MINES AND QUARRIES.

MINERAL COAL.

The coal mines of Indiana, although their development has only begun, is of high economic interest; the production has been limited to the demands of a new country with few factories, but the promise for the future from these treasure houses is grand. Our coal field embraces an area of nearly 7,000 square miles, offering a total of twelve seams at a depth ranging from nought to three hundred feet, and averaging eighty feet below the surface. Five of these seams, wherever met, are almost constantly workable, varying from two and a half to eleven feet, averaging four and a half feet in thickness; five other seams are mined at occasional favored localities; two minor coals are only worked by stripping for local use. The quality is fair to choice, as shown by analyses and tests in former geological reports.

"Block" or splint coal prevails in an area of six hundred square miles, which is used in the blast furnace, as it comes from the mine without cokeing. This Indiana block coal is of superior quality, rich in carbon, remarkably free from sulphur, ash and phosphorus, and well suited for manufacture of Bessemer steel and the highest metallurgic processes. It burns without cokeing, in a ruddy flame, like hickory wood, to a minimum of white ash. The cokeing coals furnish an excellent fuel for house, factory, mill or locomotive use. The abundance of coal and ease of access cheapen this fuel. It may be had in large lots on every line of railway at from five to ten cents per bushel, or at from $1.50 to $2.80 per ton.

The survey is indebted to report of R. Pumpelley, Special Agent of Tenth United States Census, for the following details of our mining industries for the census year:

Statistics of Indiana Coal Mines, 1880.

Number of counties with mines opened	19
Number of establishments	216
Maximum capacity of yearly production, tons	3,110,183
Product of same, tons	1,449,496
Value of product at mines	$2,143,093
Irregular product local strip-banks, tons	4,831
Total product, tons	1,454,327
Value of total product at mines	$2,150,258
Value of materials used in mines	$158,604
Wages paid to all classes of labor	$1,405,164
Men employed above ground	570
Men employed below ground	3,748
Boys, under 16, employed above ground	7
Boys, under 16, employed below ground	171
Total employes	4,496
Number of steam engines employed	65
Horse-power of steam engines	1,717
Value of all machinery, including engines	$146,908
Value of explosives used	$56,151
Amount employed as working capital	$348,665
Value of mining plants	$773,445
Value of real estate	$1,146,859
Total capital employed and invested in establishments	$2,268,969
Tons paying royalty	899,356
Amount paid as royalty	$137,311
Acres of coal land worked out	2,884
Acres of land unworked, attached to works	8,000
Acres of mining land unspecified	2,407
Total capital in establishments and irregular workings	$2,304,720
Acres available coal lands attached to working establishments	10,407
Average price per ton of product of regular mines, at mine	$1 48
Average cost of labor per ton	$0 97
Average cost of material, per ton	$0 11
Average amount left for royalty, profit, etc., per ton	$0 40
Per cent. of capital used for working capital	15.37

Per cent. of capital in plant	34 09
Per cent. of capital in real estate	50 54
Average royalty paid, per ton	$0 15
Average yearly earnings of man, net	$318 85
Average per cent. of year worked	74.34
Average per cent. of year idle, except from strikes	21.36
Average per cent. of year lost by strikes	4.30
Tons raised per man per day	1.47
Tons raised yearly per man	328.91
Per cent. ratio of product to maximum capacity	46.59

One Hundred Indiana Coal Mines Classified on the Basis of the Power Used.

Class 1. Mines using no power to supplement manual labor.
Class 2. Mines using the power of animals only.
Class 3. Mines using boiler-power not exceeding 100 horse-power.
Class 4. Mines using boiler-power exceeding 100 horse-power.

CLASS.	Number of mines in class.	Aggregate maximum yearly capacity, net tons.	Product census year, net tons.	Value of census year's product at mines, in dollars.	Average yearly product, net tons per mine.	Average value per ton at mine.	Average cost of labor per ton mined.	Average number of days worked by each man.	Average earnings per man, census year.	Average per diem wages earned.	Average product per man per day worked, net tons.	Average horse-power to mine.	Tons mined per horse-power yearly.	Per cent. of value of product paid for labor.	Per cent. of value of product paid for materials.	Per cent. of value of product for profits, including interest, repairs, and royalty.	Average number of hands to mine, all classes of labor, including sup'tendence.
1.	12	42,808	9,807	13,291	817	1 35	87	162	$202 00	$1 25	1.44	. . .	. . .	64	5.0	31.0	3.5
2.	36	430,082	143,657	214,924	3,991	1 50	84	155	244 00	1 57	1.88	2.4	1,663	56	14.6	29.4	13.7
3.	48	2,000,000	1,144,243	1,705,166	23,839	1 49	97	230	346 00	1 50	1.55	44.0	592	65	7.0	28.0	67.0
4.	.4	314,820	122,617	186,704	30,654	1 52	1 11	246	404 00	1 64	1.48	153.0	200	73	7.0	20.0	84.0
Total	100	2,787,710	1,420.324	$2,120,035	14,203	$1 49	$0 97	222	$337 00	$1 52	1.56	28.1	505	65	7.8	27.2	40.9

"These tables illustrate, in a general way, the proposition that large mining establishments, which employ power and labor-saving machinery, can pay higher wages and give more steady employment to labor than smaller ones. The mines chosen in this State were typical ones of their classes. The large amount spent for 'materials' by Class 2 is, to a great extent, made up of feed, etc., for the animals used.

"As a general rule, too, the mines employing capital most liberally can afford to yield to labor a larger share of the value of the product, since their profits depend on the volume of their business. They also employ more skilled labor. It is believed that these features run through the entire mining industry."

Rank of the States East of the 100th Meridian, Producing Bituminous Coal in the Census Year ending June 1, 1880.

Number.	Name of State.	Product of Regular Mines, Tons of 2,000 Pounds.	Percentage of Total Product.	Number.	Name of State.	Product of Regular Mines, Tons of 2,000 Pounds.	Percentage of Total Product.
1	Pennsylvania . . .	18,004,988	44.665	11	Tennessee	494,491	1.227
2	Illinois	6,089,514	15.107	12	Alabama	322,934	0.801
3	Ohio	5,932,853	14.718	13	Georgia	154,644	0.383
4	Maryland	2,227,844	5.527	14	Michigan	100,800	0.250
5	West Virginia . . .	1,792,570	4.447	15	Virginia	40,520	0.100
6	Indiana	1,449,496	3.596	16	Arkansas	14,778	0.036
7	Iowa	1,442,333	3.578	17	Nebraska	200	. . . .
8	Kentucky	935,857	2.322	18	North Carolina . .	250	. . . .
9	Kansas	763,297	1.894		Total	40,311,459	100.00
10	Missouri	543,990	1.349				

Rank of States East of the 100th Meridian, as Producers of Bituminous Coal, according to the Census of 1870.

		Per cent. Gain in 1880.
1.	Pennsylvania	131
2.	Illinois	132
3.	Ohio	135
4.	Maryland	22
5.	Missouri	13

		Per cent. Gain in 1880.
6.	West Virginia	194
7.	Indiana	231
8.	Iowa	447
9.	Kentucky	521
10.	Tennessee	270
11.	Virginia	34
12.	Kansas	2,217
13.	Michigan	258
14.	Alabama	2,836

"The United States, exclusive of the territories, has gained 134.4 per cent. in weight of product. The average price per ton has fallen from $1.99 to $1.22 during the past decade, the price for 1870 being, of course, reckoned in paper dollars."

It was intended in this report to give a review of the coal industries of the State, repeating analyses given in former reports of the State Geologist, which have done so much to advance the commerce, manufactures and wealth of our people, but a short appropriation forbids the publication of this and other articles which are with reluctance omitted. Although our coal fields are but partly developed by access of railways, and the demand, constantly growing, is but in its infancy, Indiana will take pride in the fact that the coal out-put has increased in the last decade 231 per cent., or at the handsome rate of over 23 per cent. per annum, and she ranks as the sixth State of the Union in the production of coal.

CLAYS.

The beds of fire clay which underlie the coal seams are more persistent than the coals themselves. This material, which will be of great importance for door and window casing, cornices, etc., in the buildings of the future, when common safety will require fire-proof houses, is sufficiently abundant to supply the world, and can be cheaply mined after the coal is removed. Some of the clays are aluminous, offering choice material for sewer pipes, pumps, jars and terra cotta products; others are highly silicious, suitable for fire-brick, retorts, etc. At several localities they are modified by the sorting process of water in motion and well adapted for common crockery and tiles.

The Kaolin mines of Lawrence county are filling a considerable demand from eastern cities, and contribute in enabling the Encaustic Tile Works of Indianapolis to rival the most famous tile workers of Europe. The excellence, superiority of the fabrics of this company is largely due to special clays of this State. The demand for their product is up to the full capacity of their works, and successfully meets with full competition in the cities of New Orleans, Washington, Philadelphia, New York and Boston, the flooring tiles of the world.

BUILDING STONE.

QUARRY INDUSTRIES.

Fifty years ago much of the territory constituting the State of Indiana was a wild, pathless forest or prairie solitude, the home of wild beasts and a few tribes of wilder savages. These obstacles to civilization had to be removed. Pioneer life was heroic. Constant watch and ward a duty. The rifle, knife, axe and brave hearts were necessaries of life to the farmer, artisan and housewife. Prairie and forests have been largely subdued, and the present is a high realization of the harvest planned by our fathers.

The first houses, towns, cities, bridges, even roads were built from the superabundant trees, and until within a few years no other material was required or sought. Now, that profitable tillage has removed in a large degree the encumbering forests, other building materials, as brick, clays, stone, etc., are demanded. In obedience to this call nature presents stone, easily accessible and well suited to use.

In the southeastern lower Silurian region, stone for foundations, rubble masonry is obtained from beds of that age.

Bordering to the west the close-grained, compact magnesian limestones occur, and are extensively mined in a belt extending from the Ohio on the south, northwardly across the State to the Wabash in Huntington, Wabash, Miami, Cass and Carroll counties, and to some extent in other counties north and west where generally the rocky substratum is deeply covered with drift. This Upper Silurian stone is in even beds, from a few inches to two or more feet in thickness, and meets a full demand for foundations, piers, abutments, and massive range work, where great strength is required. A stone offering, as this does, at the quarry, two sides ready for the mortar bed, commands the attention of the economical builder. Thinner strata yield slabs, flags, curbs, etc., at cheap rates.

The "North Vernon Blue Limestone," of Devonian age, covers an extended area in Jennings and Jefferson counties, and is well known to engineers and bridge builders. In some districts to the south of Vernon and Deputy these beds become aluminous, and possess hydraulic properties.

The quarry rocks of the lower Carboniferous period form the surface rock, from Warren county, on the north, to, in a widening belt, Ohio river on the south. Limestones of the Keokuk, sandstones of the Chester, and Oolitic limestone of the intermediate St. Louis group, present a great variety of valuable features. The Oolitic stones will be specifically mentioned hereafter.

In the coal measure area a variety of sandstones are quarried and used. The basal conglomerate sand rock extends in a broad belt from Warren county to Ohio river, and offers an unlimited amount of strong, fire, frost and water proof stone, suitable for foundations, piers, etc.

The following table, by favor of Superintendent of United States Census, shows the quarry industries of the State in this their beginning or infancy:

Table indicating the Amount and Kinds

LOCATION OF THE QUARRY.	COUNTY.	NAME OF THE CORPORATION, COMPANY OR INDIVIDUAL.	SPECIFIC VARIETY OF STONE. Popular Name.	SPECIFIC VARIETY OF STONE. Scientific Name.	Color.
Decatur	Adams	B. P. Rice	Limest'e	Dolomite	Drab
Bluffton	Wells	Kapp & Gardner	"	"	"
Wabash	Wabash	Bridges & Scott	"	Limestone	"
"	"	Hubbard & Smith	"	"	"
"	"	Philip Hipskin	"	"	"
"	"	Wm. J. Ford	"	"	"
"	"	Moellering & Paul	"	Dolomite	"
"	"	Lillie & Shoemaker	"	Limestone	"
Logansport	Cass	Lux & Lux	"	Limest'e, Dolom	"
"	"	J. E. Barnes	"		Gray
"	"	August Gleitz	"		"
3½ mils S. W. Kokomo	Howard	J. V. Smith	"	Mag. Limestone	Drab
Kokomo	"	Geo. W. Defenbaugh	"	Limestone	"
Marion	Grant	D. R. McKinney	"	Mag. Limestone	"
"	"	Silvester Fankboner	"	" "	"
"	"	John Murphy	"	" "	"
Montpelier	Blackford	Wm. Twibell	"	Dolomite	"
Eaton	Delaware	Geo. W. Carter	"	"	"
"	"	Bosman Brothers	"	"	"
Yorktown	"	L. D. Koontz	"	"	"
Anderson	Madison	William Crim	"	Mag. Limestone	Gray
"	"	J. W. Sansberry	"	" "	"
Greencastle	Putnam	Patrick Ash	"	Limestone	Drab
2 ms S.W. Greencastle	"	Williams Steegs	"	"	"
2 " " "	"	A. J. Crawford	"	"	"
2 " " "	"	Vandalia Railroad Co	"	"	"
Okalla	"	Moss & Hillis	"	"	"
"	"	Torr & Brother	"	"	"
Putnamville	"	James Lee	"	Siliceous l'stone	"
Longwood	Fayette	Wilson Ball	"	Fer'ginous Dol.	Drab and buff
"	"	R. H. Moffitt	"	" "	" " "
2¾ miles N.W. Laurel, Franklin county	"	H. Reese	"	Dolomite	Drab
2¼ " W. Laurel	Franklin	M. E. Secrest	"	"	"
2½ " W. "	"	John McGlin	"	"	"
3 " S. W. "	"	A. Cloud	"	"	"
3 " S. "	"	J. H. Thomas	"	"	"
New Point	Decatur	W. W. Hollensbe	"	"	"
5 ms S. W. Greensb'gh	"	Greensburgh Limestone Co.	"	"	"
St. Paul	"	W. W. Lowe	"	"	"
"	"	J. L. Scanlan	"	"	"
2 miles W. St. Paul	Shelby	G. W. McNeely	"	"	"
Ellettsville	Monroe	John Matthews & Sons	"	Bit. Limsetone.	Gray and drab
"	"	Perry Brothers	"	" "	" " "
Stinesville	"	W. H. McHenry	"	" "	Gray
"	"	McHenry & Brother	"	" "	"
"	"	Davis & Cassner	"	" "	"
Spencer	Owen	B. Schweitzer	"	Limestone	Drab
N. E. Spencer	"	Simpson & Archer	"	Bit. Limestone.	Gray
" "	"	E. R. Bladen	"	" "	"
" "	"	Howard & Denig	"	" "	"
5 miles W. Bedford.	Lawrence	N. C. Hinsdale & Co	"	Limestone	"
4½ " W. "	"	Voris, Rodgers & Co	"	"	"
1½ " E. "	"	Chicago Bed. Stone Co	"	"	"
" E. "	"	Fillion & Smith	"	"	"
Lawrenceport	"	A. F. Berry	"	"	"
Fort Ritner	Jackson	E. B. Dixon	"	Bit. Limestone.	"
3½ ms N. N'th Vernon	Jennings	Hicks & Holmes	"	Limestone	"
North Vernon	"	P. Conklin & Co	"	"	Drab
3 ms S. North Vernon	"	H. C. Herrman	"	"	"
Oakalla	"	Hicks & Holmes	"	Mag. Limestone	"
Osgood	Ripley	Peter Wagner	"	" "	
"	"	Ashman & Glasgow	"	" "	
Salem	Washington	Emanuel Zink	"	Limestone	Gray
3 ms W. New Albany.	Floyd	Christian Haller	"	"	"
3 ms W. " "	"	N. Bittinger	"	"	"
		SAND STONE.			
Williamsport	Warren	B. F. Gregory estate	Sandst'e		Gray
Attica	"	S. Bernhardt	"		Gray, blu gray.
French Lick	Orange	W. F. Osborne	"		Gray
" "	"	T. N. Braxton	"		"
3½ ms E. Cannelton	Perry	A. Hallabach	"		Light brown

of Stone Quarried in the State of Indiana.

Structure. As Regards Texture.	Structure. As Regards Stratification.	Structure. As Regards Bedding.	Geological Age of the Formation.	Year Quarry was Opened.	Cubic Yards of Space Excavated since Quarry was Opened.	Cubic Feet of Marketable Product during Census Year.	No. Grades as regards Quality, Obtained.
Compact, vesic . .	Even and parallel .	Thin to medium . . .	Upper Silurian	1876	4,000	. . . .	One
Finely vesicular .	Massive	Even, medium thick.	“ “	1867	21,800	. . . .	One
Semi Crystalline .	Wavy and irregular	Even and thin	“ “	1866	36,000	. . . .	One
“ “ .	“ “ “	“ “ “	“ “	1876	2,400	434,700	One
“ “ .	“ “ “	“ “ “	“ “	1878	1,300	. . . .	One
“ “ .	“ “ “	“ “ “	“ “	1873	3,040	. . . .	One
Vesicular	Irregular.	“ medium thick .	“ “	1866	53,000	. . . .	One
“	“	Uneven and thin. . .	“ “	1873	26,000	. . . .	One
Semi Crystalline .	Massive	“ medium thick.	“ “	1872	20,000	. . . .	Two
Fine and compact	Even and massive .	Even, “ “ .	“ “	1840	100,000	. . . .	One
“ “ “	“ “ “ .	“ “ “ .	“ “	1840	200,000	325,750	One
“ “ “	“ “ “ .	“ “ “ .	“ “	1876	8,000	. . . .	Three
(Conchoidal fract.)	Even and indistinct	“ and thin	Devonian . . .	1850	20,000	. . . .	Two
Semi Crystalline .	Variable	“ “ “	Upper Silurian	1864	23,600	. . . .	One
“ “ .	“	“ “ “	“ “	1864	20,000	. . . .	One
Fine and compact	“	Even, thin to medium	“ “	1867	20,000	207,250	One
Semi Crystalline .	Irregular.	“ “ “	“ “	1870	30,000	. . . .	One
“ Crys., vesic'lar	“	“ and thin . . .	“ “	1855	13,000	. . . .	Two
“ “ “	“	“ “ “ . . .	“ “	1855	14,400	. . . .	Two
Vesicular	Variable	“ “ “ . . .	“ “	1835	21,800	219,000	Two
Fine and compact	Even	“ thin to medium	“ “	1840	7,250	. . . .	One
“ “ “	“	“ “ “	“ “	1840	7,250	. . . .	One
Semi Crystalline .	Massive	“ medium thick .	Sub Carbonif's	1869	2,510	. . . .	Two
“ “	“	“ “ “ .	“ “	1860	64,520	. . . .	One
“ “ .	“	“ “ “ .	“ “	1870	25,800	. . . .	One
“ “ .	“	“ “ “ .	“ “	1858	1,020,000	3,212,500	One
“ “ .	“	“ “ “ .	“ “	1873	48,390	. . . .	Two
“ “ .	“	“ “ “ .	“ “	1876	18,150	. . . .	Two
“ “ .	“	“ and thick . . .	“ “	1865	22,000	. . . .	One
Vesicular	Wavy and massive.	“ medium thick .	Upper Silurian	1862	10,000	. . . .	One
“	“ “ “ .	“ “ “ .	“ “	1879	4,000	. . . .	Two
Semi Crystalline .	“ “ “ .	“ “ “ .	“ “	1877	10,000	. . . .	Two
“ “ .	“ “ “ .	“ “ “ .	“ “	1876	43,000	233,750	One
“ “ .	“ “ “ .	“ “ “ .	“ “	1870	80,000	. . . .	Two
“ “ .	“ “ “ .	“ “ “ .	“ “	1850	14,117	. . . .	Three
“ “ .	“ “ “ .	“ “ “ .	“ “	1878	1,575	. . . .	Two
“ “ .	Massive	“ thin to medium	“ “	1875	4,000	. . . .	Six
“ “ .	“	“ “ “	“ “	1850	242,000	. . . .	Three
“ “ .	“	“ medium thick .	“ “	1854	127,680	1,224,500	Three
“ “ .	“	“ “ “	“ “	1859	135,000	. . . .	Three
“ “ .	“	“ “ “ .	“ “	1859	20,000	. . . .	Three
Granular (Oolitic)	“	Even and thick . . .	Sub Carbonif's	1862	87,102	. . . .	One
“ “	“	“ “ “ . . .	“ “	1866	110,975	. . . .	One
“ “	“	“ “ “ . . .	“ “	1878	11,284	. . . .	One
“ “	“	“ “ “ . . .	“ “	1879	240	. . . .	One
“ “	“	“ “ “ . . .	“ “	1875	12,500	1,232,840	One
{Fine, compact, Conchoidal fract.}	“	“ medium to thin	“ “	1869	170,000	. . . .	One
Granular (Oolitic)	“	“ and thick . . .	“ “	1870	2,000	. . . .	Two
“ “	“	“ “ “ . . .	“ “	1879	14,400	. . . .	Two
“ “	“	“ “ “ . . .	“ “	1878	7,500	. . . .	One
“ “	“	“ “ “ . . .	“ “	1879	193,560	. . . .	Two
“ “	. . . .	“ “ “ . . .	“ “	1879	300,000	. . . .	One
“ “	. . . .	“ “ “ . . .	“ “	1876	290,340	420,150	Two
“ “	. . . .	“ “ “ . . .	“ “	1867	8,000	. . . .	Three
“ “	. . . .	“ “ “ . . .	“ “	1879	22,582	. . . .	Two
“	Even and parallel .	“ “ “ . . .	“ “	1860	20,000	. . . .	Three
“	Massive	Medium and thick. .	Devonian . . .	1875	64,500	. . . .	Two
Semi Crystalline .	Irregular.	“ “ “ . .	“ “	1873	1,210,000	. . . .	Eight
“ “ .	“	“ “ “ . .	“ “	1850	193,800	387,500	Six
“ “ .	Massive	“ “ “ . .	Upper Silurian	1876	129,080	. . . .	One
“ “ .	Wavy and massive.	“ thin	“ “	1871	35,900	. . . .	Three
“ “ .	“ “ “ .	“ “	“ “	1874	35,900	. . . .	One
Granular (Oolitic)	Massive	“ and thick . .	Sub Carbonif's	1861	80,650	204,175	One
“	“	Even “ “ . . .	“ “	1840	43,600	. . . .	Two
“	“	“ “ “ . . .	“ “	1850	30,000	. . . .	Two
					5,619,495	8,102,115	
		SAND STONE.					
Coarse	Coarse and massive	Even and thick . . .	Car. (Conglom)	1860	20,000	. . . .	One
“	“ “ “	“ “ “ . . .	“ “	1873	60,000	. . . .	Two
Fine and medium.	Even, fine, coarse .	“ medium thick .	Sub Carbonif's	1850	1,600	311,712	Tw
“ “ “ .	“ “ “ .	“ “ “ .	“ “	1830	16,130	. . . .	Tw
Medium.	Irregular.	“ one 30 ft. stratum	Carboniferous.	1871	10,000	. . . .	On
					5,727,225	8,413,827	

Table indicating the Capital, Labor and Appliances Devoted to

Capital.	Total Value of Material Quarried during the Census Year.	COUNTY.	NAME OF CORPORATION, COMPANY OR INDIVIDUAL.	LOCATION OF THE QUARRY.	Method Employed for Draining the Quarries.
		Adams	B. P. Rice	Decatur	Pump
		Wells	Kapp & Gardner	Bluffton	"
$23,860	$30,750	Wabash	Bridges & Scott	Wabash	Natura
			Hubbard & Smith	"	"
			Phillips & Hipskin	"	"
			William J. Ford	"	"
			Moellering & Paul	"	"
			Lillie & Shoemaker	"	"
		Cass	Lux & Lux	Logansport	"
			J. E. Barnes	"	"
18,000	22,750		August Gleitz	"	"
		Howard	J. V. Smith	3½ miles S. W. Kokomo	Pump
			George W. Defenbaugh	Kokomo	By tren
		Grant	D. R. McKenney	Marion	"
			Silvester Fankboner	"	"
16,250	9,725		John Murphy	"	Natural
		Blackford	William Twibell	Montpelier	Pump
		Delaware	George W. Carter	Eaton	"
			Bosman Brothers	"	"
29,500	10,100		L. D. Koontz	Yorktown	"
		Madison	William Crim	Anderson	Natural
			J. W. Sanberry	"	"
		Putnam	Patrick Ash	Greencastle	"
			William Steegs	2 miles S. W. Greencastle	"
36,000	39,000		A. J. Crawford	2 " " "	"
			Vandalia Railroad Company	2 " " "	"
			Moss & Hillis	Okalla	"
			Torr & Brother	"	"
			James Lee	Putnamville	"
		Fayette	Wilson Ball	Longwood	"
			R. H. Moffitt	"	"
		Franklin	H. Reese	2¼ miles N. W. Laurel	"
15,850	30,800		M. E. Secrest	2¼ " W. "	"
			John McGlin	2½ " W. "	"
			A. Cloud	3 " S. W. "	"
			J. A. Thomas	3 " S. "	"
			W. W. Hollensbe	New Point	"
		Decatur	Greensburgh Limestone Company	5 miles S. W. Greensburgh	Pump
			W. W. Lowe	St. Paul	"
146,700	116,000		J. L. Scanlan	"	"
		Shelby	G. W. McNeely	2 miles W. St. Paul	Natural
		Monroe	John Matthews & Sons	Ellettsville	"
			Perry Brothers	"	"
			W. H. McHenry	Stinesville	"
			McHenry & Brother	"	"
85,500	124,100		Davis & Cassner	"	"
		Owen	B. Schweitzer	Spencer	"
			Simpson & Archer	3½ miles N. E. Spencer	"
			E. R. Bladen	3½ " " "	"
			Howard & Denig	3½ " " "	"
		Lawrence	N. C. Hinsdale & Co.	5 " W. Bedford	"
			Voris, Rodgers & Co.	4½ " W. "	"
122,500	126,050		Chicago Bedford Stone Co	E. "	"
			Fillion & Smith	E. "	"
			A. F. Berry	Lawrenceport	"
		Jackson	E. B. Dixon	Fort Ritner	"
20,000	24,000	Jennings	Hicks & Holmes	3½ miles N. North Vernon	"
			P. Conklin & Co.	North Vernon	"
			H. C. Herrman	3 miles S. North Vernon	"
			Hicks & Holmes	Oakdale	"
		Ripley	Peter Wagner	Osgood	St'm p'
			Ashman & Glasgow	"	
25,500	60,000	Washington	Emanuel Zink	Salem	Natura
		Floyd	Christian Haller	3 miles W. New Albany	"
			N. Bittinger	3 " W. "	"
$539,660	$593,375				
			SAND STONE.		
		Warren	B. F. Gregory's estate	Williamsport	Natur
			S. Bernhardt	Attica	"
$73,900	$40,400	Orange	W. F. Osborne	French Lick	"
			T. N. Braxton	" "	"
		Perry	A. Hallabach	3½ miles E. Cannelton	"
[illegible]	$633,775				

Quarrying of Stone in the State of Indiana, and the Value of the Product.

Number and Kinds of Machines Employed.			Explosives.		Months Full Time.	Months Idle.	Laborers Employed.				No. of Horses
For Quarrying.	For Hoisting.	For Dressing.	Material Employed.	Value of used in the past Year.			Greatest No. the past 10	Greatest No. in Census Year.	Quarrying.	Stone Dress'g.	
				. . .	3	9	8	8	3	. .	
				. . .	6	6	22	22	15	. .	1
			Powder	$32	9	3	30	30	7	. .	1
			"	10	6	6	6	6	3	. .	
			"	2	7	5	5	5	4	. .	
			"	3	9½	2½	25	13	7	. .	
	1 derrick.		"	16	8	4	8	6	5	. .	
			"	15	8	4	15	5	3	. .	
			"	30	7	5	30	30	8	. .	3
			"	21	6	6	20	8	4	. .	
	1 derrick.		"	16	7	5	25	8	3	. .	1
	1 "		"	30	9	3	23	18	9	. .	
				. . .	8	4	12	9	5	. .	
			Powder	10	8	4	12	8	3	. .	
			"	8	8	4	5	5	3	. .	
			"	7	6	6	17	7	4	. .	
				. . .	2	10	20	12	5	. .	1
			Powder / Dy'mite	25	6	6	12	6	4	. .	
			Powder	6	8	4	10	8	7	. .	
				. . .	8	4	18	18	6	. .	2
			Powder	8	6	6	12	12	4	2	
				. . .	8	4	14	14	3	2	1
	1 derrick.		Powder	30	9	3	20	7	7	. .	
	2 "		"	90	9	3	17	15	15	. .	
			"	75	12	. .	13	8	5	. .	
	2 derricks		"	50	12	. .	47	47	47	. .	
			"	60	9	3	25	11	4	. .	
			"	75	9	3	25	25	7	. .	
	3 derricks		"	10	12	. .	20	5	5	. .	
	1 "		"	3	6	6	25	4	2	1	1
				. . .	6	6	4	5	3	1	
			Powder	1	4	8	10	10	5	. .	
			"	25	8	4	60	50	25	10	4
	1 derrick.		"	6	8	4	50	40	20	20	5
			"	5	8	4	35	14	7	. .	1
	1 derrick.		"	5	7	3	21	21	10	3	1
	2 derricks		"	6	7	5	15	6	2	2	
	6 "		"	100	12	. .	175	105	90	15	1
	6 "		"	15	10	2	175	60	47	10	
Diam'd drill	2 "		"	100	12	. .	75	50	30	. .	1
			"	13	8	4	7	7	7	. .	
channeler	10 derricks.	6 gang saws.	"	150	9	3	140	75	68	. .	1
"	4 "	4 " "	"	36	9	3	60	40	20	. .	
"	1 "			. . .	9	3	24	24	23	. .	
	1 "		Powder	1	9	3	8	8	8	. .	
channeler	1 "		"	1	9	3	15	6	6	. .	
				. . .	9	3	70	40	15	. .	
	3 derricks	1 saw	Powder	6	8	4	26	26	10	. .	
	1 "		"	75	10	2	10	10	7	. .	
channelers.	4 "	1 saw		. . .	8	4	125	125	63	. .	
"	4 "			. . .	9	. .	75	75	60	. .	
"	4 "			. . .	12	. .	85	50	35	. .	
"	4 "			. . .	9	3	150	80	50	. .	
	1 "		Powder	10	10	2	18	8	8	. .	
	2 "		"	3	8	4	12	12	8	. .	
	2 "			. . .	9	3	33	25	5	8	1
	4 "		Powder	150	8	4	100	50	40	10	
			"	100	10	2	65	40	40	. .	2
			"	40	8	4	45	15	14	1	
	4 derricks			. . .	8	4	75	75	60	12	
	3 "		Powder	Small	8	4	25	25	10	15	
	4 "		"	"	9	3	50	50	20	20	
	2 " 1 crane.	3 gang saws.	"	60	9	3	35	25	25	. .	
			"	100	7	5	2	2	2	. .	
			"	50	8	4	4	4	4	. .	
13	89 derricks, 1 crane	14		$1,690			2,420	1,638	1,054	132	50
	3 derricks		Powder	Small	8	4	12	12	7	. .	
	4 "		"	$450	9	3	74	48	20	. .	1
			"	10	8	4	30	30	15	. .	1
				. . .	9	3	10	10	10	. .	
	10 derricks.		Powder	150	12	. .	50	50	15	10	
13	106 derricks, 1 crane	14		$2,300			2,596	1,788	1,121	142	54

These tables are full and complete, and for the first time afford our citizens a knowledge of this important and growing industry of their own neighbors and people. For facility of study the following recapitulation of totals is given:

Totals from Tables representing the Quarry Industries in the State of Indiana.

Cubical contents of the space in yards excavated since the quarries were opened	5,727,225
Number of cubic feet of marketable product moved during the census year	8,413,827
Capital invested	$613,560
Total value of material quarried during the census year	633,775
Value of explosives used during the census year (powder and dynamite)	2,300
Machines employed for—	
Quarrying—Channelers and steam drills	13
Hoisting—Derricks and cranes	107
Dressing—Saw-mills	14
Dressing—Gangs, 3 per mill	42
Greatest number of hands employed at any one time during the past ten years	2,596
Greatest number of hands employed during the census year	1,788
Number employed in quarrying	1,121
Number employed in stone-dressing at quarries	142
Number of animals employed at any one time during the census year (horses)	545
Means of transportation belonging to quarries—	
Wagons and carts	153
Cars	46

OOLITIC LIMESTONE.

This stone occurs in quarry beds in the counties of Owen, Monroe, Lawrence, Washington, Harrison and Crawford, in massive strata from twenty to thirty or more feet in thickness, consequently very abundant. It was adopted, after long, careful investigation in competition with the most favored stone in the nation, as the handsomest, best material for the new State House. A similar conclusion was arrived at by authorities charged with important public structures in this and other States throughout the Union from the lakes to the Gulf of Mexico, and from the Mississippi to the Atlantic seaboard. This has given a great impetus within the past three years to the out-put of oolitic limestone.

Besides the new capitol of the State, oolitic limestone is the principal material in the $2,000,000 court house, post office, residences and churches in Indianapolis, and the best court houses in this and adjoining States. It is also in use for the Cotton Exchange, at New Orleans; the most exposed parts of the new city hall, and the water tables of Lincoln Park, at Chicago; many of the expensive structures of St. Louis, to include the Olympic Theater; and the Custom House at Louisville. Within the present month orders have been received for an outfit, amounting to one hundred and fifty car loads, for first-class structures in the cities of Philadelphia and New York.

The oolitic limestone averages over 96 per cent. carbonate of lime, a degree of purity rarely if ever surpassed, and scarcely equaled in the world.

The stone crops out with bold, perpendicular faces, which record the standpoints of streams through the long ages during which they have been engaged in hewing out of solid rock their deep valleys; even back of this the striæ and erosions of the glacial age are seen, dating back to the beginning of quarternary time, supposed by many to have been several hundred thousand years ago. This stone has withstood the elements and their disintegrating action during these long periods, and will fully answer the requirements for permanent structures. The strata are from ten to twenty feet thick, homogeneous and of similar appearance in horizontal or vertical section, the stone comes soft from the quarry, and is easily sawed; but, being tough under the chisel, it may be carved with facility and rapidity into any desired ornamental forms.

Cement should not be used in connection with this stone, in face work, but lime used instead.

This stone may be confidently recommended for the erection of extensive permanent structures.

An influential public journal of this State has the following fitting remarks:

"To conceive fairly what a good stone is, you must keep in mind the conditions under which it is to rest and do service. In this climate it will have to bear, in the direct rays of a July sun, a heat of 120° on the outside, while inside it may not be more than 70°. This difference of expansion makes a tremendous strain on the structure of the stone. In winter it may have to bear an exterior temperature of 20° below zero, and an interior heat of 70° above, or 90° of difference, which is simply a gigantic effort of nature to break the stone, like the grip of a powerful man straining a stick across his knee. It must give to one side and another under the enormous force applied on that side and reduced on the other. It is no wonder that great masses of apparently compact, homogeneous rock open in cracks, split off in layers when set on edge, burst into pieces sometimes when moisture soaks into undetected crevices and freezes with a spreading force that puts to shame the power of a steam engine or a hydraulic press. The damaging power of climate on building material is well illustrated in the case of obelisks of Paris, London and New York. They had all stood for 3,000 years in the rainless, equable climate of the Nile, with as sharp an outline of hieroglyphics, the corners as perfectly cut, the marks of the chisel as plain as when they were cut in the quarries of Syene, by Rameses. But that on the Place of the Guillotine, in Paris, has decayed till the government has been forced to save the inscriptions for historical use by making plaster fac-similes, while there is completeness enough left to assure accuracy. That on the Thames embankment, but a few years away from its native air, is breaking on the sharp corners and minute lines. So is that in New York, though it seems but a month ago—and it is but a few months really—since Lieut. Gorringe landed it. A recent publication says:

"Once in position, it was forgotten, until now some investigating visitor has made the alarming discovery that it is wearing out. Many of the inscriptions are no longer clear, and the corners are becoming rounded. The cause of this is the climate, the obelisk having been accustomed to a semi-tropical region and perpetual heat."

The dilapidation produced by freezing and thawing—the most rapid disintegrating agency in nature—the changes from dryness to incessant moisture, from excessive heat to cold, the differences of temperature at the same moment between opposite sides of the same block, the tendency of lamination to split off, of unequal densities to force apart, are all grave obstructions of the service that building stone can do in this climate that would be very slight obstructions in more equable climates. But we have stone that will bear and resist them all, and the State Geologist very fairly claims that it is the best stone in the United States. It is what the new State House is made of.

Table showing the production and the places where consumed, of the Oolitic lime stone taken from the Bedford, Bloomington, Stinesville and Ellettsville quarries for the years 1877 to 1881 inclusive:

Locality of the Quarries.	Car Loads, 1877.	Car Loads, 1878.	Car Loads, 1879.	Car Loads, 1880.	Car Loads, 1881.	Total Car Loads.
Bedford, Lawrence County	1,510	1,940	2,100	2,400	2,900	10,850
Bloomington, Monroe County	....	10	20	25	83	138
Stinesville, Monroe County	145	205	153	123	285	911
Ellettsville, Monroe County	412	400	415	600	1,087	2,914
Totals	2,067	2,555	2,688	3,148	4,355	14,813

Cubic feet per car load, 165; one cubic foot weighs 146 pounds.

The following table shows the places to which the Bedford stone has been shipped for the years 1877 to 1881 inclusive:

Points to which the Bedford Stone has been Shipped.	Car Loads, 1877.	Car Loads, 1878.	Car Loads, 1879.	Car Loads, 1880.	Car Loads, 1881.	Total Car Loads.
Indianapolis, Indiana	287	369	399	456	551	2,062
Other points in Indiana	91	116	126	144	174	651
Illinois	830	1,067	1,155	1,320	1,595	5,967
Kentucky	166	213	231	264	319	1,193
Other places outside of Indiana	136	175	109	216	261	977
Total shipments	1,510	1,940	2,100	2,400	2,900	10,850

The other quarries have shipped about the same proportion of their product to the above points.

The shipment of eighty-three car loads from Bloomington indicate the development of a new and important use of oolitic limestone. Messrs. Dunn & Dunn, from their quarries, half a mile east of the railway station, obtain buff and blue stone in strata, respectively six and seven feet thick, of superior quality for ordinary building purposes. Careful tests show that it will receive and maintain for interior decorations a fine polish. With demand for the full amount of their present capacity, they have shipped the entire output of their works to Sherman & Fowler, Chicago, and the establishment at Joliet, Illinois, where it is sawed in thin plates or "boards," planed, matched and polished. The product meets a vigorous demand, fully meeting the call of tasteful decorators for modest neutral tints; and is used for wainscoting, mantels, pilasters, and other interior ornaments, as well as table tops, etc. The demand is newly developed and constantly increasing, and will establish this a factor in architectural materials. The following analysis is by B. F. Adams, Jr., made at the laboratory of the State University:

ANALYSIS OF OOLITIC LIMESTONE—BUFF AND BLUE.

(From Dunn & Dunn's Quarry.)

White Stone.

Specific gravity	2.716	
Gangue (Residue of HCl)	1.1527	per cent.
Lime (Ca O)	53.5499	per cent.
Carbonic acid Anhydride (Co 2)	43.3218	per cent.
Magnesia (MgO)	.4238	per cent.
Iron Oxide (Fe2 O3)	.2328	per cent.
Alumina (Al2 O3)	.0640	per cent.
Manganese Oxide (Mn O2)	.0300	per cent.
Phosphoric acid Anhydride (P2 O5)	.0455	per cent.
Silicic acid Anhydride (Si O2)	.0387	per cent.
Water (H2 O)	.5873	per cent.
Total	99.4465	per cent.

Blue Stone.

Specific gravity	2.732	
Gangue (Residue of HCl)	1.5571	per cent.
Lime (Ca O)	53.5095	per cent.
Carbonic acid anhydride (Co 2)	43.0958	per cent.
Magnesia (Mg O)	.4457	per cent.
Iron Oxide (Fe2 O3)	.0908	per cent.
Alumina (Al2 O3)	.0886	per cent.
Manganese Oxide (Mn O2)	.0542	per cent.

Blue Stone—Continued.

Phosphoric Acid Anhydride (P_2O_5)............	.0594 per cent.
Silicic Acid Anhydride (SiO_2)....................	.0476 per cent.
Water (H_2O)...	.4199 per cent.
Total...	99.3686 per cent.

Prof. VanNuys, chemist, of the Indiana State University, remarks "the buff stone contains more iron than the blue," which is produced by a filtration of water, carrying with it ferric oxide, and also by action of the oxygen of the air changing perrous carbonate to ferric oxide, as the buff is always found more exposed to the air."

The Survey is under obligations to Thomas H. Johnson, M. A., C. E., for the following discussion of the building materials of our country, and "*Experiments upon the Transverse Strength and Elasticity of Building Stone.*" It is believed that this latter quality has not sufficiently engaged the attention of engineers and builders, nor has the subject been before investigated with such thoughtful care. Hence, these labored results, obtained by exact mechanical appliances, well adjusted and observed will prove a discovery of great value, and support the high estimate herein claimed for the Oolitic stone.

Mr. Johnson's great experience in the construction and determination of railways, bridges and other structures requiring strength and endurance as elements, give weight and power to his conclusions.