	$ 1,597
Decatur	4	1,055	1,055	6,737	6,737	7,237
Delaware	2	700	775	4,500	5,100	5,100
Des Moines	5	2,640	3,865	14,800	26,030	29,030
Dubuque	4	5,800	5,800	34,150	34,150	34,150
Fayette	4	1,765	2,265	11,220	15,220	16,020
Fremont	6	2,310	2,310	13,300	13,300	13,300
Floyd	2	527	527	3,989	3,989	3,989
Franklin	1	...	...	...	...	...
Greene	1	...	...	...	...	...
Grundy	1	...	...	...	...	...
Guthrie	5	2,141	2,191	15,792	16,192	30,606
Hamilton	3	5,120	5,120	35,910	35,910	75,910
Hardin	5	820	820	5,220	5,220	47,970
Harrison	7	2,585	2,585	16,200	16,200	16,200
Henry	5	870	1,070	5,520	6,930	15,330
Howard	1	...	...	...	...	...
Humboldt	1	...	...	...	...	...
Ida	1	...	...	...	...	...
Iowa	4	3,375	3,375	20,862	20,862	29,612
Jasper	8	3,600	3,700	22,450	23,300	27,150
Jefferson	4	1,112	1,112	7,896	7,896	17,846
Johnson	5	2,250	3,050	13,500	18,300	25,600
Jones	2	540	690	3,825	4,025	7,300
Keokuk	8	1,790	1,795	11,860	11,965	30,215
Kossuth	1	...	...	...	...	...
Lee	5	2,175	2,225	12,680	13,089	13,339
Linn	10	5,950	5,970	37,108	37,248	43,428
Louisa	5	1,140	1,140	7,700	7,700	8,700
Madison	1	...	...	...	...	...
Mahaska	5	4,657	7,857	33,932	66,332	73,132
Marion	4	1,515	1,615	9,755	10,755	12,715
Marshall	6	3,775	4,025	23,200	25,200	36,450
Mills	4	2,600	2,600	18,200	18,200	18,200
Monona	2	370	370	2,665	2,665	2,665
Monroe	2	127	127	912	912	912
Montgomery	4	5,490	5,490	38,430	38,630	39,190
Muscatine	8	4,675	4,675	27,950	27,950	28,270
O'Brien	2	550	550	3,000	3,000	3,035
Page	3	5,675	5,675	32,700	32,700	32,700
Plymouth	2	1,100	1,100	6,600	6,600	6,600
Pocahontas	1	...	...	...	...	...
Polk	18	30,923	42,923	214,878	345,778	426,978
Pottawattamie	9	11,000	11,700	66,425	71,225	71,350
Poweshiek	4	1,280	1,280	8,940	8,940	15,940
Ringgold	3	2,200	2,200	14,038	14,038	14,038
Sac	1	...	...	...	...	...
Scott	6	8,700	8,700	53,150	53,150	57,450
Shelby	4	1,930	1,930	13,150	13,150	13,360

*Not including fire and ornamental brick.

TABLE III—CONTINUED.

CLAY PRODUCTION BY COUNTIES FOR 1901.

COUNTIES.	Number of producers.	THOUSANDS.		VALUE.		
		Common brick.	*Total brick.	Common brick.	Total brick.	Total clay.
Sioux	2	1,425	1,425	$ 9,875	$ 9,875	$ 9,875
Story	5	1,408	1,658	11,354	13,097	30,193
Tama	6	4,800	6,800	31,000	50,500	63,500
Taylor	4	1,382	1,990	13,112	13,192	13,192
Union	2	2,330	2,330	16,310	16,310	16,860
Van Buren	4	675	675	4,375	4,375	5,375
Wapello	4	8,491	9,736	52,874	62,743	64,093
Washington	6	3,971	3,971	23,875	23,875	29,175
Wayne	5	1,515	51,545	10,390	10,390	10,390
Webster	7	14,600	18,700	88,675	130,475	201,075
Winneshiek	2	900	900	4,950	4,950	4,950
Woodbury	6	31,532	33,2·1	204,840	219,154	227,154
Wright	3	75	75	675	675	6,372
Single producers (16)		8,616	8,616	56,259	56,259	132,241
Burnt clay ballast	2	.....	.....	.....	.....	101,501
Pottery	7	.....	.....	.....	.....	26,200
Estimates	6	1,500	1,500	10,500	10,500	19,500
Total	349	254,432	286,039	$ 1,651,926	$ 1,970,666	$2,774,200

*Not including fire and ornamental brick.

During the three years preceding 1901 Iowa ranked eighth as a clay producer and doubtless has held her own for the year just closed. In 1898 she ranked fourth as a producer of vitrified brick for paving, in 1899 she dropped to seventh place while in 1900 she was a poor ninth. Paving brick have shown a remarkable advance in price per thousand during the last three years. The prices being $6.81, $8.73 and $70.09 respectively for the years 1899, 1900 and 1901.

The table appended herewith gives the ten leading clay producers for 1900 according to the figures contained in the Mineral Resources for 1900.

RANK.	STATE.	OPERATORS REPORTING.	VALUE.	PER CENT TOTAL PRODUCT FOR U. S.
1	Ohio	871	$ 18,304,628	19.03
2	Pennsylvania	508	13,391,748	13.92
3	New Jersey	149	10,928,423	11 36
4	Illinois	569	7,708,859	8.01
5	New York	269	7,660,606	7.96
6	Indiana	567	3,858,350	4.01
7	Missouri	267	3,736,567	3.88
8	Iowa	358	2,291,251	2 38
9	West Virginia	53	2,016,765	2.10
10	Massachusetts	101	1,833,101	1.91

STONE.

Nearly all of the stone producers report a stronger demand for stone for 1901 than for the preceding year. The figures returned bear out their statements and the output is $796,852 for 1901 against $604,886 for the year 1900.

The production was distributed as follows:

Limestone used for—	
Building purposes	$261,160
Flagging and curbing	18,095
Rip-rap, rubble, etc	66,355
Made into lime	230,188
Crushed stone for—	
Road making (Macadam, etc.)	68,580
Railroad ballast	48,509
Concrete, etc.	75,182
Bridge stone	9,809
Blast furnace flux	250
Other purposes	5,328
Sandstone	13,096
Total	$796,852

The production of lime more than doubled that of 1900. The classification of products is more in detail than heretofore observed and it is scarcely possible to make comparisons of the individual items. Table IV gives the production by counties and specifies the various grades of stone put upon the market.

TABLE IV.

PRODUCTION OF LIMESTONE BY COUNTIES FOR 1901.

Number of producers.	COUNTIES.	Building.	Flagging and curbing.	Rip-rap and rubble.	Lime.	Road making.	Railway ballast.	Concrete.	Other purposes.	Total.
1	Adams	$ 625		$ 250						$ 875
3	Allamakee	9,925	$ 1,000	250					$ 250	11,425
3	Appanoose	105	58							163
4	Benton	1,361	59	10	$ 6,400					7,830
12	Black Hawk	9,796	237	50	1,500			$ 40		11,623
4	Clarke	1,150	232	75						1,457
7	Cerro Gordo	11,525	450	1,975	5,100			200		19,250
7	Clayton	5,300	1,400	1,500	2,875					11,075
3	Cedar	8,750		430	11,800	$44,820	$ 5,920			71,720
10	Clinton	2,689	8	3,688		803				7,188
1	Dallas	150								150
1	Delaware	30								30
5	Decatur	968	182	143		100	200			1,593
11	Des Moines	13,691	484	2,861	125	1,105		7,126	2,025	25,417
11	Dubuque	39,819	1,512	5,216	15,280	1,149	300	1,780		67,056
2	Fayette	500			4,225					4,725
3	Floyd	4,550	500						100	5,150
1	Grundy	640								640
2	Hamilton	1,800								1,800
5	Hardin	11,780	525	600	200					13,105
3	Henry	7,900	150			2,500		4,000	100	14,650
3	Howard	1,760	21	200						1,981
2	Humboldt	1,500	20							1,520
5	Jackson	325		200	161,480	200				162,205
2	Johnson	2,800				400		280		3,480
8	Jones	40,203	1,436	11,677		2,569	30,389	4,997	4,900	96,171
11	Keokuk	3,037	60	51		150				3,298
17	Lee	14,567	124	1,650	11,153	4,293		21,619	15	53,421
7	Linn	3,368		1,015	9,000	750		9,000	309	23,133

TABLE IV—CONTINUED.

PRODUCTION OF LIMESTONE BY COUNTIES FOR 1901.

Number of producers	COUNTIES.	Building.	Flagging and curbing.	Rip-rap and rubble.	Lime.	Road making.	Railway ballast.	Concrete.	Other purposes.	Total.
8	Louisa	$ 3,448	$ 150	...	...	...	...	...	...	$ 3,907
10	Madison	9,279	24	$ 712	...	$ 923	...	$ 5,570	...	16,508
3	Marshall	2,000	9,200	24,250	...	...	$11,700	750	...	47,900
3	Mahaska	505	...	200	...	...	...	...	...	705
2	Mitchell	993	...	100	$ 900	2,100	...	...	...	4,093
2	Monroe	429	28	...	...	...	...	...	...	457
2	Montgomery	1,182	...	...	...	...	...	...	...	1,182
10	Scott	24,297	25	6,602	150	6,418	...	19,500	...	56,992
2	Tama	325	...	...	...	...	...	...	...	325
2	Van Buren	75	...	...	...	...	...	320	...	395
6	Wapello	13,072	85	1,600	...	...	...	...	...	14,757
8	Washington	3,241	125	1,050	...	300	...	...	$ 7,688	12,404
	Single producers	3,445	...	250	...	...	...	...	...	3,695
213		$ 261,460	$18,095	$66,355	$ 230,188	$68,680	$48,409	$75,182	$ 5,328	$781,756

SANDSTONE PRODUCTION FOR 1901.

COUNTIES	Number of producers.	Building.	Rubble, rip-rap, etc.	Total.
Black Hawk	1	$ 14	$ 14	$ 28
Clayton	1	210	178	388
Clinton	2	454	235	689
Fayette	1	75	.....	75
Hancock	1	.....	308	308
Jefferson	1	125	.....	125
Keokuk	2	240	10	250
Lee	3	332	252	584
Mahaska	1	600	.....	600
Webster	3	9,450	25	9,475
Total	16	$ 11,500	$ 1,022	$ 12,522

In 1900 Iowa ranked twenty-first among the stone producers and ninth as a producer of limestone. The production of the state for the last ten years is given in the table herewith appended:

YEAR.	Sandstone.	Limestone.	Total.
1892	$ 25,000	$ 705,000	$ 730,000
1893	18,347	547,000	565,347
1894	11,639	616,630	628,269
1895	5,575	449,501	455,076
1896	12,351	410,037	422,388
1897	14,771	480,572	495,343
1898	6,562	557,024	563,586
1899	17,239	792,685	809,924
1900	9,379	595,507	604,886
1901	13,096	783,756	796,852

GYPSUM.

The year 1901 proved to be a record breaker in the plaster industry of the Fort Dodge district. As during the preceding year seven companies were in operation. During a portion of the year competition between the various companies in operation was very sharp and the price fell as low as $3.50 per ton for retarded plaster, f. o. b. Fort Dodge. Later in the season the companies succeeded in adjusting their differences, and the price went back to about

$5 per ton. Appoximately seventy-five per cent of the product left the mills in the form of retarded plaster for plaster purposes, while the major portion of the balance left in the form of unretarded calcined plaster, a considerable portion of which goes to the mixers who subsequently mix it with retarder and sand for plastering purposes. A small per cent of the whole is used without retarder for hard coat and plaster of Paris finish. Doubtless less than one per cent of the whole product produced at Fort Dodge is used for other mechanical purposes than plastering. None of the gypsum is shipped for treatment elsewhere. A small portion is used as a base in the manufacture of paint by the Fort Dodge Paint Manufacturing Company, but will not affect the total. The best information at hand would make the production for 1901 125,000 tons, sold at an average of $4.50 per ton f. o. b. Fort Dodge, giving a total value of $562,500.

LEAD AND ZINC.

The production of zinc in the Dubuque region has been reduced to inconsiderable proportions. This has been brought about largely by the sharp decline in the price of zinc, and to a less extent through the exhaustion of the ore bodies in sight. The weak demand and low price have held out no inducements toward the active prospecting and development of new properties as in the years 1898 and 1899. Ore was sold during the year at a price which would not cover the cost of production, let alone yielding a reasonable return to the operator. The entire output for the Iowa field scarcely reached 350 tons, principally carbonate, "dry bone," and sold at an average of $7.70 per ton. The most select stock sold for $12 per ton, yielding fair returns to the labor and capital employed, while certain low grade ores were disposed of at $5 per ton, entailing a considerable loss to those concerned. Almost the entire output was shipped to Mineral Point, Wisconsin. LaSalle, Illinois, may be considered as a competing market, but rarely affords active competition. The two largest companies remained practically closed or were only worked in a desultory way on account of legal complications.

The Alpine Zinc Company has abandoned their old workings, at least temporarily, on account of water, but have sunk a new

shaft on the same vein several hundred yards to the westward, which promises well. A good body of high grade ore is in sight and will be marketed as soon as the price warrants.

The zinc industry in the Dubuque region gives little promise for the future unless prices strengthen materially. The plant of the Dubuque Ore Concentrating Company lay idle during the year because of the intermittent and insufficient supply of crude ore and the general decadence of the industry.

The falling off in the demand for zinc has not materially affected the demand for lead. Most of the energy and capital formerly occupied in the development of zinc properties is now devoted to the opening of lead properties. Prospecting has been vigorously prosecuted during the past year, and several rich bodies of "mineral" have been brought to light. The demand ruled firm and the price steady throughout the year and those employed in the production of lead ore were able to secure good returns for their labor and capital. Practically all the ore produced was galena and all of it was sold to the local smelter, owned and operated by Wm. G. Watters of Dubuque. The ore smelted during the year amounted to a million and a half pounds, purchased at an average price of $23 per thousand pounds and cleaning up an average of 72 per cent lead.

The production of zinc and lead for Iowa may be recapitulated briefly as follows:

Zinc, 350 tons	$ 2,700
Lead, 600,000 lbs	13,800
	$16,500

Lead smelted by Wm. G. Watters' smelter was contributed by the following states:

	POUNDS.	VALUED AT.
Iowa	600,000	$13,800
Illinois	700,000	16,100
Wisconsin	200,000	4,600
Total	1,500,000	$34,500

IRON ORE.

Since 1899 Iowa has consistently held her position in the column of iron ore producers. In 1899 the output was 1,260 long

tons, which was almost quadrupled for 1901. In view of the extensive improvements recently made for mining and handling the ore the opportunity is taken of dealing with the subject in some detail. Practically all of the ore thus far produced has been shipped to Milwaukee and used in furnace mixtures.

The principal ore body, and the only one, up to this time, which has been developed, is known as Iron Hill and is situated about three miles northeast of the town of Waukon, the county seat of Allamakee county. Iron Hill is the highest point in the county and forms the divide between Village creek and the Oneota river. The summit of the ridge reaches some 200 feet above the water of the creek. The hill trends east and west, has an area of more than half a square mile and is crowned by the ore beds which extend farthest down the south slope. The lowest level ascertained, where the beds appear to be in place, is about fifty feet above Village creek. Detached bowlders and fragments of ore are encountered in prospect holes at much lower levels. The hill has been exploited thoroughly by sinking numerous test pits and the ore body is reported to attain a maximum thickness of 135 feet. The test pit records show that the underlying limestone forms an almost level floor, slightly dipping towards Village creek. The major portion of the ore body rests upon a Galena-Trenton base, though an inconsiderable portion appears to extend down to the Saint Peter sandstone, probably brought about through "creep" produced by the undercutting of the creek.

The ore is concretionary, the concretions varying in size from a fraction of an inch to aggregations several feet in diameter, and are imbedded in an ochreous clay matrix. While some of the concretions contain stained clay cores, many are hollow and the beds when viewed *en masse* present a strikingly cavernous appearance. The caverns vary in size from one to a few inches and possess the spheroidal shapes usual to nodular structures. Irregular caverns of larger size are not uncommon. Scattered throughout the ore body are occasional chert or flint nodules, sometimes occurring singly, at other times in aggregation masses of considerable extent. In the latter the individual cherts are cemented together by the hydrated oxide of iron, which often includes a liberal admixture of water worn quartz grains, varying from sand

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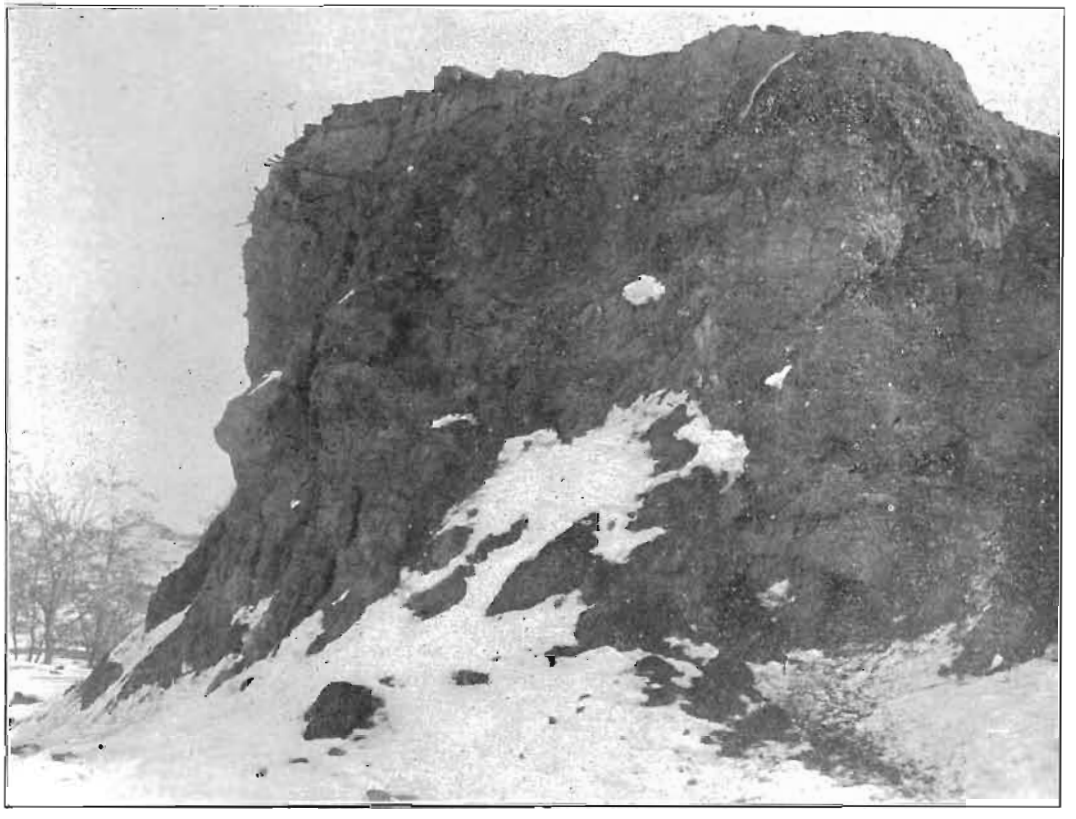

Pit of the Waukon Iron Company, showing the nodular character of the ore.

to pebbles of half an inch in diameter. The conglomeratic bowlders are more frequent at certain levels than others but appear to have no definite limits. They are often closely associated with the richest ore bodies.

Fractures and joint planes are not prominent features and when they occur may be attributed usually to the present topography and are supposedly due to creep.

The principal ore present appears to be the hydrated sesquioxide or iron or limonite, somewhat siliceous, as is shown by the analysis herewith appended:*

	Sample No. 275 G. E. Patrick, Analyst	Waukon Ore, (Black) Fischer of Milwaukee, Analyst	Waukon Ore, (Yellow) Fischer of Milwaukee, Analyst	Waukon Ore, J. B. Weems, Analyst	Average.
Metallic Iron	54.32	58.54	54.79	57.75	56.35
Silica and insoluble	.....	4.00	5.12	3.26	4.13
Water	.....	.....	11.92	10.92	11.42
Phosphoric Acid	0.13	.....	0.13	0.72	0.32
Lime	.....	.....	0.70	.....	.....
Magnesia	.....	.....	Tr.	.....	.....
Alumina	.....	.....	Tr.	0.25	.....
Manganese Oxide	.....	.....	Tr.	0.20	.....
Sulphur	None	.....	.....	.....	.....

Aside from the limonite the ore appears to be in part hematitic. This is shown by the analyses of certain selected samples which gave nearly 67 per cent iron. Pure limonite contains only 59.8 per cent iron while hematite may reach 70 per cent when pure. The phosphorus percentage shows considerable variability, doubtless owing in part to the method of sampling. The samples showing the largest amount were taken from single concretions and cannot be considered to fairly represent the general ore body. Analyses made for the purpose of grading the ore placed on the market show the phosphorus constituent well within the danger limit, rarely exceeding 0.09 for pure phosphorus. Similar variations may be noted in the sulphur content. The sulphur present is doubtless in the form of the pyrite and is not often detected.

Professor Calvin in his memoir on Allamakee county demonstrates conclusively that the ore beds cannot be accounted for

*Analyses in duplicate were made by Mr. F. M. Weakley, of the department of Mining Engineering, of an average sample of the ore, which gave: Phosphorus, 0.0108 per cent and Manganese 0.85 per cent.

through secular decay and concentration in place of the iron constituent contained by the rocks, but that some secondary process of concentration must be taken into account. A single argument put forward by him is sufficient to render impossible any *in situ* explanation. He states that a liberal estimate of the stratified rocks removed from the district would not exceed 1,000 feet, and granting the presence of one per cent of iron on the average, and no loss during the process of degradation, the maximum thickness of the ore residuum could not exceed ten feet, an amount less than one-tenth of the actual thickness reported. His conclusion is that the ore beds were accumulated through the well known processes of decaying organic matter and circulating water, generally known as the "bog iron ore" process. While the "bog iron ore theory" explains the greater portion of the deposit, the presence of the irregularly arranged siliceous concretions, and the water worn quartz pebbles, render obvious the complexity of the conditions which prevailed during the time of accumulation.

Some years since, the Waukon Iron Company was organized to exploit Iron Hill and if circumstances proved favorable to mine and ship ore. The chief organizers and owners live in the county. The first serious attempt to develop the property was during the season of 1899. Early in 1901 a complete modern ore washing plant was installed and put into operation.

The beds are easily worked. As there is almost no stripping the open pit method is adopted. The usual practice is to break up the ore by the use of heavy charges of black powder. The larger bowlder concretions are further reduced by breaking with dynamite. The ore is loaded by hand into two-ton, home made wooden ore cars and hauled by horses to the washer. A double track leads from the pit to the washer, the grade favoring the loaded car.

The plant is conveniently located at the head of a ravine which leads down to Village creek, and is equipped with a McClanahan-Stone outfit complete, manufactured by the McClanahan-Stone Machine Company of Hollidaysburg, Penn. The ore from the car is dumped into a hopper which leads to a single roll crusher. The crushed ore passes directly into a single twenty-five foot log

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1 Waukon Iron Mine, close view, showing the cavernous character of the ore. *a* represents one of cherty, concretionary masses.

washer, consisting of steel shaft armed with steel blades rigidly bolted to the shaft. Here water is admitted at the rate of 300 gallons per minute when the plant is operated at its full capacity. The ore from the log enters a standard McClanahan-Stone double shell screen. Arrangements are made so that an additional fifty gallons of water per minute may be introduced here if desired. The screenings fall directly into an inclined trough, leading to a sluice box which carries the waste down the gully. The washed ore is caught by a steel pan conveyor which carries the ore to the storage bins. The chert nodules and other impurities are removed by hand as the ore passes over this belt. An overflow bin has been provided some distance from the plant and is connected by an elevated cable conveyor. The capacity of the plant is 300 tons per ten hour shift. Power is supplied by a Fairbanks-Morse 100-horse power boiler and a Frost slide valve engine of eighty-five indicated horse power. Water is obtained from a well 500 feet in depth on the

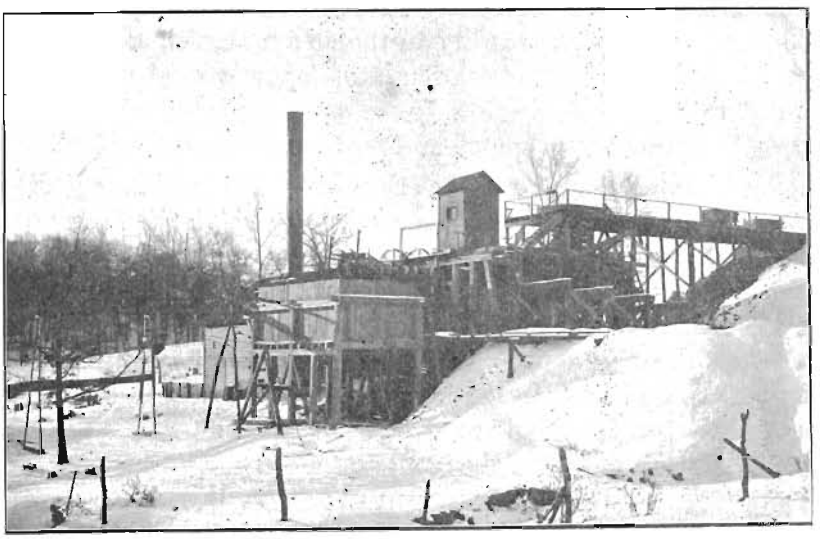

Fig 1. General view of ore washing plant, Waukon Iron Company. The foundations were built with a view of putting in a second washer and thus doubling the capacity of the plant.

premises. A constant supply is maintained by the use of an open storage reservoir of 12,000 barrels capacity. The machinery thus far installed is thoroughly modern, well housed, and well kept.

Iron Hill cannot take rank as an iron producer until better transportation facilities are provided. The Waukon branch of the Chicago, Milwaukee & Saint Paul Railway ends some three miles distant as the crow flies, but according to recent surveys would require an actual extension of some five miles to bring the plant into connection. A water grade can be secured down Village creek to the Mississippi river, but in this case a new line of railway from fifteen to eighteen miles in length would be required. At the present time it is difficult to say which would be the more practicable route. The concensus of opinion slightly favors Village creek as it is the most direct to navigable water. The industry can scarcely be said to be more than initiated. The output for the past year represents the plant running at its full capacity for less than twenty days. This state of affairs was due almost wholly to bad shipping facilities, the cost of transferring the ore from the washer to the car being fifty cents per ton, an amount greater than is paid for transporting Lake Superior ore from Duluth to Cleveland and other lake ports.

The ore would yield readily to the steam shovel, which would be more independent of weather and labor difficulties. Some form of rope haulage would effect a saving worthy of consideration. At present two horses and two drivers are required.

It is estimated that about 30 per cent of the material as it comes from the pit passes through the screen, of which the larger portion is a ferruginous clay. With the clay a considerable percentage of fine ore also escapes. No attempt is made to recover this ore. Such recovery might be effected readily by passing the screenings through a jig. The clay itself could be caught in settling basins, and used in the manufacture of brick, thus utilizing the products of Iron Hill to their fullest extent and adding no mean sum to the profits of the business.

The visible ore body on Iron Hill has a superficial area approximating 300 acres, and a maximum thickness reported to be 135 feet. The average specific gravity of limonite as it ordinarily runs is 3.75, but owing to the cavernous character of the beds in question, 3 may be assumed as a safe factor, and if seventy per cent of the deposits is marketable, the ore would run about 3,000 tons per foot per acre. If the further assumption be made that the

beds will average forty feet in thickness, the tonnage would be 120,000 tons per acre or 36,000,000 tons for the entire deposit. Or to be still more conservative and assume the average thickness to be twenty feet and reduce the acreage to 200 acres, the other factors remaining the same, the vailable merchantable ore in sight would be 12,000,000 tons, an amount worthy of respectful consideration.

Several other ore bodies, similar in occurrence and association, but much less important are known to exist in Allamakee county, but as yet have not been thoroughly explored.