COAL

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By Edward W. Parker.

The census of mines and quarries taken under the act providing for the Twelfth Census—the first of the twentieth century—found the United States firmly established as the principal coal producer of the world. At the taking of the Tenth and Eleventh censuses the United States was second in coal producing importance, with Great Britain first. At the Ninth Census it was exceeded in production by both Great Britain and Germany.

During the calendar year 1902, which is the period covered by the Twelfth Census of the mining industry, there were 27 states and 3 territories which contributed to the coal production of the United States. Of this number there were 5 in each of which the production amounted to less than 100,000 tons; there were 4 others in which the production was less than 1,000,000 tons; 5 states produced more than 10,000,000 tons each, and 1, Pennsylvania, produced more than 100,000,000 tons.

According to the character of the output, the coal fields of the United States conveniently fell under two great divisions, the anthracite and the bituminous. The areas from which the bulk of the anthracite is obtained are located in the eastern part of Pennsylvania, and ordinarily when reference is made to the anthracite fields of the United States those of eastern Pennsylvania are meant. There are, however, two small areas in the Rocky mountain region where true anthracite is produced in small quantities. One of these areas is in Gunnison county, Colo., the other in Santa Fe county, N. Mex. But, although the product of these two localities is true anthracite, the quantity obtained is so small that it is customary to include it with the bituminous production, and it is so included in this report.

The bituminous coal production shown here includes, in addition to the true bituminous coals, coking or noncoking, such varieties as semianthracite, semibituminous, cannel, splint, and block coals, and lignite or brown coal.

The following table is a comparative summary of the statistics of coal production as reported for the several census years from 1850 to 1902, inclusive:

Table 1.—COMPARATIVE SUMMARY: 1850 TO 1902.

	1902	1889	1880	1870	1860	1850
Number of mines	5,986	[1] 12,552	[2] 3,294	[2] 1,566	[2] 622	[2] 510
Number of operators	4,528	(3)	(3)	(3)	(3)	(3)
Salaried officials, clerks, etc.:						
Number	17,427	[4] 2,936	1,423	(5)	(5)	(5)
Salaries	$17,419,217	$2,193,870	(6)	(5)	(5)	(5)
Wage-earners:						
Average number	350,329	[4] 296,623	169,444	94,754	36,486	15,118
Wages	$220,198,401	$106,937,058	[6] $55,276,055	$44,316,491	$9,650,264	$4,069,188
Contract work	$1,650,535	$3,155,171	(3)	(3)	(3)	(3)
Miscellaneous expenses	$26,081,698	$15,421,591	(3)	(3)	(3)	(3)
Cost of supplies and materials	$37,539,702	$18,828,590	$11,589,091	$5,668,955	$2,752,972	$246,414
Product:						
Quantity, short tons	301,590,489	141,229,513	71,481,570	36,807,333	14,333,922	6,445,681
Value	$367,032,069	$160,226,328	$95,740,396	$73,524,972	$20,243,637	$7,173,750

[1] Includes 9,969 "local" mines (9,920 bituminous and 49 anthracite) for which there are no statistics for labor and expenditures; production of same, 2,889,286 short tons.
[2] Establishments.
[3] Not reported.
[4] Foremen included as wage-earners.
[5] Not reported separately.
[6] Salaries included in wages.

The following table shows the comparative statistics for the anthracite and bituminous coal industries, separately and combined, for 1889 and 1902:

TABLE 2.—COMPARATIVE SUMMARY: 1902 AND 1889.

	TOTAL.		BITUMINOUS.		ANTHRACITE.	
	1902	1889	1902	1889	1902	1889
Number of mines	5,986	[1] 12,552	5,652	12,138	334	414
Number of operators	4,528	(2)	4,409	(2)	119	(2)
Salaried officials, clerks, etc.:						
Number	17,427	[3] 2,936	14,413	2,408	3,014	528
Salaries	$17,419,217	$2,193,870	$14,511,924	$1,781,826	$2,907,293	$412,044
Wage-earners:						
Average number	350,329	[3] 296,623	280,638	172,841	69,691	123,782
Wages	$220,198,401	$106,937,058	$181,482,288	$67,983,885	$38,716,113	$38,953,173
Contract work	$1,650,535	$3,155,171	$1,244,114	$822,051	$406,421	$2,333,120
Miscellaneous expenses	$26,081,698	$15,421,591	$16,774,459	$6,742,221	$9,307,239	$8,679,370
Cost of supplies and materials	$37,599,702	$13,828,590	$24,798,922	$7,994,210	$12,740,780	$10,834,380
Product:						
Quantity, short tons	301,590,439	141,229,513	260,216,844	95,629,026	41,373,595	45,600,487
Value	$367,032,069	$160,226,323	$290,858,483	$94,346,809	$76,173,586	$65,879,514

[1] Includes 9,969 "local" mines (9,920 bituminous and 49 anthracite) for which there are no statistics for labor and expenditures; production of same, 2,889,286 short tons.
[2] Not reported.
[3] Foremen included as wage-earners.

Two pronounced discrepancies appear in the foregoing tables. The first of these is the marked decrease in the number of mines reported for 1902, as compared with 1889. This decrease is due to the elimination, at the Twelfth Census, of a large number of small banks producing an insignificant amount of coal for purely local consumption, which were included in the previous census. At the taking of the Eleventh Census it was possible to make use of the enumerators to secure reports from these unimportant producers, but as the mining investigation at the Twelfth Census was not taken for the same year as that of population and manufactures, it was not possible to secure the services of enumerators to get the returns from these widely distributed and unimportant sources. Neither was it possible to obtain anything like complete reports by correspondence, and to have employed special agents for a complete canvass would have entailed an expense entirely out of proportion to the value of the results to be accomplished. The output from these small banks amounts to less than 1 per cent of the total, and to have made a complete canvass would have increased the cost of the investigation by probably 100 per cent. It would also have required a much longer time than could be allowed in order to complete the report within the time prescribed by law.

The second discrepancy requiring explanation is that existing between the number of wage-earners reported for 1902 and 1889. The difference is particularly noticeable in the statistics of anthracite production, where the number of wage-earners in 1902 appears to have been only 56.3 per cent of the number employed in 1889. In the bituminous mines, which increased 172.1 per cent in production, the number of wage-earners appears to have increased only 62.4 per cent. This makes it appear that in 1902 there were 861 tons of coal produced for each wage-earner employed, as compared with 476 tons in 1889. The reason for this is in part that, following the custom employed in the other reports for the Twelfth Census, the working time was assumed to have been three hundred days in the year, and the number of wage-earners had been equated in accordance with this assumption. In 1889 the average number was calculated for the actual time the mines were in operation and not for the whole year. The report of the United States Geological Survey, which has not been equated after the manner of the Twelfth Census, shows the average number of employees to have been 148,141 in the anthracite mines and 370,056 in the bituminous mines. The average time worked was one hundred and sixteen days in the anthracite mines and two hundred and thirty days in the bituminous mines. The total number of men employed, according to the report of the Survey, was 518,197, and the general average time worked was one hundred and ninety-seven days.

It is to be noted that the statistics for 1902 show a marked increase over 1889, both in the number of salaried officials and in the amount paid in salaries. This is explained by the fact that in 1889 only the salaried force employed at or in the immediate vicinity of the mines was included. On the other hand, officials and salaried employees in central offices or at a distance from the mines were included at the Twelfth Census. In 1889 the office forces at the mines numbered 2,936 persons, who were paid $2,193,870 in salaries. The salaried list at the census of 1902 included 17,427 persons who received $17,419,217. Comparable statistics for the two censuses include those for wages, for contract work, for miscellaneous expenses, and for sup-

plies and materials. In 1889 these items aggregated $144,342,410, and in 1902, $285,470,336, making an increase for the period included between those dates of $141,127,926, or 97.8 per cent. During the same period, however, there was an increase of 129.1 per cent in the value of the product and of 113.5 per cent in the tonnage, due to the unusual conditions of the market in 1902. The foregoing statistics of expense do not include expenditures connected with the marketing of the product.

The following table shows the details of the capitalization of the incorporated companies operating coal mines, anthracite and bituminous:

TABLE 3.—*Capitalization of incorporated companies: 1902.*

	Total.	Anthracite.	Bituminous.
Number of incorporated companies	1,593	76	1,517
Number reporting capitalization	1,519	69	1,450
Capital stock and bonds issued	$797,750,237	$142,032,212	$655,718,025
Capital stock:			
Total authorized—			
Number of shares	30,883,929	1,076,946	29,806,983
Par value	$653,855,920	$59,749,350	$594,106,570
Total issued—			
Number of shares	20,290,475	981,461	19,309,014
Par value	$568,906,676	$55,482,490	$513,424,186
Dividends paid	$19,296,300	$1,936,459	$17,359,841
Common—			
Authorized—			
Number of shares	29,480,914	1,065,346	28,415,568
Par value	$577,345,713	$58,589,350	$518,756,363
Issued—			
Number of shares	19,011,108	973,560	18,037,548
Par value	$498,441,649	$54,692,390	$443,749,259
Dividends paid	$15,230,787	$1,933,251	$13,297,536
Preferred—			
Authorized—			
Number of shares	1,403,015	11,600	1,391,415
Par value	$76,510,207	$1,160,000	$75,350,207
Issued—			
Number of shares	1,279,367	7,901	1,271,466
Par value	$70,465,027	$790,100	$69,674,927
Dividends paid	$4,065,513	$3,208	$4,062,305
Bonds:			
Authorized—			
Number	276,036	71,879	204,157
Par value	$241,418,778	$87,925,222	$153,493,556
Issued—			
Number	259,484	70,454	189,030
Par value	$228,843,561	$86,549,722	$142,293,839
Interest paid	$9,904,973	$3,789,145	$6,115,828
Assessments levied	$4,100,380	$1,797,319	$2,303,061

The total number of shares of common and preferred stock issued by all coal mining companies was 20,290,475, having a par value of $568,906,676, on which dividends were paid to the amount of $19,296,300, or 3.39 per cent. Deducting assessments levied the net dividends paid amounted to $15,195,920, or 2.67 per cent on the capital stock issued. The total par value of the stock of the anthracite companies was $55,482,490, on which dividends amounting to $1,936,459, or 3.49 per cent, were paid. The par value of the total stock issue of the bituminous coal companies was $513,424,186, on which dividends were paid to the amount of $17,359,841, or 3.38 per cent.

Employees and wages.—The average number of wage-earners employed during each month is shown in Table 4, for the coal industry as a whole as well as for the anthracite and bituminous mines separately.

TABLE 4.—*Average number of wage-earners employed during each month: 1902.*

	Total.	Anthracite.	Bituminous.
Total average number	350,329	69,691	280,638
Men 16 years and over:			
January	394,841	110,018	284,823
February	392,140	110,760	281,380
March	386,821	109,165	277,656
April	376,499	109,190	267,309
May	315,527	53,169	262,358
June	274,104	16,301	257,803
July	261,974	6,493	255,481
August	271,303	7,610	263,693
September	281,267	8,136	273,131
October	321,084	34,773	286,311
November	398,407	105,516	292,891
December	407,677	110,393	297,284
Boys under 16 years:			
January	14,076	8,362	5,714
February	14,095	8,468	5,627
March	14,090	8,419	5,671
April	14,135	8,517	5,618
May	8,634	2,986	5,648
June	5,502	52	5,450
July	5,395	59	5,336
August	5,576	96	5,480
September	5,666	100	5,566
October	7,439	1,696	5,743
November	13,631	7,804	5,827
December	14,065	8,209	5,856

The effect of the anthracite coal strike on the employment of labor in that industry is clearly shown in the above table.

For more than five months, or from May 12 to October 25, mining operations were almost entirely suspended in the anthracite region, the idleness being due to a strike among the mine workers. On account of the practically complete cutting off of the supply of anthracite, there existed, during the latter half of the year, a scarcity of fuel which amounted in many parts of the Eastern states to an actual famine. The strike was finally settled by the friendly and personal intervention of the President of the United States, who with the consent of the operators and the leaders of the striking miners appointed a commission "to inquire into, consider, and pass upon the questions in connection with the strike in the anthracite region, and the causes from which the controversy arose." Operations were resumed immediately upon the appointment of the commission, but owing to the necessity for repairs and for pumping water from many of the mines, occasioned by the long period of idleness, it was several weeks before normal conditions were restored.[1]

The average number of all wage-earners employed during July, 6,493—which was the minimum—closely

[1] This matter is thus briefly referred to here, partly because of its historic interest, but chiefly because the conditions are reflected in the statistics presented in this report and require some explanation. The report of the commission has been published and can be had upon application to the United States Commissioner of Labor. It contains some interesting statistical tables on the subject of wages paid to the different classes of labor, on the cost of living in the anthracite region, and other details which will be found useful to anyone interested in the study of the anthracite industry.

approximates the average number of engineers, firemen, and other mechanics for the year, which was 6,513. The bituminous industry also shows that the minimum number was employed in July; the range, however, was not great, the minimum being less than 9 per cent below the average for the year.

Of all employees engaged in the coal industry, 19.9 per cent were employed in anthracite mines, and 80.1 per cent in bituminous mines, while employees in the anthracite industry received only 17.5 per cent of the total amount paid in salaries and wages, leaving 82.5 per cent for those engaged in the bituminous industry.

The percentages of wage-earners employed above and below ground and the percentages for the several classes of wage-earners in the two branches of the coal industry are shown in the following statement:

Percentages of wage-earners above and below ground and by occupations: 1902.

	Anthracite.	Bituminous.
Wage-earners	100.0	100.0
Above ground	40.1	12.9
Below ground	59.9	87.1
Above ground	100.0	100.0
Engineers, firemen, and other mechanics	23.3	37.5
Boys under 16 years	13.7	2.3
All other wage-earners	63.0	60.2
Below ground	100.0	100.0
Miners	42.6	77.5
Miners' helpers	16.6	1.5
Boys under 16 years	1.8	1.9
All other wage-earners	39.0	19.1

Production.—During the calendar year 1902 the coal production of the United States amounted to 301,590,439 short tons, valued at the mines at $367,032,069. Of this total, 41,373,595 tons, valued at $76,173,586, were Pennsylvania anthracite, and 260,216,844 tons, valued at $290,858,483, were bituminous and lignite coal. Compared with the output reported at the Eleventh Census, the total production of coal in the United States in 1902 showed an increase of 160,360,926 short tons, or 113.5 per cent. This increase was all in the production of bituminous coal and lignite, for, on account of labor troubles in the anthracite fields of Pennsylvania, the output of anthracite in 1902 was restricted to about two-thirds of the normal production, and was less than that of 1889 by 4,226,892 short tons, or 9.3 per cent.

The production of bituminous coal in 1902 was abnormally stimulated by the scarcity of anthracite. Owing to the continuous activity and expansion in nearly all lines of manufactures, an increased production of bituminous coal would naturally have resulted, but would probably not have reached the amount it did had it not been for the fuel famine, especially in the Eastern states. On the other hand, conditions would have been greatly improved and the production and supply of bituminous coal would have been considerably increased had the transportation companies been able to meet the demands put upon them. The productive capacity of the bituminous mines could easily have supplied all the fuel needed had it been possible to get the product promptly to the consumer.

The production of bituminous coal in 1902 amounted to 260,216,844 short tons, valued at the mines at $290,858,483. As compared with 1889, when the production was 95,629,026 short tons, valued at $94,346,809, these figures show an increase of 164,587,818 short tons, or 172.1 per cent in amount, and of $196,511,674, or 208.3 per cent in value. The relatively higher value of the product in 1902 was due partly to the improved industrial conditions in that year, and partly to the increase in prices naturally resulting from the curtailment in anthracite production. The average price per short ton for bituminous coal in 1902 was $1.12, as compared with 99 cents in 1889.

The following table is a summary of production of anthracite and bituminous coal as reported at the last six censuses:

TABLE 5.—PRODUCTION OF ANTHRACITE AND BITUMINOUS COAL: 1850 TO 1902.

[Short tons.]

	1902	1889	1880	1870	1860	1850
Total	301,590,439	141,229,513	71,481,570	36,807,333	14,333,922	6,445,681
Anthracite	[1] 41,467,532	[2] 45,600,487	28,649,812	17,543,988	8,115,842	4,138,164
Per cent of total	13.7	32.3	40.1	47.7	56.6	64.2
Bituminous	260,122,907	95,629,026	42,831,758	19,263,345	6,218,080	2,307,517
Per cent of total	86.3	67.7	59.9	52.3	43.4	35.8

[1] Includes 93,937 tons of anthracite produced in Colorado and New Mexico.
[2] Includes 53,517 tons of anthracite produced in Colorado and New Mexico, and 2,000 tons of graphitic coal produced in Rhode Island.

It will be observed in the foregoing table that in 1850 the anthracite product of Pennsylvania was nearly two-thirds of the coal production of the country, and that in 1870 the production of coal in the United States was nearly equally divided between the anthracite product of Pennsylvania and the output of bituminous mines; whereas in 1902 the production of bituminous coal was 6½ times that of anthracite. Had it not been for the strike, however, the production of the anthracite fields in 1902 would probably have reached a total of about 65,000,000 tons, indicating that under normal conditions the output of bituminous coal in 1902 would have been about four times that of anthracite.

One of the interesting features connected with the coal mining industry during the last quarter of a century has been the gradual elimination of anthracite as a factor in manufacturing. Bituminous coal has largely supplanted anthracite for manufacturing purposes, even

in the Eastern states, while the latter has become more and more restricted to household consumption. For this reason the normal increase in the production of anthracite coal has been about in proportion to the increase in population, whereas the increase in bituminous production has rapidly outstripped the increase in population, as it has the increase in production of anthracite coal.

The development of the coal resources of the United States has been coincident with the rapid advancement of this country in the last few years to the front rank among the industrial nations of the world. Indeed, the country's progress has been due largely to the abundance and cheapness of its mineral fuels, chief among which is coal. Most of this development has taken place during the last two decades and has far exceeded the growth in population, indicating a rapid change from an agricultural to a manufacturing nation. A comparison of the growth in population with the increase in production presents some interesting facts in support of this statement. The Ninth Census was the first which took separate cognizance of the mining industry, but the United States Geological Survey has compiled from such records as are available an approximate statement of the annual coal production of the United States from the year when the first anthracite coal was mined in Pennsylvania (1814) to the close of 1902.

Diagram I illustrates the growth of the coal production of the country from 1830 to 1902, both in production per capita and in comparison with the increase in population.

The following table gives the population and coal production, respectively, from 1830 to 1902, with the per cent of increase during each intervening period and the average amount of coal product per unit of population. The statistics, except those for 1890 and 1902, are taken from the reports of the United States Geological Survey.

TABLE 6.—*Population and coal production: 1830 to 1902.*

CENSUS OF—	Population.	Per cent of increase.	Coal production (short tons).	Per cent of increase.	Tons of coal per unit of population.
1830	12,866,020	.....	318,072	.....	0.025
1840	17,069,453	32.7	1,785,574	461.4	0.105
1850	23,191,876	35.9	6,445,681	261.0	0.278
1860	31,443,321	35.6	16,169,736	150.9	0.514
1870	38,558,371	22.6	36,806,560	127.6	0.955
1880	50,189,209	30.1	76,157,944	106.9	1.518
1890	63,069,756	24.9	[1] 141,229,613	85.4	2.255
1900	76,303,387	21.8	269,684,027	91.0	3.534
1902	[2] 78,576,436	3.0	301,590,439	11.8	3.838

[1] For calendar year 1889.
[2] Estimates of population, United States Census, Bulletin No. 7, 1904.

At the taking of the census of 1820 the production of coal in this country was less than 500 tons, all of which was Pennsylvania anthracite. The population of the United States in that year was 9,638,453. In 1830, when the population had grown to 12,866,020, the production of coal amounted to 318,072 short tons. At the end of the next decade the population of the United States was 17,069,453, and the coal output was 1,785,574 short tons. The production per capita in that year (1840) was 0.105 ton. This was the first census year in which the coal production amounted to as much as 0.1 ton for each person. In 1850, when the inhabitants numbered 23,191,876, the output of coal mines amounted to only 6,445,681 short tons, or 0.28 ton for each person. The census of 1860 gave a population of 31,443,321, and the coal production was 16,169,736 short tons, or 0.51 ton per capita. When the Ninth Census was taken the coal production was still less than 1 ton for each inhabitant, the population being 38,558,371, and the coal production amounting to 36,806,560, or 0.96 ton per capita.

In 1880, when the population had increased to 50,189,209, the production of coal had grown to 76,157,944 short tons, or 1.52 tons per capita. The mining census for the calendar year 1889 showed a coal production of 141,229,613 short tons and the population census for the fiscal year ending June 30, 1890, showed a total of 63,069,756 persons, the per capita production of coal being 2.26 tons. The Twelfth Census reported a population of 76,303,387, the United States Geological Survey reporting for that year a coal production of 269,684,027 short tons, or 3.53 tons for each inhabitant. If the population for 1902 be estimated at 78,576,436, the per capita coal production is shown to have been 3.84 tons for that year.

It must be remembered that within the last thirty years, during which the coal production has so markedly outstripped the growth in population, petroleum and natural gas have been produced in enormous quantities and to the value of many millions of dollars annually. The increased output of these fuels, however, has been partly offset by a decrease in the amount of wood used for fuel, but while it is known that such a decrease has taken place, there are no statistics by which comparisons can be made.

The following comparative statement shows the average production per mine and per employee from the statistics given in Table 1:

Average production per mine and per employee for each census year: 1850 to 1902.

	1902	1889	1880	1870	1860	1850
Average product:						
Per mine, tons	50,383	[1] 53,578	21,701	20,986	23,045	12,539
Per employee, tons	565	476	422	347	393	426

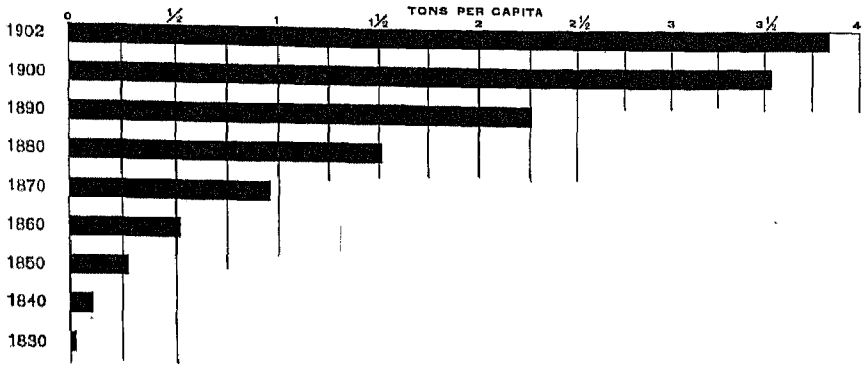
[1] Exclusive of local mines.

In all the later decades there was a steady increase in the output per employee.

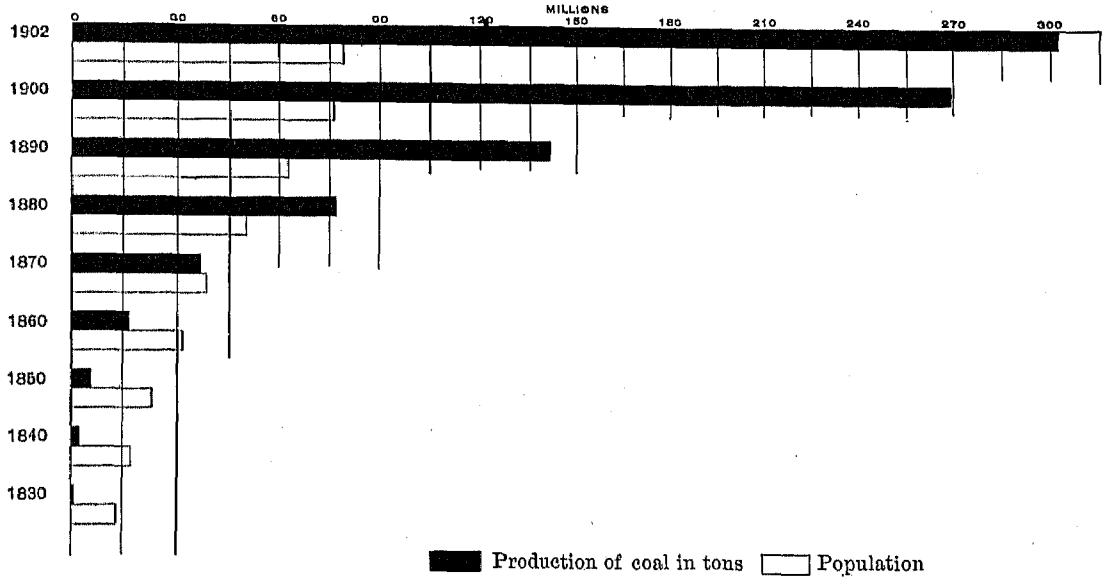
Annual statistics compiled by the United States Geological Survey show that the United States has exceeded Germany's production in every year since and including 1871, with the exception of the two years 1875 and 1876, and since and including 1899 has outranked

DIAGRAM I.—(*a*) PRODUCTION OF COAL PER CAPITA; (*b*) COMPARISON OF POPULATION WITH PRODUCTION: 1830 TO 1902.

(*a*) Production of coal per capita: 1830 to 1902.



(*b*) Comparison of population with production of coal: 1830 to 1902.



Great Britain. In 1901 and 1902 the United States exceeded in coal production the combined output of Great Britain and all its colonies and dependencies.

The following table shows the production of coal in the United States, Great Britain, Germany, and the other countries of the world in each census year from 1870 to 1902, and the same is shown graphically by Diagram II. The imports and exports of coal for the United States and the domestic production and consumption are also indicated by Diagram II.

TABLE 7.—WORLD'S PRODUCTION OF COAL, BY COUNTRIES, WITH PER CENT EACH IS OF TOTAL, AND PER CENT OF INCREASE: 1870 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Short tons.]

COUNTRY.	1902	1889	1880	1870	INCREASE, 1870 TO 1902	
					Quantity.	Per cent.
All countries	884,803,434	531,797,039	369,413,780	238,621,068	646,182,366	270.8
United States	301,590,439	141,229,613	76,157,944	36,806,560	264,783,879	719.4
Per cent of total	34.1	26.6	20.6	15.4	41.0	.....
Great Britain	254,346,447	198,146,731	164,605,738	123,682,935	130,663,512	105.6
Per cent of total	28.8	37.2	44.6	51.8	20.2	.....
Germany	165,826,496	93,640,500	65,177,634	37,488,312	128,338,184	342.3
Per cent of total	18.7	17.6	17.6	15.7	19.9	.....
All other countries[1]	163,040,052	98,780,195	63,472,464	40,643,261	122,396,791	301.1
Per cent of total	18.4	18.6	17.2	17.1	18.9	.....

[1] Includes Austria-Hungary (1901), 45,417,959; France, 33,286,146; Belgium (1901), 24,485,842; Russia (1901), 17,934,201; India, 8,326,049; Japan (1900), 8,187,262; Canada, 7,639,225; New South Wales, 6,655,052; Spain (1901), 3,027,992; New Zealand (1901), 1,374,955; Mexico, 782,251; South African Republic (1901), 752,116; Natal, 663,960; Queensland (1901), 604,209; Italy (1901), 469,154; Holland (1900), 352,888; Sweden, 335,907; Victoria (1901), 234,448; Cape Colony (1900), 222,265; Tasmania (1900), 48,171; China, Turkey, Servia, Portugal, United States of Colombia, Chile, Borneo and Labuan, Peru, Greece, etc., 2,240,000.

This table shows that while in a period of approximately thirty years the coal production of Great Britain had only a little more than doubled, that of the United States in 1902 was more than eight times what it was in 1870. It also shows that Germany and all other countries combined have only approximately quadrupled their production of coal in the same period.

ANTHRACITE.

The anthracite coal product herein reported is confined to the state of Pennsylvania, the small output of Colorado and New Mexico being included in the statistics for bituminous coal. The following table is a summary of the statistics for anthracite production in Pennsylvania, by counties, during 1902:

TABLE 8.—SUMMARY, PENNSYLVANIA ANTHRACITE, BY COUNTIES: 1902.

	Total.	Carbon.	Columbia.	Lackawanna.	Luzerne.	Northumberland.	Schuylkill.	Other counties.[1]
Number of mines	334	11	4	91	113	24	85	6
Number of operators	119	6	2	23	36	12	35	5
Salaried officials, clerks, etc.:								
Number	3,014	87	67	483	843	350	1,098	86
Salaries	$2,907,293	$82,814	$63,518	$461,964	$839,080	$294,519	$1,108,728	$56,670
Wage-earners:								
Average number	69,691	2,114	1,275	16,175	25,001	6,691	16,385	2,050
Wages	$38,716,113	$1,111,578	$711,272	$9,585,166	$13,939,752	$3,551,366	$8,609,384	$1,257,595
Contract work	$406,421	$50,697	$17,408	$58,614	$151,970	$16,483	$111,249	.....
Miscellaneous expenses	$9,307,239	$193,513	$247,125	$1,955,982	$3,776,263	$690,083	$2,301,154	$143,119
Cost of supplies and materials	$12,740,780	$370,268	$343,018	$2,441,760	$4,801,407	$1,172,483	$3,375,690	$236,154
Product:								
Quantity, long tons	36,940,710	986,201	670,115	10,779,268	12,852,826	2,878,615	7,704,202	1,069,483
Value	$76,173,586	$1,942,361	$1,375,099	$22,534,716	$27,622,900	$5,602,584	$15,051,292	$2,044,634

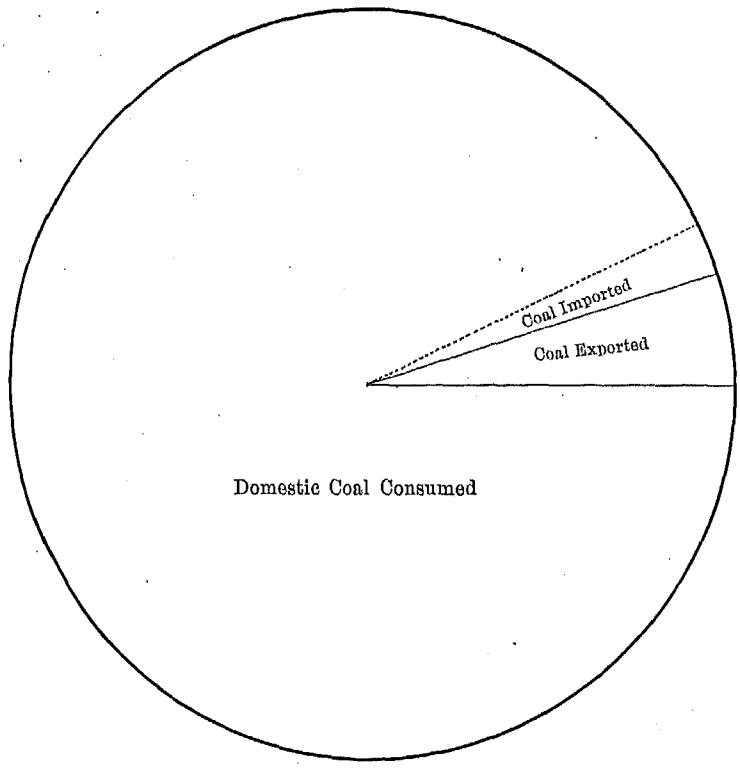
[1] Includes operators distributed as follows: Dauphin county, 2; Sullivan county, 2; Susquehanna county, 1 (2 mines).

There were 2 anthracite coal mines in Pennsylvania in the development stage for which no production was reported. One was in Luzerne county and the other in Schuylkill. These were operated by 2 of the active companies and the statistics therefor are included in the statistics for the developing bituminous coal mines of the state. There were 17 idle mines proper, distributed, by counties, as follows: Lackawanna, 1; Luzerne, 4; Northumberland, 4; and Schuylkill, 8.

Employees and wages.—In Table 9 the distribution of wage-earners according to daily rates is shown by occupations.

DIAGRAM II.—(*a*) DOMESTIC PRODUCTION AND CONSUMPTION OF COAL, 1902; (*b*) COAL PRODUCTION OF THE WORLD: 1902, 1890, 1880, AND 1870.

(*a*) Domestic production and consumption of coal: 1902.



(*b*) Coal production of the world: 1902, 1890, 1880, and 1870.

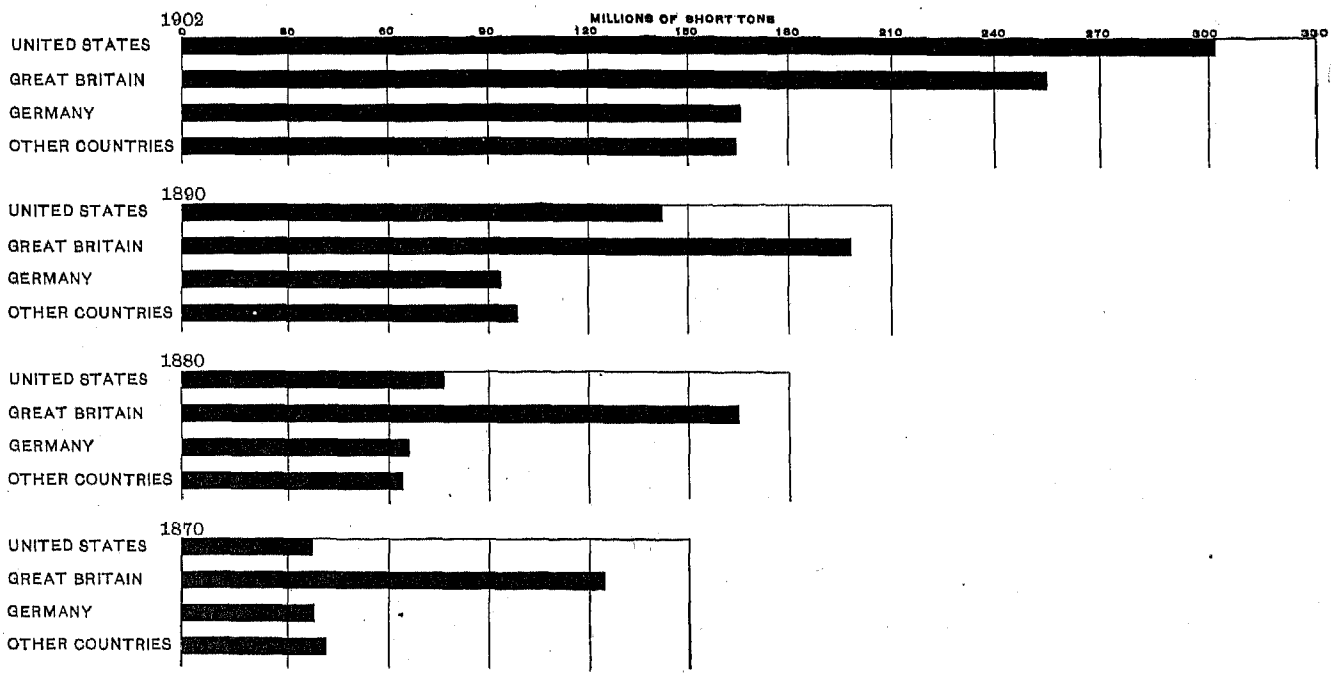


TABLE 9.—COAL, ANTHRACITE—WAGE-EARNERS AT SPECIFIED DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

[Each cumulative percentage shows the proportion of total number of persons in the given class receiving a wage as great as, or greater than, the lowest wage of the given wage group.]

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.			ENGINEERS.			FIREMEN.			MACHINISTS, BLACKSMITHS, AND OTHER MECHANICS.		
	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.
Total	69,691	100.0	.....	2,064	100.0	.....	1,836	100.0	.....	2,613	100.0	.....
Less than 0.50	70	0.1	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
0.50 to 0.74	2,459	3.5	99.9	.....	.....	.....	.....	.....	.....	.....	.....	.....
0.75 to 0.99	3,808	5.5	96.4	3	0.1	100.0	.....	.....	.....	1	(1)	100.0
1.00 to 1.24	6,546	9.4	90.9	49	2.4	99.9	9	0.5	100.0	20	0.8	99.9
1.25 to 1.49	8,495	12.2	81.5	68	3.3	97.5	123	6.7	99.5	67	2.6	99.2
1.50 to 1.74	10,712	15.4	69.3	273	13.2	94.2	621	33.8	92.8	371	14.2	96.6
1.75 to 1.99	11,547	16.6	53.9	455	22.1	81.0	815	44.4	59.0	428	16.4	82.4
2.00 to 2.24	8,159	11.7	37.3	509	24.7	58.9	219	11.9	14.6	823	31.5	66.0
2.25 to 2.49	7,253	10.4	25.6	247	12.0	34.2	21	1.1	2.7	673	25.7	34.5
2.50 to 2.74	3,132	4.5	15.2	369	17.9	22.2	27	1.5	1.6	156	6.0	8.8
2.75 to 2.99	1,819	2.6	10.7	75	3.6	4.3	1	0.1	0.1	47	1.8	2.8
3.00 to 3.24	1,806	2.6	8.1	13	0.6	0.7	.....	.....	.....	20	0.8	1.0
3.25 to 3.49	1,382	2.0	5.5	3	0.1	0.1	.....	.....	.....	2	0.1	0.2
3.50 to 3.74	1,317	1.9	3.5	.....	.....	.....	.....	.....	.....	4	0.1	0.1
3.75 to 3.99	517	0.7	1.6	.....	.....	.....	.....	.....	.....	.....	.....	(1)
4.00 to 4.24	167	0.2	0.9	.....	.....	.....	.....	.....	.....	1	(1)	(1)
4.25 and over	502	0.7	0.7	.....	.....	.....	.....	.....	.....	.....	.....	.....

RATE PER DAY (DOLLARS).	MINERS.			MINERS' HELPERS.			TIMBERMEN AND TRACK LAYERS.			BOYS UNDER 16 YEARS.			ALL OTHER WAGE-EARNERS.		
	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.
Total	17,767	100.0	.....	6,921	100.0	.....	1,977	100.0	.....	4,564	100.0	.....	31,949	100.0	.....
Less than 0.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	69	1.5	100.0	1	(1)	100.0
0.50 to 0.74	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,006	44.0	98.5	453	1.4	99.9
0.75 to 0.99	.....	.....	.....	2	(1)	100.0	2	0.1	100.0	1,881	41.2	54.5	1,919	6.0	98.6
1.00 to 1.24	.....	.....	.....	441	6.4	99.9	50	2.5	99.9	580	12.7	13.3	5,397	17.0	92.6
1.25 to 1.49	26	0.2	100.0	947	13.7	93.6	61	3.1	97.4	26	0.6	0.6	7,177	22.5	75.6
1.50 to 1.74	271	1.5	99.8	921	13.3	79.9	304	15.4	94.3	2	(1)	(1)	7,949	24.8	53.1
1.75 to 1.99	1,101	6.2	98.3	2,086	30.1	66.6	624	31.6	78.9	.....	.....	.....	6,038	18.9	28.3
2.00 to 2.24	3,293	18.5	92.1	1,196	17.3	36.5	326	16.5	47.3	.....	.....	.....	1,793	5.6	9.4
2.25 to 2.49	3,776	21.3	73.6	1,211	17.5	19.2	579	29.3	30.8	.....	.....	.....	746	2.3	3.8
2.50 to 2.74	2,195	12.4	52.3	117	1.7	1.7	23	1.2	1.5	.....	.....	.....	245	0.8	1.5
2.75 to 2.99	1,542	8.7	39.9	.....	.....	.....	5	0.2	0.3	.....	.....	.....	149	0.5	0.7
3.00 to 3.24	1,692	9.5	31.2	.....	.....	.....	2	0.1	0.1	.....	.....	.....	79	0.2	0.2
3.25 to 3.49	1,373	7.7	21.7	.....	.....	.....	1	(1)	(1)	.....	.....	.....	3	(1)	(1)
3.50 to 3.74	1,313	7.4	14.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3.75 to 3.99	517	2.9	6.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.00 to 4.24	166	0.9	3.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4.25 and over	502	2.8	2.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

[1] Less than one-tenth of 1 per cent.

As shown by the above table, the great majority of the wage-earners received from $0.50 to $2.74 per day, 62,111, or 89.1 per cent of all wage-earners having been reported at rates between those limits. But two factors somewhat peculiar to the coal industry make such generalization misleading: (1) The large number of boys employed lessens the average wage as a whole; (2) the bulk of the mining is done on a tonnage or yardage basis, the equivalent daily rate of pay for the periods reported being calculated from the amount paid and the number of miners so employed.

There were 17,767 miners reported, 25.5 per cent of all wage-earners in the industry, and there were 6,921 miners' helpers. Of the miners 15,285, or 86 per cent, were paid from $1.75 to $3.74 per day, the largest number embraced within a single rate group 3,776, or 21.3 per cent of all miners, receiving from $2.25 to $2.49 per day. There were 1,185, or 6.7 per cent, who received pay at the rate of $3.75 or more per day. A larger number of miners' helpers were included in the rate group of $1.75 to $1.99 per day than in any other group, and 91.9 per cent of the miners' helpers, or 6,361 men, were paid from $1.25 to $2.49 per day. The range of wages for 1,853 engineers, 89.8 per cent of all reported, was from $1.50 to $2.74, and of the 1,836 firemen, 1,778, or 96.8 per cent, received between $1.25 and $2.24. Of 2,613 machinists, blacksmiths, and other mechanics, 2,451, or 93.8 per cent, were paid between $1.50 and $2.74. The largest number of timbermen and track layers in one rate group, 624, or 31.6 per cent of all in this class, was paid from $1.75 to $1.99 per day, and 1,833, or 92.7 per cent, were reported at rates between $1.50 and $2.49 per day. The 4,564 boys under 16 years of age, comprised 6.5 per cent of all wage-earners. Of this number 2,006, or 44 per cent, received from $0.50 to $0.74 per day, and 4,467, or 97.9 per cent of the total number, were reported at rates between $0.50 and $1.24 per day. The group of

"all other wage-earners" comprised 45.8 per cent of the total number of wage-earners reported. Their wages ranged from less than $0.50 per day to $3.49 per day, but 83.1 per cent received from $1 to $1.99, while only 9.5 per cent received $2 per day or over and but 7.4 per cent less than $1 per day.

The following table shows the distribution of wage-earners according to daily rates of pay, by counties:

TABLE 10.—COAL, ANTHRACITE—WAGE-EARNERS AT SPECIFIED DAILY RATES OF PAY, BY COUNTIES: 1902.

[Each cumulative percentage shows the proportion of total number of persons receiving a wage as great as, or greater than, the lowest wage of the given wage group.]

RATE PER DAY (DOLLARS).	ALL COUNTIES.			CARBON.			LACKAWANNA.			LUZERNE.			NORTHUMBERLAND.			SCHUYLKILL.			ALL OTHER COUNTIES.[1]		
	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.	Number.	Per cent of total.	Cumulative percentage.
Total	69,691	100.0	.....	2,114	100.0	.....	16,175	100.0	.....	25,001	100.0	.....	6,691	100.0	.....	16,385	100.0	.....	3,325	100.0	.....
Less than 0.50	70	0.1	100.0	5	0.2	100.0	1	(2)	100.0	36	0.1	100.0	1	(2)	100.0	10	0.1	100.0	17	0.5	100.0
0.50 to 0.74	2,459	3.5	99.9	111	5.3	99.8	421	2.6	99.9	1,054	4.2	99.9	230	3.4	99.9	550	3.4	99.9	93	2.8	99.5
0.75 to 0.99	3,808	5.5	96.4	148	7.0	94.5	598	3.7	97.4	1,550	6.2	95.7	354	5.3	96.6	1,049	6.4	96.5	109	3.3	96.7
1.00 to 1.24	6,546	9.4	90.9	174	8.2	87.5	2,542	15.7	93.7	1,946	7.8	89.5	428	6.4	91.3	1,228	7.5	90.1	228	6.9	93.4
1.25 to 1.49	8,495	12.2	81.5	308	14.6	79.3	2,307	14.3	78.0	3,382	13.5	81.7	809	12.1	84.9	1,475	9.0	82.6	214	6.4	86.5
1.50 to 1.74	10,712	15.4	69.3	358	16.9	64.7	2,833	17.5	63.7	3,219	12.9	68.2	1,393	20.8	72.8	2,331	14.2	73.6	578	17.4	80.1
1.75 to 1.99	11,547	16.6	53.9	344	16.3	47.8	1,546	9.6	46.2	3,864	15.4	55.3	1,203	18.0	52.0	4,081	24.9	59.4	509	15.3	62.7
2.00 to 2.24	8,159	11.7	37.3	155	7.3	31.5	1,028	6.4	36.6	2,674	10.7	39.9	1,147	17.2	34.0	2,258	13.8	34.5	897	27.0	47.4
2.25 to 2.49	7,253	10.4	25.6	145	6.9	24.2	969	6.0	30.2	2,972	11.9	29.2	610	9.1	16.8	2,334	14.2	20.7	223	6.7	20.4
2.50 to 2.74	3,132	4.5	15.2	130	6.1	17.3	636	3.9	24.2	1,628	6.5	17.3	117	1.8	7.7	503	3.1	6.5	118	3.5	13.7
2.75 to 2.99	1,819	2.6	10.7	179	8.5	11.2	472	2.9	20.3	541	2.2	10.8	370	5.5	5.9	253	1.5	3.4	4	0.1	10.2
3.00 to 3.24	1,806	2.6	8.1	42	2.0	2.7	507	3.1	17.4	867	3.5	8.6	29	0.4	0.4	232	1.4	1.9	129	3.9	10.1
3.25 to 3.49	1,382	2.0	5.5	.....	.....	0.7	1,007	6.2	14.3	365	1.5	5.1	.....	.....	.....	9	0.1	0.5	1	(2)	6.2
3.50 to 3.74	1,317	1.9	3.5	.....	.....	0.7	829	5.1	8.1	360	1.4	3.6	.....	.....	.....	71	0.4	0.4	57	1.7	6.2
3.75 to 3.99	517	0.7	1.6	15	0.7	0.7	109	0.7	3.0	392	1.6	2.2	.....	.....	.....	.....	.....	(2)	1	(2)	4.5
4.00 to 4.24	167	0.2	0.9	.....	.....	.....	160	1.0	2.3	1	(2)	0.6	.....	.....	.....	1	(2)	(2)	5	0.2	4.5
4.25 and over	502	0.7	0.7	.....	.....	.....	210	1.3	1.3	150	0.6	0.6	.....	.....	.....	.....	.....	.....	142	4.3	4.3

[1] Includes Columbia, Dauphin, Sullivan, and Susquehanna.

[2] Less than one-tenth of 1 per cent.

In the above table the statistics are separately reported for the counties of Carbon, Lackawanna, Luzerne, Northumberland, and Schuylkill. The amount paid for contract mining, which is included in wages paid, and the average number of employees doing such work, who are included in wage-earners, are shown in the following statement:

Coal, anthracite—contract mining, by counties: 1902.

	Total.	Carbon.	Lackawanna.	Luzerne.	Northumberland.	Schuylkill.	All other counties.
Amount paid	$16,572,582	$358,013	$4,756,929	$6,171,054	$1,526,805	$3,113,770	$646,011
Average number of employees	22,629	547	5,576	8,306	2,372	4,879	949

Of the total amount paid as wages to miners and miners' helpers, 92 per cent was on account of contract mining, hence the difficulty as before noted of deducing daily rates for the miners. In Carbon county the amount paid for contract mining constituted 99 per cent of wage payments to miners and miners' helpers; in Lackawanna county it constituted 96.1 per cent; in Luzerne county, 93.2 per cent; in Northumberland county, 91.6 per cent; and in Schuylkill county, 89.3 per cent.

Contract work.—Contract work does not include contract mining by the ton or otherwise, but only work done by contract in the way of tunneling, shaft sinking, etc. For this kind of work the sum of $406,421 was expended and 1,731 men were employed.

Supplies, materials, and miscellaneous expenses.—The cost of supplies and materials reported as $12,740,780, is the largest item of expense other than wages and salaries. Of the $9,307,239 expended for miscellaneous expenses, $4,359,051 was paid for royalties and rent of mines and mining plant, and $4,948,188 was for rent of offices, taxes, and other sundries.

Mechanical power.—A total of 434,220 horsepower was reported as owned by the anthracite coal operators, of which 415,827 horsepower, or 95.8 per cent, was furnished by 4,629 steam engines, 185 horsepower by 6 gas or gasoline engines, and 18,208 horsepower by 234 primary motors of other kinds. In addition electric motors to the number of 78, aggregating 5,755 horsepower, were reported as owned by the operators.

Production.—The production of anthracite in Pennsylvania during 1902 amounted to 36,940,710 long tons, which was less than that of 1889 by 3,724,442 long tons. This decrease was due solely to the strike in the anthracite region. The normal production of the region, according to the statistics compiled by the United States Geological Survey, is between 50,000,000 and 55,000,000 long tons per year. The suspension of work for more than five months cut down the production to about 60 per cent of the normal output. It must not

be considered, therefore, that the statistics of anthracite production presented here represent the normal condition of the industry.

The total production from the time coal was first mined in Pennsylvania in 1814 to the close of 1902 is estimated at a little over 1,500,000,000 short tons, or an average of nearly 18,000,000 tons a year. During the ten years from 1893 to 1902, inclusive, the average annual production has amounted to a little over 55,000,000 short tons.[1]

The anthracite areas of Pennsylvania are included in the 9 counties of Susquehanna, Lackawanna, Luzerne, Carbon, Schuylkill, Columbia, Northumberland, Dauphin, and Sullivan. The total area of the anthracite fields of Pennsylvania is about 484 square miles.

The following statement shows the percentage of production for each county:

Percentage of anthracite production.

COUNTY.	Per cent.
Total	100.0
Luzerne	34.8
Lackawanna	29.2
Schuylkill	20.8
Northumberland	7.8
Carbon	2.7
Columbia	1.8
Susquehanna	1.1
Dauphin	1.0
Sullivan	0.8

The distribution of the product for consumption, for each county, during 1902, is shown in the following table:

TABLE 11.—*Anthracite production and distribution for consumption, by counties: 1902.*

[Long tons.]

COUNTY.	Total quantity.	Shipments.	Local trade.	Used at mines.
Total	36,940,710	31,486,120	995,655	4,458,935
Luzerne	12,852,826	11,040,374	377,379	1,435,073
Lackawanna	10,779,268	9,059,014	269,678	850,576
Schuylkill	7,704,202	6,240,258	193,278	1,270,666
Northumberland	2,878,615	2,308,253	92,719	477,643
Carbon	986,201	796,791	24,621	164,789
Columbia	670,115	588,058	11,323	70,734
Susquehanna	404,248	373,451	9,792	21,005
Dauphin	369,235	194,691	13,883	160,661
Sullivan	296,000	285,230	2,982	7,788

The shipments constitute 85.2 per cent of the total production, 2.7 per cent being sold in local trade, and 12.1 per cent consumed at the mines.

The classification of the Sullivan county product as anthracite has given rise to some contention. This coal lies in an isolated district known as the Bernice basin, in the northeastern part of Sullivan county and extending into the southeastern part of Wyoming county. Its physical characteristics are more like semi-anthracite than true anthracite, but on account of its high percentage of fixed carbon and low percentage of moisture it is classed as an anthracite by the Second Pennsylvania Geological Survey, and it is so considered in this report.

In a general way the anthracite coal field may be said to be bounded on the north by the north branch of the Susquehanna river, on the east by the Delaware and Lehigh rivers, and on the west by the Susquehanna river. These rivers, together with the Schuylkill, form the drainage outlets for the region. The entire anthracite region embraces a territory of about 3,300 square miles, but less than one-sixth of this total area, or about 484 square miles, is underlaid by workable deposits of coal. The productive portion is not in a continuous area, but consists of a number of detached valleys or basins, the general trend of which is about 60° N. to 70° E. They are arranged en échelon, from NE. to SW., for a distance of 120 miles. The greatest width is 30 miles, from Mauch Chunk to Shickshinny, or 50 miles if the Bernice basin in Sullivan county be considered as a portion of the anthracite field proper.

The anthracite coal fields, exclusive of the Bernice basin, are divided into 3 general trade regions, known as the Wyoming, Lehigh, and Schuylkill. Geographically these regions are subdivided into 4 well-defined fields or basins, known as the Northern, Eastern Middle, Southern, and Western Middle. These fields or basins are again subdivided, for convenience of identification, into districts as follows:

Anthracite coal fields, by field, local district, and trade region.

COAL FIELD OR BASIN.	Local district.	Trade region.
Northern	Carbondale	Wyoming.
	Scranton	
	Pittston	
	Wilkesbarre	
	Plymouth	
	Kingston	
Eastern Middle	Green Mountain	Lehigh.
	Black Creek	
	Hazelton	
	Beaver Meadow	
Southern	Panther Creek	Schuylkill.
	East Schuylkill	
	West Schuylkill	
	Lorberry	
	Lykens Valley	
Western Middle	East Mahanoy	
	West Mahanoy	
	Shamokin	

Of the 4 geographic divisions named above, the Southern is the largest, containing 181 square miles. The Northern is the next in size, containing 176 square miles. The Western Middle, the third in size, contains 94 square miles, and the Eastern Middle, the smallest of the divisions, contains 33 square miles.

The Northern basin.—The Northern basin extends from Forest City, on the northeast, to Shickshinny, on the southwest, a distance of 55 miles, and is drained by the valleys of the Lackawanna and the Susquehanna rivers. Its maximum width is about 6 miles. This basin, which is also known as the Wyoming Trade region, was the

[1] In previous years some coal which was classed as anthracite was mined in the eastern part of Rhode Island, and in Bristol and Plymouth counties in Massachusetts. This product is, however, in reality of a graphitic quality and not anthracite. It is not now mined for fuel purposes, and the production is included with that of graphite.

last of the anthracite basins to be developed. Mining was first begun here in 1829, the shipments in that year amounting to 7,000 long tons, or 6.25 per cent of the total anthracite shipments from the region. This region gradually developed in importance until it is now the most productive portion of the anthracite coal fields. Since 1883 more than 50 per cent of the shipments have been from the Northern basin, or Wyoming region, as it is differently called. In 1902 this region contributed 61.73 per cent of the entire shipments of anthracite. From 1829 to the close of 1902 this basin or region shipped 626,798,256 long tons of 2,240 pounds, or 49.87 per cent of the entire shipments from the anthracite coal fields of Pennsylvania.

The Eastern Middle field.—This is the smallest of the 4 main geographical divisions and lies about 15 miles south of the western end of the Northern basin, from which it is separated by a mountain range and a valley. Its greatest length is about twenty-six miles and its greatest width about ten miles, the total coal area containing about thirty-three miles.

The Eastern Middle basin forms what is known as the Lehigh Trade region, and enjoys the distinction of having the earliest recorded anthracite shipments. In 1820, 365 long tons of coal were shipped from the Lehigh region, and in the eighty-three years from 1820 to 1902, inclusive, it has shipped a total of 212,039,554 long tons, or 16.87 per cent of the total anthracite shipments.

The Southern basin.—This is the largest of the anthracite coal fields, and contains about one hundred and eighty-one square miles. It extends from Mauch Chunk, on the Lehigh river, on the northeast, to Dauphin on the Susquehanna river, on the southwest. Its greatest width, at Pottsville, is eight miles, from which it gradually tapers toward the northeast and the southwest, and in the latter direction divides into 2 long narrow basins.

The Western Middle basin.—The Western Middle basin lies southwest of and adjoins the Eastern Middle. It is north of and approximately parallel with the Southern basin, to which it is contiguous for a short distance. This basin is 36 miles long, from 4 to 5 miles wide, and contains 94 square miles underlain by coal. In this basin there are 2 distinct sub-basins or divisions, known as the Mahanoy and the Shamokin, which are about equal in size, depth, and importance.

The Southern and the Western Middle basins together form what is known as the Schuylkill Trade region. The first shipments from this region, as far as known, were made in 1822, two years after the first coal was shipped from the Lehigh region. At the close of 1902 there had been shipped from the Schuylkill region 417,944,349 long tons, or 33.26 per cent of the entire anthracite shipments.

The following table shows the shipments of anthracite from the 3 trade regions for each year from the beginning of the industry, in 1820, to the close of 1902. These statistics are from the records maintained by the Bureau of Anthracite Coal Statistics. The figures do not include shipments from the Bernice basin, in Sullivan county, nor any coal sold to local trade or consumed at the collieries.

TABLE 12.—*Annual shipments from the Schuylkill, Lehigh, and Wyoming regions: 1820 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

YEAR.	TOTAL.	SCHUYLKILL REGION.		LEHIGH REGION.		WYOMING REGION.	
	Quantity (long tons).	Quantity (long tons).	Per cent.	Quantity (long tons).	Per cent.	Quantity (long tons).	Per cent.
Total.	1,256,782,159	417,944,349	33.26	212,039,551	16.87	626,798,256	49.87
1820....	365	.....	.....	365	.....	.....	.....
1821....	1,073	.....	.....	1,073	.....	.....	.....
1822....	3,720	1,480	39.79	2,240	60.21	.....	.....
1823....	6,951	1,128	16.23	5,823	83.77	.....	.....
1824....	11,108	1,567	14.10	9,541	85.90	.....	.....
1825....	34,893	6,500	18.60	28,393	81.40	.....	.....
1826....	48,047	16,767	34.90	31,280	65.10	.....	.....
1827....	63,434	31,360	49.44	32,074	50.56	.....	.....
1828....	77,516	47,284	61.00	30,232	39.00	.....	.....
1829....	112,083	79,973	71.35	25,110	22.40	7,000	6.25
1830....	174,734	89,984	51.50	41,750	23.90	43,000	24.60
1831....	176,820	81,854	46.29	40,966	23.17	54,000	30.54
1832....	363,271	209,271	57.61	70,000	19.27	84,000	23.12
1833....	487,749	252,971	51.87	123,001	25.22	111,777	22.91
1834....	376,636	226,692	60.19	106,244	28.21	43,700	11.60
1835....	560,758	339,508	60.54	131,250	23.41	90,000	16.05
1836....	684,117	432,045	63.16	148,211	21.66	103,861	15.18
1837....	869,441	530,152	60.98	223,902	25.75	115,387	13.27
1838....	738,697	446,875	60.49	213,615	28.92	78,207	10.59
1839....	818,402	475,077	58.05	221,025	27.01	122,300	14.94
1840....	864,379	490,596	56.75	225,313	26.07	148,470	17.18
1841....	959,773	624,466	65.07	143,087	14.90	192,270	20.03
1842....	1,108,412	583,273	52.62	272,540	24.59	252,599	22.79
1843....	1,263,598	710,200	56.21	267,793	21.19	285,605	22.60
1844....	1,630,850	887,937	54.45	377,002	23.12	365,911	22.43
1845....	2,013,013	1,131,724	56.22	429,453	21.33	451,836	22.45
1846....	2,344,005	1,308,500	55.82	517,116	22.07	518,389	22.11
1847....	2,882,309	1,665,735	57.79	633,507	21.98	583,067	20.23
1848....	3,089,238	1,733,721	56.12	670,321	21.70	685,196	22.18
1849....	3,242,966	1,728,500	53.30	781,556	24.10	732,910	22.60
1850....	3,358,899	1,840,620	54.80	690,456	20.56	827,823	24.64
1851....	4,448,916	2,328,525	52.34	964,924	21.68	1,156,167	25.98
1852....	4,993,471	2,636,835	52.81	1,072,136	21.47	1,284,500	25.72
1853....	5,195,151	2,665,110	51.30	1,054,309	20.29	1,475,732	28.41
1854....	6,002,334	3,191,670	53.14	1,207,186	20.13	1,603,478	26.73
1855....	6,608,567	3,552,943	53.77	1,284,113	19.43	1,771,511	26.80
1856....	6,927,580	3,603,029	52.01	1,351,970	19.51	1,972,581	28.48
1857....	6,644,941	3,373,797	50.77	1,318,541	19.84	1,952,603	29.39
1858....	6,839,369	3,273,245	47.86	1,380,030	20.18	2,186,094	31.96
1859....	7,808,255	3,448,708	44.16	1,628,311	20.86	2,731,236	34.98
1860....	8,513,123	3,749,632	44.04	1,821,674	21.40	2,941,817	34.56
1861....	7,954,264	3,160,747	39.74	1,738,377	21.85	3,055,140	38.41
1862....	7,869,407	3,372,583	42.86	1,351,054	17.17	3,145,770	39.97
1863....	9,566,006	3,911,683	40.90	1,894,713	19.80	3,759,610	39.30
1864....	10,177,475	4,161,970	40.89	2,054,669	20.19	3,960,836	38.92
1865....	9,652,391	4,356,959	45.14	2,040,913	21.14	3,254,519	33.72
1866....	12,703,882	5,787,902	45.56	2,179,364	17.16	4,736,616	37.29
1867....	12,988,725	5,161,671	39.74	2,502,054	19.27	5,325,000	40.99
1868....	13,801,465	5,330,737	38.63	2,502,582	18.13	5,968,146	43.24
1869....	13,866,180	5,775,138	41.66	1,949,673	14.06	6,141,369	44.28
1870....	16,182,191	4,968,157	30.70	3,239,374	20.02	7,974,660	49.28
1871....	15,699,721	6,552,772	41.74	2,235,707	14.24	6,911,242	44.02
1872....	19,669,778	6,694,890	34.03	3,873,339	19.70	9,101,549	46.27
1873....	21,227,952	7,212,601	33.97	3,705,596	17.46	10,309,755	48.57
1874....	20,145,121	6,866,877	34.09	3,773,836	18.73	9,504,408	47.18
1875....	19,712,472	6,281,712	31.87	2,834,605	14.38	10,596,155	53.75
1876....	18,501,011	6,221,934	33.63	3,854,919	20.84	8,424,158	45.53
1877....	20,828,179	8,195,042	39.35	4,332,760	20.80	8,300,377	39.85
1878....	17,605,262	6,282,226	35.68	3,237,449	18.40	8,085,587	45.92
1879....	26,142,689	8,960,829	34.28	4,595,567	17.58	12,586,293	48.14
1880....	23,437,242	7,554,742	32.23	4,463,221	19.05	11,419,279	48.72
1881....	28,500,017	9,253,958	32.46	5,294,676	18.58	13,951,383	48.96
1882....	29,120,096	9,459,288	32.48	5,689,437	19.54	13,971,371	47.98
1883....	31,793,027	10,074,726	31.69	6,113,809	19.23	15,604,492	49.08
1884....	30,718,293	9,478,314	30.85	5,562,226	18.11	[1]16,677,753	51.04
1885....	31,623,530	9,488,426	30.01	5,898,634	18.65	[1]16,236,470	51.34
1886....	32,136,362	9,381,407	29.19	5,723,129	17.81	[1]17,031,826	53.00
1887....	34,641,018	10,609,028	30.63	4,347,061	12.55	[1]19,684,929	56.82
1888....	38,145,718	10,654,116	27.93	5,639,236	14.78	[1]21,852,366	57.29
1889....	35,817,093	10,486,185	29.28	6,294,073	17.57	[1]19,036,835	53.15
1890....	36,615,459	10,867,822	29.68	6,329,658	17.28	[1]19,417,979	53.04
1891....	40,448,336	12,741,258	31.50	6,381,838	15.78	21,325,240	52.72
1892....	41,893,340	12,626,784	30.14	6,451,076	15.40	22,815,480	54.46
1893....	43,089,537	12,357,444	28.68	6,892,352	15.99	23,839,741	55.33
1894....	41,391,200	12,035,005	29.08	6,705,434	16.20	22,650,761	54.72
1895....	46,511,477	14,269,932	30.68	7,298,124	15.69	24,943,421	56.63
1896....	43,177,485	13,097,571	30.34	6,490,441	15.03	23,589,473	54.63
1897....	41,637,864	12,181,061	29.26	6,249,540	15.00	23,207,263	55.74
1898....	41,899,751	12,078,875	28.83	6,253,109	14.92	23,567,767	56.25
1899....	47,665,204	14,199,009	29.79	6,887,909	14.45	26,578,286	55.76
1900....	45,107,484	13,502,732	29.94	6,918,627	15.33	24,686,125	54.73
1901....	53,568,601	16,019,591	29.92	7,211,974	13.45	30,337,036	56.63
1902....	31,200,890	8,471,391	27.15	3,470,736	11.12	19,258,763	61.73

[1] Includes Loyalsock field.

BITUMINOUS.

In 1902 the total output of the varieties of bituminous coal included in this report amounted to 260,216,844 short tons, valued at $290,858,483, as compared with 95,629,026 short tons, valued at $94,346,809, in 1889, and 42,840,751 short tons, valued at $53,466,958, in 1880.

Though the small mines numbered 826, they furnished but 196,488 tons of coal, or 0.075 per cent of the total bituminous output. They averaged 238 tons per mine, as compared with 53,879 tons, the average production of commercial mines.

A summary of the bituminous coal statistics for both commercial and small mines is presented in Table 13.

TABLE 13.—*Summary, coal, bituminous: 1902.*

	Total.	Commercial mines.	Small mines.
Number of mines	5,652	4,826	826
Number of operators	4,409	3,584	825
Salaried officials, clerks, etc.:			
Number	14,413	14,413	.....
Salaries	$14,511,924	$14,511,924	.....
Wage-earners:			
Average number	280,638	280,205	433
Wages	$181,482,288	$181,347,208	$135,080
Contract work	$1,244,114	$1,242,239	$1,875
Miscellaneous expenses	$16,774,459	$16,770,185	$4,274
Cost of supplies and materials	$24,798,922	$24,780,695	$18,227
Product:			
Quantity, short tons	260,216,844	260,020,356	196,488
Value	$290,858,483	$290,584,483	$274,000

Capital stock of incorporated companies.—The following table shows the details of capitalization of the incorporated companies operating bituminous coal mines for the United States, by states and territories:

TABLE 14.—COAL, BITUMINOUS—CAPITALIZATION OF INCORPORATED COMPANIES: 1902.

	United States.	Alabama.	Arkansas.	California.	Colorado.	Georgia.	Illinois.	Indian Territory.	Indiana.
Number of incorporated companies	1,517	63	19	7	35	2	201	19	93
Number reporting capitalization	1,450	60	19	7	32	2	194	19	91
Capital stock and bonds issued	$655,718,025	$51,572,770	$8,323,325	$8,320,000	$57,423,211	$600,000	$30,509,600	$4,931,500	$5,902,275
Capital stock:									
Total authorized—									
Number of shares	29,806,983	1,303,337	73,828	1,853,500	6,256,330	500	317,995	81,220	95,366
Par value	$594,106,570	$44,920,700	$6,492,800	$8,950,000	$50,488,000	$320,000	$28,037,400	$4,964,000	$6,151,600
Total issued—									
Number of shares	19,309,014	835,061	71,119	1,533,500	5,008,521	500	300,316	67,545	81,575
Par value	$513,424,186	$37,312,770	$6,424,325	$7,820,000	$34,464,461	$320,000	$26,606,100	$4,349,500	$5,310,275
Dividends paid	$17,359,841	$529,582	$325,609	$5,000	$1,083,506	$143,680	$680,488	$1,650	$161,336
Common—									
Authorized—									
Number of shares	28,415,568	1,153,687	58,909	1,853,500	6,233,330	500	309,415	81,220	95,276
Par value	$518,756,363	$36,021,700	$5,000,900	$8,950,000	$48,188,000	$320,000	$27,179,400	$4,964,000	$6,142,600
Issued—									
Number of shares	18,037,548	757,784	56,200	1,533,500	4,986,371	500	291,806	67,545	81,495
Par value	$443,749,259	$31,091,400	$4,932,425	$7,820,000	$32,249,461	$320,000	$25,755,100	$4,349,500	$5,302,275
Dividends paid	$13,297,536	$112,292	$251,014	$5,000	$923,506	$143,680	$677,828	$1,650	$161,096
Preferred—									
Authorized—									
Number of shares	1,391,415	149,650	14,919	.....	23,000	.....	8,580	.....	90
Par value	$75,350,207	$8,899,000	$1,491,900	.....	$2,300,000	.....	$858,000	.....	$9,000
Issued—									
Number of shares	1,271,466	77,277	14,919	.....	22,150	.....	8,510	.....	80
Par value	$69,674,927	$6,221,370	$1,491,900	.....	$2,215,000	.....	$851,000	.....	$8,000
Dividends paid	$4,062,305	$417,290	$74,595	.....	$160,000	.....	$2,660	.....	$240
Bonds:									
Authorized—									
Number	204,157	16,111	1,990	500	23,585	300	4,872	2,600	2,110
Par value	$153,493,556	$16,111,000	$1,990,000	$500,000	$23,012,500	$300,000	$4,135,000	$800,000	$685,000
Issued—									
Number	189,030	14,260	1,899	500	23,502	280	4,638	2,382	1,902
Par value	$142,293,839	$14,260,000	$1,899,000	$500,000	$22,958,750	$280,000	$3,903,500	$582,000	$592,000
Interest paid	$6,115,828	$803,049	.....	$30,000	$1,069,469	$12,570	$210,556	.....	$16,720
Assessments levied	$2,303,061	.....	.....	$325,000	$12,000	.....	$365,660	$56,372	$83,700

	Iowa.	Kansas.	Kentucky.	Maryland.	Michigan.	Missouri.	Montana.	New Mexico.	North Dakota.	Ohio.
Number of incorporated companies	89	30	93	23	21	46	8	12	8	179
Number reporting capitalization	88	27	88	23	19	46	8	11	7	166
Capital stock and bonds issued	$7,273,410	$4,642,500	$9,893,300	$21,456,100	$971,625	$2,384,400	$4,447,140	$7,143,800	$2,010,000	$41,598,170
Capital stock:										
Total authorized—										
Number of shares	791,907	43,062	191,520	1,628,400	45,680	35,284	780,500	58,700	32,000	508,519
Par value	$7,697,500	$4,258,700	$12,908,000	$20,690,000	$1,002,000	$2,240,400	$8,690,000	$5,870,000	$2,300,000	$34,854,900
Total issued—										
Number of shares	620,417	38,243	137,594	614,415	44,465	33,750	588,450	56,438	29,000	474,894
Par value	$6,630,410	$3,776,800	$8,968,400	$17,606,100	$971,625	$2,221,400	$4,447,140	$5,643,800	$2,010,000	$32,494,170
Dividends paid	$163,987	$174,010	$327,092	$562,750	$7,200	.....	$300,000	$44,760	.....	$780,697
Common—										
Authorized—										
Number of shares	575,484	42,062	189,320	1,428,150	45,280	35,084	780,500	53,700	32,000	485,889
Par value	$5,517,520	$4,158,700	$12,868,000	$18,665,000	$992,000	$2,220,400	$8,690,000	$5,370,000	$2,300,000	$33,761,900
Issued—										
Number of shares	404,085	37,243	135,394	425,670	44,065	33,550	588,450	51,438	29,000	457,072
Par value	$4,451,340	$3,676,800	$8,928,400	$15,696,600	$961,625	$2,201,400	$4,447,140	$5,143,800	$2,010,000	$31,884,670
Dividends paid	$162,937	$174,010	$325,892	$430,800	$6,000	.....	$300,000	$4,760	.....	$778,827
Preferred—										
Authorized—										
Number of shares	216,423	1,000	2,200	200,250	400	200	.....	5,000	.....	22,630
Par value	$2,179,980	$100,000	$40,000	$2,025,000	$10,000	$20,000	.....	$500,000	.....	$1,093,000
Issued—										
Number of shares	216,332	1,000	2,200	188,745	400	200	.....	5,000	.....	17,822
Par value	$2,179,070	$100,000	$40,000	$1,909,500	$10,000	$20,000	.....	$500,000	.....	$609,500
Dividends paid	$1,050	.....	$1,200	$131,950	$1,200	.....	.....	$40,000	.....	$1,870
Bonds:										
Authorized—										
Number	756	1,644	2,166	33,250	.....	1,613	.....	1,500	.....	12,855
Par value	$888,000	$865,700	$1,071,200	$4,000,000	.....	$163,000	.....	$1,500,000	.....	$11,445,000
Issued—										
Number	617	1,644	1,981	33,100	.....	1,613	.....	1,500	.....	9,981
Par value	$643,000	$865,700	$924,900	$3,850,000	.....	$163,000	.....	$1,500,000	.....	$9,104,000
Interest paid	$17,580	$4,620	$23,001	$222,000	.....	$10,189	.....	$75,000	.....	$341,789
Assessments levied	$8,000	.....	$193,504	.....	.....	$40,000	.....	.....	.....	$253,000

TABLE 14.—COAL, BITUMINOUS—CAPITALIZATION OF INCORPORATED COMPANIES: 1902—Continued.

	Oregon.	Pennsylvania.	Tennessee.	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Wyoming.	All other states and territories.[1]
Number of incorporated companies	3	236	50	17	5	11	17	216	12	2
Number reporting capitalization	3	225	48	17	5	11	16	206	10	2
Capital stock and bonds issued	$1,512,500	$225,919,033	$12,865,549	$4,252,800	$14,529,000	$2,505,000	$48,082,503	$69,931,014	$4,819,000	$2,399,000
Capital stock:										
Total authorized—										
Number of shares	15,500	2,813,003	438,777	42,588	125,700	26,210	10,975,242	971,591	282,720	18,004
Par value	$1,550,000	$194,338,450	$10,273,820	$3,943,000	$12,570,000	$2,616,000	$43,729,200	$67,724,100	$4,722,000	$1,804,000
Total issued—										
Number of shares	15,125	2,585,468	379,878	40,911	125,700	22,060	4,479,957	823,418	282,690	18,004
Par value	$1,512,500	$180,358,033	$9,883,889	$3,775,300	$12,570,000	$2,205,000	$33,075,674	$56,163,514	$4,719,000	$1,804,000
Dividends paid	.....	$8,978,084	$208,643	$145,000	$172,800	$120,000	$628,812	$1,666,155	$149,000	.....
Common—										
Authorized—										
Number of shares	15,500	2,275,650	350,191	42,588	125,700	25,710	10,868,812	958,391	282,720	17,000
Par value	$1,550,000	$146,805,788	$9,599,160	$3,943,000	$12,570,000	$2,566,000	$37,586,200	$66,404,100	$4,722,000	$1,700,000
Issued—										
Number of shares	15,125	2,064,563	303,906	40,911	125,700	21,560	4,374,707	810,218	282,690	17,000
Par value	$1,512,500	$134,837,550	$9,363,785	$3,775,300	$12,570,000	$2,155,000	$27,050,674	$54,843,514	$4,719,000	$1,700,000
Dividends paid	.....	$6,023,337	$199,390	$145,000	$172,800	$120,000	$372,562	$1,656,155	$149,000	.....
Preferred—										
Authorized—										
Number of shares	.....	537,353	88,586	.....	.....	500	106,430	13,200	.....	1,004
Par value	.....	$47,532,667	$674,660	.....	.....	$50,000	$6,143,000	$1,320,000	.....	$104,000
Issued—										
Number of shares	.....	520,905	75,972	.....	.....	500	105,250	13,200	.....	1,004
Par value	.....	$45,500,483	$520,104	.....	.....	$50,000	$6,025,000	$1,320,000	.....	$104,000
Dividends paid	.....	$2,954,747	$9,253	.....	.....	.....	$256,250	$10,000	.....	.....
Bonds:										
Authorized—										
Number	.....	49,643	12,052	4,670	2,050	780	7,216	20,194	640	1,060
Par value	.....	$47,847,667	$3,015,660	$479,000	$2,050,000	$330,000	$16,156,829	$15,238,000	$100,000	$810,000
Issued—										
Number	.....	46,142	11,518	4,666	1,959	480	6,066	16,915	640	845
Par value	.....	$45,581,000	$2,481,660	$477,000	$1,959,000	$300,000	$15,006,829	$13,767,500	$100,000	$595,000
Interest paid	.....	$1,803,381	$137,297	$16,884	$77,727	$18,000	$551,350	$655,005	$5,400	$14,250
Assessments levied	$10,000	$27,600	$129,500	$78,995	$3,150	.....	$411,780	$304,800	.....	.....

[1] Includes incorporated companies distributed as follows: Alaska, 1; North Carolina, 1.

According to this table the total number of shares, common and preferred, issued and outstanding, by incorporated bituminous coal mining companies operating in 1902, and reporting capitalization, was 19,309,014, having a par value of $513,424,186, on which dividends were paid to the amount of $17,359,841, or 3.38 per cent on the par value of the stock issued. Deducting assessments levied, $2,303,061, the net dividends paid amounted to $15,056,780, or 2.93 per cent on the capital stock.

There were 1,517 incorporated companies engaged in this branch of the coal industry, and of these 67 did not report capitalization. These nonreporting incorporated companies were distributed among 16 of the bituminous coal states, as follows: Ohio, 13; Pennsylvania, 11; West Virginia, 10; Illinois, 7; Kentucky, 5; Alabama, Colorado, and Kansas, each 3; Indiana, Michigan, Texas, and Wyoming, each 2; and Iowa, New Mexico, North Dakota, and Washington, 1 each. No dividends were reported as paid by the companies operating in Alaska, Missouri, North Carolina, North Dakota, and Oregon. The interest paid on bonds was $6,115,828, and the sum of $2,303,061 was paid in as assessments on capital stock.

Employees and wages.—The expenditures reported for salaries were $14,511,924, and for wages, $181,482,288.

In the following table is shown the distribution of the wage-earners according to their occupation and daily rates of pay:

TABLE 15.—COAL, BITUMINOUS—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

[Each cumulative percentage shows the proportion of total number of persons in the given class receiving a wage as great as, or greater than, the lowest wage of the given wage group.]

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.			ENGINEERS.			FIREMEN.			MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		
	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.
Total	280,638	100.0	.....	3,781	100.0	.....	3,112	100.0	.....	6,739	100.0	.....
Less than 0.50	117	(1)	100.0	.....	.....	.....	.....	.....	.....	.....	.....	.....
0.50 to 0.74	1,139	0.4	99.9	.....	.....	.....	1	(1)	100.0	4	0.1	100.0
0.75 to 0.99	2,720	1.0	99.6	3	0.1	100.0	10	0.3	99.9	5	0.1	99.9
1.00 to 1.24	8,084	2.9	98.6	8	0.2	99.9	32	1.0	99.7	42	0.6	99.8
1.25 to 1.49	11,928	4.2	95.7	46	1.2	99.7	144	4.6	98.7	175	2.6	99.2
1.50 to 1.74	32,034	11.4	91.5	165	4.4	98.5	459	14.8	94.1	393	5.8	96.6
1.75 to 1.99	36,797	13.1	80.1	248	6.6	94.1	721	23.2	79.3	601	8.9	90.8
2.00 to 2.24	70,909	25.3	67.0	977	25.8	87.5	1,108	35.6	56.1	1,400	20.8	81.9
2.25 to 2.49	43,609	15.5	41.7	754	19.9	61.7	283	9.1	20.5	1,876	27.8	61.1
2.50 to 2.74	32,454	11.6	26.2	930	24.6	41.8	255	8.2	11.4	1,128	16.8	33.3
2.75 to 2.99	15,814	5.6	14.6	241	6.4	17.2	54	1.7	3.2	419	6.2	16.5
3.00 to 3.24	12,038	4.3	9.0	303	8.0	10.8	38	1.2	1.5	479	7.1	10.3
3.25 to 3.49	6,370	2.3	4.7	50	1.3	2.8	5	0.2	0.3	65	1.0	3.2
3.50 to 3.74	4,402	1.6	2.4	34	0.9	1.5	2	0.1	0.1	76	1.1	2.2
3.75 to 3.99	1,324	0.5	0.8	6	0.2	0.6	.....	.....	.....	8	0.1	1.1
4.00 to 4.24	495	0.2	0.3	11	0.3	0.4	.....	.....	.....	62	0.9	1.0
4.25 and over	404	0.1	0.1	5	0.1	0.1	.....	.....	.....	6	0.1	0.1

TABLE 15.—COAL, BITUMINOUS—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902—Continued.

RATE PER DAY (DOLLARS).	MINERS.			MINERS' HELPERS.			TIMBERMEN AND TRACK LAYERS.			BOYS UNDER 16 YEARS.			ALL OTHER WAGE-EARNERS.		
	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.
Total	189,275	100.0	.....	3,637	100.0	.....	7,843	100.0	.....	5,628	100.0	.....	60,625	100.0	.....
Less than 0.50	29	(1)	100.0	.....	.....	.....	.....	.....	.....	86	1.5	100.0	2	(1)	100.0
0.50 to 0.74	86	(1)	99.9	7	0.2	100.0	1	(1)	100.0	828	14.7	98.5	212	0.4	99.9
0.75 to 0.99	342	0.2	99.9	184	5.1	99.8	27	0.3	99.9	1,754	31.2	83.8	395	0.7	99.6
1.00 to 1.24	2,513	1.3	99.8	337	9.3	94.7	24	0.3	99.7	2,407	42.8	52.6	2,721	4.5	98.9
1.25 to 1.49	6,016	3.2	98.5	347	9.5	85.4	209	2.7	99.4	332	5.9	9.8	4,659	7.7	94.4
1.50 to 1.74	19,083	10.1	95.3	608	16.7	75.9	650	8.3	96.7	110	1.9	3.9	10,566	17.4	86.7
1.75 to 1.99	24,892	13.1	85.2	293	8.1	59.2	691	8.8	88.4	60	1.1	2.0	9,291	15.3	69.3
2.00 to 2.24	46,532	24.6	72.1	551	15.1	51.1	2,460	31.4	79.6	39	0.7	0.9	17,842	29.4	54.0
2.25 to 2.49	28,304	15.0	47.5	311	8.5	36.0	2,760	35.2	48.2	12	0.2	0.2	9,309	15.4	24.6
2.50 to 2.74	25,908	13.7	32.5	361	9.9	27.5	525	6.7	13.0	.....	.....	.....	3,347	5.5	9.2
2.75 to 2.99	13,053	6.9	18.8	363	10.0	17.6	277	3.5	6.3	.....	.....	.....	1,407	2.3	3.7
3.00 to 3.24	10,240	5.4	11.9	130	3.6	7.6	182	2.3	2.8	.....	.....	.....	666	1.1	1.4
3.25 to 3.49	6,000	3.2	6.5	144	4.0	4.0	7	0.1	0.5	.....	.....	.....	99	0.2	0.3
3.50 to 3.74	4,210	2.2	3.3	1	(1)	(1)	28	0.4	0.4	.....	.....	.....	51	0.1	0.1
3.75 to 3.99	1,304	0.7	1.1	.....	.....	.....	.....	.....	(1)	.....	.....	.....	6	(1)	(1)
4.00 to 4.24	398	0.2	0.4	.....	.....	.....	.....	.....	(1)	.....	.....	.....	24	(1)	(1)
4.25 and over	363	0.2	0.2	.....	.....	.....	2	(1)	(1)	.....	.....	.....	28	(1)	(1)

[1] Less than one-tenth of 1 per cent.

This table shows that the majority of adult wage-earners received wages between $1.75 and $2.74. Including all occupations, the largest number embraced in a single rate group was reported as receiving from $2 to $2.24 per day, 25.3 per cent falling in that group. From this rate the numbers decreased regularly as the rates of pay decreased below $2 or increased above $2.24. In the class of engineers 70.4 per cent were employed at daily rates ranging from $2 to $2.74, and in the class of firemen 73.5 per cent at rates ranging from $1.50 to $2.24 per day. Of the 6,739 machinists, blacksmiths, carpenters, and other mechanics employed, 4,404, or 65.4 per cent, were paid from $2 to $2.74 per day. The miners constituted 67.4 per cent of all employees; the largest number in any rate group appear to have received from $2 to $2.24. But on account of the mining being done on a tonnage basis the daily rates of pay are largely estimates and averages. There was paid as wages for the mining of bituminous coal on a tonnage basis the sum of $128,055,854. The daily rates of pay to miners' helpers show a distribution over a much wider range than is the case with other occupations. Of the timbermen and track layers 5,220, or 66.6 per cent, were paid at rates ranging from $2 to $2.49, and 90.3 per cent received from $1.50 to $2.74 per day. The 5,628 boys under 16 years of age constituted 2 per cent of all employees; 74 per cent received from $0.75 to $1.24 per day. The remaining wage-earners, classified as "all others," comprised 60,625, and constituted 21.6 per cent of all wage-earners, and 77.5 per cent of the number were paid at daily rates ranging from $1.50 to $2.49.

As shown in Table 60 the largest number of men, for the industry as a whole, was employed in December and the smallest number in July, the maximum and minimum numbers being only about 7 per cent above and below the average number. Michigan showed a heavy falling off from April to August, but as a rule the states do not show any wide fluctuations.

Contract work.—The expenditure for contract work amounted to $1,244,114, and 5,040 men were employed thereon. This was for tunneling, shaft sinking, and like work done under contract.

Supplies, materials, and miscellaneous expenses.—The cost of supplies and materials reported amounted to $24,798,922, or 10.4 per cent of all expenses, and was the largest item next to the amount paid for salaries and wages. The amount expended for miscellaneous expenses, $16,774,459, comprised $7,442,089 for royalties and rent of mine and mining plant, and $9,332,370 paid for rent of offices, taxes, and other sundries. Miscellaneous expenses formed 7 per cent of all expenses.

Production by states.—In the following table is shown the total production of bituminous coal by states during 1902, the distribution of the product for consumption, and the value and average price per ton at the mines.

TABLE 16.—COAL, BITUMINOUS—PRODUCTION, BY STATES AND TERRITORIES: 1902.

STATE OR TERRITORY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	212,378,398	8,666,862	5,001,854	34,169,730	260,216,844	$290,858,483	$1.12
Alabama	7,271,146	78,903	244,223	2,760,298	10,354,570	12,419,666	1.20
Arkansas	1,864,912	13,639	65,881	.....	1,943,932	2,539,214	1.31
California and Alaska	79,755	3,563	3,878	.....	87,196	273,398	3.14
Colorado	5,375,215	282,027	181,546	1,562,555	7,401,343	8,397,812	1.13
Georgia and North Carolina	299,247	1,800	5,580	130,456	437,083	623,518	1.42
Idaho	.....	2,030	.....	.....	2,030	5,180	2.50
Illinois	29,299,137	2,591,770	1,048,381	85	32,939,373	33,945,910	1.03
Indian Territory	2,587,100	25,998	96,017	111,551	2,820,666	4,265,106	1.51
Indiana	8,649,144	536,899	259,681	700	9,446,424	10,399,660	1.10
Iowa	5,089,538	678,740	136,488	.....	5,904,766	8,660,287	1.47
Kansas	4,941,236	227,826	95,237	1,766	5,266,065	6 862,787	1.30
Kentucky	6,141,886	333,584	132,812	158,702	6,766,984	6,666,967	0.98
Maryland	5,187,175	48,631	35,803	.....	5,271,609	5,579,869	1.06
Michigan	818,687	117,978	28,053	.....	964,718	1,653,192	1.71
Missouri	3,503,993	318,992	67,169	.....	3,890,154	5,374,642	1.38
Montana	1,385,100	40,719	39,023	95,981	1,560,823	2,443,447	1.57
New Mexico	973,500	19,514	33,180	22,569	1,048,763	1,500,280	1.43
North Dakota	182,002	35,639	8,870	.....	226,511	325,967	1.44
Ohio	22,232,404	1,041,112	242,594	3,784	23,519,894	26,953,789	1.15
Oregon	42,591	11,232	11,825	.....	65,648	160,075	2.44
Pennsylvania	72,938,204	1,429,568	1,541,454	22,665,141	98,574,367	106,032,460	1.08
Tennessee	3,417,409	88,369	63,283	813,907	4,382,968	5,399,721	1.23
Texas	887,167	5,591	9,154	.....	901,912	1,477,245	1.64
Utah	1,277,343	21,531	45,432	230,215	1,574,521	1,797,454	1.14
Virginia	1,444,559	20,916	32,447	1,685,071	3,182,993	2,543,595	0.80
Washington	2,498,177	29,287	97,003	56,747	2,681,214	4,572,295	1.72
West Virginia	19,847,321	623,903	267,885	3,831,717	24,570,826	24,748,658	1.00
Wyoming	4,144,460	37,101	209,455	38,485	4,429,491	5,236,339	1.18

The following is a review of the production of bituminous coal in the several states and territories:

Alabama.—The coal fields of Alabama belong to the great Appalachian system, which extends from the northern part of Pennsylvania to the central part of Alabama. The coal bearing formations which become quite narrow in passing through Tennessee widen out suddenly in the northern part of Alabama and cover about 50 per cent of the northern half of the state.

The total coal area of Alabama is estimated at 6,500 square miles. There are 19 counties, all north of a line drawn midway across the state from east to west, which are underlaid by coal. In only 11 of these, however, is coal produced at present on a commercial scale. These 11 counties are Bibb, Blount, Cullman, Etowah, Jefferson, Marion, St. Clair, Shelby, Tuscaloosa, Walker, and Winston. The coal producing region is divided into 3 distinct basins or districts, which are known by the names of the rivers which drain them, the Black Warrior, the Coosa, and the Cahaba. The Warrior district is the largest, but the Cahaba is the principal producer, the county of Jefferson, which includes the city of Birmingham, in the Cahaba district, contributing more than 50 per cent of the state's total output.

All of the coals of the state are classed among the bituminous varieties. Some are coking coals of good quality, and to these is due the rapid growth of the iron and steel industries of the state. The development of these industries and of coal mining in Alabama during the last quarter of a century has been one of unusual rapidity.

The census of 1840 reported a production of coal in Alabama for that year, of 946 tons, and at the census of 1860, 10,200 tons were reported.

The distribution of the coal production, by counties, in 1902, is shown in the following table:

TABLE 17.—*Coal production of Alabama, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	7,271,146	78,903	244,223	2,760,298	10,354,570	$12,419,666	$1.20
Bibb	1,372,745	1,922	38,174	74,566	1,487,407	1,842,163	1.24
Etowah	100,290	1,280	220	.....	101,790	125,190	1.23
Jefferson	3,410,698	56,050	160,873	2,227,915	5,855,536	6,975,929	1.19
St. Clair	119,618	550	7,500	28,575	156,243	208,162	1.33
Shelby	131,241	130	4,672	.....	136,043	218,971	1.61
Tuscaloosa	108,617	924	1,848	320,322	431,711	527,504	1.22
Walker	1,748,073	16,047	30,936	108,920	1,903,976	2,147,894	1.13
Winston	26,686	2,000	.....	.....	28,686	41,250	1.44
Blount, Cullman, and Marion	253,178	.....	.....	.....	253,178	332,603	1.31

According to the Census report of 1870, the production for that year was 13,200 short tons. The output did not reach 100,000 tons until 1876, but in 1880, according to the Tenth Census, it had increased to 323,972 tons. From 1882 to 1885 there was a rapid increase in production, until at the height of the Birmingham boom, in 1885, it reached a total of 2,492,000 short tons.[1] With the bursting of the bubble and the temporary collapse of the boom, production fell off to less than 2,000,000 tons in 1886 and 1887, but as trade conditions became settled the coal mining industry improved and since 1888 has shown an almost continual growth in production. At the Eleventh Census, in 1889, the production amounted to 3,572,983 tons, about

[1] United States Geological Survey, "Mineral Resources of the United States," 1902, page 353.

eleven times what it was in 1880. In 1902 it reached the maximum, the output being 10,354,570 short tons. The selling value of this product at the mines was $12,419,666.

The amount paid in wages in 1902 was $7,841,457, salaries amounted to $709,449, contract work cost $265,579, miscellaneous expenses amounted to $734,972, and $1,219,310 was expended in the purchase of supplies and materials.

A summary of the statistics, by counties, is given in the following table, only those counties being reported separately which produce a total of 200,000 tons:

TABLE 18.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	145	91	628	$709,449	12,930	$7,841,457	$265,579	1,411	$734,972	$1,219,310	10,354,570	$12,419,666
Bibb	8	8	75	88,541	1,712	1,207,118	.....	.....	152,446	201,134	1,487,407	1,842,168
Jefferson	48	23	279	368,465	6,954	4,259,712	261,174	1,393	343,209	784,005	5,855,536	6,975,929
Tuscaloosa	11	7	44	36,406	722	360,660	250	4	7,493	21,699	431,711	527,504
Walker	43	29	152	149,179	2,313	1,410,386	.....	.....	173,512	148,886	1,903,976	2,147,894
Other counties[1]	35	24	73	66,858	1,229	603,581	4,155	14	58,312	63,586	675,940	926,176

[1] Includes Blount, Cullman, Etowah, Marion, St. Clair, Shelby, and Winston.

Alaska.[1]—There are a number of localities in the territory of Alaska where coal seams of workable thickness and quality have been located, but it has been impossible to secure exact statistics in regard to the production. Mr. Alfred H. Brooks, of the United States Geological Survey, in his report entitled "The Coal Resources of Alaska,"[2] states that the coal mines of Alaska which have produced some coal in the past may be divided naturally into three separate provinces or districts—the Pacific coast district, the Yukon district, and the Arctic coast district. The Pacific coast district includes all the mines located on Pacific coast waters and one deposit at Kootznahoo bay, one at Controller bay, one at Homer (on Cook inlet), and three on the Alaskan peninsula—at Chignik river, Herendeen bay, and Unga Island. The Yukon district includes all the mines on or near the Yukon river. Of these there are six, three of which—known, respectively, as No. 1, Williams, and Blatchford—are on the Yukon river, between Anvik and Nulato; the Pickart mine is located a short distance northeast of Nulato, on the Yukon river; the Drew mine near Rampart; and Nation River mine, between Fort Yukon and Fortymile. The Arctic coast district includes two mines, the Corwin and the Thetis, located on the Arctic ocean near the seventieth degree of north latitude. Mr. Brooks states that at the time of his visit to the region, in 1902, the mine on Kootznahoo bay, the only one in southeastern Alaska, had been shut down. He also reports that at Controller bay, 30 miles east of the mouth of the Copper river, an excellent coal has been discovered, and extensive preparations are under way for developing the field. It is probable that this mine will become a producer within a short time.

The only mines in American territory from which any production was reported for 1902 were the Williams mine, on the Yukon river below Kaltag, and the Homer property, on Cook inlet. The first mentioned property produced, in 1902, 1,700 tons of coal, which was used principally on the steamers plying on the Yukon river. The Pickart mine, also on the Yukon river, was operated for a short time during 1902, but was closed down in July. No exact information as to the amount of coal obtained during this time has been secured. The Homer mine, on Cook inlet, produced 512 tons, most of which was obtained in the course of the development of the property. At this point a railway about 7 miles in length connects the mine with the navigable waters of Cook inlet, where docks and coal bunkers have been established. The three mines on the Alaskan peninsula have been operated at different times during the last two decades, but no production was reported from them in 1902, although the one on Chignik river is known to have produced some coal to supply the local steamers, and the same is true of the one on Unga Island. A company was organized during 1902 to extend the developments of the mines on Herendeen bay, but no production was reported from it during the year. The two mines in the Arctic coast district have been worked from time to time during the last twenty years to supply whalers and revenue cutters, but the operations have never reached the dignity of an industry, and no record of their actual production has been secured. Some attempt, however, at systematic development has been recently made, and a small amount of coal was shipped to Nome, where it was said to have brought a good price.

[1] United States Geological Survey, "Mineral Resources of the United States," 1902.

[2] Twenty-second Annual Report of the United States Geological Survey, Part III.

Mr. Arthur J. Collier, assistant geologist, United States Geological Survey, who made a special investigation of the coal resources of the Yukon, has published his results in Bulletin No. 218.

During the field season of 1902 Mr. Collier was able to secure more definite data in regard to the production of the different mines along the Yukon river than have heretofore been obtained. He states that the Williams mine, on the Yukon river, 50 miles below Kaltag, which was first known as the Thein mine, was the only mine in American territory on the Yukon which was worked continuously during the season of 1902. This mine was opened in 1900 and produced some coal in that year.

The Pickart mine, 10 miles above Nulato, was opened in 1898, and produced some coal each year from that time until 1902, when it was abandoned. No definite statement as to the amount of coal produced during this time has been obtained, but the output was probably between 2,000 and 3,000 tons. The first mine to be opened on the Yukon river was what is known as the Nation River mine, 52 miles below the international boundary. About 2,000 tons of coal are said to have been produced from this mine in 1897; the mine has since been shut down and is not now operated. The next mine to be opened was what is known as the Drew mine, about 25 miles above Rampart. This mine was worked from 1897 to 1900, during which time the entire production is estimated to have amounted to about 1,200 tons. The Blatchford mine, 9 miles below Nulato, was opened in 1898 and produced some coal in 1899, 1900, and 1901. It is estimated that about 300 tons were produced at this mine during these years. What is known as Mine No. 1, about 25 miles below the Williams mine, was worked during the winter of 1898, and produced about 900 tons. Since that time it has been shut down. Mr. Collier estimates that the total amount of coal produced in American territory on the Yukon from 1897 to 1902, inclusive, is about 9,000 tons—this total being distributed annually approximately as follows:

Production of coal on the Yukon river: 1897 to 1902.

YEAR.	Name of mine.	Quantity (short tons).	Value.
1897	Nation River	2,000	$28,000
1898	No. 1, Drew, and Pickart	1,600	22,400
1899	Drew, Pickart, and Blatchford	1,200	16,800
1900	Drew, Pickart, Blatchford, and Thein	1,200	16,800
1901	Pickart, Blatchford, and Thein	1,300	15,600
1902	Williams	1,700	17,000

All of these mines are located immediately on the Yukon river. The coal from them has been used principally on the river steamers, though a smaller amount has been used for domestic purposes at Dawson and other points along the river. At Dawson the coal sells at from $15 to $20 per ton. Coal delivered at the river banks from the Yukon mines sells for from $10 to $12 per ton at present, though in years past prices have been higher, and in 1900 coal was selling for $15 per ton at the Drew mine. Adding the production of the Cook inlet mine to that of the Williams mine in 1902, the total production reported for the territory is found to be 2,212 tons, valued at $19,048. It is known, however, that some coal was also produced at the Corwin mine, at Chignik, and at Herendeen bay, but since no definite reports have been obtained from these localities they are not included in the above statement. The actual production in the territory for 1902 was, therefore, probably somewhat larger than that reported.

Arkansas.—According to Mr. Joseph A. Taff, of the United States Geological Survey, the Arkansas coal field is a direct continuation of the Indian Territory coal field, and extends from the western line of the state in an easterly direction about 75 miles. It follows the valley of the Arkansas river, which passes from west to east about the middle of the main basin.

The north edge of the field lies upon the southern foothills of the Boston mountains, which form the southern limit of the Ozark uplift. The southern border of the field is near the Ouachita mountain ridges, which extend from the vicinity of Little Rock westward into Indian Territory.

The coals vary from bituminous to semianthracite, the latter having a high reputation as a smokeless domestic fuel, its smokeless qualities causing it to be received with great favor in the cities of the Mississippi valley. It burns with a short, hot flame and leaves a comparatively small amount of ash.

The census of 1860 reported the production of 200 tons of coal for Arkansas, but the reports of the Ninth Census contained no account of production for this state. The production for 1880 was small, 14,778 short tons, having a value of $33,535. The wages paid amounted to $20,850. In 1889, at the taking of the Eleventh Census, the production amounted to 279,584 short tons, valued at $395,836. In 1902 the production had grown to 1,943,932 short tons, valued at $2,539,214.

The statistics of production in 1902, by counties, are given in the following table:

TABLE 19.—*Coal production of Arkansas, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	1,864,912	13,639	65,381	1,943,932	$2,539,214	$1.31
Franklin	327,418	1,199	9,396	338,013	377,794	1.12
Johnson	186,812	1,072	5,374	193,258	404,822	2.09
Logan	19,286	1,215	1,250	21,751	36,000	1.66
Pope	29,389	500	5,077	34,966	101,474	2.90
Sebastian	1,275,824	6,053	43,804	1,325,181	1,583,209	1.19
Ouachita and Scott	26,683	3,600	480	30,763	35,915	1.17

In the following table is presented a summary of the statistics in connection with the coal production of Arkansas:

TABLE 20.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	53	33	146	$148,113	2,574	$1,780,061	$485	5	$82,949	$177,716	1,943,932	$2,539,214
Sebastian	27	14	84	98,371	1,650	1,180,617	485	5	64,342	128,486	1,325,181	1,583,209
Other counties[1]	26	19	62	49,742	924	599,444	.....	.....	18,607	49,230	618,751	956,005

[1] Includes Franklin, Johnson, Logan, Ouachita, Pope, and Scott. (Franklin county had a production exceeding 200,000 tons, but is not shown separately in order to avoid disclosing the operations of individual operators.)

California.—All of the coal mined in both California and Oregon is of the lignite variety. In California there are a number of rather widely separated fields, the chief of which are the Mt. Diablo and Corral Hollow. The principal production in 1902 was from Alameda and Contra Costa counties, the former producing about 80 per cent of the state's total output. Smaller amounts were mined in Kern, Monterey, Riverside, and Siskiyou counties. In a number of other counties coal veins have been prospected, and the counties of Amador, Butte, Del Norte, Fresno, Orange, and San Diego have produced some lignite coal in the past. These mines, however, have been abandoned from one cause or another, principally the quality of the coal, although there was also difficulty in the mining. The Corral Hollow field, which is the one in Alameda county, has a considerable advantage, on account of its proximity to San Francisco, where the product finds its principal market. The total production of lignite in California during 1902 was only 84,984 short tons, as compared with 119,820 short tons in 1889.

The comparatively small coal mining industry of California is subjected to influences which do not affect other states. One of these is the exportation of wheat from the Pacific seaports. Vessels carrying wheat as an outgoing cargo are apt to bring back, at a low rate of freight, coals from Australia or Japan. When such is the case the demand for California coal falls off. In the years 1899, 1900, and 1901, according to the reports of the United States Geological Survey, occurred the largest outputs of coal in the state of California since 1880. The production in 1902 was reduced much below that of these years on account of the large production of crude petroleum, the use of which for fuel purposes in the manufacturing industries of the state developed very rapidly in 1902.

Colorado.—The coal fields of Colorado have been fully described by Mr. R. C. Hills, in Mineral Resources of the United States, 1892. They have also been described in considerable detail by Mr. L. S. Storrs in the Twenty-second Annual Report of the United States Geological Survey, Part III. Geologically, the coal bearing rocks of Colorado are confined to the Upper Cretaceous coal measures and, with only few exceptions, to the Laramie formation in these measures. The coal bearing territory is found along both the eastern and western flanks of the Rocky mountains.

The coal producing areas are divided into 3 groups, the Eastern, Park, and Western, the fields of each group being separated by areas of great elevation and erosion. The groups are again subdivided into distinct fields, as follows: The Eastern group into the Raton, Canyon City, and South Platte; the Park group into the Middle Park and Como; and the Western group into the Yampa, Grand river, and La Plata.

The coal fields of Colorado contain every variety of coal, from the typical lignite to the true anthracite. The area of the latter, however, is very small, Mr. Storrs stating that it probably does not exceed 80 square miles.

Owing to the aggressive policy of the Colorado Fuel and Iron Company, the coal fields of Colorado have been more thoroughly explored than those of any other state in the Rocky mountain region. Mr. Hills, in his report on Mineral Resources of the United States, 1892, estimates the available gross tonnage of the Colorado fields at 45,197,100,000 short tons, and estimating 75 per cent of this as recoverable, the net available supply is placed at 33,897,800,000 tons.

The production of the state in 1902, by counties, with the distribution of the product for consumption, was as follows:

TABLE 21.—*Coal production of Colorado, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	5,375,215	282,027	181,546	1,562,555	7,401,343	$8,397,812	$1.13
Boulder	719,554	48,454	38,363	.....	806,371	1,019,072	1.26
Delta	410	8,790	150	.....	9,350	12,450	1.33
El Paso	74,135	140,714	3,700	.....	218,549	286,279	1.31
Fremont	661,804	2,559	31,636	.....	695,999	1,146,416	1.65
Garfield	200,821	2,351	4,090	.....	207,262	228,935	1.10
Gunnison	252,861	1,519	8,614	101,880	364,874	563,593	1.54
Huerfano	1,156,555	4,891	27,867	.....	1,189,313	1,446,866	1.22
La Plata	143,412	10,178	607	832	155,029	230,901	1.49
Las Animas	1,929,116	26,250	55,435	1,234,470	3,245,271	2,919,146	0.90
Routt	600	2,535	45	.....	3,180	4,698	1.48
Weld	38,652	30,402	4,627	.....	73,681	106,574	1.45
Other counties[1]	197,295	3,384	6,412	225,373	432,464	432,891	1.00

[1] Includes Arapahoe, Larimer, Mesa, Montezuma, Ouray, Pitkin, and Rio Blanco.

Coal mining operations, as far as known, began in Colorado in 1864, the production in that year amounting to 500 tons. In 1870 the amount produced was 5,040 short tons, and at the taking of the Tenth Census the production amounted to 462,747 tons. In 1889 it had increased to 2,544,144 tons, and in 1902 it amounted to 7,401,343 tons. The United States Geological Survey estimates that the total amount of coal produced in Colorado from 1864 to the close of 1902 was 68,842,054 tons, or about one-fifth of 1 per cent of the net available supply estimated by Mr. Hills.

During 1902 coal was produced in Colorado in 18 counties, but in 7 of these there were not more than 2 establishments, so that the statistics of these 7 have been combined.

The following table is a summary of the statistics by counties where the production was 200,000 short tons:

TABLE 22.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	126	80	611	$818,445	7,955	$6,006,188	$14,413	98	$681,494	$1,059,831	7,401,343	$8,397,812
Boulder	18	10	46	55,126	832	617,864	2,394	9	76,229	89,188	806,371	1,019,072
El Paso	9	7	41	35,296	278	168,885	425	5	27,540	20,454	218,549	286,270
Fremont	6	3	33	58,234	965	705,643	.....	.....	85,769	109,173	695,999	1,146,416
Garfield	7	6	21	22,050	175	144,601	4,300	6	6,769	137,951	207,262	228,935
Gunnison	6	3	18	31,852	386	326,566	.....	.....	40,867	45,795	364,874	563,593
Huerfano	15	6	97	123,641	1,266	998,242	.....	.....	108,501	217,506	1,189,313	1,446,866
Las Animas	21	7	256	365,809	3,409	2,502,328	6,104	17	288,759	341,616	3,245,271	2,919,146
Other counties[1]	44	38	99	126,437	644	542,054	1,190	61	47,060	78,148	673,704	787,514

[1] Includes Arapahoe, Delta, La Plata, Larimer, Mesa, Montezuma, Ouray, Pitkin, Rio Blanco, Routt, and Weld. (Pitkin county had a production exceeding 200,000 tons, but is not shown separately in order to avoid disclosing the operations of individual operators.)

Illinois.—The coal fields of Illinois form by far the greater portion of the great Central coal field which underlies the larger part of Illinois, the southwestern part of Indiana, and several counties of western Kentucky.

Nearly three-fourths of the state of Illinois is underlaid by productive coal measures, the entire area being estimated at 42,900 square miles. This is the largest coal bearing area recorded for any state of the Union. There are more counties in this state in which coal is produced than in any other of the United States, the production in 1902 being reported from 54 different counties. In 9 of these the production exceeded 1,000,000 tons, and in 9 more the production was between 500,000 and 1,000,000 tons. The coal is principally bituminous, of the dry, noncoking variety.

In 1902 the state was the second in importance among the coal producing states, being outranked only by Pennsylvania. Its production was 10.9 per cent of the total production of the United States; the value was 9.2 per cent of the total value. The output in 1902 amounted to 32,939,373 short tons, valued at $33,945,910. At the taking of the Eleventh Census the production of coal in Illinois was 12,104,272 short tons, worth at the mines $11,755,203. The total production of the state during the census year 1880 was 6,115,377 short tons, valued at $8,779,832.

The expenditures reported were: For salaries, $1,564,832; for wages, $24,876,201; for contract work, $24,699; for miscellaneous expenses, $1,258,686; and for supplies and materials, $2,834,444. The incorporated companies paid $680,488 in dividends on capital stock, and $210,556 in interest on bonds.

The production by counties and the disposition of the product are shown in Table 23.

TABLE 23.—*Coal production of Illinois, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	29,299,137	2,591,770	1,048,381	85	32,939,373	$33,945,910	$1.03
Brown	.....	1,230	.....	.....	1,230	1,705	1.39
Bureau	1,653,131	55,132	61,379	.....	1,769,642	2,401,435	1.36
Christian	815,601	77,157	43,278	.....	936,036	890,512	0.95
Clinton	795,793	13,092	25,433	.....	834,318	771,246	0.92
Fulton	871,108	58,374	24,125	.....	953,607	1,104,963	1.16
Gallatin	18,325	11,971	615	.....	30,911	35,080	1.13
Greene	.....	6,000	.....	.....	6,000	9,265	1.54
Grundy	1,328,815	47,962	37,702	.....	1,414,479	1,880,231	1.33
Hancock	1,570	11,800	30	.....	13,400	22,800	1.70
Henry	44,888	89,859	3,565	.....	138,312	229,509	1.66
Jackson	857,193	27,700	45,594	.....	930,487	1,023,853	1.10
Jersey	.....	3,520	.....	.....	3,520	5,480	1.56
Johnson	200	3,650	.....	.....	3,850	4,195	1.09
Knox	36,540	48,481	830	.....	85,851	128,067	1.49
Lasalle	1,487,507	304,862	53,867	.....	1,846,236	2,369,359	1.28
Livingston	299,012	85,618	10,453	.....	395,083	544,581	1.38
Logan	218,500	35,132	15,075	.....	268,707	302,894	1.13
McDonough	20,353	14,133	150	.....	34,636	57,997	1.67
McLean	77,000	90,200	7,800	.....	175,000	254,775	1.46
Macoupin	2,033,159	66,419	85,747	.....	2,185,325	1,911,377	0.87
Madison	2,232,236	58,119	84,329	.....	2,374,684	1,941,599	0.82
Marion	841,127	37,553	43,976	.....	922,656	787,787	0.85
Marshall	421,457	19,313	17,416	.....	458,186	611,491	1.33
Menard	419,067	29,516	23,375	.....	471,958	473,369	1.00
Mercer	577,148	38,837	24,156	.....	640,141	766,725	1.20
Montgomery	558,590	46,113	14,745	.....	619,448	641,042	1.03
Morgan	.....	4,775	5	.....	4,780	7,170	1.50
Peoria	723,411	113,554	15,325	85	852,375	903,519	1.13
Perry	931,406	34,078	25,860	.....	991,344	925,131	0.93
Randolph	431,131	18,663	7,190	.....	456,984	377,318	0.83
Rock Island	50,253	31,490	1,675	.....	83,418	120,589	1.45
St. Clair	2,537,147	188,451	96,650	.....	2,822,248	2,425,846	0.86
Saline	278,662	13,279	5,630	.....	297,571	277,308	0.93
Sangamon	3,669,213	379,192	124,317	.....	4,172,722	3,805,742	0.92
Schuyler	2,520	15,877	60	.....	18,457	23,661	1.28
Scott	15,990	10,945	500	.....	27,435	42,168	1.54
Shelby	58,866	19,310	8,936	.....	87,112	178,039	2.04
Stark	6,640	21,833	570	.....	29,043	48,162	1.66
Tazewell	97,089	72,174	3,755	.....	173,018	198,891	1.15
Vermilion	2,330,705	210,043	44,543	.....	2,585,291	2,546,608	0.99
Warren	2,200	13,577	300	.....	16,077	27,935	1.74
Washington	38,754	14,951	3,130	.....	56,835	55,405	0.97
Will	25,125	14,357	1,310	.....	40,792	73,012	1.79
Williamson	2,229,073	31,682	65,187	.....	2,325,942	2,116,280	0.91
Other counties[1]	262,632	101,796	19,798	.....	384,226	501,839	1.31

[1] Includes Bond, Calhoun, Cass, Edwards, Hamilton, Jefferson, Kankakee, Macon, Wabash, and Woodford.

A summary of the statistics by counties having a production of 200,000 tons or over is given in the following table:

TABLE 24.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	875	789	1,510	$1,564,832	36,617	$24,876,201	$24,699	132	$1,258,686	$2,834,444	32,939,373	$33,945,910
Bureau	20	16	45	64,230	3,068	1,831,803	.....	.....	85,362	221,657	1,769,642	2,401,435
Christian	7	7	39	41,754	919	659,493	.....	.....	20,464	86,887	936,036	890,512
Clinton	6	3	23	25,032	789	562,444	.....	.....	9,395	58,507	834,318	771,246
Fulton	48	41	66	50,221	1,155	756,818	1,068	10	48,971	113,120	953,607	1,104,963
Grundy	24	18	52	65,230	2,856	1,566,311	1,328	3	32,807	144,843	1,414,479	1,880,231
Jackson	18	17	51	53,009	885	655,555	2,325	7	101,626	88,469	930,487	1,023,853
Lasalle	35	30	93	96,069	3,010	1,773,072	.....	.....	40,133	225,402	1,846,236	2,369,359
Livingston	14	14	17	16,259	484	350,457	46	1	16,101	36,147	395,083	544,581
Logan	5	5	19	19,195	304	240,243	.....	.....	8,404	31,318	268,707	302,894
Macoupin	16	10	83	104,587	1,874	1,402,687	.....	.....	41,586	177,847	2,185,325	1,911,377
Madison	30	22	125	119,690	2,280	1,569,367	540	6	69,537	148,689	2,374,684	1,941,599
Marion	7	6	33	44,135	840	598,540	.....	.....	8,268	102,631	922,656	787,737
Marshall	10	8	24	26,035	786	467,596	.....	.....	32,466	34,037	458,186	611,491
Menard	13	13	32	27,122	516	375,091	3,800	12	20,817	54,295	471,958	473,369
Mercer	16	15	21	26,609	766	598,456	.....	.....	4,730	49,160	640,141	766,725
Montgomery	5	5	21	18,500	487	383,036	.....	.....	11,330	38,379	619,448	641,042
Peoria	65	63	38	40,417	872	639,769	485	9	58,787	97,883	852,375	963,519
Perry	19	15	66	68,612	1,111	721,933	.....	.....	40,833	68,596	991,344	925,131
Randolph	15	15	20	17,138	357	298,324	2,244	10	14,451	33,814	456,984	377,318
St. Clair	69	53	167	157,691	2,235	1,709,516	4,500	7	97,165	153,898	2,822,248	2,425,846
Saline	17	17	17	16,465	211	162,523	200	3	12,398	28,603	297,571	277,308
Sangamon	30	22	177	175,031	3,739	2,866,988	4,142	22	156,400	281,947	4,172,722	3,865,742
Vermilion	63	57	69	71,242	2,678	1,832,935	710	5	64,500	248,223	2,585,291	2,546,608
Williamson	38	35	98	118,530	1,874	1,372,351	100	1	127,378	166,117	2,325,942	2,116,280
Other counties[1]	285	282	114	101,126	2,521	1,480,293	3,211	36	139,774	143,980	1,413,903	2,025,744

[1] Includes Bond, Brown, Calhoun, Cass, Edwards, Gallatin, Greene, Hamilton, Hancock, Henry, Jefferson, Jersey, Johnson, Kankakee, Knox, McDonough, McLean, Macon, Morgan, Rock Island, Schuyler, Scott, Shelby, Stork, Tazewell, Wabash, Warren, Washington, Will, and Woodford.

Indian Territory.—The coal areas of Indian Territory form a portion of the Western coal field, and are directly connected with the coal fields of Kansas on the north and those of Arkansas on the east.

The greater portion of the development has been in the Choctaw nation, in the territory tributary to the Missouri, Kansas and Texas Railway and the St. Louis and San Francisco Railroad, which cross the territory from north to south, and to the Choctaw, Oklahoma and Gulf Railroad, crossing it from east to west. Workable areas also underlie about half of the Cherokee nation, all of the Creek nation, and the northeast corner of the Chickasaw nation. The area underlaid by workable seams is estimated to contain about 14,848 square miles.

The entire production in the territory was from the Cherokee and Choctaw nations, the latter contributing by far the larger portion. The first recorded production was in 1880, when the amount was reported as 120,947 short tons. By the time the Eleventh Census was taken this production had increased to 752,832 tons, or 50 per cent; in 1902 it had grown to 2,820,666 tons. Of the amount of coal produced during 1902, 2,587,100 tons were loaded at mines for shipment; 25,998 tons were sold to the local trade and used by employees; 96,017 tons were used at the mines for steam and heat, and 111,551 tons were made into coke. The average price per ton received for coal was $1.51, as compared with $1.76 in 1889.

Indiana.—The coal fields of Indiana underlie the counties in the southwestern portion of the state and form a portion of the large Central coal field. There are said to be at least 8 workable coal beds, although as a usual thing not more than 3 of these are found in workable thickness at any one locality, and generally there is only one bed that can be worked from one shaft.

The eastern part of the coal fields of Indiana is noted for its production of what is known as Indiana, or "Brazil" block coal, which is in favor as a domestic and steam fuel. This coal receives its name from the almost perfect rectangular blocks into which the coal naturally breaks because of the pronounced cleavage planes intersecting each other at right angles. Some cannel and some semiblock coal are also produced in this state.

The production in 1902 amounted to 9,446,424 short tons, valued at $10,399,660. In 1889 the production was reported by the Eleventh Census at 2,845,057 short tons, valued at $2,887,852, and the Tenth Census in 1880 reported the production of that year at 1,454,327 short tons, valued at $2,150,258.

Table 25 shows by counties the total production of Indiana in 1902, the disposition of the same, and the total amount received for the coal sold, together with the average price per ton at the mines.

TABLE 25.—*Coal production of Indiana, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	8,649,144	536,899	259,681	700	9,446,424	$10,399,660	$1.10
Clay	1,241,950	28,850	44,246	.....	1,315,046	1,799,839	1.37
Daviess	178,368	33,193	5,765	.....	217,326	272,995	1.26
Dubois	.....	9,991	103	.....	10,094	14,951	1.48
Fountain	13,781	2,820	498	.....	17,099	19,894	1.16
Gibson	87,761	13,307	4,400	.....	105,468	105,059	1.00
Greene	1,596,594	34,568	32,623	.....	1,663,785	1,745,601	1.05
Knox	79,635	33,873	5,717	.....	119,225	134,970	1.13
Martin	14,370	3,107	180	.....	17,657	29,987	1.70
Parke	1,090,162	21,693	43,602	.....	1,155,457	1,481,315	1.28
Perry	10,425	10,792	360	.....	21,577	27,914	1.29
Pike	466,130	34,741	9,146	.....	510,017	532,551	1.04
Spencer	1,340	14,884	50	.....	16,274	19,886	1.24
Sullivan	1,177,158	50,579	41,208	.....	1,268,945	1,298,903	1.02
Vanderburg	97,763	112,889	7,460	.....	218,112	250,395	1.15
Vermilion	698,719	3,343	16,040	.....	718,102	652,597	0.91
Vigo	1,551,849	59,808	40,441	700	1,652,798	1,570,796	0.95
Warren	.....	3,280	100	.....	3,380	7,460	2.21
Warrick	343,139	65,181	7,742	.....	416,062	434,547	1.04

The production of Indiana in 1902 included 1,101,544 short tons of block and semiblock coal, 1,000 tons of splint coal, and 30,000 tons of cannel coal. The remainder of the product was noncoking bituminous coal. The reported mining expenses incurred in the production of Indiana coal in 1902 were as follows: For salaries, $530,492; for wages, $7,396,425; for contract work, $26,603; miscellaneous expenses, $449,054; and for supplies and materials, $729,104. The dividends paid by incorporated companies amounted during the year to $161,336, the interest paid on bonds to $16,720, and assessments were levied to the amount of $83,700. The statistics of mining operations during 1902, in counties having a production of 200,000 tons and over, are as follows:

TABLE 26.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	339	283	637	$530,492	10,593	$7,396,425	$26,603	101	$449,054	$729,104	9,446,424	$10,399,660
Clay	39	24	108	90,046	1,900	1,306,807	2,622	12	91,982	96,245	1,315,046	1,799,839
Daviess	22	19	22	13,365	308	190,313	1,000	10	11,335	9,885	217,326	272,995
Greene	37	32	100	87,412	1,559	1,235,254	800	5	59,677	158,999	1,663,785	1,745,601
Parke	23	15	67	68,847	1,473	972,682	.....	.....	57,107	109,590	1,155,457	1,481,315
Pike	30	27	40	30,328	638	394,705	.....	.....	16,042	32,733	510,017	532,551
Sullivan	24	23	86	67,516	1,101	906,129	7,601	24	65,482	101,350	1,268,945	1,298,903
Vanderburg	6	6	28	21,575	294	178,842	.....	.....	11,606	12,704	218,112	250,395
Vermilion	8	7	25	22,432	763	540,325	1,365	10	22,798	48,458	718,102	652,597
Vigo	33	23	98	85,965	1,781	1,183,537	12,340	32	81,998	103,507	1,652,798	1,570,796
Warrick	42	41	24	17,600	367	240,130	.....	.....	17,051	24,476	416,062	434,547
Other counties[1]	75	66	39	25,406	409	247,701	875	8	14,026	31,157	310,774	360,121

[1] Includes Dubois, Fountain, Gibson, Knox, Martin, Perry, Spencer, and Warren.

Iowa.—The northern part of the Western coal field is in the southwestern portion of Iowa, about two-fifths of the state being underlaid by coal, which is mined in 24 counties; 4 of these, namely, Appanoose, Mahaska, Monroe, and Polk, produced about two-thirds of the total. The total coal producing area is estimated at 20,000 square miles. The product is of the dry noncoking variety of bituminous coal, with small amounts of block and cannel. With the exception of the block and cannel coals, the product is generally better adapted for steam raising than for any other industrial purpose. Some attempts have been made to coke the Iowa coals on a commercial basis, but owing to the competition of the higher grade product from other sources the attempts were not profitable and have been abandoned, and no coke has been made in Iowa since 1891, in which year 157 tons were produced. The coals are usually high in both sulphur and ash.

Coal mining in Iowa began at quite an early date, an output of 360 tons having been reported as early as 1840. The Eighth Census showed that the production for 1860 was 41,920 short tons. By 1870 it had grown to 263,487 tons, and in 1880 to 1,461,116 tons. The census of 1889 showed a production of 4,095,358 tons. By 1902 it amounted to 5,904,766 tons. In amount of production Iowa ranked ninth among the coal producing states; in the states west of the Mississippi river it stood second, Colorado being first.

The following table shows the production, distribution, and price of coal in Iowa by counties during 1902:

TABLE 27.—*Coal production of Iowa, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	5,089,538	678,740	136,488	5,904,766	$8,660,287	$1.47
Adams	.....	19,707	44	19,751	46,693	2.36
Appanoose	848,553	35,187	16,597	900,337	1,580,002	1.70
Boone	229,062	20,790	4,472	254,324	486,624	1.91
Dallas	7,831	8,609	2,405	18,845	37,557	1.99
Davis	.....	3,953	.....	3,953	6,573	1.66
Greene	.....	11,501	72	11,573	24,404	2.11
Jasper	181,630	45,805	6,005	233,440	331,289	1.42
Jefferson	6,000	4,410	200	10,610	19,651	1.85
Keokuk	91,976	10,779	3,348	106,103	143,169	1.35
Mahaska	649,032	59,470	15,065	723,567	1,031,554	1.43
Marion	275,287	31,753	8,385	315,425	347,207	1.10
Monroe	1,355,464	23,037	27,804	1,406,905	1,806,365	1.28
Page	.....	10,022	48	10,070	25,277	2.51
Polk	763,345	231,975	28,540	1,023,860	1,541,406	1.51
Scott	.....	10,176	182	10,358	19,858	1.92
Taylor	8,357	5,785	65	14,207	32,186	2.27
Van Buren	10,836	3,967	13	14,816	24,499	1.65
Wapello	257,937	77,409	5,416	340,762	460,331	1.35
Warren	10,227	9,900	.....	20,127	38,888	1.93
Wayne	56,782	7,794	798	65,374	128,135	1.96
Webster	109,785	36,030	3,850	149,615	265,308	1.77
Guthrie, Lucas, and Story	227,484	10,081	13,179	250,744	313,317	1.25

The detailed statistics for the mining of coal in Iowa during 1902, in counties having a production of 200,000 tons or over, are shown in the following table:

TABLE 28.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	326	299	512	$436,828	9,439	$6,251,732	$48,046	240	$341,191	$841,506	5,904,766	$8,660,287
Appanoose	76	59	117	95,930	1,795	1,153,056	8,002	18	69,280	85,198	900,337	1,530,002
Boone	10	9	22	22,775	496	307,256	.....	.....	20,238	21,176	254,324	486,624
Jasper	16	15	11	9,950	286	210,790	820	4	13,209	42,407	233,440	331,283
Mahaska	42	42	59	49,350	1,048	719,324	13,690	31	34,214	143,146	723,567	1,031,554
Marion	24	24	23	15,636	404	241,057	10,128	62	9,042	42,267	315,425	347,207
Monroe	13	9	70	62,542	2,186	1,515,986	1,800	21	42,760	159,609	1,406,905	1,806,365
Polk	21	21	99	90,841	1,382	986,130	7,329	49	99,054	160,356	1,023,860	1,541,406
Wapello	17	14	34	31,285	548	307,600	5,097	37	10,605	88,837	340,762	460,331
Other counties[1]	107	106	77	58,519	1,294	810,533	1,180	18	42,789	148,510	706,146	1,125,515

[1] Includes Adams, Dallas, Davis, Greene, Guthrie, Jefferson, Keokuk, Lucas, Page, Scott, Story, Taylor, Van Buren, Warren, Wayne, and Webster. (Lucas county had a production exceeding 200,000 tons, but is not shown separately in order to avoid disclosing the operations of individual operators.)

Kansas.—The Kansas coal areas lie entirely in the eastern portion of the state, the western boundary of the Western coal field traversing Kansas in an almost due north and south line from Marshall county, adjoining the state line of Nebraska on the north, to Chautauqua county, adjoining Indian Territory on the south. There are some isolated deposits in the central portion of the state, but the beds are thin and the coal is of inferior quality and not at present mined on a commercial scale. The larger portion of the production is obtained from the counties of Cherokee and Crawford, in the southeastern corner of the state, these 2 counties contributing about 90 per cent of the entire output. These 2 counties are underlaid by the Lower Coal Measures, which form the eastern portion of the Western field, and which contain the most important and productive beds.

The production of the state is used principally for domestic and railroad consumption. A small quantity of coke is made at irregular intervals in Cherokee county, the coke being utilized by the zinc smelters in the immediate vicinity. The larger portion of the product is, like that of Iowa, of the dry, noncoking variety of bituminous coal.

Coal mining as an industry in Kansas, so far as records are concerned, began in 1869, when, according to the report of the United States Geological Survey, 36,891 tons were produced. In 1880, at the taking of the Tenth Census, the production of coal in Kansas amounted to 771,442 short tons. In 1889 it had increased to 2,221,043 tons. In 1902 it amounted to 5,266,065 tons. The development of the coal mining industry in Kansas, as in the adjoining states, Iowa and Missouri, has kept pace with the increase of population and the establishment of manufacturing industries. The markets are restricted to a comparatively limited area, and the coal is not shipped to points far distant from the mines. Any increase in production from this part of the Western coal field may be accepted as indicative in large part of the development and growth of population and manufactures within the 3 states. The statistics of production for 1902 are as follows:

TABLE 29.—*Coal production of Kansas, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	4,941,236	227,826	95,237	1,766	5,266,065	$6,862,787	$1.30
Cherokee	1,792,092	26,094	29,944	1,766	1,849,896	2,305,112	1.25
Cloud	.....	7,524	.....	.....	7,524	19,909	2.65
Crawford	2,765,898	67,895	47,481	.....	2,881,274	3,489,528	1.21
Franklin	1,795	3,204	.....	.....	4,999	12,117	2.42
Leavenworth	195,023	80,372	16,286	.....	291,681	555,969	1.91
Linn	24,000	5,480	300	.....	29,780	41,770	1.40
Osage	161,982	30,573	226	.....	192,781	416,746	2.16
Other counties[1]	446	6,684	1,000	.....	8,130	21,636	2.66

[1] Includes Atchison, Bourbon, Coffey, Jewell, Labette, and Republic.

There are only 3 counties in the state the production of which in 1902 exceeded 200,000 tons. These counties were Cherokee, Crawford, and Leavenworth. The statistics of salaries, wages, and other expenses in these counties, as compared with the production and value, are shown in Table 30.

TABLE 30.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	175	132	367	$345,162	7,017	$4,719,595	$3,644	106	$418,921	$596,501	5,266,065	$6,862,787
Cherokee	48	34	108	97,451	2,290	1,591,719	1,599	7	122,020	206,930	1,849,896	2,305,112
Crawford	50	28	180	187,503	3,604	2,434,365	382	5	244,748	320,805	2,881,274	3,489,528
Leavenworth	5	3	42	39,250	449	309,330	.....	.....	28,867	44,090	291,681	555,969
Other counties [1]	72	67	37	20,958	674	384,181	1,663	94	23,286	24,676	243,214	512,178

[1] Includes Atchison, Bourbon, Cloud, Coffey, Franklin, Jewell, Labette, Linn, Osage, and Republic.

Kentucky.—Kentucky is the only one of the United States whose coal product is drawn from more than one of the great coal fields. The coal producing counties of the eastern portion of the state are included in the coal measures of the Appalachian system, while the southern extremity of the Western coal field is found in the western counties. More than half of the entire production is obtained from the counties in the western part of the state. The Appalachian system covers the entire eastern portion of the state to an extent of 10,300 square miles, and the portion of the western part of the state underlaid by coal is estimated to contain 5,800 square miles, making a total area of 16,100 square miles.

The principal producing counties in the eastern portion of the state are: Bell, Boyd, Breathitt, Carter, Greenup, Johnson, Knox, Laurel, Lawrence, Lee, Pulaski, Rockcastle, and Whitley.

Those in the western portion are: Butler, Christian, Daviess, Hancock, Henderson, Hopkins, McLean, Muhlenberg, Ohio, Union, and Webster.

The coal found in the eastern portion of the state is usually the semibituminous variety, free burning and noncoking, but the different seams comprise all varieties of bituminous coal, from bituminous shale to cannel coal. Some of the coals in the eastern portion of the state have a high reputation as steam producers, particularly that kind known as the Jellico coal, which is mined in Whitley county, Kentucky, and in Campbell county, Tennessee. A considerable quantity of coke is made from coal mined in Hopkins county in the Western coal field, and in Bell county in the southern portion of the Eastern district. The state possesses some of the finest beds of cannel coal known to exist in the United States. It is mined both in the eastern and western districts, and is distributed widely throughout the eastern cities as a domestic grate coal. This cannel coal commands a much higher price at the mine than the ordinary bituminous and semibituminous coal mined in the state.

The production of cannel coal in Kentucky in 1902 amounted to 65,317 short tons, the largest output of this variety of coal obtained in any of the producing states. The census of 1840 credits Kentucky with a production of 23,527 short tons, and at the census of 1860, 285,760 tons were reported. The census of 1870 shows that Kentucky produced in that year 168,651 short tons, and at the census of 1880 the production was 946,288 short tons; in 1889 the Eleventh Census reported a production of 2,399,755 tons. In 1902 the output amounted to 6,766,984 tons. The production has increased steadily since 1893, the output in 1902 being more than double that in the former year.

Kentucky ranked eighth in importance among the coal producing states in 1902, and third among those south of the Ohio and Potomac rivers.

The production by counties, with the distribution of the product for consumption, is shown for Kentucky in Table 31.

TABLE 31.—COAL PRODUCTION OF KENTUCKY, BY COUNTIES: 1902.

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	6,141,886	333,584	132,812	158,702	6,766,984	$6,666,967	$0.99
Bell	352,942	5,369	7,210	96,247	461,768	478,801	1.04
Boyd	241,127	844	50	.....	242,021	193,494	0.80
Breathitt	22,919	954	.....	.....	23,873	31,487	1.32
Butler	9,600	3,268	.....	.....	12,868	15,915	1.24
Carter	268,056	8,350	4,995	.....	281,401	285,271	1.01
Clay	.....	7,093	.....	.....	7,093	6,007	0.85
Daviess	9,973	10,195	350	.....	20,518	19,558	0.95
Floyd	.....	2,728	.....	.....	2,728	2,872	1.05
Hancock	10,297	6,640	900	.....	17,837	17,252	0.97
Harlan	.....	1,628	.....	.....	1,628	1,701	1.04
Henderson	113,689	41,459	3,323	.....	158,471	149,895	0.95
Hopkins and Christian	1,499,872	38,249	44,539	59,777	1,642,437	1,340,020	0.82
Johnson	67,000	4,537	600	.....	72,137	85,296	1.19
Knott	.....	2,790	.....	.....	2,790	2,706	0.97
Knox	466,357	4,150	11,312	.....	481,819	471,754	0.98
Laurel	353,433	44,478	5,086	.....	402,997	394,883	0.98
Lawrence	37,527	12,539	7,321	.....	57,387	55,069	0.96
Lee	36,275	376	.....	.....	36,651	41,052	1.12
Leslie	.....	4,699	.....	.....	4,699	6,617	1.41
Letcher	.....	1,941	.....	.....	1,941	2,385	1.23
McLean	47,788	6,620	160	.....	54,568	50,108	0.94
Magoffin	.....	6,603	.....	.....	6,603	8,021	1.20
Morgan	49,410	3,926	1,000	.....	54,336	113,746	2.09
Muhlenberg	680,730	9,637	10,333	.....	700,700	621,841	0.89
Ohio	513,583	17,943	9,700	.....	541,226	489,518	0.90
Owsley	.....	13,494	.....	.....	13,494	18,035	1.34
Pike	.....	5,092	.....	.....	5,092	5,219	1.02
Pulaski	152,307	3,370	3,820	.....	159,497	204,537	1.28
Union	279,241	23,909	9,958	2,678	315,786	338,794	1.07
Webster	257,835	13,137	7,070	.....	278,042	238,786	0.86
Whitley	668,096	15,325	4,410	.....	687,831	952,608	1.38
Other counties[1]	3,829	12,181	675	.....	16,685	23,719	1.44

[1] Includes Crittenden, Edmonson, Elliott, Grayson, Greenup, Jackson, Madison, Martin, Menifee, Perry, Rockcastle, Trigg, Warren, Wayne, and Wolfe.

Hopkins county is the most important producer, having an output in 1902 of 1,555,084 short tons. The largest mines in the state are located in this county.

Table 32 shows the statistics relating to coal mining in Kentucky for such counties as produced 200,000 tons or over during 1902. It should be stated here that the statistics do not include a large number (from 1,000 to 1,200) of small country banks producing anywhere from 5 to 50 tons of coal a year, reports from which could not be obtained by correspondence. The quantity and value of the product were not sufficient to warrant the expense necessary to secure the reports by personal visits of special agents.

TABLE 32.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	523	503	593	$476,508	9,077	$4,522,207	$10,668	73	$285,792	$743,313	6,766,984	$6,666,967
Bell	11	11	45	41,500	644	342,547	.....	.....	35,542	29,432	461,768	478,801
Boyd	6	4	13	9,998	294	167,418	.....	.....	9,218	8,850	242,021	193,494
Carter	25	24	22	14,960	488	210,720	.....	.....	14,341	19,355	281,401	285,271
Hopkins	17	11	53	65,490	1,599	769,044	2,300	12	47,850	334,559	1,555,084	1,252,492
Knox	12	11	54	44,966	630	325,492	.....	.....	17,739	37,940	481,819	471,754
Laurel	13	13	35	27,340	637	286,657	.....	.....	11,784	15,825	402,997	394,883
Muhlenberg	16	15	50	44,984	863	448,581	500	8	25,145	41,036	700,700	621,841
Ohio	24	21	74	49,084	677	350,216	150	2	27,418	70,180	541,226	489,518
Union	11	11	23	16,962	352	202,409	.....	.....	5,114	17,645	315,786	338,794
Webster	12	11	23	14,480	322	150,088	500	3	12,693	25,834	278,042	238,786
Whitley	28	26	84	74,251	1,106	591,591	5,106	25	51,930	54,522	687,831	952,608
Other counties[1]	348	345	117	72,493	1,465	677,444	2,112	23	27,018	83,129	818,309	948,725

[1] Includes Breathitt, Butler, Christian, Clay, Crittenden, Daviess, Edmonson, Elliott, Floyd, Grayson, Greenup, Hancock, Harlan, Henderson, Jackson, Johnson, Knott, Lawrence, Lee, Leslie, Letcher, McLean, Madison, Magoffin, Martin, Menifee, Morgan, Owsley, Perry, Pike, Pulaski, Rockcastle, Trigg, Warren, Wayne, and Wolfe.

Maryland.—The coal fields of Maryland are a part of an extensive basin extending from Somerset county, in Pennsylvania, through Allegany and Garrett counties, in the western part of Maryland, to Tucker county, in West Virginia. They are separated from the main field of the Appalachian system by the Great Savage mountains, and are nearer to tidewater than any of the important coal producing fields of the United States.

In this region there occurs what is known as the Big Vein of Maryland and West Virginia, the production from which has a high and thoroughly established reputation for quality. As a blacksmithing coal it stands without a competitor in the United States, to almost all portions of which it is shipped for this purpose. Some Maryland coal is also sent abroad for blacksmithing and forge purposes. This coal is also said to make good coke, but on account of the high price obtained for the raw coal it is found more profitable to sell it in that condition than to make it into coke. Practically the entire product is sold as run-of-mine, and little screening is done in preparing the coal for market.

The first discovery of coal in Maryland was made in the vicinity of Frostburg in 1804, and coal has been extracted from this section almost continuously since that date. The exploitation on a commercial basis may be said to have begun with the construction of the Baltimore and Ohio Railroad, which reached the coal fields in 1842. According to the reports of the "Cumberland Coal Trade," which have been kept continuously since that date, shipments in 1842 amounted to 1,913 short tons, and adding an estimate of 10 per cent for local consumption, the production in that year would have been 2,104 tons. In 1850 the Chesapeake and Ohio Canal was completed to Cumberland, and from that date the production of the region continued to grow rapidly, although on account of the comparatively small productive area the increase in production has not kept pace with that of some of the other states having larger coal areas. It is thought that the maximum yearly production for Maryland has been nearly reached. The output in 1902 amounted to 5,271,609 short tons, valued at $5,579,869, as compared with 2,939,715 short tons, valued at $2,517,474, in 1889, and 2,228,917 short tons, valued at $2,585,537, in 1880. The product of 1902 was distributed as follows:

	Tons.
Loaded at mines for shipment	5,187,175
Sold to local trade and used by employees	48,631
Used at mines for steam and heat	35,803

The coal mining industry of Maryland in 1902 was considerably benefited through the strike in the anthracite coal fields in Pennsylvania. The average price per short ton was $1.06 in 1902, as compared with $0.99 in 1901. In 1889 the average price per short ton was $0.86. The bulk of the production was from Allegany county, only 2.7 per cent of the output in 1902 being from Garrett county.

Michigan.—All of what is known as the Northern coal field lies within the lower peninsula of the state of Michigan, between Lake Michigan and Lake Huron. It is estimated to contain an area of approximately 11,300 square miles. It is the only coal field known in the drainage basin of the Great Lakes and the St. Lawrence river. The coal is of an inferior quality, when compared with that of the Appalachian region, having a high percentage of both ash and sulphur. It is probably for this reason that the development of the region has been somewhat slow in comparison with that of other regions.

It is reported that the portion of the field near Jackson was producing coal as early as 1835, but it was not until 1868 that any estimate of the production was obtained. In that year the output amounted, it is stated, to 28,000 tons. The Census report of 1870 gave the production at 31,528 short tons. In 1880, according to the Tenth Census, the production was 100,800 short tons. In 1881 and 1882 there was a little increase, but for the next thirteen years, according to the reports of the United States Geological Survey, the production not only did not increase, but showed a declining tendency, which was due undoubtedly to the excessive production and consequent low prices of coal from the fields having a better quality or lower cost of production. At the Eleventh Census, for the year 1889, the output was only 67,431 tons. Since 1897, however, because of the higher prices of coal from other regions, and also because of the rapid industrial growth of the cities on Lake Erie and Lake Huron, the demand for, and the production of, Michigan coal have increased with notable rapidity. According to the report of the United States Geological Survey the production of coal in Michigan in 1901 was 1,241,241 short tons. A strike of the mine workers in 1902 reduced the production of the state to 964,718 short tons.

The distribution of this production, by counties, is shown in the following table:

TABLE 33.—*Coal production of Michigan, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	818,687	117,978	28,053	964,718	$1,653,192	$1.71
Bay	209,133	29,596	9,916	248,645	410,615	1.65
Eaton	.....	7,981	99	8,080	18,890	2.34
Saginaw	604,904	50,100	15,300	670,304	1,141,409	1.70
Huron, Jackson, and Shiawassee	4,650	30,301	2,738	37,689	82,278	2.18

There were only two counties the production of which exceeded 200,000 tons during the year. The following table shows the statistics of coal mining for these counties for 1902:

TABLE 34.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	31	30	99	$87,780	1,445	$1,075,805	$7,500	13	$106,414	$82,448	964,718	$1,653,192
Bay	9	9	35	23,968	338	257,176	2,500	7	30,660	31,300	248,645	410,615
Saginaw	11	10	55	56,742	962	751,536	5,000	6	71,323	48,488	670,304	1,141,409
Other counties[1]	11	11	9	7,070	145	67,093	.....	.....	4,431	2,660	45,769	101,168

[1] Includes Eaton, Huron, Jackson, and Shiawassee.

Missouri.—The coal areas of Missouri belong to the Western coal field and underlie about one-half of the state, the dividing line being one roughly drawn from the northeastern to the southwestern corners of the state. As they belong to the same field as those of Iowa and Kansas, what has been said in regard to the nature of the coals of those states applies also to the coals of Missouri.

Practically all of the coal produced in the state is consumed within its borders, and, other things being equal, any increased production may be considered as probably indicating a growth in local population or industry. The state is almost entirely surrounded by other coal producing states, and the large cities of the eastern portion obtain their principal supply of fuel from Illinois rather than from the mines of Missouri.

As far as any historical records go, the development of the coal mines of Missouri began in the same year as coal mining in Iowa. This was in 1840, when an output of 9,971 tons was obtained. At the census of 1870 the product was reported as 621,930 tons and at the census of 1880, as 844,304 tons. The Eleventh Census shows the production in 1889 to have been 2,557,823 tons, while in 1902 it amounted to 3,890,154 tons. Owing to the natural restrictions upon the marketing of Missouri coal, its increase in production has not kept pace with that of the neighboring states.

In Table 35 is shown the production of coal in 1902, by counties, with the distribution of the product for consumption.

TABLE 35.—*Coal production of Missouri, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	3,503,993	318,992	67,169	3,890,154	$5,374,642	$1.38
Adair	312,171	14,896	4,092	331,159	437,631	1.32
Audrain	14,211	11,068	929	26,208	43,253	1.65
Barton	186,215	10,638	3,493	200,346	240,374	1.20
Bates	319,361	28,376	6,970	354,707	397,928	1.12
Boone	11,190	15,636	180	27,006	37,169	1.38
Callaway	900	25,406	116	26,422	45,466	1.72
Carroll	.....	2,376	.....	2,376	5,065	2.13
Charlton	.....	2,116	.....	2,116	4,204	1.99
Henry	64,853	32,798	1,180	98,831	161,493	1.63
Howard	.....	2,683	.....	2,683	5,195	1.94
Johnson	.....	5,530	10	5,540	10,465	1.89
Lafayette	488,392	44,444	10,965	543,801	929,862	1.71
Linn	63,794	16,653	661	81,108	130,966	1.61
Macon	1,039,687	9,212	15,827	1,064,726	1,328,796	1.25
Monroe	.....	2,101	.....	2,101	3,839	1.83
Montgomery	1,226	2,558	317	4,101	9,052	2.21
Putnam	121,424	3,648	2,911	127,983	197,869	1.55
Ralls	18,252	1,100	20	19,372	27,088	1.40
Randolph	399,680	19,008	5,479	424,167	524,636	1.24
Ray	204,859	26,164	4,043	235,066	383,492	1.63
St. Clair	670	3,160	30	3,860	6,390	1.66
Schuyler	1,428	2,772	40	4,240	6,435	1.52
Vernon	204,412	8,433	5,494	218,339	266,369	1.22
Other counties[1]	51,268	28,216	4,412	83,896	171,605	2.05

[1] Includes Caldwell, Cedar, Cooper, Dade, Grundy, Jackson, Livingston, Morgan, Pettis, and Saline.

There were 33 counties in the state from which coal production was reported in 1902, although coal is found in as many as 39 counties. Of the 33 counties producing in 1902, there were 8 in which the output exceeded 200,000 tons.

The statistics for the industry are shown in the following table, the counties producing over 200,000 tons being given separately:

TABLE 36.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	384	345	420	$325,147	6,501	$3,927,158	$42,031	110	$250,078	$304,821	3,890,154	$5,374,642
Adair	17	12	69	40,110	513	345,000	22,744	(1)	18,892	23,789	331,159	437,631
Barton	22	18	41	37,546	261	168,659	.....	.....	51,518	31,589	200,346	240,374
Bates	32	32	21	16,811	490	340,695	9,702	40	21,800	20,699	354,707	397,928
Lafayette	54	52	67	45,400	1,127	657,471	2,601	16	18,050	34,111	543,801	929,862
Macon	19	9	69	89,002	1,469	899,903	.....	.....	60,201	93,003	1,064,726	1,328,796
Randolph	21	19	29	25,506	697	407,874	2,141	12	14,328	31,594	424,167	524,636
Ray	33	27	30	17,705	485	287,862	1,137	11	20,772	13,407	235,066	383,492
Vernon	16	13	16	7,838	242	177,408	40	2	15,367	12,742	218,339	266,369
Other counties[2]	170	163	78	45,229	1,217	642,286	3,666	29	29,150	43,887	517,843	865,554

[1] Not reported.
[2] Includes Audrain, Boone, Caldwell, Callaway, Carroll, Cedar, Charlton, Cooper, Dade, Grundy, Henry, Howard, Jackson, Johnson, Linn, Livingston, Monroe, Montgomery, Morgan, Pettis, Putnam, Ralls, St. Clair, Saline, and Schuyler.

Montana.—The coal areas of Montana are included in the Rocky Mountain fields. Most of the deposits are of the Cretaceous age and vary from lignite to bituminous, the lignites usually being in the plains region and the bituminous coals in the mountain ranges. The coal fields form a nearly continuous belt, and cross the state in a northwest-southeast direction. Little detailed investigation has been made and only a general idea can be formed as to the extent and value of these fields. The coal bearing areas are estimated to contain 32,000 square miles. Some of the coals possess excellent coking qualities, the coke being used in the smelters and refineries as far east as Omaha.

The first statement regarding the production of coal in Montana is that made by the Tenth Census, which shows that in 1880, 224 tons were produced. The active development of Montana's coal mines began in the latter part of the decade 1880 to 1890, and in 1889, according to the Eleventh Census, the production was 363,301 short tons, valued at $880,773, or an average of $2.42 per ton. In 1902 the production was 1,560,823 short tons, worth $2,443,447, or an average of $1.57 per ton. According to the reports of the United States Geological Survey the coal production of Montana reached the market limits in 1895, when it amounted to 1,504,193 short tons. Since that time the production has remained almost stationary, the maximum being attained in 1900, with a total of 1,661,775 short tons, and the minimum in 1901, when a total of 1,396,081 tons was produced.

The statistics of production in 1902, by counties, with the distribution of the product for consumption, are shown in the following table:

TABLE 37.—*Coal production of Montana, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	1,385,100	40,719	39,023	95,981	1,560,823	$2,443,447	$1.57
Carbon	576,472	9,270	19,212	.....	604,954	791,222	1.31
Cascade	697,883	14,050	14,398	35,241	761,572	1,274,169	1.67
Choteau	260	10,512	.....	.....	10,772	27,064	2.51
Fergus	600	4,600	.....	.....	5,200	16,900	3.25
Park	28,660	1,470	8,770	60,740	89,640	189,080	2.11
Other counties[1]	86,225	817	1,643	.....	88,685	145,012	1.64

[1] Includes Deerlodge, Gallatin, Granite, and Meagher.

As shown in the above table there were only two counties, Carbon and Cascade, in which the production exceeded 200,000 short tons annually. These two counties together in 1902 produced 1,366,526 short tons out of a total of 1,560,823 short tons.

The statistics of the industry are given in the following table, the counties of Carbon and Cascade having a production of over 200,000 tons each, being shown separately:

TABLE 38.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	37	34	61	$80,674	1,587	$1,516,043	$1,000	13	$118,693	$233,930	1,560,823	$2,443,447
Carbon	3	3	10	15,470	552	534,761	1,000	13	16,420	79,235	604,954	791,222
Cascade	9	7	36	47,339	766	725,078	.....	.....	88,863	111,425	761,572	1,274,169
Other counties[1]	25	24	15	17,865	269	256,204	.....	.....	13,410	43,270	194,297	378,056

[1] Includes Choteau, Deerlodge, Fergus, Gallatin, Granite, Meagher, and Park.

New Mexico.—The coal producing areas of New Mexico are found in somewhat widely distributed fields or basins having seemingly little connection with each other. The three most important areas are those in Colfax, Rio Arriba, and McKinley counties. The first-mentioned area is an extension southward of the Las Animas, or Trinidad, area in Colorado, and occupies the northwestern portion of Colfax county. The La Plata field of Colorado, which is found in the southwestern portion of that state, suddenly turns at its eastern extremity and extends in a narrow strip almost due south, through Rio Arriba county and into McKinley county. Owing to its distance from railroad communication, this area has not been extensively developed. The Gallup field, which occupies a long, narrow strip extending north and south in the western part of McKinley county and into San Juan county on the north and Valencia county on the south, is one of the most extensively developed areas in the territory. In addition to these there are the Los Cerrillos area, in Santa Fe county, and the Carthage area, in Socorro county, in both of which mining operations are carried on. These are the only fields which have been extensively developed, although there are some isolated fields of economic importance in the territory, where small amounts are mined for local consumption.

The coals of New Mexico, like those of Colorado, range from lignite to anthracite. The anthracite occurs

in the Los Cerrillos field, which has been penetrated by volcanic intrusion in close proximity to the coal beds, with the result of altering the bituminous coal to an anthracite of good grade. This anthracite is sold as far north as Denver and as far west as San Francisco. In 1902 the production was 41,326 short tons. All of this anthracite occurs in the northern part of the field. Toward the south the coal passes into coking and semi-coking varieties of bituminous coal, the transition being very gradual and almost imperceptible. Good coking coal was also produced in Colfax county, the principal operations being near Raton. There were 8 counties in the territory which produced coal in 1902. In only 2, Colfax and McKinley, did the product amount to as much as 200,000 short tons during the year. No report of coal production in New Mexico was made at the Tenth Census, the first record of operations being that for the United States Geological Survey in 1882, in which year an output of 157,092 short tons was obtained. The production reported at the Eleventh Census, for 1889, was 486,463 tons. In 1902 it was 41,326 short tons of anthracite and 1,007,437 short tons of bituminous, a total production of 1,048,763 short tons.

In the following table is shown the production in 1902, by counties, with the distribution of the product for consumption:

TABLE 39.—*Coal production of New Mexico, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	973,500	19,514	33,180	22,569	1,048,763	$1,500,230	$1.43
Colfax	304,221	10,902	8,731	22,519	346,373	392,244	1.13
McKinley	418,981	3,515	9,612	.....	432,108	593,361	1.37
Rio Arriba	47,000	.....	600	.....	47,600	69,000	1.45
San Juan	100	1,600	.....	.....	1,700	2,175	1.28
Santa Fe	81,636	422	8,837	.....	90,895	179,944	1.98
Other counties[1]	121,562	3,075	5,400	50	130,087	263,506	2.03

[1] Includes Lincoln, San Miguel, and Socorro.

The statistics for the industry are as follows, counties producing 200,000 tons or more being shown separately:

TABLE 40.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	30	25	68	$85,599	1,439	$1,027,460	$5,770	81	$63,990	$156,513	1,048,763	$1,500,230
Colfax	6	5	20	33,619	598	297,309	1,770	4	9,083	33,194	346,373	392,244
McKinley	7	5	21	24,614	476	408,064	4,000	77	25,615	69,649	432,108	593,361
Other counties[1]	17	15	27	27,366	365	322,087	.....	.....	29,292	53,670	270,282	514,625

[1] Includes Lincoln, Rio Arriba, San Juan, Sante Fe, San Miguel, and Socorro.

North Carolina.—The only productive coal field in North Carolina is a small area lying in the valley of the Deep river, just west of the point where it joins the Cape Fear river. The area from which coal may be produced is a narrow strip 30 miles in length. Another small area lying along the Dan river, near where it crosses the Virginia line, is known to contain some coal, but it has not been developed and is regarded as of little promise for the future. The only mine operated in the Deep river basin is the Cumnock, formerly known as the Egypt mine. It was opened in 1889, with a production during that year of 192 tons. Detailed statistics are not published separately, in order that the confidential nature of the reports to the Bureau of the Census may be maintained.

North Dakota.—Although the coal producing areas of North Dakota are included in the Rocky Mountain fields they are not within the mountainous areas. They lie in about the middle of the state, in the great plains region.

All of the coal produced in the state is lignite and disintegrates rapidly upon exposure. Under present conditions it can not be used satisfactorily in locomotives, but answers the need of the community for domestic fuel and for use under stationary boilers. Comparatively little labor is necessary to procure the coal, strip or surface mining being frequently practiced. The coal mine operators have endeavored to improve the quality of their product by briquetting, but so far these attempts have been unsuccessful, failure being due principally to the high cost of binding materials.

No production of coal was reported from North Dakota at the Tenth Census. In 1889 the output was 28,907 short tons. This was almost entirely mined and used by the ranchmen in the immediate vicinity of the openings. In 1902 the production amounted to 226,511 short tons. The state of North Dakota has endeavored to foster its lignite mining industry by compelling its use in all state offices and institutions.

The statistics of production and distribution, by counties, in 1902, are as follows:

TABLE 41.—*Coal production of North Dakota, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	182,002	35,639	8,870	226,511	$325,967	$1.44
Morton	13,542	4,575	200	18,317	23,078	1.26
Stark	29,700	5,300	.....	35,000	38,025	1.09
Ward	68,417	22,519	2,850	93,786	171,122	1.82
Other counties[1]	70,343	3,245	5,820	79,408	93,742	1.18

[1] Includes Burleigh, Emmons, and McLean.

Ohio.—Ohio is one of the 9 states whose coal fields are included in the great Appalachian system. Every county in the eastern half of the state, with the exception of a comparatively narrow belt of 4 counties bordering on Lake Erie, is, or has been, wholly or in part, underlaid by coal. The entire area underlaid by coal in this state has been estimated at 12,000 square miles, distributed over 30 counties in the eastern and southeastern portions. There are no less than 16 workable beds contained in the coal measures of the state, but only 6 of the 16 are of importance. The other 10 are worked by small operators, producing coal for purely local trade. The important beds are known as No. 1, the Block or Sharon coal seam; No. 2, the Wellston; No. 5, the Lower Kittanning; No. 6, the Middle Kittanning; No. 7, the Upper Freeport; and No. 8, the Pittsburg. The coals in these different beds embrace all the varieties of bituminous—steam, gas, coking, and cannel.

The most important producing bed is the Middle Kittanning, or No. 6. In Athens, Hocking, and Perry counties this bed is known as the Hocking Valley seam, which in the 3 counties mentioned produces from 35 to 40 per cent of the total output of the state. It is an excellent steam coal, is popular for domestic use, and also stands high as a furnace fuel, for which purpose it is used in its raw state. The thickness of this seam varies from 12 inches, in Columbiana county, to 13 feet in the Hocking valley.

No. 7, or the Upper Freeport, is second in importance. It is considered as one of the best steam coals in the state, and is consumed chiefly by the railroads. The principal development of this bed is in Guernsey county, which, in 1902, was third in importance as a coal producer.

The Wellston, or No. 2, is also an important producer, the chief operations being in the vicinity of Jackson and Wellston, in Jackson county. It is a free, open burning, noncoking coal, used to a considerable extent in its raw state among the local blast furnaces. It also stands high in popularity as a domestic fuel.

The No. 1, or Block coal seam, produces a good steam and domestic coal, but its chief use is as a blast furnace fuel, for which purpose it is used raw. The furnaces which first substituted coal for charcoal used this coal. What is familiarly known as "Massillon" coal, in the northern part of the state, is mined from this bed.

No. 5, or the Lower Kittanning bed, is best known for its coking qualities, it being the only coal in the state from which a fair grade of coke can be made. Little coke is made from it, however, owing to the proximity and cheapness of higher grade coking coals in Pennsylvania and West Virginia. The coal from this bed finds its principal use as a steam fuel.

No. 8, or the Pittsburg seam, underlies the whole or parts of the counties of Jefferson, Harrison, Belmont, Guernsey, Athens, and Meigs, in the southeastern portion of the state. While not the most important coal bed in the state, it is looked upon as one of the chief future sources of supply, owing to the approaching depletion of some of the other beds.

In the following table is shown the production in 1902, by counties, with the distribution of the product for consumption:

TABLE 42.—*Coal production of Ohio, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	22,232,404	1,041,112	242,594	3,784	23,519,894	$26,953,789	$1.15
Athens	3,281,410	13,146	22,241	2,800	3,319,597	3,635,762	1.09
Belmont	1,763,658	219,302	14,996	.....	1,997,956	2,069,488	1.04
Carroll	*190,969*	*30,996*	*3,414*	.....	*225,379*	*288,956*	*1.28*
Columbiana	724,765	48,102	20,991	.....	793,858	885,656	1.12
Coshocton	388,289	48,995	500	.....	437,784	536,196	1.22
Gallia	16,962	4,508	.....	.....	21,470	24,650	1.15
Guernsey	2,615,805	9,802	30,003	.....	2,655,610	2,440,906	0.92
Harrison	355,192	4,500	1,800	.....	361,492	315,756	0.87
Hocking	2,584,424	19,312	37,405	.....	2,641,141	2,893,974	1.10
Holmes	600	14,185	.....	.....	14,785	21,482	1.45
Jackson	2,344,492	37,237	30,780	.....	2,412,509	3,432,741	1.42
Jefferson	1,694,538	101,553	15,776	934	1,812,801	1,905,820	1.05
Lawrence	165,060	18,309	.....	.....	183,369	240,857	1.31
Mahoning	72,415	52,234	3,098	.....	127,747	178,517	1.40
Medina	76,399	9,333	4,986	.....	90,718	161,729	1.78
Meigs	263,402	63,506	12,731	.....	339,639	390,713	1.15
Morgan	86,821	.....	.....	.....	86,821	127,135	1.46
Muskingum	190,542	34,871	.....	.....	225,413	252,621	1.12
Perry	2,664,968	68,470	10,559	.....	2,743,997	2,913,599	1.06
Stark	998,599	68,620	13,210	.....	1,080,429	1,946,667	1.80
Summit	51,400	12,332	3,710	.....	67,442	107,417	1.59
Trumbull	6,100	5,490	440	.....	12,030	27,335	2.27
Tuscarawas	1,421,827	144,660	12,073	50	1,578,610	1,654,120	1.05
Vinton	90,751	1,124	566	.....	92,441	116,614	1.26
Wayne	74,824	2,056	1,510	.....	78,390	140,153	1.79
Other counties[1]	*108,192*	*8,469*	*1,805*	.....	*118,466*	*244,925*	*2.07*

[1] Includes Noble, Portage, Scioto, and Washington.

Coal mining in Ohio began during the first quarter of the nineteenth century, but the exact date of the first operations is not known. The first shipment of which there is a record was made from Summit county in 1828, but it is not known how much coal was in this shipment. In 1838 the entire coal production was reported as 119,952 short tons. In 1840 the production was 140,535 short tons; in 1860 it amounted to 1,133,596

tons, and in 1870 it was 2,830,559 tons. The Tenth Census reported an output of 6,008,595 short tons for the fiscal year ending June 30, 1880. The Eleventh Census, for the calendar year 1889, showed a production of 9,976,787 short tons, and in 1902 it reached the maximum record of 23,519,894 short tons. The value of the product in 1889 was $9,355,400, an average of $0.94 per short ton. In 1902 the product was valued at $26,953,789, or $1.15 per ton. It is not believed that the record made in 1902 will be greatly exceeded in the future, as much of the best coal land has been, or is rapidly becoming, exhausted.

As will be seen from the foregoing table, there were 29 counties producing coal in Ohio during 1902. Fifteen of these produced more than 200,000 tons each, thus contributing 22,626,215 tons of the total, or an average of over 1,500,000 tons each. The 14 other counties produced 893,679 short tons, or an average of about 63,800 tons each.

The total amount paid in wages at the Ohio coal mines in 1902 was $16,693,464; other expenses reported amounted to $4,972,023, making a total of $21,665,487. The statistics of the industry are shown in the following table:

TABLE 43.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	648	513	1,314	$1,222,966	25,963	$16,693,464	$46,818	290	$1,619,451	$2,082,788	23,519,894	$26,953,789
Athens	34	22	169	170,124	3,240	2,168,759	1,479	10	312,487	272,342	3,319,597	3,635,762
Belmont	52	45	108	126,762	2,060	1,403,291	195	3	63,173	146,812	1,997,956	2,069,488
Carroll	12	11	21	12,770	280	181,227	.....	.....	10,488	20,967	225,379	288,956
Columbiana	28	23	44	42,287	916	601,358	1,085	8	45,453	51,433	793,858	885,656
Coshocton	39	39	24	22,749	589	392,322	.....	.....	23,088	36,019	437,784	536,196
Guernsey	20	14	87	87,002	2,198	1,490,246	6,906	23	144,551	218,037	2,655,610	2,440,906
Harrison	5	4	13	19,915	279	186,419	5,000	6	5,695	23,397	361,492	315,756
Hocking	20	5	59	62,442	2,366	1,649,428	971	6	175,561	191,159	2,641,141	2,893,974
Jackson	74	58	189	187,229	3,514	2,021,308	3,528	48	130,192	259,567	2,412,509	3,432,741
Jefferson	41	29	61	57,310	2,184	1,284,417	75	1	96,302	267,035	1,812,801	1,905,820
Meigs	15	15	31	20,642	436	251,097	.....	.....	20,948	23,456	339,639	390,713
Muskingum	27	27	25	15,126	259	177,977	1,895	14	7,821	15,808	225,413	252,621
Perry	59	41	144	132,965	2,811	1,844,527	2,544	79	255,274	219,230	2,743,997	2,913,599
Stark	46	28	86	89,257	1,806	1,078,764	10,575	46	140,743	143,137	1,080,429	1,946,667
Tuscarawas	70	60	92	79,044	1,616	1,098,707	908	4	72,420	117,200	1,578,610	1,654,120
Other counties[1]	106	92	161	97,342	1,409	863,617	11,657	42	115,255	77,189	893,679	1,390,814

[1] Includes Gallia, Holmes, Lawrence, Mahoning, Medina, Morgan, Noble, Portage, Scioto, Summit, Trumbull, Vinton, Washington, and Wayne.

Oregon.—Oregon has only one productive coal field. This is known as the Coos Bay field, in Coos county. It is directly on the coast, giving water transportation for the production, most of which is sent to San Francisco, Cal. According to Prof. J. S. Newberry, coal was mined on Coos bay in 1855, but records of these earlier years are entirely wanting. In 1889 the production amounted to 64,359 tons; in 1902 it was 65,648 tons, showing that the industry has not developed much during the last thirteen years.

Pennsylvania.—The bituminous coal areas of Pennsylvania, which embrace nearly the entire western half of the state, form the northern extremity of the great Appalachian field. Every county in the state west of the Allegheny mountains contains coal beds of economic value, while several outlying basins east of the mountains are also extensively mined. The entire bituminous coal producing area of Pennsylvania is estimated to contain about 15,800 square miles.

In the northern portion of the state the deposits are found principally in detached basins scattered through the counties of Bradford, Cameron, Clinton, Crawford, Elk, Forest, Lycoming, Potter, Tioga, Venango, and Warren. To the south and southwest of these the coal bearing rocks cover all, or nearly all, of the counties of Allegheny, Armstrong, Beaver, Butler, Cambria, Clarion, Clearfield, Fayette, Greene, Indiana, Jefferson, Mercer, Somerset, Washington, and Westmoreland, and portions of Blair and Center counties. The Huntingdon, or Broad Top, basin lies east of the main coal fields, in Bedford and Huntingdon counties.

The counties of Allegheny, Fayette, Greene, Washington, and Westmoreland, in the southwestern corner of the state, contain the upper productive measures, in which is found the famous Pittsburg bed, probably the largest and most productive single coal seam in the world. It is from this bed that the celebrated Youghiogheny gas coal of the Pittsburg district, in Allegheny and Washington counties, is obtained. Farther to the east it produces the famous Connellsville coking coal of Fayette and Westmoreland counties. In Maryland it yields the well known Cumberland coal, while some of the best coals of Ohio and West Virginia are also mined from it. In fact, it may be said that in quality, as in quantity, the coal contained in the Pittsburg bed is equal, if not superior, to any bituminous coal in the world.

Among the other beds in the state are the Upper Freeport, Lower Freeport, Upper Kittanning, Lower Kittanning, Blossburg, Brookville, Sharon, Mercer, Sewickley, and a number of other less important ones, all of which are described in detail in the Twenty-Second

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In the production of coal Pennsylvania far exceeds any other state. The combined output of anthracite and bituminous coal in Pennsylvania, from the beginning of the industry until 1902, has each year exceeded 50 per cent of the total production of the United States, the single exception in 1902 having been due to the decrease in anthracite production caused by the long strike. The bituminous product of the state alone has for many years been from 35 to 40 per cent of the total bituminous coal output of the country. In 1902 Pennsylvania produced 98,574,367 short tons of bituminous coal out of a total of 260,216,844 short tons, the percentage for the state being 37.9. In 1889 Pennsylvania produced 36,174,089 tons, or 37.8 per cent of a total of 95,629,026 tons. At the census of 1880 the total bituminous output was 42,831,758 short tons, of which Pennsylvania produced 18,425,163 short tons, or 43 per cent.

The output of bituminous coal in the state of Pennsylvania during the fiscal year ending June 30, 1880, was, as stated above, 18,425,163 short tons and the value of this product was $18,567,129, or an average of $1.01 per ton. The total amount of wages paid during this year was $10,863,583. During the calendar year 1889, Pennsylvania produced a total of 36,174,089 short tons, or nearly double the output of the census year 1880. The value of this product at the mines was $27,953,315, or an average of $0.77 per short ton. The total amount paid in wages in 1889 was $20,738,647. In 1902 the total bituminous production of Pennsylvania was 98,574,367 short tons, or $2\frac{7}{10}$ times that of 1889, and $5\frac{1}{3}$ times that of 1880. The total value of the product in 1902 was $106,032,460, an average of $1.08 per ton, the higher value in 1902, as compared with that of the preceding censuses, being due principally to the demand created for bituminous coal by the shortage in the supply of anthracite. The total amount paid in wages in the bituminous coal mines of Pennsylvania in 1902 was $59,848,902. In 1880 the average wage cost per ton of coal produced was 59 cents; in 1889 it was 57 cents; and in 1902 it was 61 cents. In 1880 the wage cost was equal to 58.4 per cent of the average selling price per ton; in 1889 the wage cost was 74 per cent of the selling price; while in 1902, owing to the high values caused by the strike in the anthracite region, the wage cost was only 56.5 per cent of the selling value.

Of the 24 counties in Pennsylvania from which a production was reported in 1902, there were 2 counties, Fayette and Westmoreland, the output of which exceeded 18,000,000 short tons each. Two other counties, Allegheny and Cambria, each exceeded 10,000,000 tons; 4 others, Washington, Clearfield, Jefferson, and Somerset, each exceeded 5,000,000 tons; and 4 more, Armstrong, Center, Indiana, and Tioga, produced between 1,000,000 and 2,000,000 tons each. The 2 counties of Fayette and Westmoreland, together, produced nearly 5,000,000 tons more than the entire state of Illinois, which was, in 1902, the second state in the production of coal, and 50 per cent more than West Virginia, which ranked third among the coal producing states.

The statistics of production in Pennsylvania, by counties, in 1902, with the distribution of the product for consumption, are shown in the following table:

TABLE 44.—*Coal, bituminous, of Pennsylvania—production by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total..	72,938,204	1,429,568	1,541,454	22,665,141	98,574,367	$106,032,460	$1.08
Allegheny ..	11,146,343	447,835	162,160	163,231	11,919,569	12,339,715	1.04
Armstrong ..	1,727,498	37,833	27,848	.....	1,793,179	1,799,815	1.00
Beaver.....	205,549	17,255	2,358	.....	225,162	305,438	1.36
Bedford.....	638,928	5,822	8,692	143,806	797,248	1,051,677	1.32
Blair.....	192,828	1,125	3,440	140,811	338,204	373,437	1.10
Butler	427,592	21,647	4,927	.....	454,166	551,069	1.21
Cambria	9,420,308	165,942	186,049	789,536	10,561,835	12,895,501	1.22
Center	997,006	2,159	1,433	.....	1,000,598	1,002,407	1.00
Clarion	448,238	4,872	5,111	.....	458,221	577,638	1.26
Clearfield ...	6,873,639	81,423	83,560	296,163	7,334,785	8,414,670	1.15
Elk	716,624	19,442	12,682	7,484	756,182	735,622	0.97
Fayette	6,568,460	251,521	395,855	11,822,222	18,988,058	18,930,437	1.00
Huntingdon	387,751	8,485	8,326	55,923	460,485	685,680	1.49
Indiana.....	1,447,320	3,813	17,449	186,699	1,655,281	1,848,822	1.12
Jefferson....	4,825,820	17,737	60,593	1,179,344	6,083,494	5,168,321	0.85
Lawrence...	190,190	17,706	4,549	.....	212,445	264,546	1.25
Mercer.....	597,447	8,152	23,114	.....	628,713	673,455	1.07
Somerset....	5,723,387	32,430	105,231	50,278	5,911,326	7,593,413	1.28
Tioga	1,126,097	16,299	7,453	.....	1,149,849	1,761,098	1.53
Washington.	8,348,994	44,753	136,207	.....	8,529,954	8,805,995	1.03
Westmoreland	10,426,183	221,817	343,867	7,819,644	18,811,511	19,626,499	1.04
Other counties[1]	502,002	1,500	600	.....	504,102	627,205	1.24

[1] Includes Clinton, Greene, and Lycoming.

The census returns for 1902 show that 236 corporations were engaged in bituminous coal mining operations in Pennsylvania. Of these, 225 reported their capitalization, showing a total capital stock issue of 2,585,468 shares, the par value aggregating $180,338,033. The dividends paid during the year amounted to $8,978,084, while assessments were levied to the amount of $27,600.

The expenses reported for the mining of bituminous coal in Pennsylvania, exclusive of interest on bonds and the costs of the sales departments, were $78,869,528. The statistics for the industry, by counties, the production of which amounted to 200,000 tons or more, are shown in the following table:

TABLE 45.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	1,023	514	3,880	$4,142,497	92,095	$59,848,902	$474,679	985	$6,178,975	$8,224,475	98,574,367	$106,032,460
Allegheny	87	27	315	330,705	10,618	7,956,809	5,024	14	564,040	957,896	11,919,569	12,339,715
Armstrong	24	17	72	90,055	2,239	1,278,002	1,060	3	80,900	204,651	1,793,179	1,799,815
Beaver	7	7	19	19,542	264	174,385	.....	.....	19,446	19,406	225,162	305,438
Bedford	23	11	99	109,814	1,059	732,635	.....	.....	65,334	79,163	797,248	1,051,677
Blair	7	3	22	27,392	386	240,409	6,716	22	24,641	41,019	338,204	373,437
Butler	19	14	36	37,057	674	392,258	1,622	5	28,573	27,887	454,166	551,069
Cambria	136	76	439	548,505	10,902	6,893,398	351,635	634	961,433	1,015,180	10,561,835	12,895,501
Center	25	16	39	33,133	995	554,419	351	2	50,062	33,934	1,000,598	1,002,407
Clarion	28	26	35	23,554	492	312,411	.....	.....	25,077	38,390	458,221	577,638
Clearfield	163	79	333	326,842	7,148	4,735,232	4,942	27	707,579	480,433	7,334,785	8,414,670
Fayette	129	55	506	521,671	14,071	9,468,800	10,624	20	650,486	1,392,315	18,988,058	18,930,437
Huntingdon	16	11	22	27,826	598	395,537	11,000	27	19,744	45,503	460,485	685,680
Indiana	25	17	76	90,003	1,595	1,069,067	100	3	75,635	154,133	1,655,281	1,848,822
Jefferson	31	10	98	90,303	6,314	3,751,144	24,174	42	554,254	515,103	6,083,494	5,168,321
Lawrence	8	7	28	22,212	368	195,474	.....	.....	15,755	15,713	212,445	264,546
Mercer	9	9	36	30,959	766	427,909	439	2	27,887	60,337	628,713	673,455
Somerset	65	32	216	212,560	6,103	3,469,264	519	3	744,728	543,477	5,911,326	7,593,413
Tioga	24	17	57	49,636	1,668	1,212,915	63	4	87,120	80,329	1,149,849	1,761,098
Washington	53	18	673	841,779	6,978	5,028,521	.....	.....	565,590	883,942	8,529,954	8,805,995
Westmoreland	133	55	670	673,996	17,210	10,618,061	57,010	177	843,729	1,591,862	18,811,511	19,626,499
Other counties[1]	11	7	39	34,893	1,647	942,252	.....	.....	66,962	93,802	1,260,284	1,362,827

[1] Includes Clinton, Elk, Greene, and Lycoming. (Clinton and Elk counties each had a production exceeding 200,000 tons, but are not shown separately in order to avoid disclosing the operations of individual operators.)

Tennessee.—The great Appalachian coal fields cross the eastern central portion of Tennessee from northeast to southwest, the northern limit extending from Cumberland Gap, in Claiborne county, on the east, to Isham, in Scott county, on the west, a distance of about 45 miles. The coal bearing area narrows considerably toward the south, until near the center of the state, where it again widens out and is divided into two separate parallel basins. Farther south, in Alabama, it broadens still more, and covers nearly 50 per cent of the northern half of that state.

The coal fields of Tennessee are divided into two principal districts, the Jellico, in the northern half, and the Chattanooga, in the southern portion, the geographic division being made by the Emery river, a branch of the Tennessee river, which crosses the field from west to east through the southern portion of Morgan county. The Jellico district is subdivided into three distinct basins, the Jellico and the Middlesboro basins on the north, both of which extend into Kentucky, and the Wartburg basin, in the southern portion of the district. The Chattanooga district is divided into two long parallel basins referred to above, the one to the east being known as the Walden, and the one to the west as the Sewanee.

The Middlesboro basin, the northeastern extremity of the field in Tennessee, embraces portions of Campbell and Claiborne counties in Tennessee, and Bell county in Kentucky. It is a long, narrow syncline, extending in a northeast-southwest direction, and separated from the Jellico basin on the northwest by an unproductive area known as the Pineville anticline. The basin contains several coal beds of workable thickness, but only one, known locally as the Bryson bed, is mined at the present time.

The Jellico basin forms the western part of the coal field in northern Tennessee, and embraces portions of Scott and Campbell counties, in that state, and portions of Whitley and Knox counties, in Kentucky. The coal bearing formations in this basin are thinner than those in the Middlesboro basin, thinning out rapidly toward the northwest. The number and thickness of the coal beds also decrease in this portion. The principal development has been in the eastern part of the basin, along the line of the Southern Railway, where what is known as the Jellico bed is extensively worked. The coal from this bed is well known as a high-grade steam coal.

The Wartburg basin, in the southern portion of the Jellico district, underlies portions of Morgan, Anderson, and Scott counties. The principal developments have been along the eastern border, Oliver Springs, Briceville, and Coal Creek being the chief mining centers.

In the Chattanooga district the Walden basin, on the east, extends through portions of Roane, Rhea, Hamilton, and Marion counties, in a long, narrow belt running from northeast to southwest. The developments have been principally on the eastern border, along the line of the Cincinnati Southern Railway.

The Sewanee basin lies west of the Sequatchie valley, which separates it from the Walden basin. A large portion of the workable coal in this basin is found in what is known as the Sewanee bed, which, next to the Pittsburg bed of Pennsylvania, is probably the most regular and persistent in the United States. The Sewanee bed extends to the northern part of the state and

into Kentucky, where, however, it is at greater depth and is not worked at present.

As in the case of the neighboring states of Kentucky and Alabama, the earliest official record of coal production in Tennessee was that for the census year 1860, when 165,300 tons were reported, although it is known that some coal was mined in all of these states prior to and during the Civil War. The census of 1870 reported the coal production of Tennessee as 149,428 short tons. The Tenth Census, covering the fiscal year ending June 30, 1880, reported the production of the state at 495,131 short tons, valued at $629,724, an average of $1.27 per ton. The Eleventh Census showed the total production of the state to be 1,925,689 short tons, valued at $2,338,309, an average of $1.21 per ton. The increase in production from the Tenth to the Eleventh Census was 289 per cent, and the value of the product increased 271 per cent during the same period. In 1902 the production of Tennessee amounted to 4,382,968 short tons, valued at $5,399,721, an average of $1.23 per ton.

The statistics of production during 1902, by counties, with the distribution of the product for consumption, are shown in Table 46.

TABLE 46.—*Coal production of Tennessee, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	3,417,409	88,369	63,283	813,907	4,382,968	$5,399,721	$1.23
Anderson	751,687	3,201	4,388	.....	759,276	892,437	1.18
Campbell	488,429	27,913	17,823	120,000	654,165	978,575	1.50
Claiborne	694,987	15,710	4,900	33,168	748,765	815,285	1.09
Cumberland	107,450	650	1,482	.....	109,582	105,271	0.96
Grundy	264,093	622	2,658	65,177	332,550	404,855	1.22
Marion	221,116	13,858	714	76,758	312,446	456,436	1.46
Morgan	357,940	1,408	6,696	103,598	469,642	518,374	1.10
Rhea	56,744	7,461	3,389	172,103	239,697	282,838	1.18
Scott	74,480	6,496	5,640	11,913	98,529	143,538	1.46
Other counties[1]	400,483	11,050	15,593	231,190	658,316	802,112	1.22

[1] Includes Bledsoe, Franklin, Hamilton, Overton, Roane, Sequatchie, and White.

Of the 16 coal producing counties in the state of Tennessee, there were 7 the output of which in 1902 exceeded 200,000 tons each. The statistics of the industry during 1902 are shown in the following table, the 7 counties being given separately:

TABLE 47.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	84	73	418	$381,939	6,220	$3,213,532	$14,094	71	$432,029	$390,561	4,382,968	$5,399,721
Anderson	13	8	58	55,600	1,091	535,795	9,247	37	109,119	74,238	759,276	892,437
Campbell	15	13	77	78,482	943	577,738	4,450	31	49,310	58,756	654,165	978,576
Claiborne	8	8	54	52,920	736	424,852	.....	.....	93,259	55,090	748,765	815,285
Grundy	4	3	21	17,129	495	264,828	.....	.....	30,871	28,346	332,550	404,855
Marion	6	5	42	34,745	653	303,544	.....	.....	45,611	44,989	312,446	456,436
Morgan	12	12	43	31,090	365	173,167	.....	.....	24,548	26,657	469,642	518,374
Rhea	6	4	21	14,317	416	190,625	.....	.....	25,623	24,476	239,697	282,838
Other counties[1]	20	20	102	97,656	1,521	742,983	397	3	53,688	78,009	866,427	1,050,921

[1] Includes Bledsoe, Cumberland, Franklin, Hamilton, Overton, Roane, Scott, Sequatchie, and White.

Texas.—The coal areas of Texas are included in the Western coal field, which finds its true southern limit in the central part of the state. The Texas areas, however, are separated from the main body of the Western field by the Arbuckle mountains, in the Chickasaw and Choctaw nations of Indian Territory.

Extensive beds of lignite are found underlying the greater part of the prairie region from the northeastern corner of the state to the Rio Grande, and an isolated basin of bituminous coal occurs in the southwestern portion of the state, at Eagle Pass. The principal bituminous mines are located along the line of the Texas and Pacific Railway at Weatherford, in Parker county; at Thurber, in Erath county; and at Bridgeport, in Wise county. Lignite coal is produced in considerable quantities at Rockdale, in Milam county, and at Calvert, in Robertson county. A considerable amount of bituminous coal is also produced at Eagle Pass, in Maverick county, and at Santo Tomas, near Laredo, in Webb county.

No report of coal mining in Texas was made at the Tenth Census. The Eleventh Census reported a total production for 1889 of 128,216 short tons, having a total value of $340,620, or an average of $2.66 per ton. The total amount paid in wages during that year was $256,834. In 1902 the production amounted to 901,912 short tons, valued at $1,477,245, or an average of $1.64 per ton. The wages paid in 1902 amounted to $991,391. Of the total product in 1902, 696,005 short tons, worth $1,326,155, were bituminous coal, and 205,907 short tons, worth $151,090, were of the lignite variety. There were 7 counties in which bituminous coal was produced in 1902 and 9 which produced lignite. The production of lignite in the state during the census year was considerably reduced by reason of the large production and use of crude petroleum for fuel.

The following table shows the production of coal in Texas in 1902, by groups of counties, and the distribution of the product for consumption:

TABLE 48.—*Coal production of Texas, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	887,167	5,591	9,154	901,912	$1,477,245	$1.64
Bituminous:						
Eastland, Erath, Maverick, Parker, Webb, Wise, Young	683,345	4,881	7,779	696,005	1,326,155	1.91
Lignite:						
Anderson, Bastrop, Houston, Medina, Milam, Rains, Robertson, Shelby, Wood	203,822	710	1,375	205,907	151,090	0.73

Utah.—The coal fields of Utah belong to the areas included in the Rocky mountain region. Comparatively little is known in regard to the total areas underlain by coal in this state, as they have received less attention than those in most of the other states of the Rocky mountain system. The principal exploration and developments have been along the lines of transportation, and even here only in somewhat scattered localities. It is therefore impossible to estimate with any degree of accuracy the entire productive area. The known coal fields are estimated to contain about 2,000 square miles. The principal field is located in Carbon, Emery, and Uinta counties, and is an extension westward of the Grand River field of Colorado. So far as known, it exists in a comparatively narrow strip running first southwest and then northwest from the Colorado state line, between the 39th and 40th degrees of latitude. It is traversed near its western limit by the Rio Grande Western Railway, along the line of which the producing mines are located. There is also a somewhat extensive area in the southwestern portion of the state, and one in the southern central portion, neither of which has been developed to any extent on account of its distance from railroad transportation.

The quality of the Utah coal varies from lignite to semibituminous, but none of the lignite beds are operated at the present time. The principal production is of bituminous coal, some of which makes a fairly good coke. Of the total production in 1902, 230,215 short tons were made into coke in Carbon county, which is the principal coal producing county in the state, 95.8 per cent of the total output in 1902 being mined there.

The Tenth Census, covering the fiscal year ending June 30, 1880, reported the coal production of Utah at 14,748 short tons, valued at $33,645. During the calendar year 1889 the output, as reported at the Eleventh Census, was 236,651 short tons, valued at $377,456, or an average of $1.59 per ton. In 1902 the production was 1,574,521 short tons, valued at $1,797,454, or an average of $1.14 per ton.

The statistics of production and distribution, by counties, in 1902 are shown in the following table:

TABLE 49.—*Coal production of Utah, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	1,277,343	21,531	45,432	230,215	1,574,521	$1,797,454	$1.14
Carbon	1,226,542	8,501	42,431	230,215	1,507,689	1,697,986	1.13
Emery	.....	4,718	.....	.....	4,718	5,250	1.11
Summit	42,460	4,062	3,001	.....	49,523	70,136	1.42
Uinta	1,200	2,340	.....	.....	3,540	6,250	1.77
Iron, Sanpete	7,141	1,910	.....	.....	9,051	17,832	1.97

The statistics of the industry, Carbon county being given separately, are shown in the following table:

TABLE 50.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	39	36	67	$80,065	1,576	$1,254,090	$340	2	$94,123	$196,114	1,574,521	$1,797,454
Carbon	10	8	59	73,255	1,494	1,191,873	340	2	87,057	185,188	1,507,689	1,697,986
Other counties[1]	29	28	8	6,810	82	62,217	.....	.....	7,066	10,926	66,832	99,468

[1] Includes Emery, Iron, Sanpete, Summit, and Uinta.

Virginia.—There are three distinct coal producing areas in Virginia. The first of these is the Richmond basin, embracing Henrico, Chesterfield, and Goochland counties, and parts of Powhatan and Amelia, in the eastern portion of the state. This area is placed first, not because of its importance in production at present, but because of the fact that the earliest production of bituminous coal in the United States, as far as known, was obtained from it. The second is an isolated area found in Montgomery and Pulaski counties, in the

southwestern portion of the state, where some semi-anthracite is produced, principally for local consumption. The third, and by far the most important in point of production and area, is the portion of the great Appalachian region which crosses the southwestern corner of the state. A portion of this area, in Tazewell county, contains the famous Pocahontas bed, one of the highest grades of coking and steam coal to be found in the United States. The coal beds in Wise county appear to be a continuation of the Middlesboro coal series of Kentucky. There are found within this coal bearing series in Wise county six different coal seams, all of which are of workable thickness. Developments in Wise county began with the construction of the Clinch valley branch of the Norfolk and Western Railway. It is now by far the most important coal producing county in the state, 76.1 per cent of the entire output being mined in this district.

Although now of little commercial importance, the Richmond basin of Virginia was the first bituminous coal area in the United States to be developed, it having been reported that about fifty-four thousand tons were produced here in 1822. Ten years later, in 1832, the production is reported to have amounted to 132,000 short tons. With the development of other areas more favorably endowed in quality of coal and in ease of mining it, the importance of the Richmond basin as a source of supply rapidly waned, and by the middle of the last century production had almost entirely ceased. Attempts to reestablish the industry in this district in recent years have proved expensive and unsuccessful, and although a small amount continues to be mined for restricted local consumption the field is practically abandoned.

With the development of the Pocahontas region which followed the construction of the Norfolk and Western Railway in 1883, Virginia resumed some importance as a coal producing state. In the census year ending June 30, 1880, the production of the state was reported as 43,079 short tons, valued at $99,802. The first coal shipped from the Pocahontas or Flat Top region (which includes McDowell and Mercer counties in West Virginia as well as Tazewell county in Virginia) was from the Virginia side of the line. This shipment was made by the Southwest Virginia Improvement Company from Pocahontas, and amounted to 68,127 short tons. In the calendar year 1889, according to the Eleventh Census, the production of the state was 865,786 short tons, valued at $804,475, all but about 200,000 tons of this product being from the Pocahontas mines in Tazewell county. The development work in Wise county began in 1891 with the building of the Clinch valley extension of the Norfolk and Western Railway. Shipments began from this new field in 1893. In 1902 the production was 3,182,993 short tons, valued at $2,543,595. The average price per ton in 1889 was 93 cents. In 1902 it was 80 cents.

The statistics of production, by counties, and the distribution of the product for consumption are shown in the following table:

TABLE 51.—*Coal production of Virginia, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total...	1,444,559	20,916	32,447	1,685,071	3,182,993	$2,543,595	$0.80
Montgomery	7,911	4,875	.....	.....	12,786	30,716	2.40
Tazewell	538,854	9,292	13,216	162,451	723,753	684,663	0.95
Wise	875,257	6,809	17,731	1,522,620	2,422,417	1,782,583	0.74
Chesterfield, Pulaski	22,537	.....	1,500	.....	24,037	45,633	1.90

The statistics for the mining of coal in Virginia, in 1902, by counties, are as follows:

TABLE 52.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	26	22	179	$155,930	3,004	$1,407,867	$27,600	52	$315,384	$215,458	3,182,993	$2,543,595
Tazewell	3	3	39	37,050	477	268,715	.....	.....	122,075	57,515	723,753	684,663
Wise	12	8	133	114,855	2,419	1,101,863	27,600	52	190,104	155,582	2,422,417	1,782,583
Other counties[1]	11	11	7	4,025	108	37,289	.....	.....	3,205	2,361	36,823	76,349

[1] *Includes Chesterfield, Montgomery, and Pulaski.*

Washington.—The coal fields of Washington are found in the western and central portions of the state. There are four principal basins or areas, three of them in the western part of the state, lying in an almost directly north and south line, and one in Kittitas county, near the center. The three former are known as the Northern and Southern Puget Sound coal fields and the Southwestern coal field. The field in Kittitas county, in the central portion of the state, has been designated as the Roslyn basin, from the location of some of its principal operations. The Northern Puget Sound field includes the coal mines located in Skagit and Whatcom counties, in the northwestern corner of the state. The Southern Puget Sound coal field includes the coal areas

in King, Pierce, and Thurston counties, east of the cities of Seattle and Tacoma. The Southwestern field is a small one, lying directly south of Puget sound. The Roslyn field, in Kittitas county, is the most important one in point of production, nearly one-half of the entire output of the state being mined in this county.

Washington is the only one of the Pacific coast states producing true coal, all of the product of California and Oregon being lignite. Some of the Washington coals approach anthracite in character, and some natural coke has been found. A small amount of lignite is also produced in the state. Some of the bituminous coals make a fair grade of coke, and some coke is manufactured in the state each year.

Coal mining began in the middle of the last century, in the vicinity of Bellingham bay, in the northwestern part of the then territory of Washington. Operations in this locality were discontinued in 1879 and have not been resumed. Active development of the other coal fields of the state began about 1882, since which time there has been an almost steady growth in output. At the Tenth Census the coal production from Washington was 145,015 short tons, valued at $389,046. In 1889, according to the Eleventh Census, the output was 1,030,578 short tons, valued at $2,393,238, or an average of $2.32 per ton. Washington's coal production in 1902 was 2,681,214 short tons, valued at $4,572,295, or an average of $1.71 per ton.

The amount paid in wages in 1889 was $1,747,080. The wages paid in 1902 amounted to $3,220,263.

In the following table are shown the details of production, by counties, during 1902, with the distribution of the product for consumption:

TABLE 53.—*Coal production of Washington, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	2,498,177	29,287	97,003	56,747	2,681,214	$4,572,295	$1.71
King	940,140	18,017	59,731	.....	1,017,888	1,988,325	1.95
Kittitas	1,224,371	7,805	18,744	.....	1,250,920	1,712,780	1.37
Pierce	311,630	2,539	13,288	56,146	383,603	799,774	2.08
Other counties[1]	22,036	926	5,240	601	28,803	71,416	2.48

[1] Includes Lewis, Skagit, and Whatcom.

The statistics for the industry are shown in the following table, counties having an output of 200,000 tons or more being given separately:

TABLE 54.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	27	22	160	$221,915	3,931	$3,220,263	$200	3	$180,213	$473,254	2,681,214	$4,572,295
King	13	8	61	77,938	1,522	1,216,451	200	3	93,008	190,352	1,017,888	1,988,325
Kittitas	4	4	28	59,010	1,525	1,332,133	.....	.....	29,092	165,160	1,250,920	1,712,780
Pierce	7	7	61	75,375	775	589,611	.....	.....	53,807	106,151	383,603	799,774
Other counties[1]	3	3	10	9,592	109	82,068	.....	.....	4,306	11,598	28,803	71,416

[1] Includes Lewis, Skagit, and Whatcom.

West Virginia.—In the amount of area underlaid by coal West Virginia ranks first among the Eastern states, the coal fields of which belong to the Appalachian system. Nearly the entire state (17,280 square miles in all) is included in the coal bearing regions. Within the boundaries of this great coal field in West Virginia there are no less than 21 workable coal seams, chief among which is the Pittsburg bed, which underlies a large portion of southeastern Ohio, southwestern Pennsylvania, and furnishes the famous Big Vein of Maryland's coal areas. This great bed in West Virginia extends from the northern boundaries of the state, where it occurs at the bottom of the upper productive measures, to the Flat Top or Pocahontas districts, in the southern portion, where it is found among the lower coal measures. In the northern part of the state the Pittsburg bed attains a thickness of from 14 to 16 feet, and is exceptionally free from impurities in the form of slate partings or sulphur bands.

No state in the Union is more favored by nature in the number and extent of its bituminous coal seams and in the variety of high-grade qualities of coal than is West Virginia. The best grades of coking, gas, steam, and domestic coals are produced within its borders.

The principal developments in coal production have been along the lines of the three railroad systems crossing the state from east to west. These are the Baltimore and Ohio, which crosses the northern part of the state from Piedmont to Parkersburg, and the Chesapeake and Ohio, and the Norfolk and Western, which traverse the southern coal fields, the former from Hinton and the latter from Pocahontas, on the east, to the Ohio river, on the west. The Coal and Coke Railroad, now building from Elkins to Charleston, and the extensions by the Wabash interests, which have secured control of the West Virginia Central and Pittsburg Railway, are expected to develop some of the rich coal lands in

the interior of the state in the near future. The Deepwater Railroad, building from the station of Deepwater, on the Chesapeake and Ohio, to the Norfolk and Western Railway, will reach hitherto untouched areas lying between those railroads.

West Virginia ranked third in 1902 among the coal producing states, with Pennsylvania first and Illinois second; but with the completion of the railroad extensions now in progress and the additional tonnage which will result therefrom, the chances are that it will in a few years, at most, rank next to Pennsylvania.

Coal production in West Virginia began about 1860 and was entirely from the Piedmont region, to which the Baltimore and Ohio Railroad gave access. Until the completion of the Chesapeake and Ohio and the Norfolk and Western railways all of the output was from the northern part of the state. The Tenth Census, covering the fiscal year ending June 30, 1880, reported the production of coal in West Virginia at 1,829,844 short tons, valued at $2,013,671, or an average of $1.10 per ton. In the calendar year 1889, according to the Eleventh Census, the production was 6,231,880 short tons, valued at $5,086,584, or an average of 82 cents per ton. In 1902 the production amounted to 24,570,826 short tons, valued at $24,748,658, or an average of $1.01 per ton.

A relatively small amount of coal is consumed at iron works in the vicinity of Wheeling, at salt works along the Ohio river, and in some unimportant manufacturing establishments throughout the state. But with these exceptions all of the product, save that for household consumption, is shipped out of the state or is used by the railroads engaged in its transportation. Large quantities are shipped from the eastern parts of the state to the seaports of Baltimore, Norfolk, and Newport News, and from these ports to coastwise and foreign markets, and from the western fields by rail and river to interior and gulf points.

The production by counties in 1902, with the distribution of the product for consumption, is shown in the following table:

TABLE 55.—*Coal production of West Virginia, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	*19,847,321*	*623,903*	*267,885*	*3,831,717*	*24,570,826*	*$24,748,658*	*$1.01*
Barbour	455,511	21,835	9,801	25,578	512,725	560,068	1.09
Braxton	.....	4,910	.....	.....	4,910	5,665	1.15
Brooke	36,350	3,847	175	.....	40,372	53,868	1.33
Fayette	3,979,127	48,570	54,731	692,684	4,775,112	5,832,098	1.22
Gilmer	.....	3,440	.....	.....	3,440	3,480	1.01
Grant	28	2,748	.....	.....	2,776	3,226	1.16
Hancock	25,628	53,721	1,056	.....	80,400	108,953	1.36
Harrison	1,935,727	22,920	26,166	81,784	2,066,597	1,985,078	0.96
Kanawha	1,765,272	31,423	13,341	38,581	1,848,617	2,226,383	1.20
Lewis	.....	*540*	.....	.....	*540*	*405*	*0.75*
McDowell	3,761,702	67,210	45,514	1,585,229	5,459,655	4,768,455	0.87
Marion	2,817,880	24,841	54,676	499,797	3,397,194	3,090,184	0.91
Marshall	159,484	79,090	5,217	.....	243,791	245,350	1.01
Mason	73,105	68,587	3,035	.....	144,727	148,254	1.02
Mercer	993,838	9,166	6,291	238,984	1,248,279	1,100,423	0.88
Mineral	509,796	5,096	101	.....	514,993	450,168	0.87
Mingo	794,358	7,844	3,972	.....	806,174	786,165	0.98
Monongalia	95,774	1,948	437	55,320	153,474	124,968	0.81
Ohio	137,981	90,752	1,508	.....	230,241	243,758	1.06
Preston	512,641	23,146	14,553	40,096	590,436	698,447	1.18
Putnam	182,087	1,146	1,026	.....	184,259	274,992	1.49
Raleigh	273,548	3,327	4,942	.....	281,817	359,251	1.27
Randolph	310,929	4,965	625	83,626	400,145	410,945	1.03
Taylor	353,014	13,474	2,162	.....	368,650	339,459	0.92
Tucker	634,094	23,792	18,156	490,038	1,166,080	858,245	0.74
Other counties[1]	39,452	5,570	400	.....	45,422	70,370	1.55

[1] Includes Clay, Nicholas, Ritchie, and Upshur.

The statistics of the industry in the counties, the production of which was 200,000 short tons or more, are shown in the following table:

TABLE 56.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	522	406	1,987	$1,766,448	23,914	$13,524,429	$23,092	79	$2,087,528	$2,327,377	24,570,826	$24,748,658
Barbour	26	25	44	41,560	621	336,446	.....	.....	12,865	85,550	512,725	560,068
Fayette	84	63	427	396,912	5,227	3,131,412	.....	.....	533,673	476,728	4,775,112	5,832,098
Harrison	62	40	243	220,825	1,898	1,080,431	.....	.....	266,012	280,506	2,066,597	1,985,078
Kanawha	54	37	222	159,379	2,396	1,291,561	.....	.....	170,191	181,840	1,848,617	2,226,383
McDowell	46	43	305	264,890	4,648	2,509,446	13,580	39	501,367	360,261	5,459,655	4,768,455
Marion	29	12	225	216,382	2,457	1,407,444	1,500	3	196,974	242,814	3,397,194	3,090,184
Marshall	5	5	18	15,051	215	152,135	.....	.....	9,236	17,377	243,791	245,350
Mercer	14	13	78	76,102	990	545,140	4,050	6	131,240	159,983	1,248,279	1,100,423
Mineral	16	11	22	14,897	469	297,486	300	3	11,023	40,840	514,993	450,168
Mingo	22	12	77	63,960	1,006	480,180	.....	.....	89,527	49,907	806,174	786,165
Ohio	12	12	22	15,841	287	172,321	.....	.....	11,411	15,724	230,241	243,758
Preston	41	37	53	39,785	644	370,285	1,000	7	12,813	89,835	590,436	698,447
Raleigh	6	6	33	28,969	307	204,570	.....	.....	40,885	15,894	281,817	359,251
Randolph	10	7	44	42,249	291	186,369	2,239	15	8,040	33,863	400,145	410,945
Taylor	18	17	33	29,050	335	192,381	.....	.....	28,215	34,580	368,650	339,459
Tucker	9	2	66	81,286	1,270	675,394	.....	.....	20,450	143,254	1,166,080	858,245
Other counties[1]	68	64	75	59,810	853	491,428	423	6	43,576	98,421	665,320	794,181

[1] Includes Braxton, Brooke, Clay, Gilmer, Grant, Hancock, Lewis, Mason, Monongalia, Nicholas, Putnam, Ritchie, and Upshur.

Wyoming.—The coal fields of Wyoming are included among those of the Rocky mountain area, although most of the productive areas are in the plains region, east of the mountain ranges. There are no less than fourteen different and rather widely separated fields distributed throughout the state. These different areas are known as (1) the Black Hills field, located in Converse and Weston counties, in the northeastern part of the state; (2) the Casper field, a small bituminous area in the eastern part of Natrona county; (3) the Carbon field, and (4) the Hanna field, both in Carbon county; (5) the Rawlins field, in the western part of Carbon and eastern part of Sweetwater county; (6) the Rock Springs field, and (7) the Henrys Fork field, both in Sweetwater county; (8) the Hams Fork, (9) the Almy, and (10) the Sublette fields in Fremont county; (13) the Bighorn, and (14) the Powder river fields in Bighorn county, in the north-central part of the state.

The principal developments have been in the several fields of Carbon, Sweetwater, and Uinta counties, which are traversed by the Union Pacific Railroad, and, to a less extent, in Converse, Natrona, Sheridan, and Weston counties, reached by a branch of the Burlington system. Sweetwater and Uinta counties together produced 72 per cent of the state's total output in 1902.

Coal mining in what is now the state of Wyoming began in 1865 with a product of 800 tons, so far as recorded. In 1868 the production of the then territory amounted to 6,925 short tons, and in 1870 the output was 105,295 short tons. The Tenth Census reported a production of 589,595 short tons, valued at $1,080,451, or an average of $1.83 per ton. According to the Eleventh Census, the production in the calendar year 1889 was 1,388,947 short tons, valued at $1,748,617, or $1.26 per ton. In 1902 the output was 4,429,491 short tons, worth $5,236,339, an average of $1.18 per ton. At the Tenth Census the total wages paid were $579,566; at the Eleventh Census the wages paid amounted to $1,553,947, and in 1902 they were $3,207,545.

The statistics of production, by counties, in 1902, with the distribution of the product for consumption, are shown in the following table:

TABLE 57.—*Coal production of Wyoming, by counties: 1902.*

COUNTY.	Loaded at mines for shipment (short tons).	Sold to local trade and used by employees (short tons).	Used at the mines for steam and heat (short tons).	Made into coke (short tons).	Total quantity (short tons).	Total value.	Average price per ton.
Total	4,144,450	37,101	209,455	38,485	4,429,491	$5,236,339	$1.18
Carbon	352,667	3,374	26,166	.....	382,207	461,338	1.21
Converse	65,184	945	6,200	.....	72,329	95,690	1.32
Sweetwater	1,517,583	8,886	68,871	.....	1,595,340	1,821,545	1.14
Uinta	1,520,636	14,945	59,527	225	1,595,333	1,756,365	1.10
Other counties[1]	688,380	8,951	48,691	38,260	784,282	1,101,401	1.40

[1] Includes Bighorn, Crook, Fremont, Johnson, Natrona, Sheridan, and Weston.

The statistics for the industry during 1902 are shown, by counties producing 200,000 tons or more, in the following table:

TABLE 58.—SUMMARY BY COUNTIES HAVING A PRODUCTION OF 200,000 TONS OR OVER: 1902.

COUNTY.	Number of mines.	Number of operators.	SALARIED OFFICIALS, CLERKS, ETC.		WAGE-EARNERS.		CONTRACT WORK.		Miscellaneous expenses.	Cost of supplies and materials.	PRODUCT.	
			Number.	Salaries.	Average number.	Wages.	Amount paid.	Number of employees.			Quantity (short tons).	Value.
Total	36	22	125	$159,153	4,197	$3,207,545	$12,747	17	$224,947	$669,328	4,429,491	$5,236,339
Carbon	5	4	19	23,347	486	362,299	.....	.....	6	59,144	382,207	461,338
Uinta	9	3	42	51,921	1,289	1,085,018	.....	.....	148,428	311,072	1,595,333	1,756,365
Other counties[1]	22	15	64	83,885	2,422	1,760,228	12,747	17	76,513	299,112	2,451,951	3,018,636

[1] Includes Bighorn, Converse, Crook, Fremont, Johnson, Natrona, Sheridan, Sweetwater, and Weston. (Sweetwater and Weston counties each had a production exceeding 200,000 tons, but are not shown separately in order to avoid disclosing the operations of individual operators.)

Occurrence.—The bituminous coal fields are scattered widely over the United States and include altogether an area of something over three hundred and thirty-five thousand square miles. It has been customary to consider as bituminous coal all varieties from lignite to semianthracite. The different varieties merge into each other by such indistinguishable gradations that no absolute line of demarcation is possible. The general term of "bituminous" coal as used in this report includes, therefore, lignite or brown coal, cannel, block, splint, semibituminous, semianthracite, and, as stated, the small anthracite product of Colorado and New Mexico.

The bituminous areas have been divided by the United States Geological Survey into the following subdivisions: (1) Triassic, (2) Appalachian, (3) Northern, (4) Central, (5) Western, (6) Rocky Mountain, and (7) Pacific Coast. They are described briefly, as follows:

1. The Triassic field embraces the coal beds of the Triassic or New Red Sandstone formation, and is worked in the counties of Chesterfield and Henrico in Virginia (generally known as the Richmond basin), and

the coal along the Deep and Dan rivers in Chatham county, N. C. The earliest production of bituminous coal in the United States was made in the Richmond basin of Virginia. The first production from the small area in North Carolina was reported in the census year 1889. Only one commercial mine has been opened in the region and the production has not reached any large proportions during the fourteen years that the mine has been operated.

2. The Appalachian field, which extends from the northern part of Pennsylvania on the north to the central part of Alabama on the south, follows in a southwest direction the Appalachian mountain system. Its entire length is a little over 900 miles and ranges in width from 30 to 180 miles. The area of the coal fields of the Appalachian region is estimated at 70,807 miles, the productive area covering nearly all of western Pennsylvania, the eastern part of Ohio, the western part of Maryland, the southwestern corner of Virginia, nearly all of West Virginia, the eastern part of Kentucky, the east-central part of Tennessee, the northwestern corner of Georgia, and nearly all of northern Alabama.

All of the coals produced in this region are of a bituminous or semibituminous variety, except for a small amount of semianthracite mined in Montgomery county, in the southwestern part of Virginia. Within this region is found bituminous coal of nearly every variety of chemical composition and physical structure. Within its boundaries are found the famous Connellsville coking coal, in Fayette and Westmoreland counties, Pa.; the Clearfield and Pittsburg steam coals; the Youghiogheny river gas coals; the famous smithing coals of Blossburg, Pa., and Cumberland, Md.; the gas and coke producing coals of the upper Potomac and upper Monongahela rivers; the Massillon and Hocking coals of Ohio, noted for their domestic qualities and for their value in the iron reducing furnaces; the coking coals of the Pocahontas Flat Top region; the steam, gas, coking, and domestic coal of the New and Kanawha river series; the Jellico coals of southeastern Kentucky and northeastern Tennessee; and the excellent coking and steam coals of southeastern Tennessee, Alabama, and northwestern Georgia.

The production of bituminous coal in the Appalachian region during 1902 was 173,274,861 short tons. In 1889, at the taking of the Eleventh Census, this region produced 62,972,222 short tons, and in 1880, at the taking of the Tenth Census, it produced 29,834,622 short tons, showing an increase in 1902 of 110,302,639 tons over 1889 and of 143,440,239 tons over 1880.

3. The Northern coal field lies altogether in the lower peninsula of Michigan, between Lake Michigan and Lake Huron, extending from Jackson county on the south to Roscommon county on the north, and from Tuscola county on the east to Kent county on the west. It embraces an area of approximately 7,500 square miles. It is the only known coal field lying in the drainage basin of the St. Lawrence river within the limits of the United States. The northeastern edge of the field is penetrated by Saginaw bay, through which, with the Saginaw river, it is given easy access to Lake Huron and thence to the ports of the Great Lakes.

Although coal was produced in this region as early as 1835, it is only within the last few years that the production has amounted to any great importance. In 1880 the Northern coal field produced 100,800 short tons; in 1889 the output had fallen to 67,431 tons. The active development of the region really began in 1897 and by 1901 the production had amounted to 1,241,241 short tons. Labor troubles in the census year of 1902 reduced the output to 964,718 short tons.

4. The Central coal field includes all the coal producing areas of Indiana, Illinois, and western Kentucky. It extends from the northern part of Illinois (most of the central and southern parts of the state being underlain by workable coal seams) to the central part of western Kentucky. The field is estimated to contain an area of 42,900 square miles in Illinois, 9,300 square miles in Indiana, and 5,800 square miles in Kentucky, making a total for the entire field of 58,000 square miles. The coal field underlies 80 counties in Illinois, 26 in Indiana, and 20 in Kentucky, although coal is not at present mined in all of the counties in any of the three states.

It is from the Indiana portion of this field that most of the well-known "block" domestic coal is produced. In the Kentucky portion of the field the coal grades into a quality suitable for coking purposes, and considerable quantities of coke are produced in this portion of the field, although practically no coke is made in either Illinois or Indiana.

The Central coal field, while fourth in size among the coal fields of the United States, is second in producing importance. Illinois, which contains nearly three-fourths of the entire area, was second in 1902 among the coal producing states. The production from this entire field in 1902 was 46,133,024 short tons, an increase of a little over 180 per cent as compared with 1889, when the production was 16,240,314 tons, and of 466 per cent as compared with 1880, when the production was 8,150,195 tons.

5. The Western coal field forms a practically continuous belt of coal measure rocks from northern Iowa in a southwesterly direction through central Texas to the Rio Grande, a distance of 880 miles, and underlying a total of 94,076 square miles. It includes the coal bearing areas of Iowa, Missouri, Nebraska, Kansas, Indian Territory, Arkansas, and Texas.

Within its boundaries are found all the varieties in-

cluded under the general head of bituminous coal, from lignite to semianthracite, immense areas in Texas being underlain by lignite, while semianthracite is found in Indian Territory and Arkansas. Coking coals are produced in Indian Territory, cannel coal is produced in Missouri, and block coal is mined in Iowa. Most of the coal produced is of the dry, noncoking variety of bituminous coal.

The production in the census year of 1902 amounted to 20,727,495 short tons, as compared with 10,036,356 short tons in 1889 and 3,212,787 short tons in 1880. The development in this region during the last twenty years has been of extraordinary rapidity.

6. The Rocky Mountain coal field includes the productive areas in the states lying along the Rocky mountain range and also those of North Dakota, although the coal fields of the latter state do not lie within the Rocky mountain system. The states from which coal has been produced in this field are Colorado, Idaho, Montana, Nevada, North Dakota, Utah, and Wyoming, and the territory of New Mexico. Idaho and Nevada have produced insignificant amounts for purely local consumption. South Dakota has produced an insignificant amount of lignite, but none in the last few years. The known areas cover a little over one hundred thousand square miles of territory.

The production from the entire region in 1902 was 16,149,545 short tons, as compared with 5,048,413 short tons in 1889 and 1,067,314 short tons in 1880.

7. The Pacific Coast field embraces the coal producing areas in the 3 states bordering on the Pacific ocean—California, Oregon, and Washington. The coals are all of the Tertiary age and are largely lignitic in character. The only bituminous coal produced in the Pacific coast region is mined in Washington, all of the product from California and Oregon being lignite. Some of the bituminous coals in Washington possess good coking qualities, and some coke is made in the state each year.

The first production in this region was, so far as known, in California in 1861. The first coal mined in Washington was, so far as known, produced in 1880, and it was not until 1885 that any coal was reported to have been produced in Oregon. All of the growth in the last two decades has been in the Washington coal fields. The production in California has decreased since 1880. The production of Oregon in 1902 was about the same as in 1889, and 30 per cent more than in 1885. The production of Washington, however, has increased from 145,015 short tons in 1880 to 1,030,578 tons in 1889 and 2,681,214 tons in 1902. The production from the entire field has increased from 425,170 short tons in 1880 to 1,214,757 tons in 1889 and to 2,834,058 tons in 1902. A small production from Alaska, 2,212 tons, is included in this production for 1902.

Table 59 is a detailed summary of the anthracite coal industry by counties, and Table 60 is a detailed summary of the bituminous coal industry by states and territories.

TABLE 59.—COAL, PENNSYLVANIA ANTHRACITE—DETAILED SUMMARY, BY COUNTIES: 1902.

	Total.	Carbon.	Lackawanna.	Luzerne.	Northumberland.	Schuylkill.	Other counties.[1]
Number of mines	334	11	91	113	24	85	10
Number of operators	119	6	23	36	12	35	7
Character of ownership:							
Individual	9	1	.....	3	1	3	1
Firm	34	1	10	8	2	13	.....
Incorporated company	76	4	13	25	9	19	6
Salaried officials, clerks, etc.:							
Total number	3,014	87	483	843	350	1,098	153
Total salaries	$2,907,293	$82,814	$461,964	$839,080	$294,519	$1,108,728	$120,188
General officers—							
Number	134	5	28	42	6	49	4
Salaries	$363,584	$15,376	$38,630	$100,621	$34,423	$168,784	$5,750
Superintendents, etc.—							
Number	848	26	168	275	92	234	53
Salaries	$1,035,280	$26,394	$192,763	$330,956	$89,142	$351,857	$44,168
Foremen (below ground)—							
Number	998	23	147	248	129	406	45
Salaries	$812,891	$19,528	$140,497	$228,520	$94,543	$291,614	$38,189
Clerks—							
Number	1,034	33	140	278	123	409	51
Salaries	$695,538	$21,516	$90,074	$178,983	$76,411	$296,473	$32,081
Wage-earners:							
Aggregate average number	69,691	2,114	16,175	25,001	6,691	16,385	3,325
Aggregate wages	$38,716,113	$1,111,578	$9,535,166	$13,939,752	$3,551,366	$8,609,384	$1,968,867
Above ground—							
Total average number	27,964	1,014	6,042	9,474	2,579	7,594	1,261
Total wages	$12,133,983	$457,644	$2,601,875	$4,086,050	$1,093,726	$3,329,705	$564,983
Engineers, firemen, etc.—							
Average number	6,513	217	1,083	2,279	651	1,949	334
Wages	$3,921,505	$120,164	$703,183	$1,394,739	$359,674	$1,146,374	$197,371
Boys under 16 years—							
Average number	3,822	136	483	1,025	546	1,487	145
Wages	$780,153	$30,380	$98,475	$183,922	$124,436	$315,882	$27,058
All other wage-earners—							
Average number	17,629	661	4,476	6,170	1,382	4,158	782
Wages	$7,432,325	$307,100	$1,800,217	$2,507,389	$609,616	$1,867,449	$340,554
Below ground—							
Total average number	41,727	1,100	10,133	15,527	4,112	8,791	2,064
Total wages	$26,582,130	$653,934	$6,933,291	$9,853,702	$2,457,640	$5,279,679	$1,403,884
Miners—							
Average number	17,767	306	4,646	6,051	2,026	3,730	1,008
Wages	$14,364,005	$233,524	$4,360,543	$5,022,847	$1,389,177	$2,551,587	$806,327
Miners' helpers—							
Average number	6,921	248	1,167	3,025	546	1,709	226
Wages	$3,643,893	$128,134	$589,030	$1,595,735	$278,052	$936,227	$116,715
Boys under 16 years—							
Average number	742	23	165	284	49	191	30
Wages	$182,362	$5,750	$43,806	$67,024	$12,264	$45,162	$8,356
All other wage-earners—							
Average number	16,297	523	4,155	6,167	1,491	3,161	800
Wages	$8,391,870	$286,526	$1,939,912	$3,168,096	$778,147	$1,746,703	$472,486
Average number of wage-earners employed each month:							
Men 16 years and over—							
January	110,018	3,530	25,062	39,829	11,273	25,516	4,808
February	110,760	3,493	25,066	39,912	11,193	26,190	4,906
March	109,165	3,320	24,872	38,469	11,140	26,486	4,878
April	109,190	3,364	24,590	39,156	11,126	25,981	4,973
May	53,169	1,945	13,178	20,212	3,448	11,571	2,815
June	16,301	460	2,428	9,156	526	2,394	1,337
July	6,493	209	2,114	2,752	74	702	642
August	7,610	220	2,955	2,947	79	775	634
September	8,136	255	3,165	3,131	84	840	661
October	34,773	1,044	11,117	10,895	2,227	6,916	2,574
November	105,516	2,596	25,844	37,745	10,794	23,855	4,682
December	110,393	3,024	25,933	40,100	11,188	25,258	4,890
Boys under 16 years—							
January	8,362	303	1,100	2,483	1,142	3,043	291
February	8,468	265	1,089	2,470	1,153	3,196	295
March	8,419	273	1,006	2,423	1,141	3,290	286
April	8,517	314	1,113	2,489	1,149	3,160	292
May	2,986	147	599	797	211	1,032	200
June	52	.....	11	4	.....	.....	37
July	59	.....	11	4	.....	10	34
August	96	.....	23	8	.....	27	38
September	100	3	25	8	.....	27	37
October	1,696	81	416	452	80	612	55
November	7,804	244	1,192	2,196	1,121	2,791	260
December	8,209	278	1,191	2,374	1,143	2,948	275
Average number of wage-earners at specified daily rates of pay:							
Engineers—							
$0.75 to $0.99	3	.....	.....	1	1	1	.....
$1.00 to $1.24	49	.....	1	11	10	26	1
$1.25 to $1.49	68	3	9	27	12	17	.....
$1.50 to $1.74	273	12	25	89	46	96	5
$1.75 to $1.99	455	18	34	124	54	198	27
$2.00 to $2.24	509	35	64	121	51	194	44
$2.25 to $2.49	247	4	53	109	10	70	1
$2.50 to $2.74	369	.....	137	207	2	19	4
$2.75 to $2.99	75	.....	55	11	.....	9	.....
$3.00 to $3.24	13	.....	.....	12	.....	1	.....
$3.25 to $3.49	3	.....	3	.....	.....	.....	.....
Firemen—							
$1.00 to $1.24	9	.....	1	5	3	.....	.....
$1.25 to $1.49	123	11	29	32	24	27	.....
$1.50 to $1.74	621	50	112	176	82	139	62
$1.75 to $1.99	815	28	90	253	81	342	18
$2.00 to $2.24	219	.....	89	86	3	31	10
$2.25 to $2.49	21	.....	7	6	.....	7	1
$2.50 to $2.74	27	.....	3	8	.....	16	.....
$2.75 to $2.99	1	.....	1	.....	.....	.....	.....

[1] Includes operators distributed as follows: Columbia, 2 (4 mines); Dauphin, 2; Sullivan, 2; Susquehanna, 1 (2 mines).

TABLE 59.—COAL, PENNSYLVANIA ANTHRACITE—DETAILED SUMMARY, BY COUNTIES: 1902—Continued.

	Total.	Carbon.	Lackawanna.	Luzerne.	Northumberland.	Schuylkill.	Other counties.
Average number of wage-earners at specified daily rates of pay—Continued.							
Machinists, blacksmiths, carpenters, and other mechanics—							
$0.75 to $0.99	1			1			
$1.00 to $1.24	20			4	2	14	
$1.25 to $1.49	67	3	2	22	17	22	1
$1.50 to $1.74	371	6	28	100	43	173	21
$1.75 to $1.99	428	18	49	178	60	82	41
$2.00 to $2.24	823	18	147	414	69	138	37
$2.25 to $2.49	673	7	94	205	61	273	33
$2.50 to $2.74	156	4	35	41	11	42	23
$2.75 to $2.99	47		12	21	4	8	2
$3.00 to $3.24	20			13	2	2	3
$3.25 to $3.49	2			1		1	
$3.50 to $3.74	4		3	1			
$4.00 to $4.24	1					1	
Miners—							
$1.25 to $1.49	26			3	22	1	
$1.50 to $1.74	271	56	56	148	7	4	
$1.75 to $1.99	1,101		246	271	136	448	
$2.00 to $2.24	3,293	2	143	501	914	1,272	461
$2.25 to $2.49	3,776	2	572	1,435	463	1,173	131
$2.50 to $2.74	2,195	122	417	1,098	99	376	83
$2.75 to $2.99	1,542	67	397	489	359	228	2
$3.00 to $3.24	1,692	42	506	842	26	150	126
$3.25 to $3.49	1,373		1,004	362		7	
$3.50 to $3.74	1,313		826	359		71	57
$3.75 to $3.99	517	15	109	392			1
$4.00 to $4.24	166		160	1			5
$4.25 and over	502		210	150			142
Miners' helpers—							
$0.75 to $0.99	2				2		
$1.00 to $1.24	441	8	146	242	29	3	13
$1.25 to $1.49	947	40	298	528	52	21	8
$1.50 to $1.74	921	16	145	447	160	89	64
$1.75 to $1.99	2,086	100	89	696	240	998	53
$2.00 to $2.24	1,196	64	352	392	53	249	86
$2.25 to $2.49	1,211	20	125	714	10	340	2
$2.50 to $2.74	117		12	96		9	
Timbermen and track layers—							
$0.75 to $0.99	2			1		1	
$1.00 to $1.24	50	6		33	1	9	1
$1.25 to $1.49	61	7	3	21	18	8	4
$1.50 to $1.74	304	4	15	43	82	89	71
$1.75 to $1.99	624	84	23	186	92	212	27
$2.00 to $2.24	326	1	53	176	14	50	32
$2.25 to $2.49	579	63	40	179	38	248	11
$2.50 to $2.74	23		1	11		11	
$2.75 to $2.99	5	1		1	1	2	
$3.00 to $3.24	2				1	1	
$3.25 to $3.49	1						1
Boys under 16 years—							
Less than $0.50	69	5	1	36	1	10	16
$0.50 to $0.74	2,006	84	397	696	220	543	66
$0.75 to $0.99	1,881	70	172	509	258	827	45
$1.00 to $1.24	580		71	58	114	290	47
$1.25 to $1.49	26		7	10	2	6	1
$1.50 to $1.74	2					2	
All other wage-earners—							
Less than $0.50	1						1
$0.50 to $0.74	453	27	24	358	10	7	27
$0.75 to $0.99	1,919	78	426	1,038	93	220	64
$1.00 to $1.24	5,397	160	2,323	1,593	269	886	166
$1.25 to $1.49	7,177	244	1,959	2,739	662	1,373	200
$1.50 to $1.74	7,949	214	2,452	2,216	973	1,730	355
$1.75 to $1.99	6,038	96	1,015	2,246	537	1,801	343
$2.00 to $2.24	1,793	35	180	984	43	324	227
$2.25 to $2.49	746	49	78	324	28	223	44
$2.50 to $2.74	245	4	31	167	5	30	8
$2.75 to $2.99	149	111	7	19	6	6	
$3.00 to $3.24	79		1			78	
$3.25 to $3.49	3			2		1	
Contract work:							
Amount paid	$406,421	$50,697	$58,614	$151,970	$16,483	$111,249	$17,408
Number of employees	1,731	130	387	583	68	511	52
Miscellaneous expenses:							
Total	$9,307,239	$193,513	$1,955,982	$3,776,263	$690,083	$2,301,154	$390,244
Royalties and rent of mine and mining plant	$4,359,051	$92,450	$877,884	$2,065,199	$332,997	$785,784	$204,737
Rent of offices, taxes, insurance, interest, and other sundries	$4,948,188	$101,063	$1,078,098	$1,711,064	$357,086	$1,515,370	$185,507
Cost of supplies and materials	$12,740,780	$370,268	$2,441,760	$4,801,407	$1,172,483	$3,375,690	$579,172
Product:							
Quantity, long tons	36,940,710	986,201	10,779,268	12,852,826	2,878,615	7,704,202	1,739,598
Value	$76,173,586	$1,942,361	$22,534,716	$27,622,900	$5,602,584	$15,051,292	$3,419,733
Power owned:							
Total horsepower	434,220	8,603	65,925	161,460	39,774	136,602	22,456
Engines—							
Steam—							
Number	4,629	153	991	1,887	373	1,003	222
Horsepower	415,827	5,781	64,279	156,774	37,624	129,795	21,574
Gas or gasoline—							
Number	6		4				2
Horsepower	185		121				64
Other power—							
Number	234	30	21	60	54	60	9
Horsepower	18,208	2,822	1,525	4,686	2,150	6,207	818
Electric motors owned—							
Number	78		40	29	3	3	3
Horsepower	5,755		2,591	2,364	150	520	130
Supplied to other establishments, horsepower	350			350			

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1902.

	United States.	Alabama.	Arkansas.	California.	Colorado.	Georgia.	Illinois.	Indian Territory.	Indiana.	Iowa.
Number of mines	5,652	145	53	8	126	3	875	58	339	326
Number of operators	4,409	91	33	8	80	2	789	29	283	299
Character of ownership:										
Individual	2,044	21	4	1	28	.....	421	2	163	120
Firm	827	7	10	.....	16	.....	163	8	26	84
Incorporated company	1,517	63	19	7	35	2	201	19	93	89
Other form	21	.....	.....	.....	1	.....	4	.....	1	6
Salaried officials, clerks, etc.:										
Total number	14,413	623	146	24	611	24	1,510	248	637	512
Total salaries	$14,511,924	$709,449	$148,113	$30,355	$818,445	$20,326	$1,564,832	$240,581	$530,492	$436,828
General officers—										
Number	1,741	72	12	4	49	2	191	30	94	78
Salaries	$3,220,054	$152,776	$29,358	$6,600	$155,018	$4,000	$383,676	$43,438	$126,802	$103,030
Superintendents, managers, foremen, surveyors, etc.—										
Number	4,213	168	40	12	149	6	356	82	220	121
Salaries	$4,790,038	$244,385	$43,256	$15,635	$239,339	$5,180	$399,169	$96,121	$179,437	$115,137
Foremen, below ground—										
Number	3,404	133	33	5	77	11	406	49	143	169
Salaries	$2,920,723	$117,849	$29,502	$6,260	$84,452	$7,666	$387,046	$44,849	$115,507	$125,562
Clerks—										
Number	5,055	250	61	3	336	5	557	87	180	144
Salaries	$3,581,109	$194,439	$46,002	$1,860	$339,636	$3,480	$394,941	$56,173	$108,746	$93,099
Wage-earners:										
Aggregate average number	280,638	12,930	2,574	174	7,955	168	36,617	4,763	10,593	9,439
Aggregate wages	$181,482,288	$7,841,457	$1,780,061	$120,961	$6,006,183	$74,649	$24,876,201	$3,154,267	$7,396,425	$6,251,732
Above ground—										
Total average number	36,336	1,567	454	60	1,588	76	3,713	738	1,064	1,095
Total wages	$21,701,012	$804,110	$253,503	$41,633	$1,207,900	$36,262	$2,449,583	$430,089	$669,680	$651,915
Engineers, firemen, and other mechanics—										
Average number	13,632	643	183	22	507	45	1,691	328	558	417
Wages	$9,517,316	$383,897	$129,437	$20,435	$454,538	$23,252	$1,240,251	$215,339	$392,153	$282,509
Boys under 16 years—										
Average number	836	116	15	2	38	.....	62	26	8	6
Wages	$233,608	$33,015	$3,020	$480	$12,933	.....	$20,589	$7,880	$2,510	$2,081
All other wage-earners—										
Average number	21,868	808	256	36	1,043	31	1,960	384	498	672
Wages	$11,950,088	$387,198	$121,046	$20,718	$740,429	$13,010	$1,188,743	$206,870	$275,017	$367,325
Below ground—										
Total average number	244,302	11,363	2,120	114	6,367	92	32,904	4,025	9,529	8,344
Total wages	$159,781,276	$7,037,347	$1,526,558	$79,328	$4,798,283	$38,387	$22,426,618	$2,724,178	$6,726,745	$5,599,817
Miners—										
Average number	189,273	8,733	1,517	66	4,819	59	25,108	2,782	7,273	6,455
Wages	$128,211,509	$5,809,433	$1,153,972	$57,613	$3,662,292	$27,090	$17,722,115	$1,945,903	$5,264,317	$4,448,385
Miners' helpers—										
Average number	3,637	173	7	22	32	.....	641	32	63	165
Wages	$2,153,481	$73,073	$4,050	$6,000	$19,554	.....	$520,528	$20,568	$32,724	$105,454
Boys under 16 years—										
Average number	4,792	352	32	.....	56	.....	850	100	117	159
Wages	$1,335,765	$114,524	$7,644	.....	$19,980	.....	$255,619	$28,588	$35,465	$48,725
All other wage-earners—										
Average number	46,600	2,105	564	26	1,460	33	6,305	1,111	2,076	1,565
Wages	$28,080,521	$1,040,317	$360,892	$15,715	$1,096,457	$11,297	$3,928,356	$729,119	$1,394,239	$997,253
Average number of wage-earners at specified daily rates of pay:										
Engineers—										
$0.75 to $0.99	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
$1.00 to $1.24	8	.....	2	.....	.....	1	.....	.....	1	.....
$1.25 to $1.49	46	3	3	.....	.....	.....	2	.....	5	1
$1.50 to $1.74	165	9	6	.....	1	2	4	.....	8	6
$1.75 to $1.99	248	30	6	.....	1	1	9	3	12	15
$2.00 to $2.24	977	28	21	.....	7	2	122	44	47	73
$2.25 to $2.49	754	11	9	2	5	.....	142	38	22	27
$2.50 to $2.74	930	61	4	4	22	.....	249	22	91	28
$2.75 to $2.99	241	4	.....	.....	11	.....	50	4	18	5
$3.00 to $3.24	303	1	.....	4	59	.....	55	.....	17	6
$3.25 to $3.49	50	.....	.....	.....	19	.....	10	.....	1	.....
$3.50 to $3.74	34	.....	.....	.....	.....	.....	2	8	.....	.....
$3.75 to $3.99	6	.....	.....	.....	1	.....	1	.....	.....	.....
$4.00 to $4.24	11	.....	.....	.....	.....	.....	1	.....	.....	.....
$4.25 and over	5	.....	.....	.....	.....	.....	2	.....	.....	.....
Firemen—										
$0.50 to $0.74	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
$0.75 to $0.99	10	.....	.....	.....	.....	.....	.....	.....	.....	.....
$1.00 to $1.24	82	.....	3	.....	.....	4	1	.....	2	.....
$1.25 to $1.49	144	26	5	.....	.....	4	4	1	10	3
$1.50 to $1.74	459	61	6	.....	.....	1	2	23	11	22
$1.75 to $1.99	721	94	24	.....	1	.....	113	32	39	16
$2.00 to $2.24	1,108	6	4	.....	17	.....	278	16	64	40
$2.25 to $2.49	283	.....	2	1	19	.....	29	8	16	8
$2.50 to $2.74	255	.....	.....	4	43	1	11	3	2	3
$2.75 to $2.99	54	.....	.....	.....	13	.....	1	.....	1	.....
$3.00 to $3.24	38	.....	.....	.....	7	.....	.....	8	.....	.....
$3.25 to $3.49	5	.....	.....	.....	4	.....	.....	.....	.....	.....
$3.50 to $3.74	2	.....	.....	.....	.....	.....	.....	.....	1	.....
Machinists, blacksmiths, carpenters, and other mechanics—										
$0.50 to $0.74	4	.....	.....	.....	.....	.....	.....	.....	.....	1
$0.75 to $0.99	5	.....	.....	.....	.....	.....	1	.....	.....	.....
$1.00 to $1.24	42	2	1	.....	1	2	1	.....	2	.....
$1.25 to $1.49	175	12	1	.....	.....	2	.....	1	1	.....
$1.50 to $1.74	393	67	10	.....	2	11	5	6	7	4
$1.75 to $1.99	601	71	9	.....	2	.....	25	6	22	6
$2.00 to $2.24	1,400	33	32	.....	14	6	153	40	29	59
$2.25 to $2.49	1,876	45	19	1	3	7	239	32	35	51
$2.50 to $2.74	1,128	21	13	1	29	.....	107	17	71	36
$2.75 to $2.99	419	54	1	.....	17	.....	39	10	11	5
$3.00 to $3.24	479	3	.....	5	139	1	28	3	9	2
$3.25 to $3.49	65	.....	.....	.....	19	.....	.....	3	.....	.....
$3.50 to $3.74	76	.....	2	.....	10	.....	4	.....	2	.....
$3.75 to $3.99	8	.....	.....	.....	2	.....	.....	.....	.....	.....
$4.00 to $4.24	62	1	.....	.....	39	.....	1	.....	1	.....
$4.25 and over	6	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

	United States.	Alabama.	Arkansas.	California.	Colorado.	Georgia.	Illinois.	Indian Territory.	Indiana.	Iowa.
Average number of wage-earners at specified daily rates of pay—Continued.										
Miners—										
Less than $0.50	29						7		1	
$0.50 to $0.74	86				1		23		1	1
$0.75 to $0.99	342						31		10	
$1.00 to $1.24	2,513	246	10		2	10	61	104	31	18
$1.25 to $1.49	6,016	675			160	15	596	271	111	57
$1.50 to $1.74	19,083	600	85		62	19	1,651	70	274	418
$1.75 to $1.99	24,892	987	186		391	5	2,515	305	614	580
$2.00 to $2.24	46,532	1,872	88		708	6	7,064	579	1,526	2,280
$2.25 to $2.49	28,304	714	292		846	4	3,616	311	1,950	1,206
$2.50 to $2.74	25,908	2,749	256	47	960		3,869	315	1,065	1,066
$2.75 to $2.99	13,053	541	366		1,141		1,866	120	656	265
$3.00 to $3.24	10,240	271	189	19	202		2,251	656	369	329
$3.25 to $3.49	6,000	78			150		722	15	244	28
$3.50 to $3.74	4,210						554	31	345	175
$3.75 to $3.99	1,304		45		125		147		20	32
$4.00 to $4.24	398				45		54		33	
$4.25 and over	363				26		81	5	23	
Miners' helpers—										
$0.50 to $0.74	7									
$0.75 to $0.99	184	2	2							1
$1.00 to $1.24	337	15			3		21			5
$1.25 to $1.49	347	56			1		8		31	9
$1.50 to $1.74	608	88		22			14		1	25
$1.75 to $1.99	293				4		3			14
$2.00 to $2.24	551	9	5		15		94	22	5	43
$2.25 to $2.49	311						68		15	7
$2.50 to $2.74	361	3			4		71	10	8	61
$2.75 to $2.99	363				4		118			
$3.00 to $3.24	130				1		100			
$3.25 to $3.49	144						144			
$3.50 to $3.74	1									
Timbermen and track layers—										
$0.50 to $0.74	1								1	
$0.75 to $0.99	27									
$1.00 to $1.24	24	3					1			2
$1.25 to $1.49	209	2				3			1	3
$1.50 to $1.74	650	43			2	2	2		1	4
$1.75 to $1.99	691	12			1	3	18		20	8
$2.00 to $2.24	2,460	9			2		543	2	26	132
$2.25 to $2.49	2,760	12	32		3		684	130	298	16
$2.50 to $2.74	525	84	10		57		45	26	22	1
$2.75 to $2.99	277	18			139		4	5	3	
$3.00 to $3.24	182				105		3		8	
$3.25 to $3.49	7				1					
$3.50 to $3.74	28						3			
$4.25 and over	2						2			
Boys under 16 years—										
Less than $0.50	86	8	1				1			
$0.50 to $0.74	828	33	4				13	1	1	2
$0.75 to $0.99	1,754	244	35				47	58	6	9
$1.00 to $1.24	2,407	105	7	2	67		776	41	118	128
$1.25 to $1.49	332	8			16		64	17		24
$1.50 to $1.74	110				8		10	9		2
$1.75 to $1.99	60	22					1			
$2.00 to $2.24	39	36			3					
$2.25 to $2.49	12	12								
All other wage-earners—										
Less than $0.50	2									
$0.50 to $0.74	212	1	1			2	2		3	1
$0.75 to $0.99	395	34	3			5	9	3	2	2
$1.00 to $1.24	2,721	395	33		51	18	75	4	44	18
$1.25 to $1.49	4,659	647	54		21	20	51	88	70	58
$1.50 to $1.74	10,566	692	153		29	7	175	258	106	360
$1.75 to $1.99	9,291	584	60	41	416		1,352	100	241	255
$2.00 to $2.24	17,842	141	192	3	294		3,973	378	255	922
$2.25 to $2.49	9,309	157	207	17	123	4	1,110	267	1,314	128
$2.50 to $2.74	3,347	36	61	1	339		168	92	93	316
$2.75 to $2.99	1,407	35	10		612		17	110	63	3
$3.00 to $3.24	666	7	1		241		25	17	1	4
$3.25 to $3.49	99	1			40		1	15		3
$3.50 to $3.74	51				2		2			
$3.75 to $3.99	6				1					1
$4.00 to $4.24	24		3		1				1	
$4.25 and over	28				23				1	
Average number of wage-earners employed during each month:										
Men 16 years and over—										
January	284,823	12,518	2,826	134	8,015	179	36,730	5,005	10,640	10,719
February	281,380	12,359	2,793	137	8,010	177	36,690	4,918	10,774	10,462
March	277,056	12,453	2,515	133	7,467	162	35,831	4,540	10,449	9,587
April	267,309	12,688	2,357	184	7,275	164	33,524	4,112	9,939	8,068
May	262,358	12,503	2,304	180	7,183	153	32,826	4,054	9,408	7,905
June	257,803	12,661	2,309	181	7,439	154	32,809	4,442	9,618	7,749
July	255,481	10,596	2,324	184	7,295	161	33,424	4,547	9,800	8,182
August	263,693	12,160	2,405	187	7,839	164	33,841	4,614	10,111	8,520
September	273,131	12,566	2,528	187	8,155	162	36,074	4,600	10,606	9,348
October	286,311	12,893	2,576	188	8,567	169	38,381	4,729	11,172	9,873
November	292,891	13,091	2,803	186	8,703	183	38,773	4,974	11,485	10,309
December	297,284	13,056	2,784	183	8,384	188	39,557	5,109	11,614	10,566
Boys under 16 years—										
January	5,714	493	50		96		909	126	122	166
February	5,627	480	51		96		889	124	124	165
March	5,671	458	46	3	88		907	124	125	163
April	5,618	457	37	3	85		892	120	120	158
May	5,648	476	43	3	92		872	119	123	157
June	5,450	484	40	3	95		870	119	122	155
July	5,336	430	47	2	99		862	128	125	162
August	5,480	485	52	2	92		896	130	125	169
September	5,566	485	54	2	86		934	127	126	172
October	5,743	475	44	2	93		959	129	129	170
November	5,827	457	52	2	101		980	135	131	169
December	5,856	436	48	2	105		974	131	128	174

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

	United States.	Alabama.	Arkansas.	California.	Colorado.	Georgia.	Illinois.	Indian Territory.	Indiana.	Iowa.
Contract work:										
Amount paid	$1,244,114	$265,579	$485	$2,900	$14,413	$121,464	$24,695	$56,610	$26,603	$48,046
Number of employees	5,040	1,411	5	19	98	563	132	520	101	240
Miscellaneous expenses:										
Total	$16,774,459	$734,972	$82,949	$8,327	$681,494	$18,319	$1,258,686	$358,960	$449,054	$341,191
Royalties and rent of mine and mining plant	$7,442,089	$149,013	$39,533	$3,000	$228,376	.....	$425,705	$244,439	$215,458	$211,275
Rent of offices, taxes, insurance, interest, and other sundries	$9,332,370	$585,959	$43,416	$5,327	$453,118	$18,319	$832,981	$114,521	$233,596	$129,916
Cost of supplies and materials	$24,798,922	$1,219,310	$177,716	$44,930	$1,039,831	$107,994	$2,834,444	$320,664	$729,104	$841,506
Product:										
Quantity, short tons	260,216,844	10,354,570	1,943,932	84,984	7,401,343	414,083	32,939,373	2,820,666	9,446,424	5,904,766
Value	$290,858,483	$12,419,666	$2,539,214	$254,350	$8,397,812	$589,018	$33,945,910	$4,265,106	$10,399,660	$8,660,287
Power:										
Total horsepower	521,165	18,979	6,437	1,192	18,663	177	79,182	13,094	23,310	12,253
Owned—										
Engines—										
Steam—										
Number	6,516	279	153	9	258	7	1,212	169	393	298
Horsepower	489,628	18,264	6,432	1,190	16,192	165	78,493	12,709	22,026	11,673
Gas or gasoline—										
Number	152	10	1	1	2	2	14	.....	4	31
Horsepower	1,119	86	5	2	7	12	93	.....	19	142
Water wheels—										
Number	11	.....	.....	.....	.....	.....	.....	.....	.....	.....
Horsepower	1,384	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other power—										
Number	285	15	.....	.....	25	.....	11	5	13	8
Horsepower	26,675	629	.....	.....	2,214	.....	594	385	1,115	438
Rented—										
Electric, horsepower	2,167	.....	.....	.....	250	.....	.....	.....	.....	.....
Other power, horsepower	192	.....	.....	.....	.....	.....	2	.....	150	.....
Electric motors owned—										
Number	1,325	.....	15	15	83	.....	102	9	29	14
Horsepower	65,972	.....	940	240	3,276	.....	4,322	290	2,247	296
Supplied to other establishments, horsepower	1,181	.....	.....	.....	140	.....	50	.....	100	.....

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY,

		Kansas.	Kentucky.	Maryland.	Michigan.	Missouri.	Montana.	New Mexico.	North Dakota.
1	Number of mines	175	523	44	31	384	37	30	47
2	Number of operators	132	503	30	30	345	34	25	47
	Character of ownership:								
3	Individual	73	378	3	5	224	17	10	29
4	Firm	26	32	4	4	73	9	2	9
5	Incorporated company	30	93	23	21	46	8	12	8
6	Other form	3				2		1	1
	Salaried officials, clerks, etc.:								
7	Total number	367	593	210	99	420	61	68	48
8	Total salaries	$345,162	$476,508	$315,791	$87,780	$325,147	$80,674	$85,599	$40,050
	General officers—								
9	Number	35	144	56	10	53	3	4	7
10	Salaries	$71,303	$154,108	$199,400	$19,050	$71,666	$1,200	$12,700	$5,900
	Superintendents, managers, foremen, surveyors, etc.—								
11	Number	76	150	50	27	110	23	27	16
12	Salaries	$88,140	$133,677	$46,788	$26,905	$90,859	$39,728	$39,597	$17,120
	Foremen, below ground—								
13	Number	114	138	47	27	121	13	17	19
14	Salaries	$87,588	$97,650	$35,576	$20,253	$73,721	$15,073	$17,258	$12,590
	Clerks—								
15	Number	142	161	57	35	136	22	20	6
16	Salaries	$98,131	$91,073	$34,027	$21,572	$88,901	$24,673	$16,044	$4,440
	Wage-earners:								
17	Aggregate average number	7,017	9,077	4,936	1,445	6,501	1,587	1,439	287
18	Aggregate wages	$4,719,595	$1,522,207	$3,468,117	$1,075,805	$3,927,158	$1,516,043	$1,027,460	$190,964
	Above ground—								
19	Total average number	780	1,299	568	150	664	257	285	37
20	Total wages	$441,841	$614,447	$308,142	$87,401	$362,857	$230,364	$198,173	$24,745
	Engineers, firemen, and other mechanics—								
21	Average number	278	446	171	78	231	122	133	20
22	Wages	$184,454	$255,747	$110,895	$49,887	$143,006	$118,391	$98,229	$15,940
	Boys under 16 years—								
23	Average number	4	19	22		5		4	
24	Wages	$1,324	$3,304	$5,845		$1,761		$1,234	
	All other wage-earners—								
25	Average number	498	834	375	72	428	135	148	17
26	Wages	$256,063	$355,396	$191,402	$37,514	$218,090	$111,973	$98,710	$8,805
	Below ground—								
27	Total average number	6,237	7,778	4,368	1,295	5,837	1,330	1,154	250
28	Total wages	$4,277,754	$3,907,760	$3,159,975	$988,404	$3,564,301	$1,285,679	$829,287	$166,219
	Miners—								
29	Average number	5,023	5,762	3,560	1,066	4,727	863	944	187
30	Wages	$3,525,812	$3,025,485	$2,738,576	$844,577	$2,927,938	$876,572	$681,905	$125,398
	Miners' helpers—								
31	Average number	25	151		16	71	265	5	
32	Wages	$12,492	$64,768		$9,519	$44,166	$230,024	$3,240	
	Boys under 16 years—								
33	Average number	30	199	107	2	60	9	16	1
34	Wages	$9,048	$41,381	$35,935	$577	$15,740	$3,088	$5,198	$203
	All other wage-earners—								
35	Average number	1,159	1,660	701	211	979	193	189	62
36	Wages	$730,407	$776,126	$385,464	$133,731	$576,457	$175,995	$138,944	$40,618
	Average number of wage-earners at specified daily rates of pay:								
	Engineers—								
37	$0.75 to $0.99								
38	$1.00 to $1.24		3						
39	$1.25 to $1.49		6			4			
40	$1.50 to $1.74	4	13	5		11			
41	$1.75 to $1.99	5	12	7		12			
42	$2.00 to $2.24	25	54	6	1	40		1	1
43	$2.25 to $2.49	25	18	5	1	15			2
44	$2.50 to $2.74	24	6	21	18	7		4	1
45	$2.75 to $2.99	5	1	1		1		11	
46	$3.00 to $3.24	1	2	1			11	15	4
47	$3.25 to $3.49						1	1	
48	$3.50 to $3.74						13	1	
49	$3.75 to $3.99		1				1		1
50	$4.00 to $4.24						8		
51	$4.25 and over	1				1			
	Firemen—								
52	$0.50 to $0.74		1						
53	$0.75 to $0.99	1							
54	$1.00 to $1.24		4	1					
55	$1.25 to $1.49	8	11	1		7	1		
56	$1.50 to $1.74	41	36	8	1	21			
57	$1.75 to $1.99	3	16	5	27	5		1	
58	$2.00 to $2.24	9	15	6	3	9		7	
59	$2.25 to $2.49	2	1	18	1			1	
60	$2.50 to $2.74		2			2	4	10	
61	$2.75 to $2.99						9		2
62	$3.00 to $3.24						17	2	
63	$3.25 to $3.49								
64	$3.50 to $3.74								
	Machinists, blacksmiths, carpenters, and other mechanics—								
65	$0.50 to $0.74					1			
66	$0.75 to $0.99								
67	$1.00 to $1.24	4	1			1			
68	$1.25 to $1.49		14	2			1	36	
69	$1.50 to $1.74	5	46	11	1	8			
70	$1.75 to $1.99	10	55	5	2	2		1	2
71	$2.00 to $2.24	24	84	36	11	30	1	3	1
72	$2.25 to $2.49	39	25	22	2	33		2	
73	$2.50 to $2.74	34	12	5	9	16	8	4	3
74	$2.75 to $2.99	1	2	1			5	2	
75	$3.00 to $3.24	5	4	4		3	13	20	3
76	$3.25 to $3.49	2	1				3	4	
77	$3.50 to $3.74				1	2	16	7	
78	$3.75 to $3.99								
79	$4.00 to $4.24						9		
80	$4.25 and over						1		

BY STATES AND TERRITORIES: 1902—Continued.

Ohio.	Oregon.	Pennsylvania.	Tennessee.	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Wyoming.	All other states and territories.[1]	
648	9	1,023	84	26	39	26	27	522	36	8	1
513	9	514	73	24	36	22	22	406	22	8	2
206	3	131	12	3	19	3	2	157	5	4	3
127	3	147	10	4	12	8	3	33	5	2	4
179	3	236	50	17	5	11	17	216	12	2	5
1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	6
1,314	32	3,830	418	91	67	179	160	1,987	125	9	7
$1,222,966	$27,660	$4,142,497	$381,939	$90,086	$80,065	$155,930	$221,915	$1,766,448	$159,153	$7,133	8
185	15	310	79	16	5	17	19	231	17	3	9
$305,226	$8,000	$801,611	$108,935	$32,245	$11,580	$31,189	$27,360	$322,036	$28,722	$3,130	10
411	11	1,239	129	25	16	28	61	618	39	3	11
$434,589	$13,900	$1,486,589	$133,793	$26,441	$20,758	$34,869	$111,255	$647,362	$57,876	$2,133	12
307	3	935	82	22	7	42	52	403	27	2	13
$226,233	$3,460	$872,198	$60,553	$13,388	$8,869	$36,160	$57,404	$331,857	$30,734	$1,470	14
411	3	1,346	128	28	39	92	28	735	42	1	15
$256,918	$2,300	$982,104	$78,658	$18,012	$38,858	$53,712	$25,896	$465,193	$41,821	$400	16
25,963	211	92,095	6,220	1,979	1,576	3,004	3,931	23,914	4,197	46	17
$16,693,464	$144,891	$59,848,902	$3,213,532	$991,391	$1,254,090	$1,407,867	$3,220,263	$13,524,429	$3,207,545	$26,719	18
2,792	42	11,660	834	237	261	369	773	4,077	883	13	19
$1,644,456	$28,103	$6,996,388	$400,088	$87,307	$180,228	$179,444	$532,485	$2,153,890	$680,663	$5,315	20
1,105	20	3,963	254	96	78	209	255	1,413	358	8	21
$731,417	$15,711	$2,842,790	$146,428	$50,537	$66,563	$114,550	$211,519	$906,413	$309,523	$3,505	22
18	6	195	32	8	4	36	30	169	11	.....	23
$5,581	$1,844	$55,614	$7,122	$1,564	$1,332	$6,292	$10,566	$43,304	$4,413	.....	24
1,669	16	7,502	548	133	179	124	488	2,495	514	5	25
$907,458	$10,548	$4,097,984	$246,538	$35,206	$112,333	$58,602	$310,400	$1,204,173	$366,727	$1,810	26
23,171	169	80,435	5,386	1,742	1,315	2,635	3,158	19,837	3,314	33	27
$15,049,008	$116,698	$52,852,514	$2,813,444	$904,084	$1,073,862	$1,228,423	$2,687,778	$11,370,589	$2,526,882	$21,404	28
17,954	116	66,019	3,816	1,402	1,038	1,877	2,336	13,468	2,281	22	29
$12,048,761	$81,601	$44,249,784	$2,161,955	$759,736	$852,005	$888,734	$2,095,980	$8,861,187	$1,861,352	$13,081	30
61	.....	573	445	97	.....	29	54	628	75	7	31
$34,621	.....	$373,321	$159,445	$29,528	.....	$7,762	$37,892	$314,000	$46,655	$4,097	32
318	1	1,417	142	18	10	84	8	680	24	.....	33
$91,178	$340	$393,329	$24,720	$4,262	$3,662	$15,627	$2,492	$168,508	$9,937	.....	34
4,838	52	12,426	983	225	267	645	760	5,061	934	4	35
$2,874,448	$34,757	$7,836,080	$467,324	$110,558	$218,195	$316,300	$551,414	$2,526,894	$608,938	$4,226	36
.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	37
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	38
2	.....	3	3	5	.....	2	.....	5	.....	2	39
11	.....	18	16	5	.....	1	.....	45	.....	.....	40
46	.....	37	7	.....	.....	6	.....	38	1	.....	41
159	.....	200	19	6	1	4	.....	113	3	.....	42
65	.....	277	9	8	.....	5	9	55	4	.....	43
74	8	188	5	.....	3	6	27	33	24	.....	44
13	.....	80	1	.....	4	3	9	16	4	.....	45
4	.....	68	1	1	2	.....	17	14	20	.....	46
.....	.....	6	.....	.....	3	.....	4	2	2	1	47
1	.....	3	.....	.....	3	.....	2	1	.....	.....	48
.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	49
.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	50
.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	51
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	52
.....	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	53
2	.....	3	1	.....	.....	6	.....	2	.....	3	54
4	.....	21	17	1	.....	9	.....	11	.....	.....	55
13	.....	83	22	9	2	5	.....	92	.....	.....	56
67	.....	169	10	9	.....	11	6	72	1	.....	57
115	3	417	7	.....	5	3	13	48	23	.....	58
14	.....	117	.....	.....	3	.....	24	15	4	.....	59
3	4	76	2	.....	7	.....	21	2	55	.....	60
1	.....	4	.....	.....	5	.....	7	.....	11	.....	61
.....	.....	2	.....	.....	2	.....	.....	.....	.....	.....	62
.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	63
.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	64
.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	65
.....	.....	.....	1	3	.....	.....	.....	.....	.....	.....	66
1	.....	7	2	5	.....	2	.....	10	.....	.....	67
3	.....	20	19	4	.....	38	.....	19	.....	2	68
14	.....	61	32	2	.....	31	.....	70	.....	.....	69
83	.....	115	19	6	.....	24	.....	134	2	.....	70
136	.....	318	33	11	.....	23	7	305	11	.....	71
153	.....	924	11	2	1	13	25	160	32	.....	72
79	4	495	11	4	14	5	13	77	40	.....	73
31	.....	149	.....	.....	10	4	18	32	27	.....	74
7	.....	87	5	.....	11	6	34	30	57	.....	75
2	.....	2	.....	.....	1	1	9	4	14	.....	76
.....	.....	6	1	.....	.....	.....	5	5	15	.....	77
.....	.....	3	.....	.....	1	.....	1	1	.....	.....	78
2	.....	1	.....	.....	.....	.....	1	2	5	.....	79
.....	.....	.....	.....	.....	.....	.....	3	.....	2	.....	80

[1] Includes operators distributed as follows: Alaska, 2; Idaho, 5; North Carolina, 1.

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY,

		Kansas.	Kentucky.	Maryland.	Michigan.	Missouri.	Montana.	New Mexico.	North Dakota.
	Average number of wage-earners at specified daily rates of pay—Continued.								
	Miners—								
81	Less than $0.50		1			19			
82	$0.50 to $0.74		40			16			
83	$0.75 to $0.99	7	241			34			
84	$1.00 to $1.24	29	477		12	87	1		
85	$1.25 to $1.49	143	529	14	52	173		102	1
86	$1.50 to $1.74	329	1,122	83	69	402	1	252	44
87	$1.75 to $1.99	616	886	323	23	1,109	1	33	8
88	$2.00 to $2.24	693	1,464	280	18	1,393	4		47
89	$2.25 to $2.49	1,007	602	1,016	211	562	50	2	28
90	$2.50 to $2.74	836	251	417	105	421		119	56
91	$2.75 to $2.99	1,011	51	855	133	322	1	36	
92	$3.00 to $3.24	120	23	250	331	129	8	307	3
93	$3.25 to $3.49	163	40	35	65	36	117	30	
94	$3.50 to $3.74	49	1	6		24	636	14	
95	$3.75 to $3.99	18	3	269			23	47	
96	$4.00 to $4.24	1	31						
97	$4.25 and over	1		12	47		21	2	
	Miners' helpers—								
98	$0.50 to $0.74		2						
99	$0.75 to $0.99								
100	$1.00 to $1.24	10	27			3			
101	$1.25 to $1.49	1	26			3			
102	$1.50 to $1.74		70					1	
103	$1.75 to $1.99		7		6	40			
104	$2.00 to $2.24	13	19		10	5			
105	$2.25 to $2.49	1							
106	$2.50 to $2.74					20	39	4	
107	$2.75 to $2.99						225		
108	$3.00 to $3.24								
109	$3.25 to $3.49								
110	$3.50 to $3.74						1		
	Timbermen and track layers—								
111	$0.50 to $0.74								
112	$0.75 to $0.99								
113	$1.00 to $1.24	3							
114	$1.25 to $1.49		16			4			
115	$1.50 to $1.74		42	30		2			3
116	$1.75 to $1.99	1	44	16		1			
117	$2.00 to $2.24	6	88	91	63	43		2	
118	$2.25 to $2.49	99	7	33	46	79			2
119	$2.50 to $2.74	1	2	2		11		16	
120	$2.75 to $2.99	9					6	19	6
121	$3.00 to $3.24			2		1	24	14	
122	$3.25 to $3.49					5			
123	$3.50 to $3.74						24		
124	$4.25 and over								
	Boys under 16 years—								
125	Less than $0.50	1	10	2		1			
126	$0.50 to $0.74	1	134	35		14			1
127	$0.75 to $0.99	10	40	31		9		2	
128	$1.00 to $1.24	20	20	11	2	31	9	15	
129	$1.25 to $1.49		12	17		9		2	
130	$1.50 to $1.74		2	9		1		1	
131	$1.75 to $1.99	2		24					
132	$2.00 to $2.24								
133	$2.25 to $2.49								
	All other wage-earners—								
134	Less than $0.50					1			
135	$0.50 to $0.74		29			6			
136	$0.75 to $0.99	1	12	1		14			1
137	$1.00 to $1.24	77	397	19	11	73		2	1
138	$1.25 to $1.49	28	525	17	1	115	2	2	6
139	$1.50 to $1.74	336	543	378	17	236		7	6
140	$1.75 to $1.99	97	659	322	27	174		87	8
141	$2.00 to $2.24	622	88	120	85	474	7	23	19
142	$2.25 to $2.49	229	36	26	31	120	24	29	21
143	$2.50 to $2.74	109	6	9	2	20	85	58	6
144	$2.75 to $2.99	9	3	1		7	38	38	
145	$3.00 to $3.24	24	1			13	102	38	
146	$3.25 to $3.49					8			
147	$3.50 to $3.74	3	1				12	2	
148	$3.75 to $3.99	2	1				1		
149	$4.00 to $4.24						1		
150	$4.25 and over	1					2		
	Average number of wage-earners employed during each month:								
	Men 16 years and over—								
151	January	8,120	9,612	4,830	2,197	7,592	1,579	1,627	395
152	February	7,805	9,265	4,847	2,196	7,323	1,590	1,463	340
153	March	7,294	8,828	4,706	2,198	6,499	1,572	1,432	263
154	April	6,496	8,360	4,734	165	5,976	1,490	1,403	163
155	May	6,199	8,107	4,773	138	5,834	1,481	1,271	139
156	June	6,179	7,743	4,766	131	5,804	1,480	1,421	159
157	July	6,408	7,942	4,793	136	5,798	1,496	1,451	154
158	August	6,512	8,129	4,843	975	5,678	1,482	1,463	178
159	September	6,793	8,624	4,808	2,209	5,905	1,594	1,377	242
160	October	7,284	9,464	4,854	2,253	6,539	1,687	1,410	381
161	November	7,173	9,938	4,881	2,288	6,962	1,727	1,396	491
162	December	7,533	10,296	4,849	2,430	7,322	1,758	1,344	527
	Boys under 16 years—								
163	January	35	219	131	2	69	20	22	1
164	February	35	221	128	2	69	18	18	1
165	March	35	223	129	2	68	10	20	1
166	April	31	219	128		62	9	24	1
167	May	32	211	124		62	8	25	1
168	June	31	207	131		61	8	17	1
169	July	32	234	131	2	59	9	22	1
170	August	32	216	131	2	65	7	19	1
171	September	34	217	129	3	65	5	19	1
172	October	35	218	128	3	65	5	19	1
173	November	38	216	127	4	65	5	18	1
174	December	38	215	131	4	70	4	17	1

BY STATES AND TERRITORIES: 1902—Continued.

Ohio.	Oregon.	Pennsylvania.	Tennessee.	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Wyoming.	All other states and territories.	
			1								81
								4			82
1		1						8			83
23	1	183	83	71	2	824		238			84
245		1,269	368	448	1	116		670			85
2,288	12	7,764	1,013	91	1	199		2,208	26		86
1,873		10,877	944	84	3	118	7	2,395	9		87
5,553	58	17,129	667	708	28	419	1	3,448	484	15	88
2,882	1	9,913	332		489	193		1,738	339		89
3,240		7,574	118		7		179	1,481	775	2	90
981		3,307	71		343		381	478	128		91
300	40	2,034	219		1	1	1,566	459	161	2	92
102	4	3,728					124	268	51		93
293		1,864			149	7	3	30	29		94
55		268						4	248		95
23		95			1		75	26	11	3	96
95		4			13			13	20		97
			5								98
			110	66				3			99
3		24	147			21		58			100
3		23	72	31		8		72			101
9		81	64					233			102
32		46	9					132			103
3		124	38				2	84	53	7	104
11		98					48	42	21		105
		132					4	4	1		106
		16									107
		29									108
											109
											110
											111
				26				1			112
		7	3	2				3			113
1		9	20	3		59		83		5	114
10		82	63	2		65	10	287			115
51		235	34			9		228	10		116
264	4	697	27	2	3	73	28	353	2		117
245		831	6	15		9	110	98	5		118
16		91	2		31		27	37	44		119
		8			9		42	7	2		120
8		3					6	3	5		121
							1				122
		1									123
											124
2		7	22	6		14		11			125
14		135	113	5		69	3	250			126
96		757	37	6		22	6	339			127
207	7	582	1	9	10	15	15	202	7		128
6		96	1				8	40	12		129
8		31			4		6	7	12		130
3		4							4		131
											132
											133
		1									134
11		18	53	55				30			135
70		99	17	67		31		24			136
185		381	288	10	7	55	7	567	3		137
151		1,009	236	17	4	78	13	1,437	9		138
1,299		3,314	439	41	18	145	67	1,898	42		139
597		2,062	138	73	5	175	59	1,541	218		140
3,163	64	5,688	89	32	102	31	172	649	247		141
212		4,162	33	13	22	38	396	185	405		142
156		893	82		182	1	193	84	415		143
15		250	1		43		102	22	28		144
5		70			20		74	7	12	4	145
14		5					1	11			146
19		10									147
											148
15		2						1			149
									1		150
25,117	213	89,130	6,297	2,029	1,501	2,876	4,232	25,744	4,920	46	151
25,401	213	87,355	6,207	2,035	1,528	2,872	4,196	25,732	4,646	46	152
25,430	203	88,987	6,138	1,954	1,652	2,752	4,183	26,081	4,302	45	153
24,963	199	88,503	6,311	1,956	1,483	2,823	4,055	26,031	3,846	41	154
24,241	192	88,188	6,300	1,988	1,455	2,748	3,610	25,655	3,481	42	155
24,418	193	89,625	6,087	1,984	1,429	2,709	3,617	19,112	3,544	40	156
24,824	188	89,950	5,442	1,978	1,473	2,878	3,759	16,564	3,694	40	157
25,470	198	91,367	5,455	1,950	1,478	2,983	3,683	18,148	3,820	40	158
25,752	203	92,217	5,458	1,913	1,591	2,857	3,719	19,419	4,177	47	159
26,712	211	93,620	5,649	1,887	1,617	2,934	3,885	22,885	4,436	55	160
27,426	216	93,311	6,490	1,881	1,754	3,079	3,857	25,212	4,477	55	161
27,770	219	93,543	6,718	1,881	1,783	3,097	3,920	26,197	4,601	55	162
311	7	1,577	170	26	14	121	38	955	34		163
310	7	1,528	169	26	16	118	39	959	34		164
322	7	1,577	170	26	13	115	40	965	34		165
320	7	1,584	170	26	15	118	39	961	32		166
324	7	1,596	172	26	13	117	36	974	35		167
332	7	1,617	172	26	16	110	35	758	33		168
343	7	1,632	174	26	15	121	33	607	33		169
347	7	1,647	179	26	13	118	35	649	35		170
339	7	1,644	179	26	14	133	36	693	36		171
364	7	1,641	178	26	11	115	42	845	39		172
362	7	1,641	174	26	13	124	42	900	37		173
358	7	1,660	181	26	15	130	41	922	38		174

TABLE 60.—COAL, BITUMINOUS—DETAILED SUMMARY,

		Kansas.	Kentucky.	Maryland.	Michigan.	Missouri.	Montana.	New Mexico.	North Dakota.
	Contract work:								
175	Amount paid	$3,644	$10,668	$8,499	$7,500	$42,031	$1,000	$5,770	$2,795
176	Number of employees	106	73	40	13	110	18	81	9
	Miscellaneous expenses:								
177	Total	$418,921	$285,792	$312,198	$106,414	$250,078	$118,693	$63,990	$22,262
178	Royalties and rent of mine and mining plant.	$173,770	$79,189	$105,607	$48,127	$118,135	$41,153	$26,668	$1,407
179	Rent of offices, taxes, insurance, interest, and other sundries.	$245,151	$206,603	$206,591	$58,287	$131,943	$77,540	$37,322	$20,855
180	Cost of supplies and materials	$596,501	$743,313	$510,092	$82,448	$304,821	$233,930	$156,513	$86,467
	Product:								
181	Quantity, short tons	5,266,065	6,766,984	5,271,609	964,718	3,890,154	1,560,823	1,048,763	226,511
182	Value	$6,862,787	$6,666,967	$5,579,869	$1,653,192	$5,374,642	$2,443,447	$1,600,230	$325,967
	Power:								
183	Total horsepower	12,629	13,053	9,034	4,466	8,220	5,448	3,879	839
	Owned—								
	Engines—								
	Steam—								
184	Number	222	191	54	46	190	47	57	21
185	Horsepower	12,545	11,881	7,612	3,699	8,184	5,273	3,810	839
	Gas or gasoline—								
186	Number	3	3	1	1	4	.....	1	.....
187	Horsepower	17	40	12	2	36	.....	25	.....
	Water wheels—								
188	Number	.....	.....	.....	.....	.....	.....	1	.....
189	Horsepower	.....	.....	.....	.....	.....	.....	4	.....
	Other power—								
190	Number	9	10	35	5	.....	20	1	.....
191	Horsepower	67	982	1,410	765	.....	175	40	.....
	Rented—								
192	Electric, horsepower	.....	150	.....	.....	.....	.....	.....	.....
193	Other power, horsepower	.....	.....	.....	.....	.....	.....	.....	.....
	Electric motors owned—								
194	Number	9	40	.....	12	7	26	12	12
195	Horsepower	270	1,824	.....	376	300	714	1,200	86
196	Supplied to other establishments, horsepower.	.....	150	.....	.....	.....	.....	.....	.....

BY STATES AND TERRITORIES: 1902—Continued.

Ohio.	Oregon.	Pennsylvania.	Tennessee.	Texas.	Utah.	Virginia.	Washington.	West Virginia.	Wyoming.	All other states and territories.	
$46,818	.....	$474,679	$14,094	$38	$340	$27,600	$200	$23,092	$12,747	$1,800	175
290	.....	985	71	2	2	52	3	79	17	5	176
$1,619,451	$25,737	$6,178,975	$432,029	$102,237	$94,123	$315,384	$180,213	$2,087,528	$224,947	$1,535	177
$854,604	$1,607	$2,714,816	$245,001	$17,499	$643	$177,199	$40,780	$1,215,940	$63,095	$50	178
$764,847	$24,130	$3,464,159	$187,028	$84,738	$93,480	$138,185	$139,433	$871,588	$161,852	$1,485	179
$2,082,788	$86,355	$8,224,475	$390,561	$99,127	$196,114	$215,458	$473,254	$2,327,377	$669,328	$4,501	180
23,519,894	65,648	98,574,367	4,382,968	901,912	1,574,521	3,182,993	2,681,214	24,570,826	4,429,491	27,242	181
$26,953,789	$160,075	$106,032,460	$5,399,721	$1,477,245	$1,797,454	$2,543,595	$4,572,295	$24,748,658	$5,236,339	$58,728	182
46,635	527	146,921	6,042	1,899	3,197	6,221	10,156	48,674	19,883	155	183
597	11	1,440	66	53	37	52	85	433	132	4	184
45,517	527	134,932	5,678	1,895	3,197	5,846	9,116	44,495	17,283	155	185
28	.....	25	13	.....	.....	.....	.....	8	.....	.....	186
188	.....	292	94	.....	.....	.....	.....	47	.....	.....	187
.....	.....	.....	.....	.....	.....	3	7	.....	.....	.....	188
.....	.....	.....	.....	.....	.....	375	1,005	.....	.....	.....	189
10	.....	81	5	1	.....	.....	.....	18	13	.....	190
815	.....	10,255	270	4	.....	.....	.....	3,917	2,600	.....	191
85	.....	1,442	.....	.....	.....	.....	25	215	.....	.....	192
30	.....	.....	.....	.....	.....	.....	10	.....	.....	.....	193
131	.....	432	15	1	15	28	77	217	24	.....	194
5,527	.....	20,508	805	40	1,325	1,280	2,133	16,894	1,079	.....	195
.....	.....	225	.....	6	.....	315	125	70	.....	.....	196

PETROLEUM

PETROLEUM.

By F. H. Oliphant.

The only census statistics for the production of crude petroleum comparable with those of 1902 are the statistics for 1870 and 1889. No census of the industry was taken in 1860, the year following the drilling of Drake's well, and the census of 1880 was chiefly for refined petroleum, although some data were given for the crude. In Table 1, which is a comparative summary from 1860 to 1902, the production shown for 1860 is the estimate published by the United States Geological Survey, and the figures for 1880 are selections from tabulations in the census report. However defective the basis of comparison, the table is sufficient to indicate the progress made from one period to another in the rise of this important industry.

Table 1.—*Comparative summary: 1860 to 1902.*

	1902	1889	1880	1870	1860
Number of wells	118,671	35,163	15,009	[1] 2,314	(2)
Number of operators	29,522	(2)	(2)	(2)	(2)
Salaried officials, clerks, etc.:					
Number	3,033	[3] 173	(4)	(4)	(2)
Salaries	$2,986,768	$163,156	(4)	(4)	(2)
Wage-earners:					
Average number	[5] 17,552	[3] 22,366	11,477	4,488	(2)
Wages	$13,242,361	$8,388,744	$7,179,000	$3,995,030	(2)
Contract work	$12,956,631	(2)	$3,730,000	(2)	(2)
Miscellaneous expenses	$15,811,726	(2)	(2)	(2)	(2)
Cost of supplies and materials	$17,781,512	$9,505,935	$3,174,160	$1,401,945	(2)
Product:					
Quantity, barrels of 42 gallons	[6] 89,275,302	35,163,513	26,286,123	4,315,798	500,000
Value	[6] $71,397,739	$26,963,340	$24,600,638	$19,304,224	$4,800,000

[1] Establishments.
[2] Not reported.
[3] Foremen included in wage-earners.
[4] Not reported separately.
[5] The apparent decrease in the wage-earners for 1902, as compared with 1889, is caused almost entirely by the difference in the methods of computing the average number at the two censuses.
[6] The United States Geological Survey reports 88,766,916 barrels, valued at $71,178,910, which represents the product marketed. The Census figures represent the petroleum produced.

The statistics showing the production of petroleum in the United States during the decade between the census years 1889 and 1902 indicate a very remarkable increase in the quantity and value of this important natural product. The number of barrels produced in 1889 was 35,163,513, valued at $26,963,340. The number of barrels produced in 1902 was 89,275,302, valued at $71,397,739, which shows an increase of 153.9 per cent in quantity and 164.8 per cent in value. The average increase in quantity for each of the twelve years between the dates named was 12.8 per cent and in value 13.7 per cent. The conditions that brought about this increase were varied and extensive, the most conspicuous of which was the opening up of several large pools in northwestern Pennsylvania during 1890 and 1891, followed by the development of the McDonald pool near Pittsburg, which reached its zenith in 1891, giving to Pennsylvania in that year the greatest production in its record.

In Ohio, from its two fields, there has been a gradual increase, the production reaching its height in 1896, with a slight decline to the close of 1902. In West Virginia, from 1890 to 1900, there was a remarkable increase in the production, the greatest output being in the latter year; this has since been followed by a gradual decline.

In Indiana there have been almost continual gains since the beginning of 1890 to the close of 1902. In California, during the period beginning with 1894 and ending with 1902, there has been a remarkable increase in production, this being most marked from the beginning of 1900 up to the close of 1902. Since the year 1898 the production in Texas has been increasing at a wonderful rate; the gain in 1902 compared with 1901 was the greatest on record. A decided increase was also shown in Kansas.

While the combined output of the older fields in the northeastern portion of the United States showed only a very slight decline, the fields of the Southwest and West developed an extraordinary increase in new production, although this production was of a quality inferior to that of the older fields and was marketed at a less value.

The total number of all wells at the close of 1902, which includes the dry holes and those abandoned, was 118,671; of this number 108,604 were productive wells.

Wells and tankage.—The total number of wells drilled in 1902, both dry holes and productive, the number of flowing and pumping wells, the number of wells

operated, the number of wells that produced petroleum and the number abandoned, and the number of tanks at the wells and their capacity for receiving the output are shown in the following table:

TABLE 2.—RECORD OF WELLS AND TANKAGE, BY STATES AND TERRITORIES: 1902.

WELLS AND TANKAGE.	United States.	California.	Colorado.	Indiana.	Kansas.	Kentucky.	New York.	Ohio.	Pennsylvania.	Texas.	West Virginia.	All other states and territories.
Wells:												
Total number	118,671	2,757	111	9,439	470	392	8,443	42,483	40,444	955	13,109	68
Total number producing	108,644	2,574	77	8,224	419	263	8,178	39,056	37,806	852	11,138	[1] 57
Number flowing	694	35	.....	1	52	14	.....	3	1	70	500	18
Number pumping	107,950	2,539	77	8,223	367	249	8,178	39,053	37,805	782	10,638	39
Total number drilled during 1902	15,506	425	48	2,932	282	358	626	5,313	3,034	252	2,193	43
Number producing	12,348	323	20	2,489	245	249	531	4,419	2,275	216	1,544	37
Number of dry holes	3,158	102	28	443	37	109	95	894	759	36	649	6
Number abandoned during 1902	6,869	81	6	772	14	20	170	2,533	1,879	67	1,322	5
Tankage:												
Number of tanks at wells	51,774	1,439	60	2,568	304	206	2,937	11,823	20,323	1,010	11,067	37
Total capacity in barrels of 42 gallons	14,416,147	2,366,153	41,579	592,172	43,238	109,989	308,029	1,891,300	1,864,755	4,917,923	2,263,209	16,800

[1] Includes wells distributed as follows: Illinois, 2; Indian Territory, 13; Louisiana, 7; Michigan, 12; Missouri, 5; Oklahoma, 3; Tennessee, 4; Wyoming, 11.

In the entire United States there were 15,506 wells drilled in 1902; of this number 3,158 were dry holes—that is, wells which did not produce petroleum in sufficient quantity to justify pumping them or were totally destitute of petroleum. The number of producing wells drilled in 1902 was, therefore, 12,348. There were 694 flowing wells producing petroleum and 107,950 wells that were pumped, making a total of 108,644 producing wells in the United States in 1902. The greatest number of flowing wells was in West Virginia, where they numbered 500.

Flowing wells do not usually continue to flow for long periods, and are found only in comparatively new territory, where the pressure of natural gas still remains in the rock. Wells that are pumped are usually operated by sucker rods—wooden rods with iron sockets reaching down inside a 2-inch pipe or tubing to a working barrel at the bottom containing valves, the packing being made by leather cups. The motion is from 10 to 18 inches, 20 to 60 strokes per minute. The depth of wells which produce petroleum varies from 250 to 3,300 feet; the latter depth is attained only in West Virginia. Of the total producing wells 70.8 per cent are located in the states of Ohio and Pennsylvania, the former state leading the latter by 1,250 wells. The number of producing wells in New York was 8,178 and in Indiana 8,224. California comes next with 2,574 producing wells, 35 of which are flowing. The number of wells in the United States abandoned during the year was 6,869, which is more than half of the productive wells drilled in 1902. The greatest number of abandoned wells in 1902 was in Ohio, where the number reached 2,533. The number of abandoned wells in Pennsylvania was 1,879; in West Virginia, 1,322; and in Indiana, 772.

The tanks vary in capacity from 5 to 1,200 barrels, and are connected with the pipe line system by pipes. Each tank is usually measured and numbered by the pipe line company and the number of barrels to the inch noted. A valve that is attached to the bottom of the tank and the lead line is locked by the pipe line company and is only opened when the number of inches of petroleum in the tank is measured by the gauger, and it is closed by him at the end of the run.

Capital stock of incorporated companies.—The capital stock and bonded indebtedness of incorporated companies are reported by states and territories in the following table:

TABLE 3.—CAPITALIZATION OF INCORPORATED COMPANIES: 1902.

	United States.	California.	Colorado.	Indiana.	Kansas.	Kentucky.
Capital stock and bonds issued	$330,905,859	$109,679,132	$4,840,054	$13,577,400	$6,415,000	$15,248,546
Capital stock:						
Total authorized—						
Number of shares	330,456,514	110,040,309	9,180,000	1,129,814	9,603,000	9,900,100
Par value	$408,904,489	$155,147,989	$7,245,000	$13,981,400	$7,650,000	$19,720,000
Total issued—						
Number of shares	213,116,629	73,218,625	7,116,741	770,364	8,368,000	7,071,811
Par value	$324,186,603	$108,043,132	$4,428,054	$13,577,400	$6,415,000	$15,211,984
Dividends paid	$10,771,936	$1,190,012	$120,042	$1,921,191	$73,500	$34,420
Common—						
Authorized—						
Number of shares	328,039,394	107,646,689	9,180,000	1,129,814	9,603,000	9,900,100
Par value	$404,160,869	$152,754,369	$7,245,000	$13,981,400	$7,650,000	$19,720,000
Issued—						
Number of shares	210,985,678	71,097,964	7,116,741	770,364	8,368,000	7,071,811
Par value	$321,036,942	$105,922,471	$4,428,054	$13,577,400	$6,415,000	$15,211,984
Dividends paid	$10,744,563	$1,186,834	$120,042	$1,921,191	$73,500	$34,420
Preferred—						
Authorized—						
Number of shares	2,417,120	2,393,620	.....	.....	.....	.....
Par value	$4,743,620	$2,393,620	.....	.....	.....	.....
Issued—						
Number of shares	2,130,951	2,120,661	.....	.....	.....	.....
Par value	$3,149,661	$2,120,661	.....	.....	.....	.....
Dividends paid	$27,373	$3,178	.....	.....	.....	.....
Bonds:						
Authorized—						
Number	162,325	5,400	650	.....	.....	100,000
Par value	$11,775,000	$5,300,000	$650,000	.....	.....	$100,000
Issued—						
Number	91,993	1,736	412	.....	.....	36,562
Par value	$6,719,256	$1,636,000	$412,000	.....	.....	$36,562
Interest paid	$297,333	$80,883	$7,840	.....	.....	$2,060
Assessments levied	$1,954,628	$876,198	.....	.....	.....	$909,006

TABLE 3.—CAPITALIZATION OF INCORPORATED COMPANIES: 1902—Continued.

	New York.	Ohio.	Pennsylvania.	Texas.	West Virginia.	All other states and territories.[1]
Capital stock and bonds issued	$1,684,700	$37,358,100	$27,075,100	$79,928,408	$29,706,200	$5,393,219
Capital stock:						
Total authorized—						
Number of shares	16,847	373,581	270,751	152,085,235	415,862	37,441,015
Par value	$1,684,700	$37,358,100	$27,075,100	$99,424,500	$29,706,200	$9,911,500
Total issued—						
Number of shares	16,847	373,581	270,751	108,422,232	415,862	7,071,815
Par value	$1,684,700	$37,358,100	$27,075,100	$75,368,714	$29,706,200	$5,318,219
Dividends paid	$136,015	$4,715,322	$945,372	$655,216	$980,846	.....
Common—						
Authorized—						
Number of shares	16,847	373,581	270,751	152,061,735	415,862	37,441,015
Par value	$1,684,700	$37,358,100	$27,075,100	$97,074,500	$29,706,200	$9,911,500
Issued—						
Number of shares	16,847	373,581	270,751	108,411,942	415,862	7,071,815
Par value	$1,684,700	$37,358,100	$27,075,100	$74,339,714	$29,706,200	$5,318,219
Dividends paid	$136,015	$4,715,322	$945,372	$631,021	$980,846	.....
Preferred—						
Authorized—						
Number of shares	.....	.....	.....	23,500	.....	.....
Par value	.....	.....	.....	$2,350,000	.....	.....
Issued—						
Number of shares	.....	.....	.....	10,290	.....	.....
Par value	.....	.....	.....	$1,029,000	.....	.....
Dividends paid	.....	.....	.....	$24,195	.....	.....
Bonds:						
Authorized—						
Number	.....	.....	.....	55,975	.....	300
Par value	.....	.....	.....	$5,575,000	.....	$150,000
Issued—						
Number	.....	.....	.....	53,133	.....	150
Par value	.....	.....	.....	$4,559,694	.....	$75,000
Interest paid	.....	.....	.....	$202,050	.....	$4,500
Assessments levied	.....	.....	.....	$178,440	.....	.....

[1] Includes Illinois, Indian Territory, Louisiana, Michigan, Missouri, Oklahoma, Tennessee, and Wyoming.

The total amount of capital stock issued and funded debt outstanding was $330,905,859. The number of shares of common and preferred stock authorized amounted to 330,456,514. Of this amount 213,116,629 shares were issued, the par value being $324,186,603, upon which $10,771,936, or 3.3 per cent, was paid as dividends. The par value of the common stock issued was $321,036,942 and the dividends paid upon it amounted to $10,744,563; on the issue of preferred stock, the par value of which was $3,149,661, the dividends paid amounted to $27,373. The par value of the bonds issued amounted to $6,719,256 and the interest paid was $297,333, or 4.4 per cent.

The greatest amount of stock was issued in the state of California, the par value being $108,043,132, upon which $1,190,012 in dividends was paid. Texas was next, with a par value of $75,368,714, upon which $655,216 was paid in dividends. Ohio was third; the par value of stock issued amounted to $37,358,100, and the dividends paid, to $4,715,322. In Pennsylvania the par value of stocks was $27,075,100, on which dividends amounting to $945,372 were paid. In West Virginia the par value of the stock issued amounted to $29,706,200 and the dividends to $980,846.

Speculative companies, numbering 1,200 or more, have been organized since 1900, representing a capitalization estimated to be at least $600,000,000. A large amount of stock has been issued by such companies operating in Texas, California, Colorado, Louisiana, and Kentucky.

Employees and wages.—The total number of persons regularly employed in the production of crude petroleum in 1902 was 20,585, who received $16,229,129 in salaries and wages. Of this number 3,033 persons were employed as salaried officials, clerks, etc., and received $2,986,768. The total average number of wage-earners was 17,552, who received $13,242,361. The average number of wage-earners employed each month during 1902 is shown by states and territories in the following table:

TABLE 4.—AVERAGE NUMBER OF WAGE-EARNERS EMPLOYED DURING EACH MONTH: 1902.

	United States.	California.	Colorado.	Indiana.	Kansas.	Kentucky.	New York.	Ohio.	Pennsylvania.	Texas.	West Virginia.	All other states and territories.[1]
Men 16 years and over:												
January	17,364	1,094	163	1,381	135	49	410	4,007	5,633	605	3,851	36
February	17,238	1,060	170	1,364	138	49	408	3,973	5,620	606	3,814	36
March	17,346	1,117	151	1,388	136	54	408	3,976	5,620	651	3,809	36
April	17,435	1,105	155	1,423	137	74	409	4,003	5,621	661	3,811	36
May	17,482	1,093	140	1,431	140	74	410	4,009	5,622	698	3,826	39
June	17,364	1,073	157	1,443	143	74	408	4,018	5,585	615	3,799	49
July	17,484	1,098	146	1,464	149	82	407	4,020	5,583	700	3,769	66
August	17,547	1,085	142	1,493	150	87	407	4,059	5,580	735	3,753	56
September	17,566	1,086	146	1,517	149	96	406	4,035	5,566	782	3,729	54
October	17,863	1,138	139	1,541	150	112	407	4,046	5,614	863	3,799	54
November	17,934	1,183	118	1,542	161	105	408	4,046	5,633	875	3,811	52
December	18,001	1,212	137	1,569	164	92	408	4,012	5,643	885	3,829	50

[1] Includes Illinois, Indian Territory, Louisiana, Michigan, Missouri, Oklahoma, Tennessee, and Wyoming.

The greatest number of employees is found in Pennsylvania. Although Ohio, West Virginia, Texas, and California produced more petroleum, they employed fewer wage-earners, because more of their wells were large producers. Pennsylvania employed 32 per cent of the wage-earners and produced only 13.5 per cent of the entire product, the wells with one exception being pumping wells. On the other hand, Texas employed only 4.1 per cent of the wage-earners, although producing 20.7 per cent of the petroleum; and California with 6.3 per cent of the wage-earners yielded 15.7 per cent of the petroleum. There was very little fluctuation in the number employed, taken as a whole.

The average number of wage-earners by occupations at specified daily rates of pay is shown in the following table:

TABLE 5.—*Average number of wage-earners at specified daily rates of pay, by occupations: 1902.*

RATE PER DAY (DOLLARS).	All occupations.	Engineers.	Firemen.	Machinists, blacksmiths, carpenters, and other mechanics.	All other wage-earners.
Total	17,552	12,951	65	3,757	779
Less than 0.50	1	1	.....	.....	.....
0.50 to 0.74	1	1	.....	.....	.....
0.75 to 0.99	4	2	.....	.....	2
1.00 to 1.24	74	57	.....	12	5
1.25 to 1.49	61	51	.....	4	6
1.50 to 1.74	699	63	1	549	86
1.75 to 1.99	1,078	404	.....	633	41
2.00 to 2.24	1,403	601	5	572	225
2.25 to 2.49	10,046	9,872	.....	138	36
2.50 to 2.74	2,366	1,580	20	502	264
2.75 to 2.99	242	72	8	147	15
3.00 to 3.24	859	182	24	570	83
3.25 to 3.49	277	16	3	258	.....
3.50 to 3.74	89	25	.....	57	7
3.75 to 3.99	38	1	1	34	2
4.00 to 4.24	25	7	.....	16	2
4.25 and over	289	16	3	265	5

Nearly 57.2 per cent of the wage-earners connected with the production of petroleum in 1902 received between $2.25 and $2.49 per day. Only about eight-tenths of 1 per cent received less than $1.50 per day. Of the 12,951 engineers, 76.2 per cent received between $2.25 and $2.49 per day, and only 1.4 per cent received less than $1.75 per day. Of those rated as mechanics, including blacksmiths, carpenters, and others of like occupation, 63.7 per cent received from $1.50 to $2.74 per day and 19.1 per cent from $2.75 to $3.24. About four-tenths of 1 per cent of this class of wage-earners received less than $1.50 per day. Nearly 84 per cent of "all other wage-earners" received from $1.50 to $2.74 per day.

Contract work.—The amount paid for contract work was $12,956,631, or 44.4 per cent of the total amount paid for salaries, wages, and contract work. Nearly all the building of rigs, drilling of new wells, torpedoing and cleaning out was done by contract work, the cost of which also includes the value of material furnished and a profit to the contractor. There are numerous instances where the owners of wells contracted with individuals for the work necessary to pump and care for a cluster of wells, dividing the pipe line runs pro rata. The entire number thus employed is estimated to be 12,800.

A concise statement covering the entire petroleum producing fields is difficult to secure. The drilling of a well requires from ten days to seven weeks, and, when the work is completed, the crew is removed by the contractor usually to some distant location. A crew is temporarily employed to clean out a well after it has been torpedoed. In torpedoing wells, building tanks, connecting pipe lines, and in other matters of labor and materials furnished which are paid for in the lump, a similar condition of affairs existed, the workmen going from well to well or from district to district. Thus it is that no detailed account can be secured showing what part of the disbursements for this kind of work went to labor under the head of "cost of contract work" and what to "cost of supplies and materials."

Supplies, materials, and miscellaneous expenses.—Under supplies and materials are included casing, tubing, pipe, engines, boilers, tanks, etc., and renewals. Under miscellaneous expenses are included rent of offices, taxes, insurance, etc., and royalties and rent of wells and plants. The entire expense reported under the above headings for the year 1902 was $33,593,238.

Mechanical power.—For the producing wells a total of 910,077 horsepower was reported, of which 907,854 horsepower was owned by the operators and 2,223 horsepower was rented. Of the power owned 666,177 horsepower was furnished by 41,797 steam engines, 240,505 by 12,606 gas or gasoline engines, and 1,172 horsepower by 37 other prime motors. In addition, 2 electric motors with a capacity of 25 horsepower were reported. The steam engines averaged approximately 16 horsepower, and the gas or gasoline engines 19 horsepower. The rented power consisted of 125 electric and 2,098 horsepower of other kinds. The electric power, both owned and rented, was reported from California. Over 54 per cent of the horsepower was employed in Pennsylvania.

Production.—The production of crude petroleum in the United States in 1902 was 89,275,302 barrels—greater than ever before and nearly equal to that of Russia and all the other petroleum producing countries of the world combined. This was the product of 108,644 wells, an average of 822 barrels per well, or 2.14 barrels per well per day. The quantity and value of the crude petroleum produced in the United States in 1902 are given by states and territories, arranged in the order of their production, with percentages of the whole, in the following table:

TABLE 6.—*Quantity and value, with percentages, by states and territories: 1902.*

STATE OR TERRITORY.	Barrels.	Per cent.	Value.	Per cent.
Total	89,275,302	100.0	$71,397,739	100.0
Ohio	21,014,231	23.5	20,757,359	29.1
Texas	18,515,017	20.7	4,174,731	5.8
California	13,984,268	15.7	4,873,617	6.8
West Virginia	13,513,345	15.1	17,040,317	23.9
Pennsylvania	12,063,880	13.5	15,266,093	21.4
Indiana	7,480,896	8.4	6,526,622	9.1
New York	1,119,730	1.3	1,530,852	2.1
Louisiana	584,617	0.6	188,985	0.3
Colorado	396,901	0.4	484,683	0.7
Kansas	331,749	0.4	292,464	0.4
Kentucky	248,950	0.3	172,837	0.2
Indian Territory	37,000	0.1	32,190	0.1
Tennessee	12,919	(1)	9,569	(1)
Wyoming	6,253	(1)	43,771	0.1
Michigan	721	(1)	908	(1)
Missouri	525	(1)	1,000	(1)
Illinois	200	(1)	1,000	(1)
Oklahoma	100	(1)	750	(1)

[1] Less than one-tenth of 1 per cent.

Of the total production from 1859 to 1902, Pennsylvania and New York produced 53.9 per cent, Pennsylvania probably producing nearly 50 per cent, and New York about 4 per cent. Ohio produced 24.4 per cent; West Virginia, 11.3 per cent; Indiana, 3.9 per cent; Texas, 2.1 per cent; California, 3.6 per cent; leaving eight-tenths of 1 per cent for the remaining states and territories, which include Colorado, Illinois, Indian Territory, Kansas, Kentucky, Louisiana, Michigan, Missouri, Oklahoma, Tennessee, and Wyoming. It is estimated that from the crude petroleum produced in the United States in 1902, there were obtained 1,938,669,445 gallons of refined petroleum products, which represents about 72 per cent of the total refined products for the world.

In the year 1902 the United States for the first time in five years surpassed the petroleum production of Russia. In that year these two countries together produced 91.4 per cent of the total output, as compared with 93.2 per cent in 1901 and 94.1 per cent in 1900. Indications seem to point to the fact that the wide distribution of petroleum in nearly all countries of the globe, and the more successful methods of securing its profitable production and transportation, will cause an increase in the yearly output of the entire world for a number of years.

The very high grade of a large part of the crude petroleum produced in the United States gives this country a very large percentage of the production of the higher grades of refined petroleum. A careful estimate places the refined product secured from the crude in the United States at 52 per cent of its entire production, compared with 21 per cent of the entire output of Russia and 28 per cent for the average refined products secured from the crude produced in all other countries. It is estimated that the proportion of refined products—the illuminating, naphtha, and lubricating petroleums—produced in the United States in 1902 amounted to 72.1 per cent of the entire production of the world for that year; while Russia produced 25.2 per cent and all the other countries 2.7 per cent. The United States, therefore, produced nearly 2.6 barrels of refined production for every barrel produced by the rest of the world.

The most valuable grades of crude petroleum, from which the very best grades of refined products are secured, continue to be produced in the United States, principally in the northeastern portion, from the Appalachian and Lima-Indiana fields. The lubricating products made from the crude petroleum produced in this section are also superior to any others produced in the entire world. It supplies almost the entire demand for lubricants in the United States, and large quantities of it are marketed abroad. About 45 per cent of the entire quantity of refined petroleum products manufactured in the United States is marketed abroad.

In the following table is given a statement of the total quantity and value of all crude petroleum produced and marketed in the United Stated in 1902 and 1901, by states and territories and important districts, and average price per barrel:

TABLE 7.—*Production, value, and average price per barrel, by states and territories, and by districts: 1902 and 1901.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

STATE, TERRITORY, OR DISTRICT.	1902			1901		
	Quantity (barrels).	Value.	Average price per barrel.	Quantity (barrels).	Value.	Average price per barrel.
Grand total	[1]88,766,916	$71,178,910	$0.8019	69,389,194	$66,417,335	$0.957+
California	13,984,268	4,873,617	0.348	8,786,330	4,974,540	0.566
Colorado	396,901	484,683	1.22	460,520	461,031	1.00
Illinois	200	1,000	5.00	250	1,250	5.00
Indian Territory	37,000	32,190	0.87	10,000	7,125	0.7125
Indiana	7,480,896	6,526,622	0.872	5,757,086	4,822,826	0.8377
Kansas	331,749	292,464	0.88	179,151	154,373	0.862
Kentucky and Tennessee	185,331	141,044	0.76	137,259	111,527	0.813
Louisiana	548,617	188,985	0.344	.....	.....	.....
Michigan, Missouri, Oklahoma	857	1,816	2.12	2,335	2,600	1.1135
New York	1,119,730	1,530,852	1.367	1,206,618	1,460,008	1.21
Ohio	21,014,231	20,757,359	0.988	21,648,083	20,533,571	0.948
Eastern and southern	5,136,366	6,471,821	1.26	5,470,850	6,619,342	1.21
Lima	15,877,730	14,284,072	0.899	16,176,293	13,911,612	0.86
Mecca-Belden	135	1,466	10.86	940	2,617	2.78
Pennsylvania	12,063,880	15,266,093	1.265	12,625,378	15,430,609	1.222
Franklin	50,555	199,432	3.945	55,162	220,648	4.00
Pennsylvania	12,012,125	15,064,861	1.254	12,568,806	15,208,255	1.21
Smiths Ferry	1,200	1,800	1.50	1,410	1,706	1.21
Texas	18,083,658	3,998,097	0.2211	4,393,658	1,247,351	0.284
West Virginia	13,513,345	17,040,317	1.261	14,177,126	17,172,724	1.211
West Virginia	13,498,685	17,006,469	1.26—	14,164,662	17,139,241	1.21
Petroleum, Volcano	[2]14,660	33,848	2.309	[2]12,464	33,483	2.687
Wyoming	6,253	43,771	7.00	5,400	37,800	7.00

[1] In addition to this quantity, 76,538 barrels were produced in Kentucky, valued at $41,353; 489 barrels in Missouri, valued at $842; and 431,359 barrels in Texas, valued at $176,634, which were tanked and unsold by the producing companies. These appear in the totals shown in the census tables, making the aggregate 89,275,302 barrels, valued at $71,397,739.

[2] Production of light oil in Petroleum and Volcano included with West Virginia's production.

Petroleum and natural gas.—Petroleum and natural gas are intimately connected in composition and occurrence, one being a gaseous and the other a liquid hydrocarbon, and with but few exceptions they are associated in all of the fields, the gas occupying the

upper portion of the same strata which contains the petroleum. In many localities, during cold weather, a small portion of the more volatile naphthas are often condensed from the natural gas and deposited in the pipe lines. Of the combined value of the two, petroleum amounted to a little less than 70 per cent, and natural gas to a little more than 30 per cent.

In combined value they rank next to pig iron and coal in the list of the crude minerals produced in the United States in 1902. The following table presents the combined value of petroleum and natural gas by states and territories in order of values:

TABLE 8.—*Value of petroleum and natural gas: 1902.*

STATE OR TERRITORY.	Total value.	Value of petroleum.	Value of natural gas.
Total	$102,265,602	$71,397,739	$30,867,863
Pennsylvania	29,618,276	15,266,093	14,352,183
Ohio	23,112,817	20,757,359	2,355,458
West Virginia	22,430,498	17,040,317	5,390,181
Indiana	13,607,966	6,526,622	7,081,344
California	4,994,265	4,873,617	120,648
Texas	4,189,684	4,174,731	14,953
New York	1,877,323	1,530,852	346,471
Kansas	1,116,895	292,464	824,431
Colorado	486,583	484,683	1,900
Kentucky	538,448	172,837	365,611
All other states and territories[1]	292,847	278,164	14,683

[1] Includes Illinois, Indian Territory, Louisiana, Michigan, Missouri, Oklahoma, Tennessee, and Wyoming.

Exports.—Petroleum probably reaches a wider market than any other article in the whole list of our exports. It has penetrated every quarter of the globe and is without a rival in its illuminating and lubricating qualities.

Formerly petroleum was exported in barrels or cans; to-day it is largely transported in bulk, by tank steamers, from which it is delivered to receiving tanks at the various ports. Only from ten to twelve hours are required to receive or discharge a large cargo. From these receiving points it is distributed to tank cars, which reach the inland cities and towns, where it is again delivered to tanks, and finally reaches the consumer by tank wagons. A portion of it for many of the seaport towns in warm climates is still transported in cans.

The tank steamers engaged in the transportation of petroleum are modern ships throughout, and have a number of square iron tanks arranged on each side of the center line. There are a number of bulkheads made double, with water spaces between them, which separate the engine and the boilers and the quarters for the crew from the oil tanks. Some of these tank ships have a capacity of 60,000 barrels, or from 2,500,000 to 2,800,000 gallons.

In 1902 there were exported from the United States 1,064,233,601 gallons of petroleum and its products; this amount was only exceeded in the year 1901, when there were 1,079,074,519 gallons exported.

In 1902, of the total quantity exported from the United States, 50.2 per cent was loaded at New York, which is thus shown to be the leading export city, 32.4 per cent at Philadelphia, 9.2 per cent at points on the Delaware river, and 3.9 per cent at Baltimore. Lately Port Arthur and Sabine City, Tex., have become ports of export, and, together with Boston and Charlestown, Mass., and other districts, whose exports make up the remaining 4.3 per cent of the total.

The first large shipment of petroleum was in 1861, when the brig *Elizabeth Watts*, 224 tons register, sailed from Philadelphia with a full cargo of petroleum in barrels. Doctor Crawford, consul at Antwerp, had received barrels of refined petroleum previous to this shipment. For the year 1862 there were exported from Philadelphia 2,664,280 gallons, followed by 4,680,174 gallons in 1863.

In the following table the production of petroleum in barrels and their equivalent in gallons are given, together with the quantity and value of the total exports; also the quantity in gallons of the crude and manufactured products exported from 1864 to 1902, inclusive.

TABLE 9.—PRODUCTION AND EXPORTS OF CRUDE AND MANUFACTURED PRODUCTS: 1864 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	PRODUCTION.		EXPORTS (GALLONS).						
	Barrels (42 gallons).	Gallons.	Total.		Crude.	Naphtha.	Illuminating.	Lubricating and paraffin.	Residuum.
			Quantity.	Value.					
1864	2,478,709	104,105,778	23,210,369	$10,782,689	9,980,654	488,197	12,791,518	.....	.....
1865	2,424,905	101,846,010	25,496,849	16,563,413	12,293,897	480,947	12,722,005	.....	.....
1866	3,165,700	132,959,400	50,987,341	24,830,887	16,057,943	673,477	34,255,921	.....	.....
1867	3,591,900	150,859,800	70,255,481	24,407,642	7,344,248	224,576	62,686,657	.....	.....
1868	3,613,709	151,775,778	79,456,888	21,810,676	10,029,659	1,517,268	67,909,961	.....	.....
1869	4,046,558	169,955,436	100,636,684	31,127,433	13,425,566	2,673,094	84,403,492	134,532	.....
1870	4,411,016	185,262,672	113,735,294	32,668,960	10,403,314	5,422,604	97,902,505	6,871	.....
1871	5,205,234	218,619,828	152,195,617	36,668,825	11,278,589	8,396,905	182,178,843	240,228	101,052
1872	5,293,194	264,314,148	144,318,707	33,761,685	16,363,975	8,688,257	118,259,832	438,425	568,218
1873	9,893,786	415,539,012	240,369,908	45,924,880	19,643,740	10,250,497	207,595,988	1,502,503	1,377,180
1874	10,926,945	458,931,690	235,108,168	33,042,276	14,430,851	10,616,644	206,562,977	993,068	2,504,628
1875	12,162,514	510,825,588	237,526,312	31,734,861	16,536,800	14,048,726	203,678,748	938,052	2,323,986
1876	9,132,669	383,572,098	263,449,455	49,545,219	25,343,271	13,252,751	220,831,608	1,157,929	2,863,896
1877	13,350,363	560,715,246	361,883,225	57,539,873	28,773,233	19,565,909	307,373,842	1,914,129	4,256,112
1878	15,396,868	646,668,456	349,346,258	41,022,007	24,049,604	13,431,782	306,212,506	2,525,545	3,126,816
1879	19,914,146	836,394,132	421,719,782	37,235,467	28,601,650	19,524,582	365,597,467	3,168,561	4,827,522
1880	26,286,123	1,104,017,166	346,779,443	31,505,645	36,748,116	15,115,131	286,131,557	5,607,009	3,177,630
1881	27,661,238	1,161,771,996	514,561,719	48,556,103	40,430,108	20,655,116	444,666,615	5,053,862	3,756,018
1882	30,510,830	1,281,454,860	503,492,462	44,623,074	45,011,154	16,969,839	428,424,581	8,821,536	4,265,352
1883	23,449,633	984,884,586	533,145,429	47,763,079	59,018,537	17,365,314	440,150,660	10,108,394	6,502,524

TABLE 9.—PRODUCTION AND EXPORTS OF CRUDE AND MANUFACTURED PRODUCTS: 1864 TO 1902—Continued.

YEAR.	PRODUCTION.		EXPORTS (GALLONS).						
	Barrels (42 gallons).	Gallons.	Total.		Crude.	Naphtha.	Illuminating.	Lubricating and paraffin.	Residuum.
			Quantity.	Value.					
1884	24,218,438	1,017,174,396	544,495,608	$49,457,116	79,679,395	13,676,421	433,851,275	11,985,219	5,303,298
1885	21,858,785	918,068,970	560,784,459	49,671,743	81,435,609	14,739,469	445,880,518	12,978,955	5,713,908
1886	28,064,841	1,178,723,322	591,884,302	48,145,204	76,346,480	14,474,951	485,120,680	13,948,367	1,993,824
1887	28,283,483	1,187,906,286	601,846,317	46,898,842	80,650,286	12,382,213	485,242,107	20,582,613	2,989,098
1888	27,612,025	1,159,705,050	572,457,975	48,105,703	77,549,452	13,481,706	455,045,784	24,510,437	1,870,596
1889	35,163,513	1,476,867,546	680,705,456	53,293,299	85,189,658	13,984,407	551,769,666	27,903,267	1,858,458
1890	45,822,672	1,924,552,224	693,829,848	52,270,953	96,572,625	12,462,636	550,873,438	32,090,537	1,830,612
1891	54,291,980	2,280,263,160	673,905,577	46,174,835	96,722,807	11,424,993	531,445,099	33,310,264	1,002,414
1892	50,509,136	2,121,383,712	744,638,463	42,729,157	104,397,107	16,393,284	589,418,185	34,026,855	403,032
1893[1]	48,412,666	2,033,331,972	804,221,230	42,142,058	111,703,508	17,304,005	642,239,816	32,432,857	541,044
1894[1]	49,344,516	2,072,469,672	908,252,314	41,499,806	121,926,349	15,555,751	730,368,626	40,190,577	211,008
1895[1]	52,892,276	2,221,475,592	884,502,082	46,660,082	111,285,264	14,801,224	714,859,144	43,418,942	137,508
1896[1]	[2] 60,960,361	2,560,335,162	890,458,994	62,383,403	110,923,620	12,349,319	716,455,565	50,525,530	204,960
1897	[2] 60,475,516	2,539,971,672	994,297,757	59,057,547	121,488,726	13,430,320	795,919,525	51,228,284	12,230,902
1898	[2] 55,364,233	2,325,297,786	986,480,610	52,551,048	114,915,082	17,026,626	761,152,107	63,968,341	29,418,454
1899	[2] 57,070,850	2,396,975,700	951,024,441	64,982,249	117,683,967	17,904,015	724,562,993	69,329,188	21,544,278
1900	[3] 63,620,529	2,672,062,218	975,123,476	73,276,282	137,501,160	18,262,744	730,585,487	68,997,715	19,776,370
1901	69,389,194	2,914,346,148	1,079,074,519	72,784,912	127,008,062	21,684,734	827,479,493	75,305,938	27,596,352
1902	[4] 88,766,916	3,728,210,472	1,064,233,601	68,597,143	145,233,723	19,682,637	778,800,978	82,200,503	38,315,760

[1] Exports are for fiscal years from 1893 to 1896, inclusive.
[2] In addition, 4,325 barrels of crude oil were produced in Kentucky and Tennessee in 1896, 4,377 barrels in 1897, 19,125 barrels in 1898, and 13,578 barrels in 1899, for which, as none was sold or used, no value could be given.
[3] Includes 41,405 barrels of oil sold in Kentucky and Tennessee in 1900, but produced in previous years.
[4] In addition to this quantity, 508,386 barrels were produced, but not marketed.

Of the total production of crude petroleum in the United States over 38 per cent is exported as crude or refined products, leaving nearly 62 per cent, which is consumed at home. The home consumption has been growing of late, as well as the production of crude petroleum of second quality. As before noted, the total exports, for the first time, exceeded one billion gallons in 1901. There was a slight decline in 1902, yet the amount for the year was still over one billion gallons. The exports of lubricating and paraffin products have for a number of years shown a steady increase.

Foreign markets.—The following table shows the foreign markets for American petroleum and petroleum products for the nine fiscal years ending June 30, 1902:

TABLE 10.—EXPORTS OF PETROLEUM IN ITS VARIOUS FORMS FROM THE UNITED STATES, BY COUNTRIES, FOR THE FISCAL YEARS 1894 TO 1902.

[United States Geological Survey, "The Production of Petroleum," 1902.]

[Gallons.]

COUNTRY AND KIND.	YEAR ENDING JUNE 30—								
	1902	1901	1900	1899	1898	1897	1896	1895	1894
CRUDE.									
Total	133,536,800	138,448,430	133,023,656	113,088,060	113,297,397	131,726,243	110,923,620	111,285,264	121,926,349
Europe	114,315,698	126,240,274	118,735,001	101,640,504	101,167,659	118,379,316	98,596,596	98,545,330	106,498,307
France	89,733,032	108,993,721	95,603,800	83,630,510	85,125,657	100,153,929	79,242,152	72,802,459	84,434,953
Germany	6,848,989	4,214,041	3,536,491	3,485,360	3,585,777	2,430,249	817,212	3,966,870	4,877,593
Netherlands	.....	.....	3,328,764	2,409,040	2,400,000	2,400,000	4,455,469	.....	.....
Spain	10,132,815	10,229,755	16,127,318	9,723,420	9,914,851	12,049,778	12,869,235	15,188,547	15,176,034
United Kingdom	7,531,278	2,547,501	.....	310	5,060	.....	.....	3,997,013	.....
Other Europe	69,584	255,256	138,628	2,391,864	136,314	1,345,360	1,212,528	2,590,441	2,009,727
North America	17,047,967	12,187,081	14,285,875	11,447,556	12,128,712	12,487,397	12,325,724	12,733,934	15,426,042
Mexico	10,844,913	8,356,258	8,002,845	7,968,871	7,713,859	7,090,850	6,779,059	5,229,983	8,026,189
Cuba	6,126,778	3,584,240	5,935,494	3,297,175	3,829,463	4,772,589	4,838,657	6,980,372	6,865,549
Porto Rico	.....	.....	211,503	160,000	.....	.....	.....	.....	.....
Other North America	76,276	246,583	136,033	20,510	585,390	623,958	708,008	523,579	534,304
South America: Brazil	.....	.....	.....	.....	1,026	841,140	.....	.....	.....
All other countries	2,173,135	21,075	2,780	.....	.....	18,390	1,300	6,000	2,000
REFINED.									
Naphtha	23,498,479	17,834,254	21,988,093	16,252,785	16,252,929	14,249,028	12,349,319	14,801,224	15,555,754
Europe	21,221,988	16,717,472	21,387,603	15,710,221	15,612,796	13,711,520	11,883,216	14,385,121	15,242,221
France	4,381,896	4,146,165	4,776,290	1,517,758	1,713,646	2,103,725	1,672,056	1,564,360	3,764,569
Germany	7,852,195	4,940,546	6,803,632	4,716,306	6,135,309	2,800,883	2,814,217	4,900,028	4,278,757
Netherlands	.....	.....	2,030,232	1,477,034	1,500	1,400,000	.....	.....	.....
United Kingdom	8,259,392	7,340,307	7,356,743	7,584,526	7,380,140	7,125,371	7,236,285	7,343,355	6,834,760
Other Europe	728,505	290,454	420,706	414,597	382,201	281,541	160,658	577,378	364,135

TABLE 10.—EXPORTS OF PETROLEUM IN ITS VARIOUS FORMS FROM THE UNITED STATES, BY COUNTRIES, FOR THE FISCAL YEARS 1894 TO 1902—Continued.

[Gallons.]

COUNTRY AND KIND.	YEAR ENDING JUNE 30—								
	1902	1901	1900	1899	1898	1897	1896	1895	1894
REFINED—continued.									
Total	2,276,491	1,116,782	600,490	542,564	640,133	537,508	466,103	416,103	313,533
North America	1,269,189	382,536	241,340	251,879	290,372	256,869	208,249	145,970	106,454
West Indies	12,250	318,185	20,479	15,864	18,261	83,529	104,062	84,299	67,195
South America	171,438	145,848	95,314	137,743	85,492	67,178	96,020	135,752	79,777
Asia and Oceania	781,505	245,152	228,228	120,123	231,487	120,479	49,927	45,217	57,057
Africa	42,109	25,061	15,129	16,955	14,521	9,453	7,845	4,865	3,050
Illuminating	842,829,070	781,207,105	721,027,637	722,279,480	824,426,581	771,350,626	716,455,565	714,859,144	730,338,626
Europe	589,282,066	550,603,378	506,651,963	536,943,261	572,103,407	535,987,703	521,060,492	541,238,985	490,252,345
Belgium	43,231,583	41,561,489	43,675,550	40,715,711	44,317,797	42,437,133	35,418,132	35,385,765	36,312,974
Denmark	16,889,651	16,066,427	18,236,065	17,548,051	18,969,052	14,001,755	12,693,927	14,626,436	9,290,251
France	4,379,541	3,022,129	3,962,328	3,994,908	5,875,777	2,736,190	5,338,501	6,204,663	11,812,091
Germany	133,241,233	136,399,456	124,542,723	115,124,570	137,981,137	114,583,356	121,841,266	100,829,413	86,388,785
Italy	21,362,433	21,402,629	17,534,620	19,750,201	18,705,089	24,525,066	22,648,184	28,017,572	22,945,037
Netherlands	120,984,836	127,113,407	121,135,337	138,188,341	134,204,836	126,341,441	122,510,644	45,900,640	31,868,189
Sweden and Norway	31,209,568	27,809,142	24,693,536	17,345,423	23,567,695	18,961,261	10,582,677	24,623,246	9,848,074
United Kingdom	211,228,093	169,548,529	146,477,760	178,796,530	179,160,587	185,200,507	181,883,052	279,064,424	274,655,010
Portugal	3,791,534	4,317,989	1,826,056	2,692,476	5,500,240	4,712,019	4,286,732	.....	.....
Other Europe	2,963,594	3,362,181	4,567,988	2,787,050	3,821,197	2,488,975	3,862,377	6,586,826	7,232,024
North America	20,836,052	20,084,061	17,586,808	17,066,976	16,489,252	15,552,214	15,716,758	13,231,867	14,152,838
British North America	13,911,744	13,087,191	10,845,114	9,861,600	9,952,286	9,071,814	9,141,934	7,621,352	8,218,417
Central America	857,580	1,024,643	1,102,066	1,075,322	1,034,878	1,201,053	1,371,502	.....	.....
Mexico	371,421	225,172	282,160	581,222	550,544	335,692	241,061	.....	.....
West Indies—									
British	2,511,564	2,468,793	2,729,301	2,609,283	2,675,186	2,661,734	2,712,126	4,109,358	4,174,856
Other	3,125,750	3,229,659	2,592,440	2,899,504	2,234,338	2,218,373	2,189,271		
Other North America	57,993	48,603	35,727	40,045	42,020	63,548	60,864	1,501,157	1,759,565
South America	43,330,860	43,964,117	39,930,195	32,406,592	41,956,836	40,473,418	38,509,268	32,335,575	23,341,806
Argentina	9,682,775	10,644,774	10,182,529	6,483,293	10,648,733	9,703,792	7,803,218	5,876,742	3,162,846
Brazil	21,306,338	21,099,678	18,409,626	16,289,130	19,569,447	19,819,941	18,490,043	15,315,196	12,154,709
Chile	4,805,671	4,679,902	4,166,481	3,685,800	3,923,448	3,622,300	4,325,915	.....	.....
Uruguay	3,546,710	3,067,220	3,120,200	1,760,465	3,576,570	2,821,420	3,622,810	3,898,514	2,520,571
Venezuela	1,179,410	1,409,753	1,021,839	1,327,681	1,417,804	1,456,472	1,483,127	.....	.....
Other South America	2,809,956	3,092,790	3,029,520	2,760,223	2,820,834	3,049,493	2,784,155	7,245,123	5,503,680
Asia	161,080,240	128,299,535	126,781,665	109,120,865	161,578,808	153,005,091	111,604,908	99,596,634	180,446,123
China	56,702,129	27,419,929	32,775,880	22,683,425	44,324,344	42,516,120	25,694,890	18,022,860	40,377,296
Hongkong	17,990,990	18,708,250	19,181,230	18,095,260	15,637,420	14,977,050	19,499,000	10,595,610	16,888,820
East Indies—									
British	10,364,540	10,712,570	9,906,240	20,109,900	33,341,284	19,276,390	24,762,150	46,680,054	85,907,557
Dutch	15,025,710	17,044,320	11,207,740	15,371,400	12,534,930	24,898,000	16,947,830		
Other East Indies	.....	585,580	.....	.....	.....	.....	.....	.....	.....
Japan	59,598,671	53,299,686	51,297,805	32,705,180	51,621,050	46,252,501	33,701,038	24,298,170	37,272,450
Other Asia	1,398,200	529,200	2,412,770	155,700	4,119,840	5,085,030	.....	.....	.....
Oceania	17,129,511	24,388,373	20,788,133	15,469,567	20,734,303	16,343,862	19,283,532	18,322,982	14,766,839
British Australasia	15,131,216	23,136,046	19,542,573	14,396,782	18,859,348	15,329,222	13,721,827	14,686,752	11,821,881
Hawaiian Islands	.....	.....	1,217,780	1,049,210	785,740	391,150	629,740	.....	.....
Philippine Islands	1,971,100	1,208,100	.....	.....	.....	.....	.....	.....	.....
Other Oceania	27,195	44,227	27,780	23,575	1,089,215	623,490	4,931,965	3,636,230	2,944,958
Africa	11,170,341	13,867,641	9,288,873	11,372,219	11,563,915	9,988,338	10,280,607	10,133,101	7,378,675
British Africa	9,093,430	10,950,723	5,981,035	7,540,818	5,963,379	4,851,040	10,280,607	9,676,741	7,049,455
Other Africa	2,076,911	2,916,918	3,307,838	3,831,401	5,600,536	5,137,298	.....	456,360	329,220
Lubricating	76,035,611	71,457,605	74,583,769	67,424,393	60,299,365	50,199,345	50,525,530	43,418,942	40,190,574
Europe	60,722,900	55,543,003	60,107,870	53,722,269	50,018,598	41,591,347	43,535,736	37,082,352	35,406,607
Belgium	4,369,691	4,046,434	4,798,917	4,625,800	3,872,617	3,784,941	4,078,951	2,679,832	2,931,204
France	8,146,935	7,321,129	7,170,304	6,500,107	5,246,208	4,225,199	5,165,586	3,271,804	3,050,544
Germany	9,542,846	8,921,513	10,279,660	8,233,910	8,086,776	6,877,196	5,990,561	5,378,398	5,637,471
Italy	2,865,719	1,965,691	2,084,206	1,921,123	1,970,890	1,550,688	1,324,994	1,381,587	1,356,340
Netherlands	5,822,073	4,850,272	5,223,275	4,332,727	4,196,352	2,840,832	2,724,546	2,641,209	2,346,896
United Kingdom	28,084,029	26,762,400	28,669,308	26,353,051	25,724,836	21,301,290	23,436,081	21,209,497	19,668,767
Other Europe	1,891,607	1,675,564	1,882,200	1,755,551	920,919	1,011,201	815,017	520,025	415,385
Total	15,312,711	15,914,602	14,475,899	13,702,116	10,280,767	8,607,998	6,989,794	6,336,590	4,783,967
North America	2,249,658	2,198,465	1,932,313	1,549,299	1,429,468	1,259,249	1,244,538	1,248,751	1,308,586
West Indies	531,515	417,532	308,429	416,680	186,285	114,942	213,304	316,274	417,123
South America	2,442,606	2,282,039	2,488,018	2,899,295	1,971,050	1,876,794	2,221,780	2,159,844	1,509,708
Asia and Oceania	9,344,628	10,413,188	9,244,955	7,737,421	5,978,725	4,879,886	3,000,471	2,438,975	1,433,191
Africa	744,304	603,378	502,184	1,099,421	715,239	477,127	309,701	172,746	115,359
Residuum (barrels)	721,655	622,538	395,933	730,214	475,562	142,612	4,880	3,27[illegible]	5,029
Europe	710,070	607,778	389,919	724,241	471,604	140,777	4,248	2,099	2,056
North America	10,916	12,873	2,894	5,299	1,680	566	438	1,045	2,460
All other countries	669	1,887	3,120	674	2,278	1,269	194	130	513

The quantities of petroleum and the different petroleum products exported to the several continental groups, Europe, North and South America, Asia and Oceania, and Africa, with percentages for the fiscal year ending June 30, 1902, are shown in the following table:

TABLE 11.—*Exports of petroleum and petroleum products to Europe, North and South America, Asia and Oceania, and Africa, with percentages for the fiscal year ending June 30, 1902.*

[United States Geological Survey, "The Production of Petroleum," 1902.]

[Gallons.]

KIND.	Europe.	North America.	South America.	Asia and Oceania.	Africa.
Total	815,365,592	42,405,103	45,973,002	190,509,019	11,956,754
Illuminating	589,282,066	20,836,052	43,330,860	178,209,751	11,170,341
Lubricating	60,722,900	2,781,173	2,442,606	9,344,628	744,304
Naphtha	21,221,988	1,281,439	171,438	781,605	42,109
Residuum[1]	29,822,940	458,472	[2] 28,098	.....	.....
Crude	114,315,698	17,047,967	.....	2,173,135	.....
Percentage of each	73.7	3.8	4.2	17.2	1.1

[1] In barrels: Europe, 710,070; North America, 10,916; all other countries, 669.
[2] Includes all other countries.

Of the total exportation of all varieties of petroleum during the fiscal year ending June 30, 1902, there was shipped to Europe 73.7 per cent, to Asia and Oceania 17.2 per cent, South America 4.2 per cent, North America 3.8 per cent, and to Africa 1.1 per cent.

Of that portion which went to Europe, exclusive of "residuum," the exports of which are given as 710,070 barrels (or 29,822,940 gallons), the United Kingdom received 32.5 per cent, Germany 20 per cent, the Netherlands 16.1 per cent, France 13.6 per cent, and Norway and Sweden 4 per cent, the remaining 13.8 per cent being divided among Belgium, Denmark, Italy, Portugal, Spain, and the other European countries.

Of the total amount of illuminating oil exported, Japan consumed 7.1 per cent and China and Hongkong 8.9 per cent. These countries consumed over 71 per cent of the total amount exported to Asia and Oceania.

Prices.—The price per gallon of refined petroleum at New York and Philadelphia in 1902, when loaded into bulk steamers, ranged from 4.65 cents to 5.65 cents for oil in bulk; from 7.15 cents to 8.15 cents for oil in barrels; and from 8.40 cents to 10.60 cents for oil in cases; the minimum prices prevailed at the beginning and for the greater part of the year, and the maximum at the close. There was a slight advance in prices in May, June, and July, followed by a decline, and a second advance toward the close of the year.

The average yearly prices in cents per gallon of 70° Abel test refined oil in barrels at New York for the years 1892 to 1902, inclusive, were as follows:

Average yearly prices per gallon of refined petroleum: 1892 to 1902.

YEAR.	Average price (cents per gallon).	YEAR.	Average price (cents per gallon).
1892	6.07	1898	6.32
1893	5.24	1899	7.98
1894	5.19	1900	8.45
1895	7.36	1901	7.48
1896	6.98	1902	7.33
1897	5.91		

The monthly average prices per gallon of crude and refined illuminating petroleum exported in bulk, for the years 1899 to 1902, inclusive, are shown in the following table:

TABLE 12.—*Monthly average prices per gallon of oil exported from the United States in bulk: 1899 to 1902.*

[Cents per gallon.]

MONTH.	1902		1901		1900		1899	
	Mineral, crude.	Refined, illuminating.	Mineral, crude.	Refined, illuminating.	Mineral, crude.	Refined, illuminating.	Mineral, crude.	Refined, illuminating.
January	4.5	6.2	4.7	6.3	6.0	8.4	4.8	4.9
February	4.1	6.3	4.8	6.5	5.9	8.6	4.7	4.9
March	4.5	6.0	5.0	7.1	6.0	8.7	4.7	4.8
April	4.0	6.3	5.1	6.8	6.3	8.6	5.1	4.5
May	4.5	6.5	4.8	6.3	5.8	8.1	4.8	4.5
June	4.8	6.0	4.5	6.1	5.5	7.5	4.6	4.7
July	3.9	6.3	4.5	6.2	4.9	7.0	4.8	5.1
August	4.3	6.1	4.5	6.6	4.9	7.1	4.9	5.3
September	4.3	5.8	4.7	6.4	4.9	7.0	5.1	6.1
October	5.0	6.2	5.0	6.8	4.9	6.3	5.4	6.5
November	4.4	6.6	4.5	6.5	4.9	6.6	5.5	6.9
December	3.9	7.3	5.0	6.4	4.7	6.2	5.9	7.3

PRODUCTION IN THE UNITED STATES SINCE 1859.

The production of crude petroleum in the United States by states, since the commencement of production in 1859, is shown in the following table:

TABLE 13.—PRODUCTION, BY STATES AND TERRITORIES: 1859 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

YEAR.	United States.	Pennsylvania and New York.	Ohio.	West Virginia.	California.	Kentucky and Tennessee.	Colorado.	Indiana.	Illinois.	Kansas.	Texas.	Missouri.	Indian Territory.	Wyoming.	Louisiana.
Total	1,165,290,248	628,401,456	283,751,317	131,701,296	41,834,473	633,212	6,852,926	45,836,215	6,576	1,027,493	24,596,224	5,399	54,554	40,490	548,617
1859	2,000	2,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1860	500,000	500,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1861	2,113,609	2,113,609	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1862	[1] 3,056,690	3,056,690	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1863	2,611,309	2,611,309	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1864	2,116,109	2,116,109	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1865	2,497,700	2,497,700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1866	3,597,700	3,597,700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1867	3,347,300	3,347,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868	3,646,117	3,646,117	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869	4,215,000	4,215,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870	5,260,745	5,260,745	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871	5,205,234	5,205,234	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1872	6,293,194	6,293,194	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873	9,893,786	9,893,786	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874	10,926,945	10,926,945	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	[2] 12,162,514	8,787,514	[3] 200,000	[3] 3,000,000	[3] 175,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1876	9,132,669	8,968,906	31,763	120,000	12,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877	13,350,363	13,135,475	29,888	172,000	13,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878	15,396,868	15,163,462	38,179	180,000	15,227	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879	19,914,146	19,685,176	29,112	180,000	19,858	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	26,286,123	26,027,631	38,940	179,000	40,552	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	27,661,288	27,376,509	33,867	151,000	99,862	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	30,510,830	30,053,500	39,761	128,000	128,636	[4] 160,933	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	23,449,633	23,128,389	47,632	126,000	142,857	4,755	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	24,218,438	23,772,209	90,081	90,000	262,000	4,148	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	21,858,785	20,776,041	661,580	91,000	325,000	5,164	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	28,064,841	25,798,000	1,782,970	102,000	377,145	4,726	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	28,283,483	22,356,193	5,022,682	145,000	678,572	4,791	76,295	.....	.....	.....	.....	.....	.....	.....	.....
1888	27,612,025	16,488,668	10,010,868	119,448	690,333	5,096	297,612	.....	.....	.....	.....	.....	.....	.....	.....
1889	35,163,513	21,487,435	12,471,466	544,113	303,220	5,400	316,476	33,375	1,460	500	48	20	.....	.....	.....
1890	45,823,572	28,458,208	16,124,656	492,578	307,360	6,000	368,842	63,496	900	1,200	54	278	.....	.....	.....
1891	54,292,655	33,009,236	17,740,301	2,406,218	323,600	9,000	665,482	136,634	675	1,400	54	25	30	.....	.....
1892	50,509,657	28,422,377	16,362,921	3,810,086	385,049	6,500	824,000	698,068	521	.....	45	10	80	.....	.....
1893	48,431,066	20,314,513	16,249,769	8,445,412	470,179	3,000	594,390	2,335,293	400	18,000	50	50	10	.....	.....
1894	49,344,516	19,019,990	16,792,154	8,577,624	705,969	1,500	515,746	3,688,666	300	40,000	60	8	130	2,369	.....
1895	52,892,276	19,144,390	19,545,233	8,120,125	1,208,482	1,500	438,232	4,386,132	200	44,430	50	10	37	3,455	.....
1896	[5] 60,960,361	20,584,421	23,941,169	10,019,770	1,252,777	1,680	361,450	4,680,732	250	113,571	1,450	43	170	2,878	.....
1897	[5] 60,475,516	19,262,066	21,560,515	13,090,045	1,903,411	322	384,934	4,122,356	500	81,098	65,975	19	625	3,650	.....
1898	[5] 55,364,233	15,948,464	18,738,708	13,615,101	2,257,207	5,568	444,383	3,730,907	360	71,980	546,070	10	.....	5,475	.....
1899	[5] 57,070,850	14,374,512	21,142,108	13,910,630	2,642,095	18,280	390,278	3,848,182	360	69,700	669,013	132	.....	5,560	.....
1900	63,620,529	14,559,127	22,362,730	16,195,675	4,324,484	62,259	317,385	4,874,392	200	74,714	886,039	[6] 1,602	6,472	5,450	.....
1901	69,389,194	13,831,996	21,648,083	14,177,126	8,786,330	137,259	460,520	5,757,086	250	179,151	4,393,658	[7] 2,335	10,000	5,400	.....
1902	[8] 88,766,916	13,183,610	21,014,231	13,513,345	13,984,268	185,331	396,901	7,480,896	200	331,749	18,083,658	[7] 857	37,000	6,253	548,617

[1] In addition to this quantity it is estimated that for want of a market some 10,000,000 barrels ran to waste in and prior to 1862 in the Pennsylvania fields; also a large quantity in West Virginia and Tennessee.
[2] Includes all production prior to 1876 in Ohio, West Virginia, and California.
[3] Includes all production prior to 1876.
[4] Includes all petroleum produced in Kentucky and Tennessee prior to 1883.
[5] In addition to this quantity, 4,325 barrels of crude oil were produced in Kentucky and Tennessee in 1896, 4,377 barrels in 1897, 19,125 barrels in 1898, and 13,578 barrels in 1899, for which, as none was sold or used, no value could be given.
[6] Includes the production of Michigan.
[7] Includes production of Michigan and small production in Oklahoma.
[8] Does not include 508,386 barrels produced, but not marketed.

Since the year 1888, when the entire production was only 27,612,025 barrels of crude petroleum, there has been on the whole a gradual increase. The year 1891, when the production reached 54,292,655 barrels, had the largest output up to that date, owing chiefly to the increase in Pennsylvania petroleum, caused by the opening up of some wonderfully prolific territory at McDonald, in Allegheny and Washington counties. From 1891 to 1893 there was a considerable decline in the production, the latter year having the smallest output since 1891. After 1894 there was an increase, and the year 1896 showed a larger production than any year up to that date. The figures were not surpassed until 1900, when the production was 63,620,529 barrels. The year 1901 showed substantial gains over 1900, while that of 1902 was nearly 20,000,000 barrels greater than 1901. This increase was due chiefly to the increased production of Texas, California, and Louisiana. The grade of the oil, however, was generally inferior to that of older fields. The production of the high grades of petroleum produced in the Appalachian, Lima-Indiana, Kansas, Corsicana, and the Colorado fields remained about the same as in the previous year. From the output of these fields a superior grade of refined products is manufactured. The poorer grades of petroleum produced in Texas, Louisiana, and California were marketed in 1902, principally for fuel, at much reduced values, although the average price received for the better grades increased about 4 cents per barrel over the average price in 1901.

It will be seen in Table 13 that the production of crude petroleum in the United States from the beginning of the

petroleum industry in 1859 to the end of 1902 was 1,165,290,248 barrels. Allowing 5.6 cubic feet for the cubical contents of a barrel of 42 gallons, this quantity would occupy 6,525,625,389 cubic feet and would require a cube 1,869 feet on each side to contain it. It would fill a tank the base of which was 1 mile square to a height of 234 feet. This quantity would fill 38,843 ordinary tanks containing 30,000 barrels; allowing 90 feet for their diameter, if they were placed side by side they would reach a distance of over 662 miles. Again if 2½ feet be taken as the height of a barrel of 42 gallons and if there were sufficient barrels to contain this amount of crude petroleum and the barrels were laid so that their heads would touch, they would encircle the globe 2.27 times. Allowing 3½ barrels to equal the fuel value of a ton of the average coal, the amount represents a fuel value of 332,940,071 tons of coal. There were 301,590,439 tons of coal produced in the United States in the year 1902; the fuel value of the petroleum produced in 1902 would equal that of 25,507,229 tons of coal. The value of the petroleum produced since 1859 to the close of 1902 was $1,166,885,363; the average price was therefore $1.0014 per barrel. The amount invested in wells and fixtures at the end of 1902 is estimated at $290,000,000.

The quantity and value of the crude petroleum produced in the United States for each year since 1859 is shown in Table 14.

TABLE 14.—*Quantity and value of production: 1859 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Barrels (42 gallons).	Value.	YEAR.	Barrels (42 gallons).	Value.
Total.	1,165,290,248	$1,166,885,363	1880....	26,286,123	$24,600,638
			1881.....	27,661,238	23,512,051
1859.....	2,000	(1)	1882.....	30,510,830	23,759,911
1860.....	500,000	4,800,000	1883.....	23,449,633	25,740,252
1861.....	2,113,609	1,035,668	1884.....	24,218,438	20,476,294
1862.....	[2] 3,056,690	3,209,525	1885.....	21,858,785	19,193,694
1863.....	2,611,309	8,225,623	1886.....	28,064,841	20,028,457
1864.....	2,116,109	20,896,576	1887.....	28,283,483	18,856,606
1865.....	2,497,700	16,459,843	1888.....	27,612,025	17,950,353
1866.....	3,597,700	13,455,398	1889.....	35,163,513	26,963,340
1867.....	3,347,300	8,066,993	1890.....	45,823,572	35,365,105
1868.....	3,646,117	13,217,174	1891.....	54,292,655	30,526,553
1869.....	4,215,000	23,730,450	1892.....	50,509,657	25,901,463
1870.....	5,260,745	20,503,754	1893.....	48,431,066	28,932,326
1871.....	5,205,234	22,591,180	1894.....	49,344,516	35,522,095
1872.....	6,293,194	21,440,503	1895.....	52,892,276	57,691,279
1873.....	9,893,786	18,100,464	1896.....	[4] 60,960,361	58,518,709
1874.....	10,926,945	12,647,527	1897.....	[4] 60,475,516	40,929,611
1875.....	[3] 12,162,514	11,863,133	1898.....	[4] 55,364,233	44,193,359
1876.....	9,132,669	22,982,822	1899.....	[4] 57,070,850	64,603,904
1877.....	13,350,363	31,788,566	1900.....	63,620,529	75,752,691
1878.....	15,396,868	18,044,520	1901.....	69,389,194	66,417,335
1879.....	19,914,146	17,210,708	1902.....	[5] 88,766,916	[5] 71,178,910

[1] Value not obtainable.
[2] In addition, it is estimated that for want of a market some 1,000,000 barrels ran to waste in and prior to 1862 in the Pennsylvania fields; also a large quantity in West Virginia and Kentucky.
[3] Includes all production prior to 1876 in Ohio, West Virginia, and California.
[4] In addition, 4,325 barrels of crude oil were produced in Kentucky and Tennessee in 1896, 4,377 barrels in 1897, 19,125 barrels in 1898, and 13,578 barrels in 1899, for which, as none was sold or used, no value could be given.
[5] Does not include 508,386 barrels, valued at $218,829, produced but not marketed.

REVIEW OF THE INDUSTRY BY FIELDS.

The following table shows the production by fields and states for the years 1889 to 1902, inclusive:

TABLE 15.—PRODUCTION, BY FIELDS AND STATES: 1889 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States."]

[Barrels of 42 gallons.]

FIELD.	1902	1901	1900	1899	1898	1897	1896
Total	[1] 88,766,916	69,389,194	[2] 63,620,529	[3] 57,070,850	[3] 55,364,233	[3] 60,475,516	[3] 60,960,361
Appalachian	32,918,787	33,618,171	36,295,433	33,068,356	31,717,425	35,230,271	33,971,902
Lima-Indiana	23,358,626	21,933,379	21,758,750	20,225,356	20,321,328	22,805,033	25,255,870
Southern California	13,984,268	8,786,330	4,324,484	2,642,095	2,257,207	1,903,411	1,252,777
Colorado	396,901	460,520	317,385	390,278	444,383	384,934	361,450
Kansas	331,749	179,151	74,714	69,700	71,980	81,098	113,571
Texas	18,083,658	4,893,658	836,039	669,013	546,070	65,975	1,450
Wyoming	6,253	5,400	5,450	5,560	5,475	3,650	2,878
Louisiana	548,617	.....	.....	.....	.....	.....	.....
All other	38,057	12,585	8,274	492	370	1,144	463

FIELD.	1895	1894	1893	1892	1891	1890	1889
Total	52,892,276	49,344,516	48,412,666	50,509,971	54,291,980	45,852,638	35,163,513
Appalachian	30,959,139	30,781,924	31,365,890	33,433,212	35,848,777	30,096,516	22,355,225
Lima-Indiana	20,236,741	17,296,510	15,982,097	15,867,575	17,452,612	15,078,378	12,186,564
Southern California	1,208,482	705,969	470,179	385,049	323,600	307,360	303,220
Colorado	438,232	515,746	594,390	824,000	665,482	368,842	316,476
Kansas	44,430	40,000	.....	.....	1,400	1,200	500
Texas	50	60	50	45	54	64	48
Wyoming	3,455	2,369	.....	.....	.....	.....	.....
Louisiana	.....	.....	.....	.....	.....	.....	.....
All other	1,747	1,938	60	90	55	278	1,480

[1] Does not include 508,386 barrels produced, but not marketed.
[2] Includes 41,405 barrels of oil sold in Kentucky and Tennessee in 1900, but produced in previous years.
[3] In addition to this total 4,325 barrels of crude oil were produced in Kentucky and Tennessee in 1896, 4,377 barrels in 1897, 19,125 barrels in 1898, and 13,578 barrels in 1899, for which, as none was sold or used, no value could be given.

Percentages of production in the Appalachian, Lima-Indiana, and all of the other fields combined for the years 1896 to 1902, inclusive, are as follows:

Per cent of total crude petroleum produced in the several fields: 1896 to 1902.

FIELD.	1902	1901	1900	1899	1898	1897	1896
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Appalachian	36.1	48.5	57.0	58.0	57.3	58.3	55.7
Lima-Indiana	26.3	31.6	34.2	35.4	36.7	37.7	41.4
All other	37.6	19.9	8.8	6.6	6.0	4.0	2.9

During the last three years there has been a constant decline in the proportionate production of crude petroleum in the Appalachian and Lima-Indiana fields, and a very rapid increase in the production of the fields yielding lower grade or fuel oils. In 1896 only 2.9 per cent was produced outside of these two older fields. In 1902 the outside production was 37.6 per cent, of which California produced about 15.7 per cent and Texas 20.4 per cent, leaving only about 1.5 per cent for the remainder of the sections outside the Appalachian and Lima-Indiana fields.

Appalachian field.—This great field follows the northwestern flank of the Appalachian mountains in a generally southwestern direction from New York to Alabama, a distance of about 650 miles. It embraces all the producing regions in New York, Pennsylvania, West Virginia, Kentucky, and Tennessee, and a southeastern portion of Ohio. It includes within its area not less than 40,000 square miles. It is the oldest producing field in the United States.

The first well drilled near Titusville, Pa., in 1859, was followed by a great development which has been succeeded by a vast number of successful operations, extending up to the present time. The great portion of the petroleum output of this field is of a superior quality, and produces a larger proportion of valuable products than any other field in the world. The Appalachian field since its first discovery has produced 72 per cent of the entire output of the United States up to the close of 1902. In 1902 it produced 36.1 per cent of the entire production. The decline of this field has been gradual. The decrease in 1902 was 4.8 per cent, as compared with 7.4 per cent in 1901. The greatest decrease has been in the states of New York, Pennsylvania, and West Virginia. The work in 1902 was confined mostly to the development of the known pools, and no new areas were added to those already known. The southern portion of the field has been recently connected by a large pipe line system, reaching from Parkersburg, W. Va., to Lacy, Pickett county, Tenn., a distance of 270 miles, with several branch lines.

Table 16 shows the production of the several states in this field from 1889 to 1902. It is impossible to completely separate the outputs of New York and Pennsylvania, as some of the fields extend across the boundary, and are thus in both states. The regularity in the output of this field for the last twelve years is noticeable, as shown in the table of total production.

TABLE 16.—*Production of petroleum in the Appalachian oil field, by states: 1889 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

YEAR.	Total.	Pennsylvania and New York.	West Virginia.	Southeastern Ohio.	Kentucky and Tennessee.
1889	22,355,225	21,487,435	544,113	318,277	5,400
1890	30,073,307	28,458,208	492,578	1,116,521	6,000
1891	35,848,777	33,009,236	2,406,218	424,323	9,000
1892	33,432,377	28,422,377	3,810,086	1,193,414	6,500
1893	31,365,890	20,314,513	8,445,412	2,602,965	3,000
1894	30,783,424	19,019,990	8,577,624	3,184,310	1,500
1895	30,960,639	19,144,390	8,120,125	3,694,624	1,500
1896	33,971,902	20,584,421	10,019,770	3,366,031	1,680
1897	35,230,271	19,262,066	13,090,045	2,877,838	322
1898	31,717,425	15,948,464	13,615,101	2,148,292	5,568
1899	33,068,356	14,374,512	13,910,630	4,764,934	18,280
1900	36,295,433	14,559,127	16,195,675	5,478,372	62,259
1901	33,618,171	13,831,996	14,177,126	5,471,790	137,259
1902	32,018,787	13,183,610	13,513,345	5,136,501	185,331

This table shows a decrease in the production in 1902, as compared with that of 1901, of 1,599,384 barrels, the equivalent of 4.8 per cent, which was greatest proportionally in southeastern Ohio. There were 5,591 productive wells drilled in both 1901 and 1902, and only 31 more dry holes drilled in the latter year than in the former. The only division showing an increase was Kentucky and Tennessee.

The well records for the Appalachian field are shown in Tables 17 and 18.

The total number of dry holes, or those that were destitute of petroleum in paying quantities, in the Appalachian field in 1902 was 2,131. This leaves 5,591 productive wells and shows that 72.4 per cent were productive and 27.6 per cent dry. The number of dry holes drilled in 1901 was 2,118, and there were 5,591 productive wells—the exact number credited to 1902 also. The proportion of productive and dry wells was 72.5 per cent and 27.5 per cent, respectively.

TABLE 17.—TOTAL NUMBER OF WELLS COMPLETED IN THE APPALACHIAN OIL FIELD, BY DISTRICTS: 1892 TO 1902.

[United States Geological Survey, "The Production of Petroleum," 1902.]

DISTRICT.	WELLS COMPLETED.										
	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893.	1892
Total	7,722	7,709	8,845	8,752	4,792	6,072	7,824	7,136	3,763	1,980	1,968
Bradford	254	264	404	642	488	696	769	578	284	52	37
Allegany	533	455	575	597	264	350	331	258	82	41	21
Middle	459	490	583	558	388	481	594	401	215	91	131
Venango and Clarion	1,146	1,082	1,494	1,535	772	990	1,614	1,783	731	243	131
Butler and Armstrong	599	534	764	699	497	802	1,153	1,292	755	298	342
Southwest	2,950	3,424	3,598	2,925	2,017	2,255	2,744	2,364	1,481	1,065	1,230
Southeastern Ohio	1,781	1,460	1,427	1,796	366	498	619	460	215	190	76

The wells completed, dry holes, wells productive, initial daily production, wells drilling, and the rigs building in the Appalachian field, by months, during 1902, were as follows:

TABLE 18.—*Well record in the Appalachian oil field: 1902.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

MONTH.	Wells completed.	Dry holes.	Wells productive.	Initial production.[1]	Wells drilling.	Rigs building.
Total	7,722	2,131	5,591	[2]7,099	[2]600	[2]334
January	582	169	413	6,008	622	337
February	455	132	323	4,233	570	335
March	514	158	356	6,366	572	323
April	579	186	393	6,140	560	312
May	648	161	487	6,668	611	307
June	745	214	531	7,348	590	323
July	685	166	519	7,753	592	304
August	725	149	576	7,725	621	331
September	730	194	536	9,866	624	368
October	713	176	537	9,090	617	352
November	729	209	520	8,900	634	377
December	617	217	400	5,090	582	343

[1] Barrels of 42 gallons. [2] Average.

Appalachian, Lima-Indiana, and all other fields.—Table 19 gives the production of the Appalachian, Lima-Indiana, and all other fields from 1896 to 1902, by years, and the percentage each is of the total. It also gives the average value of the production by years and the average price per barrel at which it was marketed.

One of the interesting conditions revealed is the regularity of the combined production of the Appalachian and the Lima-Indiana fields for the last five or six years; another is the very remarkable increase in the combined production of all other fields, which in 1896 amounted to but 2.84 per cent of the whole, but which was increased to 19.94 per cent in 1901, and to 37.62 per cent in 1902. The value of the petroleum and natural gas marketed in 1902 was greater than in previous years. In 1900 there was the largest production of higher priced grades of petroleum.

The value of natural gas marketed during the several years and the combined value of petroleum and natural gas are also given, for the reason that they are so intimately associated.

The largest production of natural lubricating petroleum is from the Franklin district, Pa. The other districts in the United States which produce natural lubricating petroleum are Petroleum and Volcano, in West Virginia; Mecca and Belden, in Ohio; and Salt Creek, in Wyoming. In 1902 the entire production amounted to 71,603 barrels, valued at $278,517.

TABLE 19.—PRODUCTION OF PETROLEUM IN THE APPALACHIAN, LIMA-INDIANA, AND ALL OTHER FIELDS, PERCENTAGES OF EACH, VALUE PER BARREL, AND THE VALUE OF PETROLEUM AND NATURAL GAS, SEPARATE AND COMBINED: 1896 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States."]

[Barrels of 42 gallons.]

FIELD.	1902		1901		1900		1899		1898		1897		1896	
	Production.	Per cent.	Production.	Per cent.	Production.	Per cent.	Production.	Per cent.	Production.	Per cent.	Production.	Per cent.	Production.	Per cent.
Total	88,766,916	100.00	69,389,194	100.00	63,620,529	100.00	[1]57,070,850	100.00	[1]55,364,233	100.00	[1]60,475,516	100.00	[1]60,960,361	100.00
Sum of both fields	55,377,413	62.38	55,551,550	80.06	58,054,183	91.25	53,293,712	93.38	52,038,748	93.99	58,035,304	95.97	59,227,772	97.16
Appalachian	32,018,787	36.07	33,618,171	48.45	36,295,443	57.05	33,068,356	57.94	31,717,425	57.29	35,230,271	58.26	33,971,902	55.73
Lima-Indiana	23,358,626	26.31	21,933,379	31.61	21,758,750	34.20	20,225,356	35.44	20,321,323	36.70	22,805,033	37.71	25,255,870	41.43
All other	33,389,503	37.62	13,837,644	19.94	5,566,341	8.75	3,777,138	6.62	3,325,485	6.01	2,440,212	4.03	1,732,589	2.84
	Gross value.	Value per barrel.	Gross value.	Value per barrel.	Gross value.	Value per barrel.	Gross value.	Value per barrel.	Gross value.	Value per barrel.	Gross value.	Value per barrel.	Gross value.	Value per barrel.
Total	$102,046,578	.....	$93,483,412	.....	$99,451,365	.....	$84,678,777	.....	$59,490,372	.....	$54,753,033	.....	$71,521,221	.....
Value of petroleum	[2]71,178,910	$0.802	66,417,335	$0.957	75,752,691	$1.191	64,603,904	$1.132	44,193,559	$0.798	40,926,611	$0.677	58,518,709	$0.959
Value of natural gas	30,867,668	.....	27,066,077	.....	23,698,674	.....	20,074,873	.....	15,296,813	.....	13,826,422	.....	13,002,512	.....

[1] In addition to these quantities, 4,325 barrels were produced in Kentucky and Tennessee in 1896, 4,377 barrels in 1897, 19,125 barrels in 1898, and 13,578 barrels in 1899, for which, as none was sold or used, no value could be given.
[2] Does not include $218,829, the value of product not marketed.

The following table gives the production and value of lubricating petroleum in the several districts in Pennsylvania, West Virginia, Ohio, and Wyoming from 1896 to 1902, inclusive:

TABLE 20.—PRODUCTION AND VALUE OF NATURAL LUBRICATING PETROLEUM, BY STATES AND DISTRICTS: 1896 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

STATE AND DISTRICT.	1902		1901		1900		1899		1898		1897		1896	
	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.	Barrels.	Value.
Total	71,603	$278,517	73,966	$294,548	85,687	$329,495	85,168	$328,323	74,212	$296,804	65,209	$255,432	66,677	$258,323
Pennsylvania: Franklin district.	50,555	199,432	55,162	220,648	59,036	236,144	61,085	244,340	56,090	224,360	48,880	195,520	49,329	197,316
West Virginia: Petroleum and Volcano districts	14,660	33,848	12,464	33,483	18,918	43,638	17,724	40,819	11,965	30,501	12,034	27,592	13,804	35,086
Ohio: Mecca and Belden districts.	135	1,466	940	2,617	2,283	11,563	799	4,244	682	3,618	645	3,120	666	2,897
Wyoming: Salt Creek district	6,253	43,771	5,400	37,800	5,450	38,150	5,560	38,920	5,475	38,325	3,650	29,200	2,878	23,024

The value of the lubricating petroleum produced in Wyoming has for several years been $7 per barrel. The general character of the natural lubricating petroleum produced in West Virginia is similar to that produced at Franklin, Pennsylvania.

The production of the Franklin district for 1902 was 50,555 barrels, which was less than that of 1901 by 4,607 barrels.

There has been a gradual decline in this field since 1899, when the total yield was 61,085 barrels. The price received in 1902—$3.94—was slightly less than in 1901, when it was $4.

The following group of tables gives the runs or receipts, the shipments or deliveries, and the stocks of crude petroleum reported by the pipe lines in the Appalachian and Lima-Indiana fields for a series of years. Table 21 gives, in detail, the pipe line runs in the Appalachian field from 1888 to 1902, inclusive, and Table 22 the totals of the pipe line runs in the Appalachian and Lima-Indiana fields.

Table 23 shows the shipments in the Appalachian and Lima-Indiana fields, and Table 24 the stocks of petroleum in the same for the years 1894 to 1902, inclusive.

TABLE 21.—PIPE LINE RUNS IN THE APPALACHIAN FIELD, IN DETAIL: 1888 TO 1902.

[United States Geological Survey, "The Production of Petroleum," 1902.]

[Barrels of 42 gallons.]

YEAR.	Total.	National Transit.	Tide Water.	Octave.	Pittsburg.	Southwest.	Franklin.	Western and Atlantic.	Charles Miller.
1888	16,366,664	11,503,084	1,389,599	25,072	344,618	1,845,076	76,512	842,890	99,525
1889	22,029,729	13,675,776	1,593,939	32,536	.....	3,734,519	64,244	2,501,826	188,113
1890	21,196,543	15,407,552	1,827,798	36,001	.....	7,565,743	67,788	3,109,477	160,571
1891	34,876,266	14,046,171	1,777,875	36,527	.....	13,317,894	65,185	2,173,213	143,700
1892	32,749,562	11,362,978	1,458,462	30,137	.....	10,829,246	58,459	1,442,160	68,888
1893	31,003,260	8,037,337	1,579,586	23,348	.....	5,740,856	66,278	1,019,849	36,724
1894	30,117,096	8,248,016	1,751,897	10,699	.....	5,540,345	57,070	68,117	.....
1895	30,351,414	8,863,706	1,803,636	.....	.....	5,253,378	48,711	.....	.....
1896	33,505,197	9,476,112	1,993,449	.....	.....	6,666,334	49,329	.....	.....
1897	34,773,565	9,807,620	1,822,480	.....	.....	5,329,358	48,880	.....	.....
1898	31,156,449	7,943,222	1,561,458	.....	.....	4,133,458	56,090	.....	.....
1899	32,260,689	6,835,262	1,565,611	.....	.....	3,620,311	53,278	.....	.....
1900	35,540,964	6,899,801	1,645,225	.....	.....	3,716,139	51,405	.....	.....
1901	33,091,120	6,207,595	1,445,530	.....	.....	4,018,862	48,107	.....	.....
1902	31,404,187	5,788,322	1,302,468	.....	.....	3,607,759	43,789	.....	.....

YEAR.	Eureka.	Elk.	Emery.	Mellon.	Cumberland.	United States.	Producers and Refiners' Pipe Line Company (Limited).	Buckeye-Macksburg Division.
1888	.....	.....	.....	.....	.....	.....	.....	240,288
1889	.....	.....	.....	.....	.....	.....	.....	238,776
1890	.....	.....	.....	.....	.....	.....	.....	1,021,613
1891	2,184,413	257,995	155,976	340,085	.....	.....	.....	377,232
1892	3,666,066	324,219	329,458	1,813,263	.....	.....	249,079	1,117,147
1893	7,554,866	280,870	371,058	3,103,915	.....	.....	1,113,458	2,075,115
1894	7,774,215	218,874	359,459	2,528,852	.....	.....	1,196,849	2,362,703
1895	7,313,251	243,839	330,663	1,985,376	.....	.....	1,554,376	2,954,478
1896	9,983,201	283,741	322,685	.....	.....	.....	1,392,170	3,338,176
1897	13,008,941	227,817	318,074	.....	.....	.....	1,316,469	2,893,935
1898	13,558,409	194,229	311,308	.....	.....	.....	1,260,204	2,138,071
1899	13,765,761	185,314	292,950	.....	.....	.....	1,313,436	4,628,766
1900	16,114,588	192,551	313,454	.....	.....	32,573	1,321,013	5,254,215
1901	14,143,726	176,280	344,183	.....	131,419	53,722	1,210,457	5,311,239
1902	13,041,896	162,766	317,963	.....	180,620	73,717	1,819,946	5,064,991

TABLE 22.—TOTALS OF PIPE LINE RUNS IN THE APPALACHIAN AND LIMA-INDIANA FIELDS: 1888 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

YEAR.	Total.	Appalachian.	Lima-Indiana.	YEAR.	Total.	Appalachian.	Lima-Indiana.
1888	25,265,668	16,366,664	8,899,004	1896	55,715,208	33,505,197	22,210,011
1889	32,285,451	22,029,729	10,255,722	1897	54,444,077	34,773,565	19,670,514
1890	33,115,453	21,196,543	11,918,910	1898	48,285,346	31,156,449	17,128,897
1891	49,392,036	34,876,266	14,515,770	1899	49,444,493	32,260,689	17,183,804
1892	46,317,299	32,749,562	13,567,737	1900	53,771,543	35,540,964	18,230,579
1893	45,454,455	31,003,260	14,451,195	1901	51,661,890	33,091,120	18,570,770
1894	46,191,446	30,117,096	16,074,350	1902	51,388,553	31,404,187	19,984,366
1895	48,767,044	30,351,414	18,415,630				

TABLE 23.—SHIPMENTS IN THE APPALACHIAN AND LIMA-INDIANA FIELDS: 1894 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

FIELD.	1902	1901	1900	1899	1898	1897	1896	1895	1894
Total	57,283,160	54,242,241	51,218,694	51,946,942	54,858,356	53,756,750	49,361,661	48,862,992	50,661,037
Appalachian	35,192,689	36,481,726	35,401,113	30,317,426	30,405,936	33,664,324	29,340,195	32,032,626	36,207,275
Lima-Indiana	22,090,471	17,760,515	15,817,581	21,629,516	24,452,420	20,092,426	20,021,466	16,830,366	14,453,762

TABLE 24.—STOCKS OF PETROLEUM IN THE APPALACHIAN AND LIMA-INDIANA FIELDS AT THE CLOSE OF THE YEAR: 1894 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

FIELD.	1902	1901	1900	1899	1898	1897	1896	1895	1894
Total	23,048,050	27,395,798	28,464,476	23,997,118	26,967,495	33,772,823	33,048,492	26,839,632	26,658,146
Appalachian	5,741,624	9,635,492	13,475,548	13,451,191	11,786,603	11,010,044	9,745,722	5,344,784	6,499,880
Lima-Indiana	17,306,426	17,760,306	14,988,928	10,545,927	15,180,892	22,762,779	23,302,770	21,494,848	20,158,266

The fields in Kansas, Texas, and California and elsewhere are not so well supplied by pipe line companies, and the petroleum is transported mostly by private pipe lines, often owned by the producing company.

It will be seen from the preceding tables that for the year 1902 the combined runs for the Appalachian and Lima-Indiana fields were 51,388,553 barrels, which amount does not vary greatly from the average for the past eight years, though a slight decline was recorded in 1902 as compared with 1901. There are some few deliveries to refineries direct from the field and some petroleum loaded in tank cars that are not included in the pipe line reports.

The shipments which represent the deliveries from both these fields to the refineries and other consumers were quite large in 1902, amounting to 57,283,160 barrels, an increase of 3,040,919 barrels over those of 1901. As the shipments were larger than the production, the increase was made up from the stocks which had been accumulated by the pipe line companies.

The Appalachian and Lima-Indiana stocks on hand at the close of 1902 amounted to 23,048,050 barrels, showing a decrease for these fields of 4,347,748 barrels as compared with the amount at the close of 1901. These stocks are stored in large iron tanks at a number of localities, generally near the pumping stations of the main pipe lines.

The stocks in the fields are held principally by the large pipe line companies, who have, in nearly all cases, purchased the crude petroleum. There is also a varying amount of stock held by the original producers at their wells.

In the states of Texas and California, besides the stock in the hands of the producers and refiners, there are a number of individuals, companies, and railroads who own their tankage. The estimated stock in these and other states and territories, as well as in the Appalachian and Lima-Indiana fields, is shown in the following table:

TABLE 25.—*Stocks of petroleum held in the several fields, states, and territories at the close of 1902, 1901, and 1900.*

[Barrels of 42 gallons.]

FIELD.	1902	1901	1900
Total	36,168,050	32,090,798	29,350,476
Stocks in the Appalachian field [1]	5,741,624	9,635,492	13,475,548
Stocks in the Lima-Indiana field [2]	17,306,426	17,760,306	14,988,928
Stocks in Kansas (estimated)	210,000	70,000	60,000
Stocks in Colorado (estimated)	100,000	80,000	60,000
Stocks in Texas (estimated)	7,650,000	1,725,000	6,000
Stocks in California (estimated)	4,800,000	2,800,000	750,000
Stocks in Louisiana (estimated)	320,000	.....	.....
Stocks in all other states and territories [3]	40,000	20,000	10,000

[1] The Appalachian field includes New York, Pennsylvania, West Virginia, Kentucky, Tennessee, and the southeastern portion of Ohio.

[2] The Lima-Indiana field includes Indiana and northwestern Ohio.

[3] Includes Indian Territory, Oklahoma, Wyoming, Michigan, Missouri, and Illinois.

Stocks of Pennsylvania or Appalachian crude petroleum have decreased since the close of 1891. In that year there were 16,457,089 barrels of what is known as Pennsylvania oil, held in tanks, principally in Pennsylvania, and smaller amounts in West Virginia and Ohio, as compared with 5,741,624 barrels held at the close of 1902. In the Lima-Indiana field there were 22,103,705 barrels, principally in Ohio, making a total stock for the two fields of 38,560,794 barrels in 1891, as compared with 23,048,050 barrels at the close of 1902. Of the latter amount 5,741,624 barrels were Appalachian petroleum and 17,306,426 barrels Lima-Indiana petroleum. The success in refining the petroleum from the Lima-Indiana field has greatly increased the production of the higher grade of illuminating petroleum and enabled the refiners to supply their home consumers and furnish an increasing quantity for the export trade.

The following table gives the average yearly price of all the grades of petroleum from 1889 to 1902:

TABLE 26.—*Average yearly price of all the petroleum produced: 1889 to 1902.*

[Barrels of 42 gallons.]

YEAR.	Average price (cents).	YEAR.	Average price (cents).
1889	76.62	1896	95.90
1890	77.17	1897	67.70
1891	56.25	1898	79.80
1892	51.83	1899	113.20
1893	59.75	1900	119.10
1894	72.00	1901	95.70
1895	103.88	1902	80.20

The average prices shown in the following table cover the ordinary grades of petroleum. They do not include special oils, such as the lubricating oils from the Franklin district, nor those from the Petroleum and Volcano districts of West Virginia, nor those from the Mecca-Belden district of Ohio, but only those, such as Pennsylvania oil, used chiefly for the production of illuminants.

TABLE 27.—*Range of prices paid for petroleum in the Appalachian oil region by the Seep Purchasing Agency during 1902.*

[Barrels of 42 gallons.]

DATE.	Tiona.	Pennsylvania.	Corning.	Newcastle.
January 1	$1.30	$1.15	$0.98	$0.90
April 16	1.35	1.20	1.03	0.95
June 26	1.37	1.22	1.05	0.97
October 4	1.40	1.25	1.08	1.00
October 7	1.42	1.27	1.10	1.02
October 16	1.45	1.30	1.13	1.05
October 29	1.48	1.33	1.16	1.08
November 6	1.51	1.36	1.19	1.11
November 11	1.54	1.39	1.22	1.14
November 25	1.57	1.42	1.25	1.17
December 4	1.60	1.45	1.28	1.20
December 6	1.63	1.48	1.28	1.35
December 12	1.66	1.51	1.31	1.38
December 31	1.69	1.54	1.34	1.41

In some of the districts oil is worth more than ordinary Pennsylvania oil, and in some districts it is worth less. This is owing to the fact that the production of some districts furnishes a larger percentage of illuminating oil and of by-products. Petroleum that has remained in tanks at the wells for a long period loses a percentage of its illuminating properties and is worth less than what is known as fresh oil, or petroleum recently produced at the wells.

The great volume of trade is controlled by the prices under the name of Pennsylvania oil, which includes nearly all the oil sold in New York, nearly all of that sold in Pennsylvania and West Virginia, and a large proportion of the ordinary Appalachian petroleum sold in Ohio.

In the following table are given the average monthly prices during 1901 and 1902 of crude petroleum produced in the various districts of the Appalachian oil regions in which special prices are paid. It is considered that the bulk of the crude petroleum is sold at prices slightly greater than the average price per month.

TABLE 28.—*Average monthly prices of Appalachian crude petroleum: 1902 and 1901.*

[Barrels of 42 gallons.]

MONTH.	1902				1901			
	Tiona.	Pennsylvania.	Corning.	Newcastle.	Tiona.	Pennsylvania.	Corning.	Newcastle.
January	$1.30	$1.15	$0.98	$0.90	$1.34½	$1.19½	$1.02½	$0.94½
February	1.30	1.15	0.98	0.90	1.40	1.25	1.08	1.00
March	1.30	1.15	0.98	0.90	1.44	1.29	1.12	1.04
April	1.32½	1.17½	1.00½	0.92½	1.35½	1.20½	1.03½	0.95½
May	1.35	1.20	1.03	0.95	1.22⅝	1.07⅝	0.90⅝	0.82⅝
June	1.35⅝	1.20⅝	1.03⅝	0.95⅝	1.20	1.05	0.88	0.80
July	1.37	1.22	1.05	0.97	1.28⅝	1.13⅝	0.96⅝	0.88⅝
August	1.37	1.22	1.05	0.97	1.40	1.25	1.08	1.00
September	1.37	1.22	1.05	0.97	1.40⅝	1.25⅝	1.08⅝	1.00⅝
October	1.48½	1.28½	1.11½	1.03½	1.45	1.30	1.13	1.05
November	1.53½	1.38½	1.21½	1.13½	1.45	1.30	1.13	1.05
December	1.64	1.49	1.29½	1.33¾	1.36	1.21	1.04	0.96
Average	1.38¾	1.23¾	1.06½	0.99½	1.36	1.21	1.04	0.96

The average monthly prices of Lima (Ohio) and Indiana crude petroleum, per barrel of 42 gallons each, in the years 1902 and 1901 were as follows:

TABLE 29.—*Average monthly prices of Ohio and Indiana crude petroleum: 1902 and 1901.*

[Barrels of 42 gallons.]

MONTH.	1902			1901		
	North Lima.	South Lima.	Indiana.	North Lima.	South Lima.	Indiana.
January	$0.85	$0.80	$0.80	$0.87½	$0.82½	$0.82½
February	0.85	0.80	0.80	0.91	0.86	0.86
March	0.85	0.80	0.80	0.93½	0.88½	0.88½
April	0.86½	0.81½	0.81½	0.88½	0.83½	0.83½
May	0.88	0.83	0.83	0.80½	0.75½	0.75½
June	0.88⅝	0.83⅝	0.83⅝	0.79	0.74	0.74
July	0.89	0.84	0.84	0.84	0.79	0.79
August	0.89	0.84	0.84	0.91	0.86	0.86
September	0.89	0.84	0.84	0.91½	0.86½	0.86½
October	0.93⅝	0.88⅝	0.88⅝	0.91	0.89	0.89
November	1.00½	0.95½	0.95½	0.94	0.89	0.89
December	1.10	1.05	1.05	0.88⅝	0.83⅝	0.83⅝
Average	0.90¾	0.85¾	0.85¾	0.88½	0.83½	0.83½
Average of North and South Lima	0.88¼		.....	0.86		.....

The North Lima is separated from the South Lima field by an east-and-west line passing through the southern portion of the town of Fostoria, Ohio. This division is made owing to the lighter gravity of North Lima petroleum and the larger percentage of the more valuable products secured from it. The production of the Indiana field is of the same grade as the South Lima petroleum and commands the same price.

In the following table there is shown the fluctuations in prices for the various grades of Lima oil in 1902. The dates are those on which changes in prices were made.

TABLE 30.—*Fluctuations in prices of Lima (Ohio) and Indiana crude petroleum: 1902.*

DATE.	North Lima.	South Lima.	Indiana.
January 1	$0.85	$0.80	$0.80
April 16	0.88	0.83	0.83
June 26	0.89	0.84	0.84
October 4	0.91	0.86	0.86
October 7	0.92	0.87	0.87
October 16	0.95	0.90	0.90
October 29	0.97	0.92	0.92
November 6	0.99	0.94	0.94
November 11	1.01	0.96	0.96
November 25	1.03	0.98	0.98
December 4	1.06	1.01	1.01
December 6	1.09	1.04	1.04
December 12	1.12	1.07	1.07
December 31	1.15	1.10	1.10

The highest, lowest, and average prices of Lima (Ohio) oil for the last sixteen years have been as follows:

TABLE 31.—*Highest, lowest, and average prices of Lima (Ohio) crude petroleum: 1887 to 1902.*

YEAR.	Highest.	Lowest.	Average.	YEAR.	Highest.	Lowest.	Average.
1887	$0.15	$0.15	$0.15	1895	[1]$1.27	[2]$0.50	$0.71⅔
1888	0.15	0.15	0.15	1896	[1]0.90	[2]0.52	0.66⅔
1889	0.15	0.15	0.15	1897	[1]0.60	[2]0.41	0.48
1890	0.37½	0.15	0.30	1898	[1]0.80	[2]0.41	0.61⅔
1891	0.35	0.30	0.30½	1899	[1]1.17	[2]0.74	0.89⅞
1892	0.37½	0.35	0.36⅝	1900	[1]1.26	[2]0.74	0.98⅔
1893	[1]0.49	[2]0.40	0.47½	1901	[1]0.94	[2]0.74	0.86
1894	[1]0.55	[2]0.47½	0.48	1902	[1]1.15	[2]0.80	0.88¼

[1] North Lima. [2] South Lima.

REVIEW OF THE INDUSTRY BY STATES AND TERRITORIES.

Alaska.—There are three known localities along the west coast of Alaska in which there are surface indications of the existence of natural petroleum. The first begins a short distance northwest of Cape Yaktag, 450 miles northwest of Sitka and just west of Mt. St. Elias. There are numerous natural springs of petroleum and water extending for a distance of 25 miles farther northwest, in a line parallel to that of the coast. For this distance there is a continuous line of foothills 500 to 600 feet in height, cut by numerous streams. Along the streams, near the axis of this uplift, there are numerous petroleum indications. Seventy-five miles farther west along the coast line, between Cape Suckling and Cape Martin, near the waters of Catella bay, there are also springs of petroleum associated with sulphur water and natural gas a short distance inland. Still farther inland there are seams of bituminous coal from 3 to 8 feet in thickness and of superior quality. This section is generally known as the Kayak region, as it is nearly opposite Little Kayak Island. Seventy-five miles farther north, also on the mainland opposite Kochernak bay, at the mouth of Cooks inlet, there are also some surface indications of petroleum.

One of the original discoverers of these surface indications was Mr. R. C. Johnson, who ran across them while exploring the numerous small creeks along the ocean for gold. A company he organized succeeded in getting down a well late in the summer of 1902, which, at 365 feet, gave very promising results. It was located on one of the small streams entering Catella bay from the east on a low divide extending toward Point Hay, where there were abundant surface exposures and small feeders of petroleum constantly coming to the surface. The following is a record of the well as reported by the company:

Log of well east of Catella bay, Kayak district, drilled in 1902.

FORMATION.	Feet.
Total	366
6 feet surface drift	6
10 feet decomposed shale	16
140 feet light colored shale	156
18 feet fine grained sandstone	174
One-half foot coal contained in the sandstone	174½
190 feet dark shale, very hard	364½
One-half foot quartz containing iron pyrites, and contained in the shale	365
1 foot oil sand and flow of oil	1
Length of 12-inch casing	220
Length of 9⅝-inch casing	340

Numerous small showings of petroleum and natural gas were encountered as the drill proceeded downward. At 366 feet a large quantity of oil was developed, which is reported to have flowed, and the well is said to have continued to flow until capped.

California.—Although there were fewer wells drilled in California in 1902 than in 1901, the production reported showed a large increase over that of the previous year, which is partially due to the large quantity held from the previous year at the wells owing to the lack of transportation. The production in 1902 placed this state third in the order of output; only Ohio and Texas produced greater quantities. There is no question that if all the facilities for transportation had been supplied the production would have been largely increased.

Under these conditions the production in 1902 was 13,984,268 barrels, produced by 2,574 wells. The value of the production was $4,873,617. The average price was 34.8 cents per barrel. There were stored at the close of 1902 nearly 4,000,000 barrels of petroleum awaiting transportation.

The completion of the pipe line must have the effect of relieving this condition in the Kern river field and of delivering large quantities of petroleum to Point Richmond, on San Francisco bay, where it will find a ready market as fuel. This is especially desirable, as there is a scarcity of coal on the Pacific coast.

The importation of coal fell off more than 25 per cent during 1902. The number of large manufactories and railroads using this liquid fuel almost exclusively is rapidly increasing, so that the indications are that the importation of coal must suffer a still greater decrease, and the introduction of petroleum as a fuel must become general. There can be at least 25,000,000 barrels annually disposed of as fuel in California alone. It has been demonstrated that the use of cheap fuel is one of the chief aids to commercial supremacy, and with the development of this and other natural advantages California may become one of the prominent manufacturing states.

There were 425 wells completed during 1902, but of this number 102 were dry or unproductive, leaving 323 productive wells. The total number of pumping wells was 2,539 and of flowing wells, 35.

Wells were drilled in 18 counties in California during 1902, from the extreme northern county of Humboldt to San Diego on the south. The counties in which the greatest production was secured are, in the order of their output, Kern, Los Angeles, Orange, Fresno, Ventura, Santa Barbara, and San Mateo. Of the total production, 69.4 per cent came from Kern county, 13.9 per cent from Los Angeles county and the remaining 16.7 per cent from the remaining productive counties.

In drilling the many wells in numerous portions of the state only one new pool was discovered—in Santa Clara, near Sargent Station—where, at a depth of 800 feet, a producing sand was found which yielded 80 to 90 barrels per day. There were a number of test wells drilled near Half Moon bay, in San Mateo county, but these produced only a limited quantity of a high grade crude petroleum. There is a great variety of crude petroleum produced in California, ranging from a black, tarry liquid of 11° Baumé to water-white naphtha. The great proportion is a heavy, dark petroleum of about 16° Baumé eminently fitted for fuel purposes.

Bakersfield is the largest producing district in California. It is generally known as the Kern river field, and is located in Kern county, a few miles north of the city of Bakersfield. There are two other fields to the south, known as the Sunset and McKittrick pools, but these are as yet insignificant in production when compared with the Kern river field. The petroleum produced in this latter field varies from 11° to 17° Baumé. There is a remarkable bed of sand, ranging from 200 to 500 feet in thickness, found in most of the wells, and considerable sand and some water are found in the crude petroleum. This is separated by allowing the petroleum to stand in large ponds, although in some instances it is necessary to heat the petroleum to secure a complete separation. There is, no doubt, a large quantity of petroleum in this pool, which can be taken out when the conditions of transportation have become more favorable, as during 1902 many of the wells were shut in for a portion of the time.

The Los Angeles field is one of the original fields in this state and has produced a large quantity of fuel petroleum for a number of years. There was a slight decline in the production of 1902 as compared with that of 1901. The wells in this field range from 600 to 1,200 feet in depth and vary in production from 2 to 25 barrels per day. The petroleum is black, with a gravity varying from 15° to 17° Baumé. Recently a pipe line has been constructed connecting the Whittier pool with Los Angeles. There is also a producing field at Newhall, at the head of the Santa Clara canyon, in this county, which yields a superior grade of petroleum.

Some very good wells have been secured in Orange county at Fullerton, at Brea canyon, and elsewhere in the vicinity. A few of these wells were drilled to a depth of 2,400 feet, and the production at first reached as much as 1,000 barrels per day. The Whittier pool, in Los Angeles county, lies just northwest of the Fullerton pool. These pools produce a petroleum of high grade, which is in demand for refining and for which a high price is paid.

The Coalinga field, on the east flank of the Coast Range in Fresno county, was opened up in 1897. Most of the petroleum produced in this field ranges from 22° to 38° Baumé, although there is some petroleum as heavy as 11° Baumé. In the northeastern portion of the field the gravity of the production ranges from 20° to 28° Baumé. It is suitable for refining and is in demand as an enricher of manufactured gas.

Ventura county continued to produce petroleum in a comparatively small way along the Santa Clara valley to the south. There is considerable variation in the character and gravity of the petroleum produced. A very light petroleum of about 35° Baumé is found in Pico canyon near the Los Angeles county line.

Operations were active in Santa Barbara county in 1902. A large production was secured on Los Alamos creek, which locality has been operated successfully for several years. A well with a capacity of 200 barrels was found near Lompoc. Summerland district is in this county, but was not actively operated during 1902, and has declined in production.

The problem of transportation from the California oil fields has not been fully solved. The oil development of the state has been much retarded by the lack of facilities for getting the oil to market. Most of the production is within reach of the railways by short pipe lines, but there has been a deficiency of cars to meet the demands, and consumers have hesitated to

adopt oil as fuel because of the uncertainty of getting a supply when needed.

An 8-inch pipe line is being constructed from the Kern river district to a refinery at Point Richmond, on San Francisco bay, which eventually will have branches to the important oil producing localities in the San Joaquin valley. A branch to the Coalinga field is now in process of construction. The main pipe line will be 278 miles in length with 10 pumping stations, and the oil will be heated to permit its easy pumping. The completion and operation of this pipe line are matters of very great importance to the industry of the state. A railway, chiefly for the transportation of crude oil, is projected from the Sunset district to tide water at Port Harford, but at the close of 1902 little progress had been made toward its construction.

Tankage supply stations have been established in the Hawaiian Islands, and large tank steamers are now running to the islands from San Francisco and southern California ports. Large supply stations are also being installed at various points along the coast as far north as Washington, and these will be supplied by the railways or by ocean transit as will be most convenient.

The chief use of California petroleum is as fuel, and the market for it was gradually extended during 1902.

The railways of the state are adopting it as rapidly as possible. The Southern Pacific Railway has established a large amount of tankage on its line at different points. Both the Southern Pacific and the Atchison, Topeka and Santa Fe railways are the owners of tracts of oil lands from which part of their supply is drawn. The use of the heavy oils for improving roads is increasing.

The price of California oil during 1902 was low, but some advance took place toward the close of the year. Large contracts for the delivery of oil at the wells for a period of five years, however, were made at the rate of 20 cents a barrel. This price applied to the heavier oils of the Kern river and McKittrick districts. Lighter oil produced in the southern part of the state commanded as high as $1.00 and $1.20 a barrel where the quality was such as to permit refining into illuminating oils.

During the year the number of refineries in the state increased from 11 to 33. Most of them were small and designed more particularly for the production of asphalt from the heavy oils, which yield from 40 to 50 per cent of this material. The distillates obtained in this way are used largely for domestic fuel, for gas making purposes, and, to a slight extent, for spraying fruit trees. The largest installation for refining California oils is at Point Richmond, near San Francisco. In the following table is shown the production of petroleum in California by counties for the years 1897 to 1902:

TABLE 32.—*Production of crude petroleum in California, by counties: 1897 to 1902.*

[Barrels of 42 gallons.]

COUNTY.	1902	1901	1900	1899	1898	1897
Total production	13,984,268	8,786,330	4,324,484	2,677,875	2,249,088	1,911,569
Total value	$4,873,617	$4,974,640	$4,076,975	$2,660,793	$2,376,420	$1,918,569
Average price per barrel	$0.35	$0.57	$0.94	$0.99	$1.05	$1.00
Fresno	572,498	780,650	532,000	409,372	154,000	70,140
Kern	9,705,703	4,493,455	892,500	15,000	10,000	.....
Los Angeles	1,938,114	2,188,633	1,730,263	1,409,356	1,462,871	1,327,011
Orange	1,058,549	724,565	372,200	108,077	60,000	12,000
Santa Barbara	242,840	135,900	153,756	208,370	132,217	130,136
Santa Clara	.....	.....	771	1,500	3,000	4,000
Ventura	484,764	463,127	418,000	496,200	427,000	368,282
Unapportioned	[1] 1,800	.....	225,000	.....	.....	.....

[1] San Mateo.

Colorado.—There was a considerable amount of new work accomplished in Colorado during 1902, although the product was but 396,901 barrels, a decrease of 63,619 barrels as compared with 1901. The production of the Boulder pool was only 11,800 barrels. Its quality was superior to any other petroleum found west of the Mississippi river, and its gravity when fresh was 42.5° Baumé.

The new Boulder field was partially opened up in 1901 by the McKenzie well, which found petroleum at a depth of 2,720 feet and was the cause of the drilling of a number of deep wells in this new field. These, however, produced only a limited quantity of high-grade petroleum. There were 48 wells drilled in the state, 28 of which were dry. The total number of producing wells was 77, and the number abandoned during the year, 6. There were 60 tanks at wells, with a combined capacity of 41,579 barrels.

An important deep well was drilled in the old Florence field south of the city, which at a depth of 3,650 feet found a pay streak never before reached by any of the wells in that field. The strata in which the petroleum is found stored in this field, and also in the Boulder field, are considered to belong to the Fort Pierce group of the Montana Cretaceous. The Florence field furnished nearly 98 per cent of the state's production in 1902.

The petroleum is of a dark green color, with a gravity of from 31° to 32° Baumé, and in refining gives a fair yield of the more valuable products. The production in 1902 sold for $484,683, an average of $1.22 per barrel being secured.

Illinois.—The production of petroleum in this state, although extending over a period of nearly fifteen years, has been insignificant. Even the small production secured seems to be growing smaller. There is a probability, however, that the state may yet produce sufficient petroleum to become of significance as a producer.

Nearly all of the petroleum comes from Litchfield, Montgomery county, and is used locally for lubricating

purposes. Its gravity is 22° Baumé. The wells are from 640 to 670 feet in depth. There is a small production from shallow wells at Washington, Tazewell county. It finds a sale as lubricating petroleum, the production, valued at $5 per barrel, amounting to $1,000. In October, 1901, petroleum was reported to have been found in small quantities 6 miles west of Canton, Fulton county, and also in the town of Herscher, Kankakee county. The production of the state since 1889 has been as follows:

TABLE 33.—*Production of petroleum in Illinois: 1889 to 1902.*

[Barrels of 42 gallons.]

YEAR.	Quantity.	YEAR.	Quantity.
Total	6,576	1895	200
		1896	250
1889	1,460	1897	500
1890	900	1898	360
1891	675	1899	360
1892	521	1900	200
1893	400	1901	250
1894	300	1902	200

Indiana.—The production in this state comes almost entirely from one horizon, known as the Trenton limestone. There are probably 28 barrels of salt water pumped for each barrel of petroleum produced.

A number of wells that were formerly natural gas producers have been drilled deeper and have found petroleum in paying quantities. It is a field of easy access, and is abundantly supplied with facilities for transporting supplies, as well as with pipe lines, for marketing the petroleum. The production in 1902 was 7,480,896 barrels of crude petroleum, valued at $6,526,622. This is a gain of 1,723,810 barrels in quantity, and $1,703,796 in value over 1901, the increase amounting to 29.9 per cent in quantity and 35.3 per cent in value. Indiana was the only state in the northeastern portion of the United States that gave an increased production in 1902.

The most active operations during 1902 were in Grant county, one-third of the new wells in the state being drilled in this county, adding a considerable new and rich territory to the known productive area of the state. The section near Marion once famous for large natural gas wells is now important as a petroleum producing region. The exhaustion of the gas enabled operators to drill the wells deeper, and results have been remarkably successful. The counties of Adams, Blackford, Delaware, Huntington, Jay, Madison, Randolph, and Wells were all more or less conspicuous for new wells and increased production during the year. In addition to the production from the regular limestone strata of the Trenton horizon, there are a number of small pools in newer horizons that have produced small quantities of petroleum, but no very successful wells were discovered, although there was a small production in Dubois, Jasper, Martin, and Vigo counties.

The following table gives the production of petroleum in Indiana from 1891 to 1902:

TABLE 34.—*Production of petroleum in Indiana: 1891 to 1902.*

YEAR.	Quantity (barrels).	Total value at wells of all oil produced, excluding pipeage.	Value per barrel.
1891	136,634	$54,787	$0.40
1892	698,068	260,620	0.37
1893	2,335,293	1,050,882	0.45
1894	3,688,666	1,774,260	0.48
1895	4,386,132	2,811,444	0.64
1896	4,680,732	2,954,411	0.63
1897	4,122,356	1,880,412	0.45⅝
1898	3,730,907	2,214,322	0.59⅜
1899	3,848,182	3,363,738	0.87⅜
1900	4,874,392	4,693,988	0.96 3/16
1901	5,757,086	4,822,826	0.83 7/16
1902	7,480,896	6,526,622	0.87⅛

The whole number of producing wells in 1902 was 8,224, of which 8,223 were pumping and 1 flowing. There were 2,932 wells drilled, of which 443 were dry and 2,489 were producers. The abandoned wells numbered 772. The number of receiving tanks at the wells was 2,568, having a combined capacity of 592,172 barrels.

Kansas.—This state was the scene of a large amount of development during 1902. The main portion of the production was secured in Allen, Neosho, and Wilson counties. Several new pools were opened up, and the Chanute pool opened in 1901 was greatly extended. No very large gushers were developed, yet a large percentage of the wells drilled were profitable producers. The depth of the wells in the Kansas field is not great, ranging from 750 to 900 feet, and their production runs from 10 to 50 barrels.

The petroleum and natural gas developed in southeastern Kansas are generally found in a dark sand from 15 to 25 feet in thickness, almost immediately above the Mississippian limestone. It is not a persistent stratum, but is more or less a local deposit in the Cherokee shales. In other sections of the state these shales carry deposits of bituminous coal. There is a general dip to the west, which soon carries this formation too deep to be reached by ordinary methods of drilling. Indications point to the probability of Kansas becoming a large producer of petroleum, and in 1902 its production increased 85.2 per cent; the pipe lines and transportation companies could not take care of it. Early in 1903 a pipe line was constructed, connecting the refinery at Neodesha with the newly developed field of Chanute and Humboldt.

The total number of wells drilled in the state of Kansas during 1902 was 282. Of this number, 245 were productive and 37 dry holes. The total number of pumping wells was 367, and the flowing wells numbered 52. There were 14 wells abandoned. There were 304 tanks at the wells, with a combined capacity of 43,238 barrels.

The total production of oil in Kansas, so far as records have been obtained, is as follows:

TABLE 35.—*Production of petroleum in Kansas: 1889 to 1902.*

[Barrels of 42 gallons.]

YEAR.	Quantity.	YEAR.	Quantity.
1889	500	1896	113,571
1890	1,200	1897	81,098
1891	1,400	1898	71,980
1892	.....	1899	69,700
1893	18,000	1900	74,714
1894	40,000	1901	179,151
1895	44,430	1902	331,749

The value of the petroleum produced in Kansas in 1902 was $292,464, an average of 88 cents per barrel. The average price per barrel received in 1901 was 84 cents.

Kentucky.—The events of 1902 were of considerable importance, the extensive pipe line system being completed from Parkersburg, W. Va., to Somerset, near the southern boundary of the state. There are also branch lines from the main trunk line to Barbourville, Ragland, and the Prestonsburg fields. The entire length of the trunk line from where it crosses the state line from West Virginia to the Tennessee state line is 190 miles. There are also 85 miles of branches, making a total of 275 miles of pipe line. A very considerable amount of development work was done in Kentucky during 1902 in the counties of Allen, Barren, Bath, Clark, Clay, Clinton, Cumberland, Estill, Knox, Lewis, Lincoln, Menifee, Morgan, Powell, Pulaski, Rowan, and Wayne. The production of petroleum in 1902 was 248,950 barrels, valued at $172,837, an average of 69 cents per barrel, a gain of 81.4 per cent in quantity over the production in 1901.

Louisiana.—The presence of petroleum in this state has been known for a number of years, as there were numerous localities in the southwestern portion where springs carrying a proportion of petroleum were known to exist. The developments in 1901, a few miles to the southwest, were the incentive to a larger amount of prospecting in various portions of the state during the years 1901 and 1902. There was some slight production in this state during the year 1901, but there were no sales, and no value could be given. The most successful development was near Jennings, 90 miles east of Beaumont, Tex., and 190 miles west of New Orleans. There were also a number of productive wells drilled at Welsh, 12 miles west of Jennings, and a number of wells in which there were indications of petroleum were drilled at Calcasieu, Lake Charles, Crowley, Lafayette, and Sulphur. In several other localities there were outbursts of natural gas accompanied by a slight showing of petroleum. The most important field discovered in the latter part of 1901 was located 6 miles northeast of Jennings, in Acadia parish.

At a depth of 1,822 feet one well found a considerable amount of petroleum in a bed of loose sand. It flowed spasmodically considerable quantities of petroleum, mixed with more or less sand, to a considerable height above the derrick. Owing to caves and several unforeseen conditions this well had to be abandoned at the close of 1902. In this pool in the same stratum producing the petroleum a strong gas pressure was encountered which threw out large quantities of loose sand, frequently clogging up the casing and thereby shutting off the flow. Some of these difficulties were overcome by the insertion of perforated casing in the bottom. Little or no solid formation is found in the drilling of these wells. The petroleum is about 26° Baumé, and is said to be somewhat superior to that produced in the Beaumont and Sour Lake pools.

About 12 miles west of Jennings the Welsh pool is located. There are indications that a considerable area of productive territory would be found in this locality. The same difficulty presented by beds of loose sand associated with petroleum and natural gas is encountered in this field. The Jennings and Welsh fields had been connected by pipe line with both railroad and tide water transportation, and a large amount of the product has been marketed as fuel petroleum.

Missouri.—There has been a small production of petroleum in this state since 1889, the product being secured from a shallow well located in Bates county, near the town of Merwin. It is heavy and dark in color, and finds sale as a lubricating petroleum.

During the year 1902 seven shallow wells, from 340 to 490 feet in depth, were drilled at Belton, in Cass county, and a small quantity of lubricating petroleum was secured. The production in this field, although insignificant in 1902, showed an increase over the previous year.

Michigan.—The production of petroleum in Michigan has been somewhat irregular since it was first developed in a small way in 1900 near Port Huron. The principal source of petroleum is the Corniferous limestone, and the pay rock, 13 feet in thickness, is found at a depth of 524 feet. This same stratum is productive to the east, in Canada.

Montana.—In the northern part of this state, near the Canadian border and east of the Flathead river, there are a number of indications of petroleum in natural springs. North of this section, in Alberta, Canada, a recent strike of petroleum is reported on the waters of the Kootenai river. In the southeastern portion of this state, in Carbon and Sweet Grass counties, some petroleum indications are reported. Three wells were recently completed in Carbon county, in which, however, only a very small quantity of petroleum was secured.

Nevada.—Although several wells were drilled in this state during 1901 and 1902 no production of petroleum was secured. Several wells drilled in the vicinity of

Elko encountered sand and shales similar to those in which petroleum is found in other localities, but no petroleum was developed.

New Mexico.—There are indications of petroleum and asphaltum deposits scattered over a large area in New Mexico, but nothing yet has been developed in the way of productive wells. There are a considerable number of natural showings of petroleum in San Juan county, and indications are reported in the Salado region near Santa Rosa in Guadalupe county, as well as in Colfax, Eddy, Lincoln, Otero, and Union counties, all of which remain to be tested.

New York.—For the sake of conducting the business of collecting the crude petroleum in a convenient manner, and keeping the same grade of petroleum together, the producing areas in the several states have been divided into districts. These districts are not always separated by state lines, as in several instances a producing area extends from one state into another, and the complete separation of the products of the different states is more or less difficult. This is particularly so in the Appalachian field.

The productive area of petroleum in New York is located in the southwestern portion of the state, and embraces the most northeastern part of the Appalachian field. There are two districts, one known as the Allegany district, which is entirely within the state, and the other as the Bradford district, which extends as a continuous producing area into Pennsylvania. The entire production of petroleum in 1902 was 1,119,730 barrels, valued at $1,530,852, an average of $1.367 per barrel. The number of barrels produced in 1902 showed a decrease of 7.2 per cent, yet the value of the production increased $70,844, as compared with 1901. During 1902, 8,443 wells were reported by 2,123 companies or individuals. There were 626 wells drilled, of which 95 were dry and 531 productive, and 170 wells were abandoned. There were 8,178 pumping wells operated during 1902.

Ohio.—Since 1895 Ohio has produced more petroleum than any other state. In the southeastern part of the state petroleum has been known to exist for many years. The field in the northwestern portion was developed in 1885. There are two well-defined grades of petroleum produced. That in the southeastern portion is similar to the petroleum produced in Pennsylvania and West Virginia; that in the northwestern portion is a peculiar variety of petroleum, containing a considerable percentage of sulphureted hydrogen. For years it was extensively used as a fuel petroleum, as the sulphureted hydrogen imparted a very disagreeable odor to the refined products. It was only after several years that it was successfully refined.

The total production of Ohio in 1902 was 21,014,231 barrels, valued at $20,757,359. Of this amount there were 5,136,366 barrels produced in the southeastern portion, which is a part of the Appalachian field, and 15,877,730 barrels produced in the northwestern portion, known as the Lima-Indiana field. There was also a very small amount of lubricating petroleum produced in this state, in the Mecca and Belden fields, amounting to 135 barrels. This commanded a high price. The value of petroleum produced in the southeastern portion of the state was $6,471,821. That produced in the Lima-Indiana portion was valued at $14,284,072. The output of the Mecca and Belden pools was valued at $1,466. Ohio has produced 24.4 per cent of all the petroleum that the United States has produced since the beginning of the petroleum production. The total number of wells completed in the state during 1902 was 5,318. Of these 3,532 were in the Lima-Indiana field and 1,781 in the southeastern field. Of the total number 894 were dry and 4,419 productive, which includes 3 flowing wells. There were all told 39,056 producing wells, and 2,533 wells were abandoned.

The total quantity and value of crude petroleum produced in Ohio in all fields during 1902 and 1901 are shown in the following table:

TABLE 36.—*Total quantity and value of crude petroleum produced in Ohio: 1902 and 1901.*

DISTRICT.	1902			1901		
	Quantity (barrels).	Value.	Price per barrel.	Quantity (barrels).	Value.	Price per barrel.
Total.....	21,014,231	$20,757,359	$0.99	21,648,083	$20,533,571	$0.95
Lima.....	15,877,730	14,284,072	0.89	16,176,293	13,911,612	0.86
Southeastern....	5,136,366	6,471,821	1.26	5,470,850	6,619,342	1.21
Mecca-Belden...	135	1,466	10.85	940	2,617	2.78

The gross output of the state has exceeded 21,000,000 barrels for the last four years. It will be seen that during 1902 there was a decrease in the production of 633,852 barrels as compared with 1901. In 1901 there was a decline from 1900 of 714,147 barrels.

The production of the Lima (Ohio) district since 1889 has been as follows:

TABLE 37.—*Production of petroleum in the Lima (Ohio) district: 1889 to 1902.*

YEAR.	Quantity (barrels).	YEAR.	Quantity (barrels).
1889	12,153,189	1896	20,575,138
1890	15,014,882	1897	18,682,677
1891	17,315,978	1898	16,590,416
1892	15,169,507	1899	16,377,174
1893	13,646,804	1900	16,884,358
1894	13,607,844	1901	16,176,293
1895	15,850,609	1902	15,877,730

The production of the southeastern Ohio district for the same period is given in the following table:

TABLE 38.—*Production of petroleum in the southeastern Ohio district: 1889 to 1902.*

YEAR.	Quantity (barrels).	YEAR.	Quantity (barrels).
1889	317,037	1896	3,365,365
1890	1,108,334	1897	2,877,193
1891	422,883	1898	2,147,610
1892	1,190,302	1899	4,764,135
1893	2,601,394	1900	5,475,589
1894	3,183,370	1901	5,470,850
1895	3,693,248	1902	5,136,366

The production of the Mecca-Belden lubricating oil districts of Ohio has decreased from 2,283 barrels in 1900 to 940 barrels in 1901 and 135 barrels in 1902. This is the highest grade natural petroleum produced in the United States, but the demand for it is very small and operations are at a standstill. The average price for the Mecca oil in 1902 was $15.91 per barrel, or about 38 cents per gallon. This is much greater than the price of the manufactured article, which has in a measure driven this natural product out of the market.

Oklahoma.—There are many natural petroleum seeps in this territory, but nothing in the way of established production of petroleum was reported for 1902. Some oil is produced quite near the boundary line of Indian Territory. In addition numerous springs and wells have indications of petroleum, and liquid and solid asphalt have been found in shafts and water wells. Guthrie, Lawton, Fort Sill, Richards, and Granite all have a number of natural vents, showing both petroleum and natural gas, and in all probability a few years will see this territory placed on the list of regular producers.

Oregon.—A number of test wells were drilled in Lane, Douglas, Jackson, and Wasco counties, none of which found petroleum or natural gas. In Josephine county there are several springs reported on which a film of petroleum collects.

Pennsylvania.—Of the entire production of petroleum in the United States since the first discovery of the oil in 1859, Pennsylvania has produced one-half of the entire output. The production of petroleum in Pennsylvania in 1902 was 12,063,880 barrels, amounting to 13.5 per cent of the total, valued at $15,266,093. The number of wells producing in that year was 37,806. The number drilled was 3,034, of which 2,275 were productive and 759 were dry. The abandoned wells numbered 1,879. There were 20,323 tanks of varying sizes at the wells, with a capacity of 1,864,755 barrels.

The petroleum producing areas of Pennsylvania are divided into districts on the basis of quality of output and county lines. A district is in some cases subdivided into pools which produce similar grades.

The Bradford district is located in McKean county in the most northern portion of the state, a portion of it extending over into New York. It was formerly a very prolific region, nearly the entire area being underlaid by a productive sand 50 feet thick, but for several years it has shown the effect of drainage by a steadily decreasing output. In 1881 this district produced 23,000,000 barrels of petroleum. Its production for 1902 was 2,506,981 barrels.

The Gaines district is located in Tioga county, just east of the Potter county line. It is the most easterly district producing petroleum in the United States. Its production for 1902 was 24,881 barrels, which was 12,610 barrels less than that of the previous year. The wells in this district are known as "flashy"—that is, they produced a large amount when first opened up, but soon dropped off and became very small producers.

Clarendon and Warren district includes the western portion of McKean county, the eastern portion of Warren county, the northeastern portion of Forest county, and the northwestern portion of Elk county. In this district some of the finest petroleum produced in the United States is found, known as Tiona petroleum, which commands a higher price than the ordinary Pennsylvania variety. The Clarendon and Warren district proper produced 468,420 barrels in 1902, which is a gain of 63,987 barrels over the previous year.

The lower district contains the oldest wells in the Appalachian field, along the valley of Oil creek. Some of these wells have been producing over twenty-five years. The district includes a portion of Forest, Venango, Clarion, and Butler counties. There is a great number of wells of small production in this district. The production in 1902 was 4,754,979 barrels, which is a decrease of 100,070 barrels as compared with the previous year. Many deep wells were drilled in the new Speechley field, near the old Modac pool, in Butler county, and there were also a number of large wells secured in the Fourth sand near Middletown, which, however, rapidly declined.

In the Allegheny county district no new pools were developed in 1902. This district produced 1,376,212 barrels in 1902, which was a decline of 64,755 barrels as compared with the previous year. This district contained the famous McDonald pool, which in 1891 increased its production to 10,317,258 barrels.

The Washington county district produced 1,396,831 barrels in 1902, which was a gain of 96,432 barrels over the previous year. There were no new pools discovered, but several extensions of the older pools were developed.

Beaver county district produced during the year 1902 528,734 barrels. There was a decline of 270,544 barrels in 1902 compared with 1901.

Greene county district also showed a slight decrease in 1902, when the output amounted to 721,574 barrels against 771,708 barrels in 1901. All the wells drilled

in this section are from 2,400 to 3,000 feet in depth, which makes the drilling and operating expensive. A dry hole under such circumstances means a loss of between $6,000 and $7,000. Some of the older wells in this region are remarkable, on account of their continuous production, the decline being very slight during a series of years.

Franklin district is a subdivision of the lower district, and has long been celebrated for the production of the finest natural lubricating petroleum found in the United States. The production of this variety of petroleum is secured from the First sand, which has a thickness of about 50 feet. This stratum is at a comparatively shallow depth, and is associated with large quantities of salt water. Many of these wells produce only a few gallons of this superior grade of petroleum in a day. The production of this district in 1902 was 50,555 barrels, which showed a decline of 4,607 barrels when compared with the previous year.

The production of the Pennsylvania and New York fields for the years 1891 to 1902, inclusive, by districts, is shown in the following table, all of the districts being wholly within Pennsylvania, except Allegany and a portion of the Bradford district referred to under the head of New York:

TABLE 39.—PRODUCTION OF CRUDE PETROLEUM IN PENNSYLVANIA AND NEW YORK, BY DISTRICTS: 1891 TO 1902.

[Barrels of 42 gallons.]

YEAR.	Total.	Allegany county, N. Y.	Bradford.	Bullion.	Clarendon and Warren.	Grand Valley.	Holiday Run.	Middle.	Tioga county.	Second sand.
1891	33,009,236	1,121,574	5,452,418	117,463	360,227	198,954	47,551	1,536,606	.....	268,855
1892	28,422,377	908,603	4,291,061	.....	272,523	128,101	.....	1,145,320	.....	272,011
1893	20,214,515	733,709	3,502,136	.....	327,680	54,700	.....	1,249,067	.....	245,205
1894	19,019,990	656,845	3,359,835	.....	338,570	46 000	.....	1,169,628	.....	315,724
1895	19,144,390	637,139	3,244,808	.....	369,747	20,988	.....	1,149,404	.....	260,872
1896	20,584,421	736,606	3,604,771	.....	385,294	.....	.....	956,390	.....	.....
1897	19,262,066	771,606	3,904,230	.....	378,075	.....	.....	1,329,448	.....	.....
1898	15,948,464	757,492	3,444,299	.....	414,212	.....	.....	932,000	.....	.....
1899	14,374,512	807,814	3,206,845	.....	414,352	.....	.....	528,440	.....	.....
1900	14,559,127	817,326	3,022,493	.....	383,493	.....	.....	452,136	115,105	.....
1901	13,831,996	765,402	2,757,603	.....	404,433	.....	.....	176,185	37,491	.....
1902	13,183,610	768,753	2,506,981	.....	468,420	.....	.....	162,762	24,881	.....

YEAR.	Tarkill and Egypt.	Tiona.	Tidioute and Titusville.	Lower.	Washington county.	Allegheny county, Pa.	Beaver county.	Greene county.	Franklin.	Smiths Ferry.
1891	868,275	553,730	837,287	6,952,539	2,997,278	10,317,258	943,223	341,813	65,185	29,000
1892	.....	475,708	629,164	6,837,703	2,452,388	10,196,856	623,372	102,108	58,459	29,000
1893	.....	286,597	225,348	5,396,969	2,077,564	5,488,792	465,300	74,377	66,278	20,793
1894	.....	318,611	183,425	5,760,574	1,720,780	4,559,342	466,790	64,176	57,070	2,620
1895	.....	325,843	50,129	6,904,355	1,676,676	3,864,111	472,276	116,931	48,711	2,400
1896	.....	309,252	.....	7,539,807	1,975,169	4,380,607	550,296	94,796	49,329	2,704
1897	.....	291,585	.....	6,825,599	2,175,712	2,958,540	317,926	258,065	48,880	2,400
1898	.....	251,447	.....	5,500,443	1,742,677	2,301,651	220,796	325,177	56,090	2,180
1899	.....	212,217	.....	5,080,182	1,460,036	1,988,754	232,154	381,483	61,085	1,150
1900	.....	256,915	.....	5,364,398	1,375,341	1,706,886	416,319	588,379	59,036	1,300
1901	.....	466,909	.....	4,855,049	1,300,399	1,440,967	799,278	771,708	55,162	1,410
1902	.....	421,728	.....	4,754,979	1,396,831	1,376,212	528,784	721,574	50,555	1,200

Tennessee.—The production of petroleum in this state since 1896 has been secured in great measure from a remarkable well drilled on the Obey river in Fentress county. This well at a depth of 276 feet struck a deposit of petroleum which alone has produced nearly 40,000 barrels up to the close of 1902. It would seem that this well pierced a cavern either in the Clinton limestone or the upper Hudson river formation. The petroleum is of a light green color with a specific gravity of 0.846 or 35° Baumé. During 1901 the large tanks near this well were connected by a pipe line with the Slickford pool in Kentucky, a distance of 20 miles. During the year 1902 a few small wells were opened in the vicinity of this remarkable well which helped to increase the production in this state. There were a number of wells completed in Pickett, Fentress, and Sumner counties, several of which had a considerable showing of petroleum or natural gas; the greater portion, however, were destitute of petroleum in sufficient quantities to become paying wells. The numerous surface indications over a large area in this state have generally proved misleading. There seems to be an absence of an open, porous, continuous bed that is capable of furnishing a reservoir for the accumulation of petroleum. The wells that so far have proved to be producers, in greater or less amounts, seem to draw their supply from a crevice in the stratum or a cavity in the limestone formation.

Texas.—For a number of years the state of Texas produced an insignificant amount of petroleum from Sour Lake, Nacogdoches, and the San Antonio fields. Its remarkable output in 1902 placed it second in the list, next to Ohio. The year 1896 was notable for the opening of the Corsicana petroleum field, in which a considerable quantity of a very valuable petroleum was discovered. This petroleum is rather dark in color and ranges from 38° to 40° Baumé. A few years later a refinery was erected at Corsicana, where almost the entire production has been successfully refined.

On January 10, 1901, a very remarkable well was

completed in southeastern Texas, about 4 miles south of Beaumont, in Jefferson county, and about 20 miles north of the Gulf of Mexico. At the close of 1902 there were some 120 wells producing in this locality. The producing area is confined to about 185 acres, on an elevation or mound which rises to about 15 feet above the general surface of the plain. The summit is nearly 40 feet above the level of the sea. The wells are usually slightly over 1,000 feet in depth, and originally were gushers. Some of them in the early history of the field produced as much as 75,000 barrels per day. Outside of this immediate locality described, nothing but dry holes have been developed, although some of these wells have been drilled to a depth of from 2,500 to 3,000 feet.

Probably no other event in the development of the petroleum industry in the United States created such a profound sensation as the opening up of this prolific territory near tidewater. The productive area near the original well during the summer and fall of 1901 and the early part of 1902 was crowded by a great number of wells, many of which were productive, although the output of the later ones was insignificant in comparison to the output of the earlier. The first well in this pool was located by Capt. A. F. Lucas, who was attracted to the locality by the existence of strong sulphur and acid springs and the presence of pure sulphur, together with a considerable outflow of natural gas. Two unsuccessful attempts had formerly been made to test this locality. A considerable amount of gas pressure in pockets was developed above the oil producing horizons, and this in some instances blew out great volumes of sand and water before it became exhausted.

During the latter portion of 1901 another large pool was partially developed at Sour Lake, 20 miles northwest of Beaumont, underlying the shallow wells that were originally drilled in this locality. In November of that year a well was completed to a depth of 1,500 feet which encountered more or less loose sand alternating with beds of gravel. At a depth of between 850 and 880 feet a deposit of sand was found which gave a large flow of hot sulphur water at a temperature of about 100° F., accompanied by some showing of petroleum. At a depth of 1,040 feet four distinct sands were encountered. These loose sands contained some petroleum associated with hot water, but no considerable quantity was developed.

About the middle of March, 1902, a gusher was opened up at a depth of 683 feet, after 40 feet of very promising oil sand had been penetrated; when the water became exhausted the well began to flow vigorously, accompanied by the outburst of loose sand, which on several occasions completely shut off the petroleum. By the use of casing with larger perforations than had previously been used, the inrush of loose sand was overcome, and many very productive wells were secured.

The gravity of petroleum produced in this region ranges from 22° to 23° Baumé, equal to a specific gravity of 0.92. The fresh oil gives a flash point at 120° F., while upon standing in a tank for some time the flash point is increased to 160° F. In the latter part of 1901 and the year 1902 a number of pipe lines were constructed reaching from Beaumont to Port Arthur and Sabine Pass. Two pipe lines were constructed from Sour Lake to Beaumont.

Twelve miles northwest of Sour Lake, in what was known as the Saratoga district, several productive wells of moderate capacity were drilled with promising indications of an increased production. In the old Nacogdoches district numerous shallow wells were drilled previous to 1895, but no very large producers were secured. A considerable amount of money has been invested in drilling wells and building a pipe line to the railroad in this locality, but operations have been of late years practically abandoned.

In the Bexar county district small quantities of heavy petroleum were produced from wells at a depth of 600 to 800 feet. This pool is located near San Antonio.

The number of wells drilled during 1902 was 252; of these 216 were productive and 36 were dry holes. The number of flowing wells was 70, and the total number of pumping wells was 782, making a total of 852 productive wells. There were 67 wells abandoned during the year. The number of tanks at the wells was 1,010, with a combined capacity of 4,917,923 barrels.

The localities in which petroleum has thus far been found are shown in the following list, arranged alphabetically by counties, the list being taken from Bulletin 18 of the University of Texas:

Anderson county, New Palestine, sand impregnation; Bastrop county, near Elgin; Bell county, western part, small quantities near Belton; Bexar county, Dulnig place, 7 miles south of San Antonio, J. Linn Survey, 10 miles south of San Antonio; Brazoria county, Kaiser mound, near Columbia; Brewster county, 6 miles east of Terlingua, in bituminous shale; Brown county, Brownwood; Burleson county, near Rita; Caldwell county, near Lockhart; Clay county, 2 miles from Hurnville, north of Henrietta; Coleman county, near Trickham; Cooke county, Muenster, west; Coryell county, Gatesville; Denton county, reported 6 miles from Denton; Duval county, Piedras Pintas, near Benavides; Edwards county, reported near Rocksprings; El Paso county, 20 miles north of Vanhorn, in small amount; Gonzales county, near Ottine; Grimes county, near Keith, Lamb Springs neighborhood; Hardin county, Saratoga, Sour Lake; Jack county, 10 miles north of Jacksboro; Jefferson county, the Beaumont field; Live Oak county, Atascosa creek, 12 miles north of Oakville; McCulloch county, near Milburn; McLennan county, near Waco; McMullen county, Crowther; Medina county, near Dunlay; Montague county, St. Jo, east; Nacogdoches county, Oil Springs, 6 miles south of Melrose, Chireno;

Navarro county, the Corsicana field, the Powell field, Frost; Nueces county, Puerto-Richard Kings' ranch; Palo Pinto county, near Strawn, 1 mile north of Mineral Wells; Pecos county, 15 miles northeast of Fort Stockton and 22 miles north of Fort Stockton; Reeves county, Pecos Valley, above and below Pecos City, 9 miles north of Toyah; San Augustine county, San Augustine; Shelby county, near Timpson; Tarrant county, near Fort Worth; Travis county, Walnut creek, 9 miles north of Austin; Wilson county, Sutherland Springs.

The total quantity of crude petroleum produced in 1902, was 18,515,017 barrels, of which 18,083,658 barrels were sold and 431,359 barrels were held in tanks by the producers.

It is estimated that at the close of 1902 storage tanks in the state contained about 7,300,000 barrels, leaving 11,215,017 barrels as the quantity which was either consumed locally or shipped from the state. The total production in 1901, excluding stocks, was 4,393,658 barrels. The gain of 1902 over 1901, excluding stocks, amounted to 311.6 per cent. The value of the crude petroleum produced in 1902 was $4,174,731, an average of 22.55 cents per barrel. Compared with 1901 the total value, excluding stocks, shows a gain of 220 per cent.

The production of crude petroleum in 1902, by districts, was as follows:

	Barrels.
Total	18,515,017
Beaumont	17,852,308
Corsicana	571,059
Powell	46,812
Sour Lake, etc. (beginning in September)	44,838

A comparative summary of the value of crude petroleum at wells sold in 1902 and 1901, by fields (excluding stocks), is as follows:

TABLE 40.—*Value of petroleum sold in Texas, by fields: 1902 and 1901.*

[Barrels of 42 gallons.]

FIELD.	1902			1901		
	Quantity.	Value.	Value per barrel.	Quantity.	Value.	Value per barrel.
Total	[1]18,083,658	$3,998,097	$0.2211	[1]4,393,658	$1,247,150	$0.284
Beaumont	17,420,949	3,563,285	0.2045	3,593,113	630,752	0.175
Corsicana	571,059	410,536	0.7189	763,424	604,249	0.7915
Powell	46,812	9,863	0.2107	37,121	12,148	0.3277
Sour Lake, etc.	44,838	14,413	0.3215	.....	.....	.....

[1] Includes small production of petroleum in Bexar county.

The following statement shows the production and stocks in the Beaumont district in 1902 and 1901:

Total production in Beaumont district: 1902 and 1901.

	Barrels.
Total production, including stocks	23,038,191
Production in 1902, including stocks	17,852,308
Production in 1901, including stocks	5,185,883

The stock in tanks at the close of 1902 and 1901 in the Beaumont fields was estimated as follows:

Stock of petroleum in tanks in the Beaumont fields at the close of 1902 and 1901.

	Barrels.
Stock in tanks on January 1, 1902	1,592,770
Increase at the close of 1902	5,707,230
Total amount in tanks at the close of 1902	7,300,000
Shipments during 1902	10,552,308
Total production	17,852,308

By the close of 1902 the iron tankage completed in Jefferson county had a capacity of 5,775,500 barrels. The capacity of the wooden tanks was 200,000 barrels. The earthen tankage is more difficult to determine, as there was a large number of earthen tanks unfinished; but it is probable that enough was completed to contain 2,300,000 barrels. This gives a total capacity of 8,275,500 barrels. There were also 50 large iron tanks, with a capacity of 2,100,000 barrels, erected by the Santa Fe Railway, the Southern Pacific Railway, and the Houston and Texas Central Railroad, scattered over north-central and western Texas, with Beaumont as a starting point. These tanks have a capacity ranging from 10,500 to 55,000 barrels, and are used for the storing of fuel oil to supply locomotives. This last-mentioned tankage, added to the iron tankage of Jefferson county, brings up the total capacity to 7,875,500 barrels for storing the petroleum produced at Spindle Top, Sour Lake, and Saratoga. There were also two large tanks erected at Sour Lake and one at Saratoga to receive the petroleum produced in the last-named localities.

The shipments of petroleum by rail from the Beaumont district are estimated as 9,646 carloads, or 1,462,968 barrels, in 1901, and 67,275 carloads, or 11,426,559 barrels, in 1902. The shipments in 1902 increased by months from 546,881 barrels in January to 1,117,624 barrels in December.

The water shipments, coastwise and foreign, in 1902 aggregated 167,390,829 gallons, of which 139,512,712 gallons, or 83.3 per cent, went to coastwise ports on the Gulf and the Atlantic, and 27,878,117 gallons, or 16.7 per cent, were exported to Habana, Cuba, and Dover and Plymouth, England, chiefly to the last-named port. Of the shipments by water only about 6 per cent were of refined petroleum. The shipments from Port Arthur aggregated 109,050,253 gallons, increasing from 5,560,044 gallons in January to 15,848,750 gallons in December, and the shipments from Sabine Pass aggregated 58,340,576 gallons, increasing from 504,000 gallons in January to 8,675,014 gallons in December. The total water shipments, 167,390,829 gallons, shows an increase from 6,064,044 gallons in January to 24,523,764 gallons in December. The cargoes were 275 in number, 144 from Port Arthur and 131 from Sabine Pass. The shipments from Port Arthur in 1901 were 8,494,794 gallons coastwise and 2,722,902 gallons to foreign ports, a total of 11,217,696 gallons. There were no shipments of refined petroleum from Sabine Pass in 1902.

The exports of crude petroleum from Port Arthur and Sabine Pass in 1901 aggregated 2,276,787 gallons, of a value of $20,061. The exports of crude and refined petroleum from these ports in 1902 to foreign countries were as follows:

Exports from Port Arthur and Sabine Pass, Texas: 1902.

	Quantity (gallons).	Value.
Total	27,878,117	$247,738
Crude	19,641,591	115,415
Naphtha	297,174	4,275
Illuminating	2,824,883	81,778
Residuum	5,114,469	46,270

Utah.—Petroleum in limited quantities has been found on the Green river in Emery county, and it is also reported near Sinbad, where a number of shallow wells have been drilled and small quantities of lubricating petroleum secured. This state in former years produced considerable quantities of natural paraffin, or black wax, from localities in the Sanpete valley, east of Salt Lake, but these have been exhausted. At the present time some gilsonite, a variety of solid hydrocarbon, is produced.

Washington.—A number of test wells were drilled in 1902 in different portions of this state in search of petroleum and natural gas. So far there have been no indications of the existence of either of these substances in paying quantities.

West Virginia.—This state produced considerable petroleum along the Burning Springs uplift a few years after the discovery of petroleum in northern Pennsylvania. It was not until about the year 1889, however, that it became of considerable importance as a producer. In the fall of that year an important well was drilled near Mannington, in Marion county, separated by many miles from any other producing territory. The development of the state after this well proved itself to be a producer was rapid. Although the great depth at which a large portion of the petroleum producing strata were found has somewhat retarded the increase of production, the most conspicuous feature in the development of West Virginia in 1902 was the opening up of the Folsom, the Pine Grove, and the Falling Timber run pools, in Wetzel county. There were also some new developments on the Big Knot and Wolf Penn run, in Ritchie county. However, no pool of any considerable size has been developed for several years, and the production of this state has been on a gradual decline since the year 1900. Some of the first wells drilled west of the Appalachian mountains were located on the Kanawha river near Charleston in search of salt brine. At this point petroleum and natural gas were found many years before oil was drilled for in Pennsylvania.

The production of petroleum in this state in 1902 was 13,513,345 barrels, which were valued at $17,040,317, an average of $1.26 per barrel. There were included in this amount 14,660 barrels of lubricating petroleum, which had a value of $2.31 per barrel. The total number of producing wells in 1902 was 11,138, and of this number 500 were flowing wells. The total number of wells drilled during the year 1902 was 2,193; of this number 1,544 were productive and 649 were unproductive or dry holes. The number of abandoned wells during the year was 1,322.

The quantity and value of crude petroleum produced in West Virginia from 1889 to 1902, inclusive, is shown in the following table:

TABLE 41.—TOTAL QUANTITY AND VALUE OF CRUDE PETROLEUM PRODUCED IN WEST VIRGINIA: 1889 TO 1902.

YEAR.	TOTAL.			REGULAR CRUDE.			LUBRICATING CRUDE.		
	Quantity (barrels).	Value.	Price per barrel.	Quantity (barrels).	Value.	Price per barrel.	Quantity (barrels).	Value.	Price per barrel.
1889	544,113	$653,827	$1.20⅛	520,511	$595,730	$1.145	23,602	$58,097	$2.46⅛
1890	492,578	501,198	1.01⅞	.....	.....	.....	.....	.....	.....
1891	2,406,218	1,612,826	0.67	.....	.....	.....	.....	.....	.....
1892	3,810,086	2,119,901	0.556	.....	.....	.....	.....	.....	.....
1893	8,445,412	5,425,522	0.642	8,433,412	5,398,522	0.64	12,000	27,000	2.25
1894	8,577,624	7,221,717	0.842	8,563,954	7,182,794	0.839	13,670	38,923	2.847
1895	8,120,125	11,038,770	1.359	8,109,782	11,017,651	1.359	10,343	21,119	2.042
1896	10,019,770	11,829,618	1.181	10,005,966	11,794,532	1.17⅞	13,804	35,086	2.542
1897	13,090,045	10,310,178	0.78⅞	13,078,011	10,282,586	0.78⅝	12,034	27,592	2.293
1898	13,615,101	12,426,359	0.913	13,603,136	12,395,858	0.91⅛	11,965	30,501	2.549
1899	13,910,630	18,014,766	1.295	13,892,906	17,973,947	1.29⅜	17,724	40,819	2.303
1900	16,195,675	21,922,702	1.353	16,176,757	21,879,064	1.35½	18,918	43,638	2.307
1901	14,177,126	17,172,724	1.211	14,164,662	17,139,241	1.21	12,464	33,483	2.687
1902	13,513,345	17,040,317	1.261	13,498,685	17,006,469	1.26	14,660	33,848	2.309

Wyoming.—The output of petroleum in this state is greatly restricted by the lack of a market near where it is produced. Large bituminous coal deposits and a thinly settled country have prevented more than a slight demand for it. There has been, however, since 1893 a regular production of superior lubricating petroleum at Salt Creek, 50 miles north of Casper, to which place it is hauled by wagons and refined. In the southwestern portion of the state, at Spring Valley, Uinta county, some petroleum of light gravity and superior quality has been produced, but not as yet in commercial quantities. There are numerous petroleum seeps in the western and central portions of Natrona county, and outcrops of sandstone largely impregnated with petroleum on the north flank of the Rattlesnake range of mountains.

In the Pope Agie district, in Fremont county, several

successful wells that flow naturally have been drilled. Some of the wells drilled in 1884 still flow petroleum when opened up. It is reported that 4,000 barrels were produced in this region and allowed to remain in earthen tanks, owing to cost of transportation, only a small portion being used for fuel and lubrication. This petroleum is quite heavy and dark and its specific gravity varies from 18° to 23° Baumé.

REVIEW BY YEARS, 1890 TO THE CLOSE OF 1901.

A summary of the principal features in the development of the petroleum industry is herewith presented; it covers the years from the publication of the Eleventh Census in 1890 to the close of 1901.

1890.—One of the most notable features in the petroleum industry in the United States in 1890 was the enormous increase in the production, a gain of 10,660,059 barrels being made over the production of 1889. The principal increase was in Pennsylvania and New York, the increase amounting to 6,970,773 barrels. Discoveries of petroleum were numerous in Pennsylvania, and the borders of some of the older districts had to be extended to embrace a wider area of productive territory. The sections conspicuous for heavy gains were the Glade Run pool in Butler county, the Shannopin pool in Beaver county, and the Montour, Wildwood, and Chartiers pools in Allegheny county. The increased production in Ohio amounted to 3,653,190 barrels and was general throughout both the Lima and the southeastern fields.

The average value of pipe line certificates in the Pennsylvania field declined from 94⅛ cents per barrel in 1889 to 86¼ cents in 1890, making a net loss of 7⅞ cents. The average price of Lima (Ohio) petroleum advanced from 15 cents per barrel in 1889 to 30 cents per barrel in 1890.

The state of Indiana was credited with a production of 63,496 barrels in 1890, as compared with 33,375 barrels in 1889, the first year in which Indiana appears in the list of productive states. West Virginia produced slightly less in 1890 than in 1889. Although the original well at Mannington was opened up in October, 1889, it required time to drill the deep wells of that region and to connect them to pipe lines, and the effect of the greater "strikes" upon the production was not at once apparent.

1891.—The amount of petroleum produced in 1891, 54,292,655 barrels, was larger than that of any preceding year and was not exceeded until 1896. The most important event that marked the year was the opening up of the remarkable McDonald petroleum field, in Allegheny and Washington counties, Pa., in July of that year. By September the production of this district reached 41,000 barrels per day. It is estimated that the total production of the McDonald field for the last six months of 1901 was over 6,000,000 barrels. This was probably the most prolific field of petroleum ever developed in the Appalachian field, when its area is considered.

The oil bearing sand was composed of beautiful quartz pebbles from the size of a pea up to that of a hickory nut. It gave up large quantities of petroleum with great rapidity. In this great reservoir the wells soon ceased to be more than ordinary producers, but a few months sufficing to measurably exhaust several of the wells which, when first opened up, flowed at the rate of 15,000 to 18,000 barrels per day. The Wildwood field, in Allegheny county, was also a factor in increasing the Pennsylvania production, although to a much less extent than the McDonald pool, and Butler county furnished some new and fairly productive wells. There was a considerable decrease in the production of the other Pennsylvania districts. There was a large decline in southeastern Ohio, owing to the low prices that prevailed. The production of southeastern Ohio in 1890 was 1,108,334 barrels, as compared with 422,883 barrels produced in 1891. On the other hand, in the Lima field there was a large increase in production.

The Appalachian field produced in the year 1891 a total of 35,848,777 barrels, which is the greatest production on record with the exception of the year 1900, when the production was slightly in excess of these figures. This large production of petroleum had the effect of reducing the price so that the average price quoted for the year 1891 was 67 cents, as compared with 76⅝ cents in 1889. In this year West Virginia began to be conspicuous as a producer of petroleum. The production of 1891 was 2,406,218 barrels, which was due to the opening up of the new field extending from Mt. Morris, near the Pennsylvania state line, to Mannington, in Marion county. Indiana also began to be conspicuous as a producer, having increased its production largely over that of 1890.

1892.—The production in 1892 showed a considerable falling off, due largely to the decline in the yield of the McDonald field in Pennsylvania. West Virginia increased over a million barrels in production, which was due to the increasing yield of the Mannington field and the newly developed Sistersville pool. The Gordon sand, underlying the Big Injun sand, was discovered to be productive south of Mannington. There was a reduction in the output of northwestern Ohio, an increase in that of southeastern Ohio, and a considerable increase in the production of Indiana, due to developments in the Trenton formation. Up to this time a greater portion of the petroleum of the Lima-Indiana fields, in Ohio and Indiana, had been sold for fuel. In this year an increasing amount was marketed for refining, owing to the process lately perfected for the removal of the sulphur. The average price received for the petroleum produced in the Appalachian field was 55⅝ cents per barrel, which, with the exception of 1861, is the lowest quotation on record. The price of Lima-Indiana petroleum was 36⅝ cents per barrel.

There was an increase in the exports of petroleum and its products.

1893.—The important features connected with the production of petroleum in 1893 were a decline in the output of the older fields, especially Pennsylvania; an increase in the amount of production in southeastern Ohio, West Virginia, and Indiana; the slight increase in price, and the increase in the refining of Lima-Indiana petroleum. There was also an increase in the quantity exported. Practically all the petroleum produced came from the Appalachian field, the Lima-Indiana field, the Florence field of Colorado, and the districts of southern California. The decline in the entire production in 1893 as compared with 1892 was 2,078,591 barrels. There was a large increase in the output of West Virginia and Indiana. The decline in the Appalachian products of 2,067,322 barrels nearly accounts for the entire shortage. The average price of certificate oil in the Appalachian field was 64 cents per barrel, an increase of 8⅝ cents over that of 1892. In the Lima field the average price of petroleum in 1893 was 47.25 cents, an increase of 10⅝ cents over that of 1892.

The increase of petroleum exports in 1893 over those of 1892 was nearly 60,000,000 gallons, and the total exportation of all varieties of petroleum amounted to 804,221,230 gallons, the largest up to that date.

1894.—The notable events in the progress of the petroleum industry in 1894 were the development of the Ormsby district, in the Bradford field in northern Pennsylvania, the opening of the Williamstown pool, in Wood county, W. Va., and the discovery of a Berea sand pool near Steubenville, Ohio. There were also some promising developments near Marietta, Ohio. The year was also notable for the advent of the state of Wyoming to the list of oil producers, 2,369 barrels being produced by this state. The quality was that of a superior lubricating petroleum. The year showed a very slight increase in production over that of 1893, but the increase in value was over $6,000,000. In the Appalachian field the combined product of New York and Pennsylvania showed a decrease of 1,294,523 barrels. West Virginia showed a slight increase over the preceding year. Southeastern Ohio showed quite an increase, amounting to 581,976 barrels. In the Lima (Ohio) district there was a decrease of only 38,960 barrels. Indiana showed an increase of 1,353,373 barrels, a gain of 58 per cent. The average price of the Appalachian petroleum in 1894 was 83⅞ cents, a gain of almost 20 cents per barrel. The average price of the Lima-Indiana petroleum was 48 cents a barrel, general average price 72 cents.

1895.—The notable features of the year were the nearly identical production of the Appalachian field with that of 1894; the increased production in Ohio, Indiana, and California; the advance of Ohio to first place, its production for the first time being greater than that of Pennsylvania; the decrease in stocks and the rise in price; and the further extension of profitable producing districts, including the opening up in West Virginia of the Elk Fork pool, east of Sistersville, and of another on Indian creek near the Big Moses well; and successful tests in southeastern Kansas. There was a slight increase in the combined production of New York and Pennsylvania and an increase of over two million barrels in the production of the Lima (Ohio) field. A slight decline, amounting to 457,499 barrels, was recorded in the production of West Virginia. There was an increase of about 700,000 barrels in Indiana and of over 500,000 barrels in California. The total production in 1895 was 52,892,276 barrels. The stocks of crude petroleum in the Appalachian field at the close of 1895 were 5,344,784 barrels, as compared with 6,499,880 barrels at the close of 1894; in the Lima-Indiana field there were 21,494,848 barrels, making a total for both fields of 26,839,632 barrels at the close of 1895.

The price for what was known as Pennsylvania certificate oil was $1.35⅞ cents, as compared with 83⅞ cents in 1894, a gain of 52 cents. In the Lima-Indiana district the average price in 1895 was 71¾ cents, as compared with 48 cents in 1894, a gain of 23¾ cents. The average price of the entire production was $1.089 per barrel in 1895.

1896.—This year was remarkable for the large increase in the production which came principally from the state of West Virginia and the Lima-Indiana district in northwestern Ohio, and from the Watsonville pool in McKean county, Pa. There was an increase in the amount of stocks held and a decrease in the price. The entire production for the year 1896 was 60,960,361 barrels, larger than that of any previous year in the history of the industry, and a gain of 8,068,085 barrels over 1895. There was a slight increase in the combined production of New York and Pennsylvania, with an increase of 4,400,000 barrels in Ohio, and an increase of 1,900,000 barrels in West Virginia. A slight increase is to be noted in the production of the state of Indiana, and a large increase in the state of Kansas as compared with that of the previous year.

The new field at Corsicana, Tex., was first opened up during 1896 and produced 1,400 barrels. The total amount of stocks held in the Appalachian and Lima-Indiana fields, at the close of the year 1896, was 33,048,492 barrels, as compared with 26,839,632 barrels at the close of 1895, a gain of 6,208,860 barrels. There was a decrease in the price of petroleum. The average value of what has been called Pennsylvania certificate oil, in the Pennsylvania field, was $1.18 as compared with $1.36 in 1895, showing a decline of 18 cents per barrel. In the Lima (Ohio) field the price fell from an average of 71¾ cents in 1895 to 66¾ cents in 1896, a decline of 5 cents per barrel. The total value of all of the petroleum marketed in 1896 was $58,518,709, an

average of about 95.9 cents per barrel. This was an increase in value of only $827,430 over the preceding year.

1897.—The total quantity of petroleum produced in the United States in 1897 was 60,475,516 barrels, a decrease as compared with 1896 of only 484,845 barrels. There was a slight increase in the production of the Appalachian field as a whole, which came principally from West Virginia. There was a decided decrease in the yield of the Lima-Indiana field in the states of Ohio and Indiana. There was also considerable decrease in the number of wells drilled in both of these states as compared with 1896. The production of petroleum in Texas amounted to 65,975 barrels, as compared with 1,450 barrels produced in 1896, and nearly all of it was produced in the Corsicana field. There was an increase in stocks and a still further decrease in price.

There was a decline in value amounting to $17,589,098. The average price per barrel for all the petroleum produced in 1897 was 67.7 cents as compared with 95.9 cents in 1896. There was a decrease of 2,450,837 barrels in the production of the Lima-Indiana field. Colorado increased its output by 23,484 barrels, and the California field by 650,634 barrels. The largest proportional gain, however, was in the Corsicana field in Texas. The stocks in the Appalachian field at the close of 1897 were 11,010,044 barrels, an increase of 1,264,322 barrels. In the Lima-Indiana field the stocks of petroleum at the close of the year 1897 were 22,762,779 barrels, a loss of 539,991 barrels. The total stocks in both fields at the close of 1897 amounted to 33,772,823 barrels, a gain of 724,331 barrels over those at the close of 1896. The average price of certificate or credit balances of Pennsylvania oil in 1897 was 78⅝ cents, as compared with $1.17⅞ in 1896, showing a decline of 39¼ cents. The average price of Lima (Ohio) petroleum was 48 cents, as compared with 66¾ cents in 1896, a decrease of 18¾ cents.

1898.—The quantity of petroleum—55,364,233 barrels—produced in 1898 showed a decrease of 5,111,283 barrels as compared with the 60,475,516 barrels produced in 1897. There was a decrease in both the Appalachian and the Lima-Indiana fields. The average price paid for Pennsylvania petroleum was 91⅛ cents per barrel, as compared with 61¾ cents per barrel for the production of the Lima-Indiana field. The initial well in Scio, Harrison county, Ohio, was completed in August. There was a large increase of production in California and Texas, but a decrease in Indiana.

There was a decrease in the number of wells drilled in the Appalachian and the Lima-Indiana fields. The total number drilled in both these fields was 7,186, of which 1,539 were dry, as compared with 8,558 drilled in 1897, of which number 1,964 were dry. The total stocks of these fields at the close of 1898 were 26,967,495 barrels, as compared with 33,772,823 barrels at the close of 1897, a decrease of 6,805,328 barrels. Stocks decreased and the price increased. The exports decreased as compared with 1897.

1899.—The entire production of the United States was 57,070,850 barrels, as compared with 55,364,233 barrels in 1898. The year was conspicuous for the increased production in southeastern Ohio, amounting to over 2,500,000 barrels, principally from the Scio pool, Harrison county, which added over 1,600,000 barrels to the output. The petroleum of this pool was found in the Berea formation at a depth of about 1,200 feet, being quite evenly distributed and of a very superior quality. There was a decrease in the production of Pennsylvania, Colorado, and Kansas, while all the other states showed an increase. There was a considerably increased production in the state of Texas. The average price of all of the petroleum produced in 1899 was $1.132, as compared with 79.8 cents in 1898, showing a gain of 33.4 cents. The average price of what is known as Pennsylvania certificate oil, which includes about 96 per cent of the Appalachian production, was $1.29⅝ per barrel in 1899, as compared with 91⅛ cents in 1898, an increase of 38¼ cents. The average price of Trenton rock, or Lima-Indiana, petroleum was 88⅝ cents in 1899, as compared with 59.4 cents in 1898, an increase of 29.2 cents per barrel.

There was a decrease in the stocks in 1899, due to shrinkage in the Lima-Indiana district, as the total stocks in the Appalachian field increased by 1,664,588 barrels. At the close of 1899 the total stocks held in the Appalachian and Lima-Indiana fields amounted to 23,997,118 barrels, as compared with 26,967,495 barrels at the close of the previous year. The decrease in 1899 was 2,970,377 barrels. The total amount of petroleum exported from the United States in 1899 was 22,643,439 barrels (951,024,441 gallons), valued at $64,982,249.

1900.—One of the important features in the development of the petroleum industry in the year 1900 is the fact that the production in that year was greater than for any previous year. The total production was 63,620,529 barrels, which amount was greater by 6,549,679 barrels than that of the year 1899. There was a large increase in the output of California, Texas, Indiana, and West Virginia. West Virginia produced 16,195,675 barrels, which was greater than the production of any previous year. There was also an increase in the number of wells drilled and in the stocks. There was an increase in the average price or value of the petroleum at the wells, the price of $1.19 being reached this year, which was the highest since 1877; the average price of Pennsylvania petroleum was $1.35¼ per barrel. The price of Lima-Indiana petroleum advanced from 89⅝ to 98¾ cents. The exports of petroleum and its products also showed a considerable gain in quantity and value.

1901.—The production in 1901 was again greater than for any previous year. It was 69,389,194 barrels, an increase of 5,768,665 barrels. There was a most

remarkable increase in the production in both Texas and California, which combined amounted to about 8,000,000 barrels. There was a decline in the product of West Virginia amounting to over 2,000,000 barrels. There were also slight declines in New York, Pennsylvania, Ohio, and Wyoming; all the remaining oil producing states showed an increase. The average price of all the petroleum produced in 1901 was 95.7 cents, as compared with $1.191 in 1900, a decrease of 23.4 cents per barrel. The average price of Pennsylvania certificate petroleum was $1.21 per barrel, as compared with $1.35¼ per barrel in 1900, showing a decline of 14¼ cents. The average price of Lima (Ohio) petroleum fell from 98¾ cents in 1900 to 86 cents in 1901. There was also a decline of 37.7 cents in the average price paid for California petroleum and a decline of 76 cents per barrel in the average price of the Texas production. There was an increase in the exports of petroleum and its products (mineral oils), which for the first time exceeded 1,000,000,000 gallons. The total value of the exports was, however, slightly less than in 1900.

On January 10, 1901, an immense gusher was drilled near Beaumont, Tex., and flowed a stream 150 feet high and 6 inches in diameter. Before it was controlled it is estimated to have produced not less than 500,000 barrels, averaging not less than 60,000 barrels per day.

The year was also notable for the organization of an immense number of stock companies in California and Texas, which secured a large amount of capital. Many of them never produced a single barrel of petroleum.

The Boulder field in Colorado was just opening up at the close of the year. It created considerable excitement, and a large amount of capital was invested in stock companies. These investments in most cases resulted in disappointment and a total loss to the investors.

REVIEW OF THE INDUSTRY IN FOREIGN COUNTRIES.

Canada.—Since the year 1862 Canada has produced a considerable quantity of petroleum. The output, however, does not supply the amount necessary for home consumption. In 1902, 11,389,390 imperial gallons of refined petroleum were produced from the crude in Canada, and 13,220,005 imperial gallons of petroleum and its products were imported. An import tax amounting to about 5 cents a gallon is imposed. For a number of years the production in Canada was over 700,000 barrels, but there has been a gradual decline in the output since 1898. The production in 1902 was 520,000 barrels. The main productive territory is situated in Lambton county, Ontario, the two principal districts being Petrolea and Oil Springs.

In quality the petroleum produced in this portion of Canada is very similar to that produced in the Lima-Indiana field, which contains a considerable proportion of sulphureted hydrogen, and it has been successfully refined in former years at Petrolea and in later years at Sarnia. There are other sections in Canada in which more or less petroleum is known to exist, but which have up to the present time yielded little or no output.

In the vicinity of Moncton, New Brunswick, several wells recently completed have produced petroleum in sufficient quantities to be successfully operated. Other localities in which petroleum is known to exist are Gaspé bay in Quebec and near Lake Ainslie in Nova Scotia, but no profitable production has been secured.

There are also indications of petroleum along the northwest coast of Newfoundland. A number of wells have been drilled and petroleum in small quantities has been found, but up to the present time no successful operations have been developed.

In the southwestern portion of Alberta a well was completed during the year 1902 which was reported to have found a considerable flow of petroleum. A well was also drilled near Calgary. There are many localities along the Athabasca river in Athabasca district where petroleum, and especially natural gas, are more or less abundant in surface indications. Although several test wells have been drilled in this section no large quantities of either have been developed.

Peru.—For a number of years this country has produced a considerable quantity of petroleum. The production for 1902 was, in round numbers, 60,000 barrels. The variety is similar to that produced in California, and is inferior in quality to the output of the eastern portion of the United States. The scarcity of good coal along the western coast of South America has added considerable interest to the development of petroleum in Peru. However, the production seems to be on the decline. Outside of the United States, Peru and Canada are the only countries on the Western continent that have produced petroleum in commercial quantities, although it is known to be widely distributed in Argentine, Brazil, Colombia, Cuba, Ecuador, Mexico, Trinidad, and Venezuela. In most of these countries there are local springs and shallow wells, worked generally in a very crude manner by the natives, which have produced a small amount of crude petroleum.

Russia.—For the first time in eight years, Russia in 1902 showed a decreased output of crude petroleum. The decrease from the output of 1901 amounted to 4,628,511 barrels, a falling off of about 5 per cent. The principal reasons for the decline seem to have been the want of organization among the producers, insufficient means of storage and transportation, and the taxes imposed by the Government upon certain territory.

A number of large spouting wells were drilled during the year, one of the largest of which was on the Rothschild plot, No. 25, at Romany, Bibi Eibat district. For a time this well yielded 80,000 barrels per day. Another large well near by produced at the rate of 100,000 barrels per day. The depth at which large spouting wells

are secured is gradually increasing, adding largely to the expense. Often several years are consumed in completing one of these very deep wells, which require many feet of casing, beginning with a size as large as 26 inches in diameter and ending with a diameter 10 to 12 inches. In some of them the wrought iron pipe and casing used weighs as much as 90 tons, which, together with the time consumed in drilling, entails a cost of from $15,000 to $20,000.

During the year a new field was discovered by the drilling of a well near Berekei station, 170 miles northwest of Baku. The Grosni field, 500 miles north of Baku, has produced considerable petroleum for the last five years. The greater portion, or 95 per cent, of the petroleum continues to be produced from an area of about 10 square miles in the Apsheron peninsula near Baku. The following table shows the yearly production of petroleum in Russia, by districts, since 1889:

TABLE 42.—*Production of crude petroleum in Russia, by districts: 1889 to 1902.*

[Barrels of 42 gallons.]

YEAR.	Total.	Balakhani.	Sabunchi.	Romani.	Bibi Eibat.	Binagadi.	Grosni.
1889	23,502,163	8,424,364	12,905,012	.....	2,172,787	.....	.....
1890	27,660,953	7,742,995	17,525,134	189,022	2,203,802	.....	.....
1891	33,565,819	9,067,861	19,992,359	1,585,342	2,920,257	.....	.....
1892	35,026,144	7,025,973	18,916,516	5,017,286	4,066,369	.....	.....
1893	39,703,304	7,070,101	17,883,692	8,943,313	5,806,198	.....	.....
1894	36,375,428	7,217,054	17,485,232	7,542,922	4,130,220	.....	.....
1895	46,140,174	8,258,961	18,500,196	13,619,639	5,761,378	.....	.....
1896	47,220,633	10,470,315	18,664,322	9,546,250	8,539,746	.....	.....
1897	54,399,568	11,774,479	20,406,918	11,821,815	7,642,356	.....	2,754,000
1898	61,609,357	12,921,001	22,396,000	12,292,016	11,800,340	.....	2,200,000
1899	65,954,968	13,788,013	27,701,955	11,834,548	9,704,779	19,614	3,906,059
1900	75,779,417	14,967,598	30,208,182	13,785,820	13,110,092	48,801	3,658,924
1901	85,168,556	14,139,716	35,444,697	15,297,031	16,039,998	56,196	4,190,918
1902	80,540,045	12,185,354	32,071,908	16,800,000	15,298,200	58,583	4,125,999

The total production of petroleum in Russia, as compared with that of the United States, from 1894 to 1902, inclusive, together with the percentages of gains or losses for each year, as compared with the previous year, and the production of Russia in percentage of the production of the United States, are shown by the following table:

TABLE 43.—*Comparative production of crude petroleum of Russia and the United States: 1894 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 gallons.]

YEAR.	UNITED STATES.			RUSSIA.			Production of Russia in percentage of production of United States.
	Production.	Gain or loss.	Percentage of gain or loss.	Profitable production.	Gain or loss.	Percentage of gain or loss.	
1894	49,344,516	.....	.....	36,375,428	.....	.....	.....
1895	52,892,276	3,547,760	+ 7.19	46,140,174	9,764,746	+26.8	87.2
1896	60,960,361	8,068,085	+15.25	47,220,633	1,080,459	+ 2.3	77.4
1897	60,475,516	484,845	− 0.80	54,399,568	7,178,935	+15.2	89.9
1898	55,364,233	5,111,283	− 8.40	61,609,357	7,209,789	+13.3	111.3
1899	57,070,850	1,706,617	+ 3.08	65,954,968	4,345,611	+ 7.05	115.5
1900	63,620,529	6,549,679	+11.50	75,779,417	9,824,449	+14.9	119.1
1901	69,389,194	5,768,665	+ 9.07	85,168,556	9,389,139	+12.4	122.7
1902	[1]88,766,916	19,377,722	+27.91	80,540,045	4,628,511	− 5.4	90.7

[1] Does not include 508,306 barrels produced but not marketed.

The following tabular statement gives the shipments of crude and refined petroleum from the ports of Batum and Novorossiisk on the Black sea to foreign countries and to Russian ports near by, in 1902 and 1901, as reported by Mr. James C. Chambers, United States consul at Batum, Russia:

TABLE 44.—SHIPMENTS OF RUSSIAN PETROLEUM FROM BLACK SEA PORTS: 1902 AND 1901.

[United States gallons.]

TO—	TOTAL.		REFINED.		SOLAR AND DISTILLATE.[1]		LUBRICATING.		CRUDE AND RESIDUUM.	
	1902	1901	1902	1901	1902	1901	1902	1901	1902	1901
Total shipped	461,762,020	460,249,530	354,642,630	357,859,645	45,373,800	48,214,740	46,235,900	39,640,925	15,509,690	14,534,220
Total exported	422,488,925	428,657,210	319,651,670	328,732,460	45,373,800	48,195,010	44,645,400	38,459,820	12,818,055	13,269,920
Africa	.....	297,120	.....	297,120	.....	.....	.....	.....	.....	.....
Austria-Hungary	5,743,225	7,381,560	3,973,690	3,429,585	.....	2,385,695	1,768,035	1,566,280	1,500	.....
Belgium	23,016,250	21,503,045	9,729,645	10,127,250	990,380	313,560	8,747,840	7,950,995	3,548,385	3,111,240
Bulgaria	2,787,740	2,851,950	2,733,390	2,787,050	.....	.....	49,600	53,150	4,750	11,750
Cochin China	.....	999,640	.....	999,640	.....	.....	.....	.....	.....	.....
China	7,625,250	21,320,040	7,624,750	21,320,040	.....	.....	250	.....	250	.....
Egypt	15,852,345	13,759,075	15,536,645	13,569,525	.....	.....	277,650	178,550	38,050	11,000
United Kingdom	113,994,905	87,017,195	82,699,895	55,782,960	20,138,395	20,709,610	9,157,745	8,197,845	1,998,870	2,326,780
France	41,676,260	38,467,800	958,200	1,204,190	24,242,275	24,786,145	13,871,675	9,907,420	2,604,110	2,540,045
Germany	35,799,865	24,193,780	24,436,535	12,874,280	.....	.....	9,795,120	9,119,960	1,568,210	2,199,540
India	42,742,150	53,664,490	42,699,000	53,624,490	.....	.....	43,150	40,000	.....	.....
Italy	9,226,425	10,835,555	7,065,715	8,277,185	2,750	.....	170,500	199,650	1,987,460	2,358,770
Japan	5,067,850	4,070,000	5,067,850	4,070,000	.....	.....	.....	.....	.....	.....
Java	1,471,100	5,832,070	1,471,100	5,832,070	.....	.....	.....	.....	.....	.....
Malta	1,841,730	1,297,975	1,841,730	1,297,975	.....	.....	.....	.....	.....	.....
Netherlands	12,307,040	6,497,265	12,134,540	6,159,815	.....	.....	252,500	337,450	.....	.....
Philippines	2,237,400	1,965,350	2,237,400	1,965,350	.....	.....	.....	.....	.....	.....
Portugal	2,202,100	1,116,650	2,202,100	1,116,650	.....	.....	.....	.....	.....	.....
Roumania	228,660	661,930	158,860	549,680	.....	.....	68,300	111,450	1,500	800
Siam	.....	473,000	.....	473,000	.....	.....	.....	.....	.....	.....
Spain	269,735	1,268,915	.....	.....	.....	.....	269,585	607,020	150	651,895
Suez Canal[2]	61,386,715	81,716,235	61,386,715	81,716,235	.....	.....	.....	.....	.....	.....
Turkey	29,514,600	39,479,560	29,303,400	39,268,960	.....	.....	125,400	131,850	85,800	78,750
All other countries	7,417,580	2,057,010	6,390,510	1,989,460	.....	.....	48,050	58,200	979,020	9,350
Russian ports	39,273,095	31,592,320	34,990,960	29,127,185	.....	19,730	1,590,500	1,181,105	2,691,635	1,264,300

[1] "Solar and distillate" means gas oil to the United Kingdom and distillate to France.
[2] To unknown ports beyond the canal, the shipments being in bulk.

About 80 per cent of the entire petroleum production is marketed in the interior of Russia by way of the Caspian sea and the Volga river. In 1902 the quantity amounted to 2,054,990,000 gallons, of which 1,693,420,000 gallons, or over 82.4 per cent, was residuum used for fuel and 107,995,000 gallons, or 5.3 per cent, was crude petroleum. Only 12.3 per cent of the illuminating and lubricating products was marketed in the great inland portion of Russia.

The average price of crude petroleum at the wells at Baku in 1902 was 6.65 kopecks per pood, or 3.42 cents for 5 gallons, or 28⅔ cents per barrel, as compared with 8.25 kopecks per pood, or 32⅔ cents per barrel, in 1901.

WORLD'S PRODUCTION.

One of the conspicuous features of the world's production of petroleum in 1902 was the remarkable increase in the output of the inferior grades in the United States. Of the world's production the United States produced 47.9 per cent in 1902. In 1901 it produced 41.84 per cent. Another very important feature was the decline in the Russian production which, in 1902, amounted to 43.50 per cent of the world's production, as compared with 51.38 per cent in 1901.

The United States and Russia in 1902 produced 91.44 per cent of the world's production, in 1901 they produced 93.22 per cent, and in 1900 their production was 94.11 per cent.

The following table gives the production of crude petroleum in all the known countries of the world, together with the percentage for each during 1902, 1901, and 1900:

TABLE 45.—*World's production of crude petroleum: 1900 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Barrels of 42 United States gallons.]

COUNTRY.	1902		1901		1900	
	Quantity.	Per cent of total.	Quantity.	Per cent of total.	Quantity.	Per cent of total.
Total	185,151,089	100.00	165,773,361	100.00	148,114,975	100.00
United States	[1] 88,766,916	47.94	69,389,194	41.84	63,620,529	42.95
Canada	520,000	0.28	572,500	0.35	692,650	0.47
Peru	60,000	0.03	72,261	0.04	102,976	0.07
Russia	80,540,045	43.50	85,168,556	51.38	75,779,417	51.16
Galicia	4,142,160	2.24	3,251,544	1.96	2,346,505	1.58
Sumatra, Java, and Borneo	5,860,000	3.17	3,038,700	1.84	1,967,700	1.33
Roumania	2,059,930	1.11	1,406,160	0.85	1,628,535	1.10
India	1,617,363	0.87	1,430,716	0.86	1,078,264	0.73
Japan	1,193,000	0.64	1,100,000	0.67	528,000	0.36
Germany	353,675	0.20	313,630	0.19	358,297	0.24
Italy	12,000	.....	10,100	.....	12,102	0.01
All other countries	26,000	0.02	20,000	0.02	.....	.....

[1] Does not include 508,386 barrels produced but not marketed.

There was a steady increase in the world's production of petroleum during the last three years, which would be much more marked in 1902 were it not for the fact that the Russian production showed a decrease of 4,628,511 barrels in that year. The total increase in the world's production in 1902 amounted to 11.1 per cent as compared with 1901 and to a little over 25 per cent when compared with that of 1900.

DESCRIPTIVE.

Origin.—Much speculation and controversy have been aroused among chemists and geologists as to the origin of petroleum, but no complete and satisfactory solution of the problem has yet been presented. Numerous theories have been advanced as to the original source of the carbides and hydrocarbons and their combinations, entering into the formation of petroleum, and many scientists of note have a particular theory, but there appears little possibility of reaching an agreement in the matter in the near future. Experiments in the laboratory have been made so as to combine the elements artificially and the resultant, in most instances, has been a liquid, which in appearance and composition is very similar to the natural petroleum. Petroleum has also been produced by the distillation of shales, and there are many upholders of the claim that the formation of petroleum is due to the natural distillation by internal heat of the shales and hydrocarbons found in the earth's crust. Its origin is one of the unsolved problems.

The various theories advanced by men of science to account for the formation may be in most cases narrowed down to two, each of which has found numerous supporters. These are—first, its physical origin by the distillation of organic matter in the sedimentary strata, either animal or vegetable; second, its chemical origin from inorganic matter or direct production by the decomposition of carbides through the action of steam deeply buried below all sedimentary strata.

In all of the known fields of the world the occurrence of petroleum is limited to comparatively small areas. The area of the same strata in which the petroleum is not found invariably covers a vastly greater area than the portions that are productive. This is the case also in some instances where the structural conditions may favor its accumulation, and the surrounding slates and shales are similar. When productive rocks can be traced to their outcrop there is invariably no trace of petroleum or asphaltum to be found in them. The wells drilled outside of these favored localities usually find no trace of petroleum or natural gas, although numerous sands may have been pierced which are productive elsewhere and are sufficiently open and porous to be receptacles.

Chemical and physical properties.—Petroleum, in both its liquid and solid forms, is largely made up of carbon and hydrogen. It ranges from 77° Baumé, or 0.6763 specific gravity, in the case of the lightest naphtha, condensed naturally from natural gas, up to between 1.1 and 1.3 in its more dense and solid form, such as natural asphalt, which usually contains from 50 to 80 per cent of carbon, 6 to 10 per cent of hydrocarbon,

and 8 to 10 per cent of sulphur. These solid forms are widely distributed, vary greatly in composition, and are usually associated, in varying proportions, with more or less silica and carbonate of lime.

General structural conditions influencing occurrence.—There is a vast difference in the character of petroleum produced in the United States and in foreign countries, and a great variety in the character of the strata which contains it. The infiltration of the petroleum into different sands and limestones has had much to do with imparting to it the varied physical and chemical properties. However, the structural conditions of these strata and the position they must occupy in order to bring about a concentration of the petroleum are similar in all of the productive fields. Its occurrence in small quantities in strata where the conditions necessary for concentration are wanting has in many instances been the cause of financial loss and disappointment.

Geological occurrence of petroleum and natural gas in the United States.—The intimate association of the liquid and gaseous hydrocarbons has made it difficult to separate them when one or the other is discussed. The great deposits of petroleum in the Appalachian field are in a series of sand rocks reaching up from the Lower Devonian to the Upper Barren measures or Monongahela formation, less than 100 feet above the Pittsburg coal, and embraces not less than 50 distinct horizons. The greater portion of the production, however, comes from the Catskill division, Upper Devonian, which group is petroleum bearing from northern Pennsylvania, near the northern portion of Venango county, southwest to the Little Kanawha river in West Virginia. In Warren, McKean, and Elk counties, Pa., productive sands are found below this group and are largely productive. They extend into south central New York and belong to the Middle Devonian formation. The overlying Berea and the Pocono or Big Injun and Lower Carboniferous sands are above the Catskill group in the geological scale, and are largely productive in West Virginia, southeastern Ohio, and to some extent in eastern Kentucky. The highest series of productive strata in the region east of the Mississippi river are composed of the sands of the upper and lower coal series, which are productive in southwestern Pennsylvania, West Virginia, and southeastern Ohio. The sandstone series of the Appalachian division, in 1902, produced 36 per cent of the total production.

Over 85 per cent of the petroleum produced in the United States from the beginning of production up to the close of 1902 also came from the sandstone strata of the Appalachian field. Here there are 40 distinct horizons in 3,300 feet of measures, and the individual beds of sandstone vary from 2 to 120 feet in thickness and differ in texture from an open light colored sand with layers of pebbles, which is very prolific, to sand of a close and hard texture, which it is necessary to torpedo in order to secure production. The highest productive sand of any practical value in the geological scale is the Mahoning, or Dunkard, sand of Pennsylvania or the first Cow Run sand of Ohio; the lowest is the Kane sand in Elk and McKean counties, Pa., and the sands of western New York. The Venango county sands are made up of a series of from four to six distinct beds, separated by strata of slate and shale. These sands generally contain layers or beds of white pebbles, often capped by a hard siliceous portion and separated by beds of shale and slate ranging in color from black to red. In Venango county the series has an average thickness of 300 feet from top to bottom, increasing to 430 feet at McDonald, in Allegheny county, Pa., and in portions of West Virginia. There is a general thinning out of this group toward the west and it thickens toward the east. They are generally known as the white-sand group.

Most of the sands below, and including the Speechley and Bradford sands, are darker in color and finer in texture than those above and are known as the dark-sand group. All of them consist of distinct layers, invariably capped by strata of dark slate or shale, which vary in thickness and allow the layers of sand to approach much nearer to each other in some localities than in others.

The source of the petroleum in the Lima-Indiana field is the Trenton limestone, which has produced very largely since first discovered in this field in 1885. From its first discovery to the close of 1902, this formation has produced 9 per cent of the total output of the United States. It is productive only in the region which embraces northeastern Ohio and central Indiana, known as the Lima-Indiana field. This limestone, which is usually over 500 feet in thickness, has a series of porous streaks embedded in the regular strata, and these streaks differ in composition from the great mass, being a dolomite which has replaced the carbonate of lime with crystals that are smaller than the carbonate crystal, and which do not, therefore, fill up the original space in the process of replacement. This changed and open conditions of the strata which invariably contain the petroleum (often associated with large deposits of salt water) are found at intervals of from 20 to 325 feet in extreme cases from the upper surface of the limestone.

The Trenton limestone is a remarkably regular and clearly defined deposit. The change from the Utica black slate, which caps it, to the rock is distinct and easily recognized by the driller.

The horizon in which petroleum is found in Kansas and Indian Territory corresponds to that of the salt sand group in West Virginia, located in the lower portion of the Pottsville group, resting on the Mississippian limestone, which is in a general way equivalent to the subcarboniferous limestone of southwestern Pennsylvania and West Virginia. All the remaining production west of the Mississippi river is secured from strata that are much more recent, reaching from the Permian to the Quaternary. These newer productive

measures consist of much thicker strata—a thickness of 15,000 feet is recorded in localities—and are made up of the recent sedimentary deposits. The several pools west of the Mississippi river produced 37.61 per cent of the output in 1902.

Character and composition of petroleum produced in the United States.—The Mississippi river separates the petroleum fields of the United States into two great divisions. The fields east of this line, to an almost universal extent, have developed petroleum with a paraffin base, while the fields to the west have, with a few exceptions, produced petroleum with an asphalt base. Crude petroleum with a paraffin base is generally much lighter and is much more valuable, owing to the greater quantity and superior quality of the naphthas and illuminating and lubricating derivatives it yields, as well as the paraffin, which is secured from the heavier distillates after the lighter products have been extracted.

On the other hand, petroleums with an asphalt base, in most cases, yield only a comparatively insignificant quantity of naphtha and a much smaller proportion of illuminating and lubricating products, which are of inferior quality, while the remaining distillates are principally valuable for fuel and as asphalts. The asphalt petroleums are also usually much heavier and are more difficult to transport by means of pipe lines, so generally applied in the fields producing paraffin petroleum.

These conditions restrict the market for asphalt petroleum, so that in general it is consumed as fuel oil, as distillates for enriching manufactured gas, and as asphalt. There are several exceptions to this generalization, however, as petroleum, in comparatively small amounts, is found in portions of Kansas, Texas, Indian Territory, Colorado, and California that yields refined products little inferior to the best grades of paraffin oil.

The products obtained by the refining of the Appalachian petroleum, and of oils from the other fields, are given below, in percentages, in a series of statements representing general results. There are marked differences in the composition of crude petroleum and in methods of refining. These methods are often varied, to a certain extent, to meet the demands of the market.

The following statement gives the general average products secured from the combined petroleum output of the Appalachian and the Lima-Indiana fields, which in 1902 represented 62.38 per cent of the total output of the United States:

Average products from the petroleum produced in the Appalachian and Lima-Indiana fields: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	13.9
Illuminating oils	58.7
Lubricants and heavy oils	8.2
Residuum (paraffin 3.42 per cent)	12.8
Loss from uncondensed light products and water	6.4

The following statement for the Appalachian field gives the average production obtained from the crude petroleum produced in western Pennsylvania, West Virginia, and southeastern Ohio:

Average products from petroleum produced in the Appalachian field: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	20.1
Illuminating oils	61.4
Lubricants and heavy oils	7.1
Residuum (paraffin 3.10 per cent)	6.3
Loss from uncondensed light products and water	5.1

For many years only a comparatively small proportion of the petroleum produced from the Trenton limestone, in the Lima-Indiana field, was refined. This was owing to the presence of a large amount of sulphureted hydrogen, which seemed to be thoroughly combined with the carbon and hydrocarbon which constitute the main elements of petroleum. By double refining the petroleum, however, and the oxidation of the sulphur—the black oxide of copper being used—the refiner has succeeded in producing an article which can scarcely be distinguished from the products of Pennsylvania crude petroleum, although the percentage of refined products secured is smaller.

The following is a fair average result of the distillation of crude petroleum from the Lima-Indiana field, which is located in Ohio near its northwestern extremity, reaching over into Indiana, the average specific gravity being 38.5° Baumé:

Average products from petroleum produced in the Lima-Indiana field: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	10.9
Illuminating oils	48.8
Metal and heavy oils	17.2
Residuum and loss	23.1

There are some refined samples which contain a small fraction of a per cent of sulphur, which does not in any way manifest itself in the process of combustion, while in others all but the faintest trace of sulphur must be removed. The original crude oil from the Lima-Indiana fields contains nearly 0.56 per cent of sulphur. The amount of sulphur found in the Pennsylvania petroleum varies from 0.025 to 0.002 per cent. Nearly all of the sulphur in the Lima-Indiana petroleum goes over when distilled, being found in both the light and heavy distillate, and it is necessary to oxidize the sulphur in order to remove it.

The gravity of naphtha varies from 90° to 60° Baumé, the lighter portions being too unstable for an accurate statement owing to their tendency to change from a liquid to a gaseous condition upon a slight rise in the

temperature or a fall in the barometer. The gravities of refined oil distillates range from 50° to 44° Baumé; that of residuum from 25° to 15°. There is usually left in the bottom of the still, after the liquid is drawn off, from 1 to 1.5 per cent of the original charge. This remains in the form of a compact cellular solid, known as "coke," which is almost pure carbon, and which is usually disposed of to parties who manufacture carbon pencils for electric arc lights. During the process of distillation the proportion of these products is varied, to meet the demand of the market, by prolonging or shortening the intervals of cutting off from one variety and beginning on the other. The lighter products are always the first to condense, then come those with an average density, and the heaviest last.

The quality of a portion of the petroleum produced in Kansas and Indian Territory in many respects resembles Pennsylvania petroleum, although the gravity is lower. Separated by intervals of dry or undeveloped territory, there are a number of productive pools, which yield petroleum of a gravity varying from 36° to 28° Baumé, although there is a considerable portion as heavy as 18° to 20°. Nearly the entire production of the lighter grades is sold to the refineries at Neodesha, where an excellent water-white illuminating petroleum is manufactured.

In these fields the lighter products amount to about 45 per cent of the total yield. A considerable portion of the heavier products is marketed as a gas enricher or as a fuel oil. The following may be taken as a fair average of the products secured from the petroleum of 36° Baumé in the Kansas field:

Average products from petroleum produced in the Kansas field: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	18.0
Illuminating oils	30.0
Heavy distillate	25.0
Residuum and loss	27.0

The crude petroleum found in the Florence field, Colo., is of good quality, and comes principally from the Florence pool. This pool produces a petroleum of 31° Baumé, and contains about 10 per cent naphtha and gasoline, 36 per cent illuminating oil, and 54 per cent residuum and loss.

During 1902 a remarkably pure petroleum, of 43° Baumé, was developed in a small pool, near Boulder, 30 miles north of Denver. This petroleum gave the following remarkable analysis when refined:

Analysis of petroleum developed near Boulder, Colorado: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	17.0
Illuminating oils	41.0
Signal oils	7.5
Lubricating and cylinder oils	32.0
Loss in refining	2.5

There are two or more different varieties of crude petroleum found in Texas. A comparatively small quantity produced in the Corsicana district is a superior oil, as the following analysis will show:

Analysis of petroleum produced in the Corsicana (Tex.) district: 1902.

PRODUCT.	Per cent.
Total	100.0
Naphthas	10.8
Kerosene (illuminating product principally)	54.5
Lubricating oils and residuum	34.7

Its specific gravity is 0.82, equal to 40° Baumé. In the year 1902 about 96 per cent of the Texas production was an inferior grade of petroleum, containing 1.4 to 1.8 per cent of sulphur, and having a specific gravity of nearly 0.92, equal to 22° Baumé. This is satisfactory as a fuel product, and a very large part of it is consumed as such. A comparatively small yield of the lighter products is secured in refining. According to Prof. C. A. Mabery, at from 145° to 200° only 4 per cent passed over as naphtha at 46° Baumé, or 0.7954 specific gravity; and at from 200° to 250° only 11 per cent passed over at 35° Baumé, equal to 0.8484 specific gravity. This latter distillate represents the illuminating product, which is much heavier than that usually secured in other parts of the United States, where it ranges usually from 0.800 to 0.815 in specific gravity.

Dr. Broverton Redwood, of London, England, records the following results in a test of a sample of illuminating petroleum refined at Port Arthur, Tex., burned in a lamp with a Hinks duplex burner; and from these results he formed the opinion that the oil represented by the sample would be found, in practical use, a thoroughly satisfactory illuminating agent:

Specific gravity at 60° F., 0.823.
Flash point (Abel test), 83° F.
Color, prime white, 2.6.
Odor, good merchantable.
Sulphur, 0.1 per cent.
Illuminating power, initial, 26.
Illuminating power, after three hours, 24.8.

Illuminating power, after six hours, 24.7.

Illuminating power, average for six hours, 25.2.

Diminution in illuminating power during six hours, 5 per cent.

Consumption of oil per hour, 1,193 grains.

Consumption of oil per candle hour, 47.4 grains.

The composition of Pennsylvania, Lima (Ohio), Beaumont (Tex.), California, and Russian crude petroleum is as follows:

Composition of American and Russian crude petroleum.

ELEMENTS.	Pennsylvania (1).	Ohio (Lima) (2).	Beaumont (3).	Beaumont (4).	California (5).	California (6).	Russia (7).
Carbon	86.10	85.00	84.60	85.03	86.93	84.00	86.60
Hydrogen	13.90	13.80	10.90	12.30	11.82	12.70	12.30
Sulphur	0.06	0.60	1.63	1.75	.....	0.40	.....
Oxygen and nitrogen	.....	.....	2.87	.....	1.25	2.90	1.10
Loss in treatment with excess of H_2SO_4	21.00	30.00	.....	39.00	.....	.....	.....

Analyses by: (1) Engler; (2) Mabery; (3) Denton; (4) Richardson and Wallace; (5) Peckham; (6) Salathe; (7) Redwood.

In some analyses the sulphur in the Beaumont petroleum is placed as high as 2 per cent. For the most part, however, it is not combined chemically, but is merely dissolved, and can, therefore, be more easily separated than that found in the Lima-Indiana petroleum.

Wyoming produced comparatively an insignificant quantity of a very high-grade lubricating petroleum, which is partially distilled and filtered under pressure before it is put upon the market.

There are a number of grades of crude petroleum produced in California, ranging from natural naphtha, with a specific gravity of 65° Baumé, to heavy black tar, with a gravity as low as 14° Baumé.

About 80 per cent is made up of the very heavy petroleum which finds a market principally as fuel. The portion that is refined does not produce such light products as the eastern oils; they are all heavier, as they have a larger proportion of carbon to that of hydrogen in their composition. Largely for the same reason, they do not have the same illuminating effect when burned in the ordinary lamp. To make them acceptable as illuminating oils they are often mixed with the eastern products.

The following analyses are of a number of varieties of petroleum produced in southern California, as determined by Prof. F. Salathe, Ph. D.:

Analysis of petroleum produced in southern California: 1902.

LOCATION.	Degrees Baumé.	Naphtha.	Illuminating distillate.	Gas distillate.	Lubricating distillate.	Asphalt and loss.
Sespe	25.20	7.30	19.50	25.00	35.80	12.40
Torry Canyon	27.00	9.20	21.50	26.00	30.30	13.00
Adams Canyon	24.00	5.20	24.60	17.30	46.00	7.00
Los Angeles	14.20	Trace.	6.00	17.50	51.50	25.00

Near Coalinga, in Fresno county, a petroleum is found in considerable quantity that is much lighter than the output of other parts of the state, its gravity ranging from 35° to 30° Baumé. Its composition is as follows:

Analysis of petroleum produced in Fresno county, California: 1902.

PRODUCT.	Per cent.
Total	100 to 100
Naphtha	16 to 20
Kerosene	47 to 48
Heavy fuel oil	13 to 10
Benzine, tar, and loss	22 to 22

The general increase in the production of the inferior grades of petroleum during the last three years, and the slight decrease in the production of the higher grades, are among the notable features in the general course of development. The very recent and large production in Texas, Louisiana, and California is one of the important facts in the growth of this industry, and indicates that in the future the refiner will be called upon to supply standard goods from inferior stock.

The calorific value of petroleum.—The calorific or heat producing properties of petroleum are measured by the pounds of water that a given weight will evaporate at a temperature of 212° F. when there is no heat lost. It has also been determined that the heating energy necessary to evaporate 1 pound of water at 212° F. would raise the temperature of 966 pounds of water 1° F. The unit used is the heat necessary to raise the temperature of 1 pound of pure water 1° F. at or near 39.1° F., which is known as the British thermal unit, generally expressed as "B. T. U." The French thermal unit, the "calorie," is that quantity of heat required to raise the temperature of 1 kilogram (2.2046 pounds) of water 1° C. The "B. T. U.," therefore, is equal to 0.252 calorie. The "pound calorie" is sometimes used by English engineers; it is the quantity of heat necessary to raise the temperature of 1 pound of pure water 1° C.; 1 pound calorie equals nine-fifths "B. T. U.," or 0.4536 calorie.

It is remarkable that petroleums of different specific gravity and chemical composition, and coming from widely separated localities and countries, have calorific values so nearly equal, as indicated by the number of pounds of water theoretically and actually evaporated per pound of petroleum consumed. In giving the test of boilers, under the head of actual pounds of water evaporated at and above 212° F., they are often credited with the results of special tests made when the boilers and the surrounding appliances were in perfect condition; therefore, in practice, the results will in many cases be lower than the figures quoted.

The specific gravity, British and French calorific equivalents, and the actual and theoretical number of pounds of water evaporated from and at 212° F. per pound of petroleum consumed are shown in the following tabular statement:

Comparative calorific value of fuel petroleum from the principal fields of the United States and from Russia.

LOCALITY.	Specific gravity (per cent).	Degrees Baumé.	British thermal unit.	French calorie.	Actual pounds of water evaporated at 212° F. in boilers.	Theoretical pounds of water evaporated at 212° F.
Pennsylvania, crude	0.8291	40	19,800	11,000	14.85	19.75
Pennsylvania, crude, heavy	0.8860	28	20,736	11,520	16.00	21.46
Ohio, Lima	0.8383	37	19,900	11,055	15.45	20.60
Texas, Beaumont	0.9210	22	19,480	10,816	14.80	20.16
Texas, Sour Lake	0.9333	20	18,950	10,535	14.40	19.62
Louisiana, Jennings	0.9090	24	19,420	10,675	14.60	20.01
California, Bakersfield	0.9589	16	19,000	10,555	14.20	19.67
Russia, Baku	0.8805	29	20,550	11,420	15.20	21.28

There is a wider variation in the fuel value of the various kinds of bituminous coal than there is in the different grades of fuel petroleum. The following tabular statement gives the water evaporated per pound of the different varieties of bituminous coal and the number of barrels of petroleum that will do the same work under boilers having modern arrangements for efficiency:

The comparative fuel value of petroleum and bituminous coal.

FUELS.	Pounds of water evaporated at 212° F. per pound of combustible.	Barrels of petroleum to equal 1 ton of coal.	Comparative cost of coal per ton on basis of petroleum at $1 per barrel.	
			Gross cost.	Less 10 per cent, owing to economy in handling petroleum.
Petroleum, 16° to 40° average	15.3	.....	.....	.....
Pittsburg, Pa., lump	10.0	4.1	$4.10	$3.69
Pittsburg, Pa., slack	7.5	3.1	3.10	2.79
Pocahontas, W. Va., lump	10.5	4.3	4.30	3.87
Cumberland, Md., lump	10.0	4.1	4.10	3.69
Ohio Hocking Valley, lump	8.0	3.3	3.30	2.97
Indiana, block, lump	9.5	3.9	3.90	3.51
Indiana, ordinary, run of mine	7.8	3.2	3.20	2.88
Kansas, average, run of mine	7.3	3.0	3.00	2.70
Indian Territory, average	7.5	3.1	3.10	2.79
British Columbia, Nanaimo	7.3	3.0	3.00	2.70
Washington, Carbon Hill	6.2	2.5	2.50	2.25

The final column gives the price per ton of coal that would be paid to equal petroleum at $1 per barrel. The poorer the quality of the coal the fewer the barrels of petroleum required to equal the heating effect.

Liquid fuel for marine purposes.—The development in the last two years in Texas, Louisiana, and California of large fields of petroleum specially adapted for fuel, with the probabilities of increased production in these localities in the near future, has added to the interest felt in the practical solution of the fuel problem. The possibility of the successful and economical use of liquid petroleum in the Southwest and West has been fully demonstrated in its application to locomotives and stationary engines, as well as to a vast number of manufactories that require a large supply of fuel.

In eastern Europe and southern Asia, along the path of the great ocean commerce and on the waters of the Black and Caspian seas, its use is increasing.

Russia and Borneo, and, to a less extent, Sumatra and Java, furnish the liquid fuel in these far-off countries. At Singapore a central supply depot of considerable magnitude has been established within the last few years. There are smaller supplies stored at Suez, Bombay, Calcutta, Hongkong, and Yokohama. There are a number of large steamers employed on the Gulf of Mexico and the Pacific coast, some of which have used liquid fuel for a number of years and have fully demonstrated its superiority. The number of petroleum burning steamers is rapidly increasing.

The utilization of the entire energy in petroleum will be accomplished only when it is mixed with the atmosphere under high pressure and exploded in the cylinder direct, in which case the costly, troublesome, and wasteful boiler will no longer be necessary.

During the year 1902 the U. S. Navy made some very interesting experiments with petroleum as a fuel, which were conducted by a special division of the Bureau of Steam Engineering known as the Liquid Fuel board, under the direction of Rear-Admiral George W. Melville, Chief Engineer U. S. Navy.

Character of lubricating petroleum in the United States.—Natural lubricating petroleum of the finest grade is often found in the higher strata of the productive series at shallow depths below the earth's surface. It is usually associated with more or less salt water, usually ranges from 32° to 34° Baumé, is not affected, so far as fluidity is concerned, by a temperature of zero or below, and commands a higher price than any other variety of natural petroleum.

The petroleum lubricants differ according to the crude petroleum from which they are made. The chemical composition of crude petroleum from different localities is not the same, showing either that the materials used in its preparation in the earth vary, or that by filtration through different strata different combinations are formed. The largest production of natural crude lubricating petroleum is from the neighborhood of Franklin, Pa., which has long been celebrated for the production of the finest natural lubricating petroleum found in the world.

There is also a large amount of lubricating oil manufactured from Pennsylvania crude petroleum, some of which is mixed with the natural product. No other lubricating petroleum is equal to that produced in the Appalachian field. Its reputation is world wide. Many railroads and steamship lines use it exclusively; the railroads using it in the United States operate 97 per cent of the total mileage. Nearly 2,000,000 barrels were exported in 1902.

Early development of petroleum in the United States.—Years ago the process of distilling natural mineral hydrocarbons was being perfected and vigorously pushed in the Eastern states, and cannel shale was imported from England and distilled at refineries near Boston and Portland. On the Allegheny river near Freeport, Armstrong county and Darlington, Beaver county, Pa.; in Ohio, West Virginia, western Kentucky, and elsewhere in this country and in Europe, there were refineries or distilling plants endeavoring to supply the demand for an efficient and cheaper lighting oil. The high price, however, prevented its universal introduction. The tallow candle was almost the universal source of artificial light before the great natural deposits of petroleum were known.

The earliest records of the travelers who first penetrated the wilderness of southwestern New York, northwestern Pennsylvania, southeastern Ohio, and south central Kentucky mention the existence of petroleum and natural gas; and the early explorers were guided to these localities by the Indians, who regarded the phenomena with religious superstition. On Oil creek, Pa., there were a number of localities where globules of petroleum and bubbles of natural gas constantly came to the surface of the water. The remains of pits that were cribbed in a crude manner were noted by the early explorers in numerous localities, extending from the mouth of Oil creek to Titusville.

From 1848 to 1856 Mr. Samuel M. Kier, of Tarentum, Pa., bottled the petroleum obtained from his salt well and sold it under the name of "Seneca oil," which name it acquired from the Seneca Indians in New York state, who were early acquainted with its medicinal virtues. The partial refining of the petroleum found in the salt-brine wells at Tarentum was accomplished by Mr. Kier about the year 1857. Owing to the rude method of refining and the poorly constructed lamps of that day there were many bitter complaints of the odor and smoke of the new illuminating oil when it was first tried.

During the years 1853 to 1860 there were four large plants erected near Freeport, Pa., on the Allegheny river, near the mouth of the Kiskiminitas river, for the distillation of a cannel slate, which in this locality varies from 2½ to 7 feet in thickness and forms the roof of the lower Freeport coal strata.

In 1856, after many failures, a plant at Freeport succeeded in producing an oil that burned with a bright light and was free from odor and smoke. Its introduction was accompanied with difficulty, owing to the dangerous and highly explosive "burning fluid" that was at that time in use. At this period there were also cannel coal distilling plants at Darlington, Beaver county, Pa., Canfield, Mahoning county, Ohio, Cannelton, W. Va., and Cloverport and Maysville, Ky. In Massachusetts parties who had formerly been engaged in the manufacture of whale oil commenced to manufacture a paraffin oil from cannel slate (called boghead mineral) imported from Scotland. About this time small quantities of petroleum were collected by Mr. J. D. Angier, on an island near the mouth of Pine creek on Oil creek, Pa., about 1½ miles below Titusville, from pits arranged one above the other, and by others who used blankets and temporary dams.

On the 30th day of December, 1854, the Pennsylvania Rock Oil Company was organized, based upon the purchase of 105 acres at the junction of Oil and Pine creeks, near Titusville, Pa., and the certificates of incorporation filed at New York city and Albany. In April, 1855, the elaborate and favorable report of Prof. B. Silliman, of Yale College, was made public, adding largely to the prospective value of the original company. The eastern capitalists hesitated to subscribe for the stock, as they were uncertain whether a company under the laws of New York could hold land in fee in Pennsylvania. To overcome this difficulty a new company, which retained the original title, increasing the capital stock to $300,000, was organized under the laws of Connecticut, September 18, 1855. A deed was executed to Ashel Pierpont and William A. Ives, of New Haven, who gave bond for the value of the property and promptly leased it for ninety-nine years to the new company.

On December 30, 1857, the property was leased to Edwin E. Boditch and Edwin L. Drake, at a royalty of 5½ cents per gallon. This lease was superseded by another to the same parties, fixing the royalty at 12 cents per gallon. Under the terms of this lease the Seneca Oil Company was formed, March 23, 1858, which drilled the first well in search of petroleum or rock oil in the underlying rocks, finding it in quantity in August, 1859, at a depth of 69½ feet. The selection of this locality was most fortunate, as nowhere else on Oil creek was petroleum found in quantity at so shallow a depth.

In the year 1860 petroleum was found all along Oil creek to its mouth; also at Henrys Bend, Tidioute, and Franklin on the Allegheny river, and at Smiths Ferry on the Ohio river.

During the year 1861 there was an immense amount of prospecting done, wherever any signs of oil were found, from central New York to Alabama, and from the Manitoulin Islands, in northwestern Ontario, to eastern Kentucky. In Europe, also, arrangements for drilling wells were completed. In Russia, Roumania, Galicia, and India, where oil springs and shallow wells or pits had produced petroleum in limited quantities for many years previously, the idea of drilling wells in order to secure larger supplies from greater depths seems only to have been entertained after the wonderful results were accomplished on Oil creek, Pennsylvania.

The year 1861 was also remarkable for the large flowing wells that were found; several are credited with flowing from 2,000 to 2,500 barrels per day. This caused a remarkable fall in the price, which was as low,

in some cases, as 10 cents per barrel, yet without purchasers. The means of storage and transportation, too, were utterly inadequate to handle such quantities. There was some oil secured from old salt wells on the Kanawha and Little Kanawha rivers during this year.

The refiners of cannel coal and cannel slate along the Allegheny river, near Freeport, and elsewhere, soon turned their attention to the refining of crude petroleum and abandoned the distillation of cannel slate. This movement materially assisted in the distribution and consumption of the new illuminant.

The remarkable growth of the industry during these early years is shown by a comparison of the yearly outputs, which are estimated as follows:

	Barrels.
1858	2,000
1860	500,000
1861	2,113,689
1862	3,056,690
1863	2,611,309
1864	2,116,109

The year 1864 showed somewhat of a decline, while the facilities for transportation, as well as the demand for the manufactured products, were steadily increasing. The price advanced in June, 1864, to $12.12 per barrel and was fairly well maintained throughout the remaining portion of the year.

In the spring of 1865 there was a freshet which did great damage to oil properties along Oil creek, in some instances, in the more exposed locations, wiping them out of existence. The productive area was considerably enlarged during the year, as oil was obtained in quantity at Church Run, Pithole, Parkers Landing, and on Dunkard creek in Greene county, in southern Pennsylvania; at White Oak and Burning Springs, in West Virginia, and at Cow Run and other localities in southeastern Ohio.

There were also numerous test wells located in eastern Kentucky and central Tennessee. The success of the original investors incited others to thoroughly canvass the country wherever a spring carried a trace of petroleum, or where natural gas was found bubbling in the water, and wherever an abandoned salt well, which had given showings of petroleum, was located, a well was projected.

The first well drilled for petroleum within the borders of West Virginia was begun in 1859 and finished in May, 1860, by the Rathbon Brothers, of Parkersburg. It was located near Burning Springs run; it was drilled by a spring pole, to a depth of 303 feet, at which point the Dunkard or Cow Run sand was penetrated and it flowed 100 barrels per day. This well and tract were sold to a company organized at Parkersburg and a second well was drilled before the close of 1860, which at 300 feet flowed 30 to 40 barrels per hour. The opening of these two promising wells was followed by a great rush of prospectors and a village was soon erected.

At the height of the development in 1863 the Confederate cavalry forces raided the region and set fire to about 300,000 barrels of petroleum that had been stored in tanks, and completely frightened away the capitalists who had invested in the field. The wells were not reopened for several years, when they were found to be unproductive.

Transportation.—In the early history of petroleum production it became necessary to find some other means of transporting the crude oil to the railroads and the navigable streams than in barrels conveyed by wagons. The measure adopted was the pipe line system, the success of which gradually displaced, in a great measure, transportation by rail and boat, and developed a new and a remarkably cheap and efficient system of transportation for both the crude and refined product. Pipe lines have proved indispensable to the general industry of petroleum and natural gas. The fact that the manufacturer could supply at a reasonable price wrought iron pipe in sizes up to eight inches in diameter which would stand 1,000 to 1,500 pounds pressure to the square inch, and had almost perfect joints, has aided greatly the economical collection and distribution of petroleum in all the producing regions.

The first petroleum from Oil creek was shipped in barrels made of oak staves banded with hoop iron. The penetrating and salient nature of crude petroleum made it difficult to manufacture barrels that would retain it, even after these barrels had been coated inside with hot glue. The difficulty of returning the barrels when empty, the uncertainty of their condition, and the liability to loss by this method of transportation, made it very unsatisfactory, and a source of annoyance to shippers and transportation companies.

About the year 1865 railroads put wooden tanks or tubs for carrying crude petroleum in each end of box cars, a car thus equipped holding from 2,000 to 4,000 gallons. While this improvement was being made by the railroads, transportation by the Allegheny river was also greatly improved by the use of bulk oil boats. These boats, each of which held from 1,500 to 2,000 barrels, were made 130 feet long, 22 feet broad, from 3½ to 4½ feet in depth and were divided into 8 watertight compartments. These were loaded at Oil City and floated down the river to the refineries at Freeport, Pittsburg, Rochester, Mingo, Wheeling, Marietta, and Parkersburg. The latter points also received crude petroleum transported in bulk boats from Burning Springs on the Little Kanawha river. When there was water enough in the Allegheny river these empty bulk boats and flats were towed upstream by steam towboats; at times of low water they were towed up by horses.

Though these improvements in transportation, both by rail and by boat, removed a part of the difficulty, there yet remained the obstacles that were experienced in moving the crude petroleum from the wells to the railroad or river. This was still done by team, and the roads were often almost impassable on account of the

depth of the mud; the method was at best expensive, and accompanied by great hardship to man and beast. It was chiefly this condition which restricted the amount of petroleum that could be put upon the market.

This condition of affairs suggested the first pipe line. The first one that was a success was constructed by Mr. Daniel Van Syckle, of Titusville, Pa., in the summer of 1865, extending from Pithole to the railroad at the Miller farm, on Oil creek, a distance of 4 miles. In the fall of the same year, Henry Harley constructed a pipe line from Benninghoff run to the Shaffer farm. The original line built by Van Syckle was purchased by the firm of Abbot & Harley, who united the two under the name of the Allegheny Transportation Company. Both of these lines were successful, much to the discomfiture of the teamsters and roustabouts, who, in some instances, interfered with the operation of the line by cutting or pulling it in two with their teams. A number of arrests followed, and from then on the pipe line was an accomplished fact and an important factor in the collection and delivery of petroleum to points where it could be loaded in tank cars or bulk boats. The growth of long pipe lines was gradual, and it was several years before it was practically demonstrated that long lines could be successfully operated. The improvement in railway transportation by the introduction of the iron tank car was a decided advance over the wooden tanks set in box and flat cars, which for a time answered all the requirements.

The tanks at the wells are connected by a system of small lines or veins which feed the main lines or arteries. These smaller lines usually are concentrated at the lowest portions of the field drained at points known as local pumping stations. A considerable proportion of the oil finds its way into the tanks at these stations by gravity and is forced to the large receiving tanks at the main station by pumps, which are often driven by natural gas engines, or it flows by gravity through suction lines to pumps into pits and is then elevated to receiving tanks. From the large receiving tanks the petroleum is forced into the main lines at a pressure often of between 600 and 900 pounds to the square inch.

These massive pumps generally represent the highest known mechanical efficiency, having triple expansion engines, Corliss valves, condensers, air pumps, and efficient boilers. They usually develop 300 to 400 horsepower and handle from 30,000 to 35,000 barrels in twenty-four hours. The boilers are economical and properly proportioned to this work, showing a duty of 16 pounds of water evaporated at and above 212° F. per pound of crude petroleum consumed as fuel. One pound of good coal will evaporate 10 pounds of water, and 1 pound of natural gas (equal to 20 cubic feet) will evaporate 20 pounds of water under the same conditions.

The main pumping plants are placed from 30 to 50 miles apart, according to the elevation of summits that must be overcome; and by the addition of a parallel line, or loop lines, for a portion of the way the distance can be increased so as to reach localities convenient for fuel or water without greater tax upon the pumps.

There are probably 4,600 miles of main trunk line, from 4 to 8 inches in diameter, in the Appalachian and the Lima-Indiana fields, reaching from northern Tennessee to Parkersburg, Cleveland, Buffalo, Franklin, Olean, and to the seaport cities of New York, Philadelphia, and Baltimore. From the Lima-Indiana field the main lines reach westward to Chicago, Montpelier, Toledo, Lima, and eastward it connects with the Appalachian system.

Kansas has an extensive system of main lines and local lines, reaching in several directions from Neodesha. In California a main line was recently completed, reaching from Bakersfield to a refinery at Point Richmond, near San Francisco, and having a branch line to Coalinga. The length of this main line is 278 miles, and it is connected near its starting point with about 150 tanks holding 35,000 barrels each. There are other smaller lines in California, extending from Pico canyon to Ventura and connecting Fullerton with Los Angeles.

Texas has in the last two years greatly increased its mileage of main line. There are four lines from 22 to 30 miles in length, reaching from the original field near Beaumont to tide water on the Gulf, and connecting it with Port Arthur and Sabine Pass. Sour Lake and Saratoga are also connected by pipe lines with Beaumont. The Corsicana field in the northeastern part of the state is connected by pipe lines with the refinery there. The length of the entire system of main lines in use in the United States in 1902 was approximately 7,800 miles, a large portion of which is double and triple lines, to which may be added 50,000 miles of smaller lines connecting the 51,774 tanks of the producing wells with the iron tanks of the receiving and transporting companies.

As early as 1875 organizations were effected and charters secured for the privilege of building pipe lines to the seaboard. However, these chartered companies at that time confined their operations to the oil regions, where they built numerous lines, usually of a 2-inch diameter, to the several railroads and their branches and to the nearby refineries. The competition among these new pipe line companies for securing the production of the fields began to be marked, especially in Butler county, Pa., and rates for delivery were cut to such an extent that the lines were in several instances operated at a loss. The demand for a consolidation of these competitive companies became more and more emphatic. Under the title of the Fairview Pipe Line a company was organized by Capt. J. J. Vandergrift and George V. Foreman, under the laws of Pennsylvania, the act bearing date of April, 1874. This company was afterwards known as the United Pipe Line Association. Into it was merged, from time to time, the other local

lines until it controlled almost the entire system. Gradually the temporary and uncertain characteristics of pipe line transportation disappeared, and more permanent structures were built.

The first trunk line, constructed in 1875, was 39 miles long and built of 4-inch pipe, now removed. It started at Carbon Center, 5 miles east of the town of Butler, Butler county, Pa., and extended to Brilliant, a suburb of Pittsburg. The trunk line to Cleveland, Ohio, was completed in the summer of 1879. This was a 5-inch line, beginning at Hilliard station, in the northern portion of Butler county, 8 miles west of Bear Creek station, and extending 103 miles to Cleveland, Ohio, where it supplied the refineries that had formerly received their crude petroleum by tank cars. There were relay stations on this line at intervals of 25 to 30 miles.

During the same year other shorter lines were laid in the Bradford field, reaching the Erie Railroad at Carrollton and Olean on the north and the Pennsylvania Railroad at Kane on the south. In the winter of 1879 and 1880 the first trunk lines to the seaboard were begun. The one in Pennsylvania, which was built of 6-inch pipe, started at Colegrove, in McKean county, and extended to Philadelphia, a distance of 235 miles; a 5-inch branch line left the main line at Millway and extended 66 miles to Baltimore, Md. The other seaboard lines started at Olean, N. Y., and were laid double; there were two 6-inch lines, running parallel through the southern counties of New York to Saddle River, N. J., where they separated, one terminating at the Bayonne refineries in New Jersey, the other passing on, under the North and East rivers, to the refineries located at Hunters Point, on Long Island. The distance between the points named was about 313 miles; the length of the pipe required by reason of loops, etc., was 762 miles. Olean was shortly afterwards connected by pipe line with Bear Creek station, on the Allegheny river, near Parker, Pa., making a continuous line to Bayonne, N. J., a distance of 420 miles.

The southern trunk line, which begins at Morgantown, W. Va., extends across nearly the whole length of the state to Philadelphia, a distance of 274 miles; it was completed in 1890.

The cheap and efficient method of transportation by trunk pipe lines, permitting the crude and refined petroleum to be delivered at seaboard at a cost much less than it was possible for it to be transported by rail or canal, marked an important era in the history of the petroleum industry. Many problems had to be solved in the construction of the first pipe line. The question of the proper selection of pipes and the making of pipe joints that would not leak under the great pressure; the manner of carrying pipe lines across large streams and rivers and over high, steep hills; the selection of proper localities for tanks and pump stations; the selection of pumps; the cleaning of the pipes when foul; and the method of equalizing distance between pump stations, by the doubling of a portion of the line, so as to equalize the work on the pumps at each station, were all new conditions and demanded the highest mechanical and engineering skill in order to overcome them. These difficulties were all surmounted in a comparatively short time.

The transportation annually of 10,000,000 tons of petroleum an average distance of 380 miles by pipe lines, with only insignificant loss by leakage, evaporation, or fire, represents a triumph of the highest engineering and mechanical skill. The introduction of the pipe line system brought about the removal of the refining branch of the petroleum industry to the centers of manufacture in the lake and seaboard cities, where at least 80 per cent of the crude product is now converted into illuminating oils and other merchantable commodities. Great numbers of the small refineries, that were formerly scattered over western New York, western Pennsylvania, West Virginia, and southeastern Ohio, have disappeared, and the business of refining oil has been transferred to the immense refining plants near New York, Philadelphia, Baltimore, Cleveland, Buffalo, and Whiting, Ind.; Port Arthur, Tex.; and Point Richmond, Cal. From these great industrial centers the manufactured petroleum finds its way to the markets of the world by ocean tank steamers, or by the bulk carriers of our inland lakes, or it is distributed by rail in tank cars to the consumers who can not be reached by these more economical methods of transportation. The important inland refineries remaining are located at Olean, N. Y.; Titusville, Oil City, Franklin, Warren, and Pittsburg, Pa.; Parkersburg, W. Va.; Lima, Ohio; Neodesha, Kans.; Corsicana, Tex., and Florence, Colorado.

The pipe line companies for many years have been the purchasers of the crude petroleum in the older fields. The pipe line company, upon application from the producer, sends an agent, generally known as a gauger, to measure and inspect the petroleum in his tank and run it into its lines. The tanks throughout the field are carefully measured and numbered, and when the oil is accepted and run into the tanks of the pipe line company a card is issued showing the number of barrels to the credit of the producer. Every tank is carefully gauged and numbered and a table prepared, which shows the number of barrels it contains for every inch of liquid from top to bottom. The temperature of the crude petroleum is also recorded and the contents of the tank examined for water. After measuring the petroleum the gauger gives the operator what is known as a "run ticket," keeping a copy for himself. The pipe line company deducts the royalty due the owner of the property according to the terms of an agreement on file at the office, and the next day the producer may secure the cash for his petroleum at the market quotation for the day or hour of his sale at the nearest home office of the company.

If the producer wishes, he can secure a certificate when his production in the tanks of the pipe line company amounts to 1,000 barrels. These pipe line certificates are made payable to bearer and are therefore transferable. They are subject to transportation charge in the district of 20 cents per barrel, and to a charge for storage at the rate of 25 cents per day per 1,000 barrels when the price is less than $1; 30 cents when over $1 and under $1.50; and 40 cents for all over $1.50 per barrel. They are to be returned for exchange to the pipe line company within six months after issue, being subject to a charge of one-twentieth of 1 per cent daily thereafter until exchanged. To cover losses by fire or lightning, certificates are subject to an assessment pro rata on all oil in custody of the pipe line. None of these charges are included in the prices as quoted and which are the prices at or near the wells. To these prices, when the oil is delivered to the refineries, charges are added for storage and transportation.

It was upon these certificates that the speculative business at the exchanges at New York, Bradford, Titusville, Oil City, and Pittsburg was based.

TABLE 46.—DETAILED SUMMARY: 1902.

	United States.	California.	Colorado.	Indiana.	Kansas.	Kentucky.	New York.	Ohio.	Pennsylvania.	Texas.	West Virginia.	All other states and territories.[1]
Number of wells	118,671	2,757	111	9,439	470	392	8,443	42,483	40,444	955	13,109	68
Number of operators	29,522	290	12	2,567	12	39	2,123	10,002	9,808	211	4,446	12
Character of ownership:												
Individual	29,031	68	3	2,561	3	1	2,122	10,001	9,806	26	4,440	
Firm	69	31		2		2				30	4	
Incorporated company	417	190	9	4	9	36	1	1	1	152	2	12
Other form	5	1							1	3		
Salaried officials, clerks, etc.:												
Total number	3,033	384	23	108	33	63	69	450	550	999	328	26
Total salaries	$2,986,768	$452,320	$43,055	$138,536	$31,664	$44,376	$92,116	$629,369	$686,098	$444,129	$399,207	$25,898
General officers—												
Number	439	117	8	3	11	5	5	22	23	228	11	6
Salaries	$651,003	$148,041	$24,635	$17,747	$9,745	$4,810	$23,031	$131,696	$109,082	$111,649	$61,007	$9,560
Superintendents, managers, foremen, surveyors, etc.—												
Number	1,814	164	8	78	14	37	51	333	339	545	234	11
Salaries	$1,709,477	$223,122	$10,960	$95,560	$16,960	$33,376	$55,083	$397,769	$369,868	$242,174	$253,245	$11,360
Clerks—												
Number	780	103	7	27	8	21	13	95	188	226	83	9
Salaries	$626,288	$81,157	$7,460	$25,229	$4,959	$6,190	$14,002	$99,904	$207,148	$90,306	$84,955	$4,978
Wage-earners:												
Aggregate average number	17,552	1,112	147	1,463	146	79	408	4,017	5,610	723	3,800	47
Aggregate wages	$13,242,361	$1,087,839	$138,436	$1,045,925	$108,756	$69,189	$296,713	$2,915,787	$4,072,287	$699,209	$2,773,312	$34,908
Engineers, firemen, and other mechanics—												
Average number	16,773	831	100	1,462	111	66	408	3,968	5,594	482	3,713	35
Wages	$12,654,696	$859,102	$109,700	$1,045,225	$90,617	$61,678	$296,713	$2,881,687	$4,062,271	$501,251	$2,718,174	$28,278
All other wage-earners—												
Average number	779	278	47	1	35	13		49	16	241	87	12
Wages	$587,665	$228,737	$28,736	$700	$18,139	$7,511		$34,100	$10,016	$197,958	$55,138	$6,630
Average number of wage-earners at specified daily rates of pay:												
Engineers—												
Less than $0.50	1					1						
$0.50 to $0.74	1	1										
$0.75 to $0.99	2	1										1
$1.00 to $1.24	57	7	1	17		5	1	15	10		1	
$1.25 to $1.49	51	1		5		5		26	8	4	2	
$1.50 to $1.74	63	2		10	11			29		7	2	2
$1.75 to $1.99	404	7		24	28	2	13	169	146	14	1	
$2.00 to $2.24	601	87		181	7	2	12	158	142	5	1	3
$2.25 to $2.49	9,872	36	17	1,161		5	289	3,237	3,209	6	1,912	
$2.50 to $2.74	1,580	172	3		6	3	24		776	30	563	3
$2.75 to $2.99	72	22	34	1	1					14		
$3.00 to $3.24	182	58				2				122		
$3.25 to $3.49	16	2								14		
$3.50 to $3.74	25	1				1				23		
$3.75 to $3.99	1			1								
$4.00 to $4.24	7	1	2							4		
$4.25 and over	16	7				1				8		
Firemen—												
$1.50 to $1.74	1					1						
$2.00 to $2.24	5			2	1					1		1
$2.50 to $2.74	20	9				1				10		
$2.75 to $2.99	8	4								4		
$3.00 to $3.24	24	7								17		
$3.25 to $3.49	3									3		
$3.75 to $3.99	1	1										
$4.25 and over	3				1					2		
Machinists, blacksmiths, carpenters, and other mechanics—												
$1.00 to $1.24	12	1			2	1					5	3
$1.25 to $1.49	4				1	2						1
$1.50 to $1.74	549	4			1	3	9		292	3	237	
$1.75 to $1.99	633	3		3	7	1	10		337		265	7
$2.00 to $2.24	572	26		15	5	5	31	22	241	16	209	2
$2.25 to $2.49	138	15		10	4	5		73	8		22	1
$2.50 to $2.74	502	50	8	5	3	1	7	107	48	92	175	6
$2.75 to $2.99	147	3	3	3	2		2		55	8	70	1
$3.00 to $3.24	570	114	3	12	12	4	6	66	180	41	132	
$3.25 to $3.49	268	7	2		3		4		133	10	99	
$3.50 to $3.74	57	20	18		3				8	3	5	
$3.75 to $3.99	34	22		2		3					7	
$4.00 to $4.24	16	10	1		2					3		
$4.25 and over	265	133	8	7	11	12		66	1	18	5	4

[1] Includes operators and wells distributed as follows: Illinois, 1 (2 wells); Indian Territory, 2 (13 wells); Louisiana, 2 (7 wells); Michigan, 1 (13 wells); Missouri, 2 (10 wells); Oklahoma, 1 (3 wells); Tennessee, 1 (7 wells); Wyoming, 2 (13 wells).

TABLE 46.—DETAILED SUMMARY: 1902—Continued.

	United States.	California.	Colorado.	Indiana.	Kansas.	Kentucky.	New York.	Ohio.	Pennsylvania.	Texas.	West Virginia.	All other states and territories.
Average number of wage-earners at specified daily rates of pay—Continued.												
All other wage-earners—												
$0.75 to $0.99	2	1								1		
$1.00 to $1.24	5	1	1			1				2		
$1.25 to $1.49	6	3			1	2						
$1.50 to $1.74	86	2	30		18	4		4		1	18	9
$1.75 to $1.99	41	6	1					4		20	10	
$2.00 to $2.24	225	78		1	15	4		41	16	22	48	
$2.25 to $2.49	36	15	1			1				16	3	
$2.50 to $2.74	264	116	8		1					133	6	
$2.75 to $2.99	15	4	3							4	2	2
$3.00 to $3.24	83	40	2							40		1
$3.50 to $3.74	7	5	1							1		
$3.75 to $3.99	2	2										
$4.00 to $4.24	2					1				1		
$1.25 and over	5	5										
Average number of wage-earners employed during each month:												
Men 16 years and over—												
January	17,364	1,094	163	1,381	135	49	410	4,007	5,633	605	3,851	36
February	17,238	1,060	170	1,364	138	49	408	3,973	5,620	606	3,814	36
March	17,346	1,117	151	1,388	136	54	408	3,976	5,620	651	3,809	36
April	17,435	1,105	155	1,423	137	74	409	4,003	5,621	661	3,811	36
May	17,482	1,093	140	1,431	140	74	410	4,009	5,622	698	3,826	39
June	17,361	1,073	157	1,443	143	74	408	4,018	5,586	615	3,799	49
July	17,484	1,098	146	1,464	149	82	407	4,020	5,583	700	3,769	66
August	17,547	1,085	142	1,493	150	87	407	4,059	5,580	735	3,753	56
September	17,566	1,086	146	1,517	149	96	406	4,035	5,566	782	3,729	54
October	17,863	1,138	139	1,541	150	112	407	4,046	5,614	863	3,799	54
November	17,934	1,183	118	1,542	161	105	408	4,046	5,633	875	3,811	52
December	18,001	1,212	137	1,569	164	92	408	4,012	5,643	885	3,829	50
Contract work:												
Amount paid	$12,956,631	$131,699	$9,650	$1,091,333	$99,467	$194,462	$272,759	$2,212,923	$2,969,046	$1,363,463	$4,176,647	$135,182
Number of employees	7,949	352	28	1,310	105	174	183	1,892	1,391	1,061	1,406	47
Miscellaneous expenses:												
Total	$15,811,726	$571,138	$10,163	$1,286,499	$51,654	$147,295	$259,740	$4,896,861	$3,275,131	$713,176	$4,523,499	$47,170
Royalties and rent of wells and plants	$8,929,891	$214,261	$18,597	$1,034,070	$28,255	$53,613	$194,717	$3,046,994	$1,916,987	$261,150	$2,132,243	$29,004
Rent of offices, taxes, insurance, interest, and other sundries	$6,881,835	$356,877	$21,566	$252,429	$22,799	$93,682	$65,023	$1,849,867	$1,358,144	$452,026	$2,391,256	$18,166
Cost of supplies and materials	$17,781,512	$1,479,528	$68,708	$1,126,627	$296,821	$227,822	$440,004	$5,504,792	$3,356,606	$675,937	$4,564,908	$39,759
Product:												
Quantity, barrels of 42 gallons	89,275,302	13,984,268	306,901	7,480,896	331,749	[1] 248,950	1,119,730	21,014,231	12,063,880	18,515,017	13,513,345	606,335
Value	$71,397,739	$4,873,617	$484,683	$6,526,622	$292,464	$172,837	$1,530,852	$20,757,359	$15,266,093	$4,174,731	$17,040,317	$278,164
Power:												
Total horsepower	910,077	17,876	1,279	23,018	1,244	1,954	39,362	135,472	497,192	8,707	183,524	449
Owned—												
Engines—												
Steam—												
Number	41,797	786	73	556	25	95	2,517	6,262	22,084	240	9,126	33
Horsepower	666,177	14,367	1,202	8,418	699	1,698	34,347	81,317	335,055	6,124	182,543	407
Gas or gasoline—												
Number	12,606	112	4	812	21	17	251	3,187	8,107	26	65	4
Horsepower	240,505	2,274	77	14,600	530	196	5,015	54,147	162,137	506	981	42
Other power—												
Number	37	3			1					33		
Horsepower	1,172	132			15					1,025		
Rented—												
Electric, horsepower	125	125										
Other power, horsepower	2,098	978				60		8		1,652		
Electric motors, owned—												
Number	2	2										
Horsepower	25	25										
Supplied to other establishments, horsepower	612	356								256		

[1] Includes 1,520 barrels, valued at $1,370, obtained as a by-product of natural gas wells.

NATURAL GAS

NATURAL GAS.

By F. H. Oliphant.

The existence of natural gas, in greater or less quantity, accompanying petroleum, has been known since the early development of that industry, beginning with 1859. The introduction of this gas, first as a fuel and light, afterwards as a source of power, was slow. The doubt concerning the duration of the supply, the lack of appreciation of its value as a fuel, and the uncertainty as to transportation contributed largely to postpone its general use. The subsequent demonstration that it existed in large quantities in natural reservoirs, that it could be conveyed efficiently in pipe lines, and that it was of great utility as a fuel caused a remarkable increase in its consumption, and natural gas soon became one of the most valuable of mineral productions. Although used extensively as far back as 1882, it was not regarded as of sufficient commercial value to warrant statistical consideration until during the decade ending with 1890. The reports of the Eleventh Census are the first in which this industry is presented. The statistics for 1902 and 1889 are summarized in the following table:

Table 1.—*Comparative summary: 1902 and 1889.*

	1902	1889
Number of wells	15,806	[1] 2,247
Number of operators	1,967	([2])
Salaried officials, clerks, etc.:		
Number	1,923	785
Salaries	$1,810,337	$525,956
Wage-earners:		
Average number	4,678	5,899
Total wages	$2,986,279	$1,210,433
Contract work	$4,459,001	([2])
Miscellaneous expenses	$5,912,257	([3])
Cost of supplies and materials	$6,607,255	[4] $13,184,497
Value of product	$30,867,863	[5] $21,097,099

[1] Producing wells only.
[2] Not reported.
[3] Not reported separately.
[4] Includes the amounts expended for contract work, and for labor and materials used in development work.
[5] Value of fuel displaced; amount actually received by producers was $11,044,858.

The number of wells producing at the close of December, 1889, was given as 2,247, and the amount received for the gas consumed was $11,044,858. The value of the fuel displaced was computed at $21,097,099, including that displaced by gas used at oil pipe line stations, in pumping and drilling oil wells, and for other purposes. This was regarded as the actual value. The value given for 1902 is the amount received from the sale of the gas. The quantity and value of petroleum produced from natural gas wells are included in the statistics for petroleum, but the statistics pertaining to wages, employees, and other expenses are included under natural gas.

During 1902, 15,806 wells were operated; of this number, 1,250 were abandoned during the year, leaving 14,556 that were productive at the close of the year. These 14,556 wells produced natural gas valued on an average at $2,147 for each well. During the year 1889 the output of the 2,247 wells producing natural gas was valued at $4,915 per well. As a result of the severe competition in the marketing of natural gas during 1889 and the large outlay caused by the drilling of numerous wells and the construction of a number of pipe lines, the expenses were $3,876,028 greater than the amount received from the sale of the natural gas produced in that year. The quantity of natural gas marketed during 1902 is estimated to have been 205,784,453,333 cubic feet, which was sold at an average price of 15 cents per 1,000 cubic feet. The quantity marketed in 1889 is estimated to have been 552,150,000,000 cubic feet, which gives an average of 2 cents per 1,000 cubic feet. At that time a very large proportion was used for fuel purposes in mills and factories; afterwards it came to be used very generally as a domestic fuel.

A large amount was wasted and unnecessarily consumed in the years closely following the introduction of natural gas, but this waste has in a great measure been overcome in the more economical combustion of the gas, and better prices have been obtained.

The value of coal that was displaced in 1902 by natural gas is estimated to have been $39,798,833, as compared with $21,097,099 in 1889; or it may be said that while the quantity of natural gas produced in 1902 was 168.3 per cent less than that produced and sold in 1889 the revenue from it was 179.5 per cent more.

The following table shows the value of the natural gas produced in 1902, the record of wells, and the length of pipe in use up to the close of 1902, by states:

TABLE 2.—VALUE OF NATURAL GAS PRODUCED, RECORD OF WELLS, AND LENGTH OF PIPE LAID, BY STATES: 1902.

STATE.	Value of natural gas produced during 1902.	WELLS.				TOTAL LENGTH OF PIPE LAID UP TO DECEMBER 31, 1902.	
		Operated during 1902.	Abandoned during 1902.	Producing during 1902.	Dry or nonproducing during 1902.	Feet.	Miles.
Total	$30,867,863	15,806	1,250	[1] 14,556	594	131,859,636	24,973.41
California	120,648	29	.....	29	.....	365,925	69.30
Illinois	1,844	28	.....	28	2	31,894	6.04
Indiana	7,081,344	6,861	882	5,979	205	36,121,980	6,841.28
Kansas	824,431	414	24	390	63	5,034,791	953.56
Kentucky	365,611	117	.....	117	2	749,875	142.02
Missouri	2,154	13	.....	13	2	14,672	2.78
New York	346,471	612	14	598	8	5,894,517	1,116.38
Ohio	2,355,458	1,352	75	1,277	40	20,093,670	3,805.62
Pennsylvania	14,352,183	5,408	203	5,205	232	48,863,621	9,254.48
South Dakota	10,280	6	1	5	1	26,900	5.09
Texas	14,953	14	.....	14	.....	96,196	18.22
West Virginia	5,390,181	949	51	898	37	14,548,395	2,755.38
All other states and territories [2]	2,305	3	.....	3	2	17,200	3.26

[1] Includes 51 wells that were not used.

[2] Includes Colorado, Indian Territory, and Tennessee.

Capital stock of incorporated companies.—Of the 651 incorporated companies, 430 reported capitalization. The details of their capitalization are shown in the following table:

TABLE 3.—CAPITALIZATION OF INCORPORATED COMPANIES: 1902.

	United States.	California.	Indiana.	Kansas.	Kentucky.	New York.	Ohio.	Pennsylvania.	West Virginia.	All other states. [1]
Number of incorporated companies	651	6	337	37	6	29	59	126	46	5
Number reporting capitalization	430	4	229	19	5	21	32	86	33	1
Capital stock and bonds issued	$111,634,737	$1,041,000	$39,669,670	$3,737,262	$4,147,000	$2,361,400	$17,657,400	$28,610,475	$14,394,530	$13,000
Capital stock:										
Total authorized—										
Number of shares	6,526,052	15,100	1,650,047	3,528,923	37,420	32,694	311,855	613,269	336,444	300
Par value	$99,400,806	$790,000	$28,002,593	$4,318,250	$3,715,000	$2,287,200	$17,093,900	$27,246,463	$15,944,400	$3,000
Total issued—										
Number of shares	5,185,230	14,640	1,618,911	2,400,935	33,360	32,366	295,939	598,973	189,806	300
Par value	$92,190,870	$744,000	$26,679,003	$3,190,262	$3,309,000	$2,254,400	$16,344,400	$26,234,275	$13,432,530	$3,000
Dividends paid	$4,944,034	$2,880	$739,602	$7,500	$49,000	$61,325	$649,137	$2,856,094	$578,496	.....
Common—										
Authorized—										
Number of shares	6,512,802	15,100	1,646,047	3,527,923	37,420	32,694	311,855	605,269	336,194	300
Par value	$98,565,806	$790,000	$27,602,593	$4,308,250	$3,715,000	$2,287,200	$17,093,900	$26,846,463	$15,919,400	$3,000
Issued—										
Number of shares	5,172,580	14,640	1,614,911	2,399,935	33,360	32,366	295,939	591,573	189,556	300
Par value	$91,385,870	$744,000	$26,279,003	$3,180,262	$3,309,000	$2,254,400	$16,344,400	$25,864,275	$13,407,530	$3,000
Dividends paid	$4,894,134	$2,880	$715,602	$7,500	$49,000	$61,325	$649,137	$2,830,194	$578,496	.....
Preferred—										
Authorized—										
Number of shares	13,250	.....	4,000	1,000	.....	.....	.....	8,000	250	.....
Par value	$835,000	.....	$400,000	$10,000	.....	.....	.....	$400,000	$25,000	.....
Issued—										
Number of shares	12,650	.....	4,000	1,000	.....	.....	.....	7,400	250	.....
Par value	$805,000	.....	$400,000	$10,000	.....	.....	.....	$370,000	$25,000	.....
Dividends paid	$49,900	.....	$24,000	.....	.....	.....	.....	$25,900	.....	.....
Bonds:										
Authorized—										
Number	50,938	300	31,571	825	8,380	100	3,980	3,170	1,612	1,000
Par value	$20,642,867	$300,000	$13,520,667	$547,000	$838,000	$110,000	$1,428,000	$2,577,200	$1,812,000	$10,000
Issued—										
Number	48,659	300	30,501	825	8,380	97	3,415	2,969	1,172	1,000
Par value	$19,443,867	$300,000	$12,990,667	$547,000	$838,000	$107,000	$1,313,000	$2,376,200	$962,000	$10,000
Interest paid	$1,041,402	$18,000	$697,100	$35,820	$50,280	$6,170	$57,400	$133,112	$43,520	.....
Assessments levied	$1,121,776	$113,000	$127,883	$20,260	.....	.....	$80,000	$780,633	.....	.....

[1] Includes companies distributed as follows: Colorado, 3; Missouri, 1; Tennessee, 1. Of these the company in Missouri did not report details of capitalization. The details of capitalization for the 3 companies in Colorado are included in the report on petroleum.

The capital stock and bonds issued amounted to $111,634,737. The number of shares of capital stock issued was 5,185,230, and the total par value was $92,190,870. The average value of the shares was $17.78. The dividends paid amounted to $4,944,034, or 5.4 per cent of the total par value of shares issued. The dividends paid in Pennsylvania amounted to 10.9 per cent on the stock issued, which was the largest rate returned; on the other hand, the dividends paid in Kansas amounted to only two-tenths of 1 per cent. There were 48,659 bonds issued having a par value of $19,443,867; the interest paid reached $1,041,402 and the assessments levied amounted to $1,121,776.

Employees and wages.—Wage-earners constituted 70.9 per cent of the total number of employees, and their wages were 61.9 per cent of the total salaries and wages. Table 4 shows the average number of wage-earners employed during each month.

TABLE 4.—*Average number of wage-earners employed during each month: 1902.*

January	3,821
February	3,577
March	3,633
April	3,868
May	4,113
June	4,573
July	4,633
August	5,084
September	5,670
October	5,495
November	5,332
December	6,337

The minimum average number of wage-earners employed was 3,577, during the month of February, and the maximum, 6,337, during December. The increase was great during the summer months, but was greatest toward the close of the year, when a number of large natural gas mains were constructed in West Virginia, Ohio, and Pennsylvania.

Of the total number of wage-earners employed in the United States during 1902 by natural gas companies, 94 per cent found employment in Pennsylvania, Indiana, Ohio, and West Virginia.

In the following table the number of wage-earners at each specified rate of pay is shown for the various classes of employees:

TABLE 5.—*Average number of wage-earners at specified daily rates of pay: 1902.*

RATE PER DAY (DOLLARS).	All occupations.	Engineers.	Firemen.	Machinists, blacksmiths, carpenters, and other mechanics.	Boys under 16 years.	All other wage-earners.
Total	4,678	352	121	1,074	2	3,129
0.50 to 0.74	2	.....	.....	1	.....	1
0.75 to 0.99	11	1	.....	2	1	7
1.00 to 1.24	28	5	.....	2	1	20
1.25 to 1.49	248	4	14	8	.....	222
1.50 to 1.74	1,230	51	30	51	.....	1,098
1.75 to 1.99	873	39	30	118	.....	686
2.00 to 2.24	1,090	80	21	429	.....	560
2.25 to 2.49	558	38	19	195	.....	306
2.50 to 2.74	326	57	4	121	.....	144
2.75 to 2.99	72	14	.....	37	.....	21
3.00 to 3.24	67	22	.....	35	.....	10
3.25 to 3.49	8	3	.....	5	.....	.....
3.50 to 3.74	28	1	1	14	.....	12
3.75 to 3.99	37	26	.....	1	.....	10
4.00 to 4.25	34	9	1	18	.....	6
4.25 and over	66	2	1	37	.....	26

Of the wage-earners 80.2 per cent received between $1.50 and $2.49 per day. The best paid wage-earners were those classified as machinists, blacksmiths, carpenters, and other mechanics. These are intrusted with manipulation of the wells, drips, and pipe lines in the field, and have charge of the lines and regulators in the cities and towns. Although the work is not often laborious, it requires good judgment and special training to deal successfully with the various conditions that require personal attention. The employees classified under the head of "all other wage-earners" include line walkers, regulator watchmen, men who relieve the wells and drips of salt water, men who carry out instructions as to the regulation of pressure on the main lines by opening or closing the gates at the wells, and men engaged in pulling out wells and retubing them as exigencies may require.

Contract work.—Besides these wage-earners an average of 3,268 workmen were employed as rig builders, drillers, and helpers, and were paid by contractors for drilling wells. This number, added to the 4,678 wage-earners in the regular employ of the natural gas companies, increases the number of wage-earners employed in the natural gas industry to 7,946. The workmen employed by the contractors in building rigs and in drilling wells are specialists and are usually men of more than ordinary ability and bodily strength. Their wages are high, ranging from $3 to $4.50 per day; their total earnings, however, are not great because of the time lost in moving from one location to another, which occurs frequently, as a well is completed usually in from twenty to forty days.

The contractors are generally paid by the foot. The price varies greatly because of the differences in the depth of the wells and the character of the strata passed through, and the number of different sizes of casing required to complete the well, which may vary from 1,000 to 2,500 feet in depth to the gas sand.

Where only a single string of 5⅝-inch casing is used, the price averages about forty-five cents per foot; where two strings of casing are required, the price per foot will average 75 cents. In the deep holes in southern Pennsylvania and West Virginia, where three and in some cases four strings of casing are required to complete a deep well, the price ranges from $1.20 to $1.50 per foot. The rig, or derrick, and the casing are generally furnished by the natural gas company, the contractor supplying everything else that is necessary to complete the well, and receiving pay only in case the well is turned over to the gas company in perfect condition. The plugging or loss of a well before it is completed falls upon the contractor.

Supplies, materials, and miscellaneous expenses.—The miscellaneous expenses, which amounted to $5,912,257, were made up of rents, royalties, taxes, insurance, and sundry expenses. The cost of supplies and materials amounted to $6,607,255, and included the cost of pipe, casing, tubing, engines, boilers, pumps, drips, regulators, and sundry other items necessary for the delivery of the natural gas to the points of consumption.

Mechanical power.—The total primary power employed in 1902 aggregated 104,107 horsepower. This was used to free the gas wells of water and to compress the gas so that it could be transported in sufficient quantity to the place where the original pressure had decreased. Of this horsepower 94,595, or 90.9 per cent, was generated by steam; 7,083, or 6.8 per cent, was supplied by gas or gasoline engines; and 2,162, or 2.1 per cent, was furnished by other prime motors. The rented horsepower was two-tenths of 1 per cent of the total, the amount being 267 horsepower; of this, 225 horsepower,

or 84.3 per cent, was electric. In addition 6 electric motors, having a total capacity of 50 horsepower, were owned.

Production.—It is estimated that the United States produced over 98 per cent of the world's output of natural gas in 1902. Canada produced 1.2 per cent, and the rest of the world the remaining eight-tenths of 1 per cent. The total value of the production of natural gas in the United States for 1902 was $30,867,863. This is the largest value thus far recorded in the history of the industry, and is equal to 43.2 per cent of the value of the petroleum produced in the same year. The following table, compiled from the published reports of the United States Geological Survey, shows the production of natural gas from 1872 to 1902:

TABLE 6.—*Value of production of natural gas: 1872 to 1902.*

YEAR.	Value.	YEAR.	Value.
Total	$317,757,731	1893	$14,346,250
		1894	13,954,400
1872 to 1884	[1] 9,100,000	1895	13,006,650
1885	[2] 4,857,200	1896	13,002,512
1886	[2] 10,012,000	1897	13,826,422
1887	[2] 15,817,500	1898	15,296,813
1888	[2] 22,629,875	1899	20,074,873
1889	[2] 21,107,099	1900	23,698,674
1890	[2] 18,792,725	1901	27,066,077
1891	15,500,084	1902	30,867,863
1892	14,800,714		

[1] Estimated. [2] Value of coal and wood displaced.

If it be assumed that an average of 7 cents per 1,000 cubic feet was the price of natural gas from the time it was first introduced in 1872 until the close of 1902, the total value of the product for those years—$317,757,731—would indicate a volume of 4,539,396,159,000 cubic feet. If it were possible to confine this immense quantity of natural gas in a tank whose section was 1 square mile, and if the density would remain the same throughout, it would require a tank 30.8 miles long; or it would fill a pipe having a diameter of 67½ feet encircling the globe. This quantity represents a fuel value equal to 226,969,800 short tons of coal.

Large as this quantity of natural gas may seem, it probably does not represent more than one-half of the amount that has been taken from the original reservoirs. The early and even more recent development was accompanied by profligate waste, and large quantities were also lost during the development of the numerous petroleum fields, as many of the rocks above the petroleum strata, when pierced by the drill, were found to contain great quantities of natural gas, which was allowed to flow into the air until it was exhausted. In the early development of some of the largest fields many of the first wells, when the pressure was greatest, were permitted to discharge immense quantities into the atmosphere for months and years. Torches and escape pipes were allowed to consume and blow off great quantities. There seemed to be a general impression that these great reservoirs of natural gas were practically inexhaustible. The methods employed in applying the gas in mills and factories, and also in domestic service, were wasteful in the extreme. For many years the natural gas companies allowed their customers to consume any quantity that would pass through a certain sized orifice. The mills and factories usually paid according to the amount of finished product, using the gas as they saw fit, which was often in the most crude and extravagant manner.

In a measure this condition was brought about by a number of companies owning wells in the same field over which the declining pressure adjusted itself. When the pressure began to decline each owner made an attempt to realize the greatest revenue before the field became exhausted to such an extent that his pipes could not deliver sufficient natural gas to cause the returns to be profitable.

It has been estimated that since the beginning of the industry the greatest quantity of natural gas was consumed in 1888. This quantity, estimated to have been not less than 750,000,000,000 cubic feet, was partly utilized and partly wasted. It is estimated that it displaced fuel to the value of $22,629,875, which gives an average of 3 cents per 1,000 cubic feet.

Because of the nature, occurrence, and uses of natural gas, it is a very difficult task to ascertain the exact value and quantity consumed; every effort, however, has been made to secure these totals, and each succeeding year the records have been nearer the true amount, and the quantity unreported has gradually become less.

The following table gives the value of the natural gas produced and the value of that consumed in the United States from 1899 to 1902, by states:

TABLE 7.—VALUE OF NATURAL GAS PRODUCED AND CONSUMED, BY STATES: 1899 TO 1902.

STATE.	1902		[1] 1901		[1] 1900		[1] 1899	
	Produced.	Consumed.	Produced.	Consumed.	Produced.	Consumed.	Produced.	Consumed.
United States	$30,867,863	$30,867,863	$27,066,077	$27,066,077	$23,698,674	$23,698,674	$20,074,873	$20,074,873
Pennsylvania	14,352,183	13,942,823	12,688,161	11,785,996	10,215,412	9,812,615	8,337,210	7,926,970
Indiana	7,081,344	[2] 6,710,080	6,954,566	[2] 6,276,119	7,254,539	[2] 6,412,307	6,680,370	[2] 5,833,370
Ohio	2,355,458	4,785,766	2,147,215	4,119,059	2,178,234	3,823,209	1,866,271	3,207,286
West Virginia	5,390,181	2,473,174	3,954,472	2,244,758	2,959,632	1,530,378	2,335,864	1,310,675
New York	346,471	1,723,669	293,232	1,694,925	335,367	1,456,286	294,593	1,236,007
Kansas	824,431	824,431	659,173	659,173	356,900	356,900	332,592	332,592
Kentucky	365,611	255,736	270,871	187,660	286,243	194,082	125,745	125,745
California	120,648	120,648	67,602	67,602	79,083	79,083	86,891	86,891
Texas	14,953	14,953	18,577	18,577	20,000	20,000	8,000	8,000
South Dakota	10,280	10,280	7,255	7,255	9,817	9,817	3,500	3,500
Missouri	2,154	2,154	1,328	1,328	547	547	290	290
Colorado	[3] 2,305	[3] 2,305	1,800	1,800	1,800	1,800	1,480	1,480
Illinois	1,844	1,844	1,825	1,825	1,700	1,700	2,067	2,067

[1] From United States Geological Survey, "Mineral Resources of the United States."
[2] A portion of this was consumed in Chicago, Ill.
[3] Includes Indian Territory and Tennessee.

More than nine-tenths of the natural gas output of the United States was produced and consumed in Pennsylvania, Indiana, Ohio, West Virginia, and New York. The production was in excess of the consumption, as follows: $2,917,007 in West Virginia, $409,360 in Pennsylvania, $371,264 in Indiana, and $109,875 in Kentucky. On the other hand, the consumption exceeded the production by $2,430,308 in Ohio and by $1,377,198 in New York. Gas was supplied to Ohio from Pennsylvania, West Virginia, Kentucky, and Indiana. A comparatively insignificant amount from Canada was consumed in New York; the great bulk of the supply for this state came from Pennsylvania. Although gas was furnished to Ohio and New York from Pennsylvania, a large quantity of the gas consumed within Pennsylvania was brought from West Virginia. From Indiana gas was sent to Illinois as well as to Ohio.

In Indiana, Kansas, and Kentucky the value of the natural gas produced exceeded the value of the petroleum. The value of natural gas in Pennsylvania in 1902 was only $913,910 less than that of the petroleum product of the state. In this state the largest part of the total value of the output of natural gas and petroleum was obtained. The combined value of petroleum and natural gas in 1902 amounted to $102,265,602, and ranked next to coal in the list of the values of the crude mineral products of the United States.

The detailed statistics of the industry for 1902 are given in Table 8.

DESCRIPTIVE.

The principal elements in the composition of natural gas are carbon and hydrogen, which are combined, practically in the proportion of 75 per cent of carbon and 25 per cent of hydrogen forming CH_4, known as marsh gas or methane. This constitutes from 90 to 97 per cent of the different varieties of natural gas. The elements which go to make up the remainder are nitrogen, oxygen, carbonic acid, and hydrogen sulphide.

Occurrence.—In the United States the principal sources of natural gas so far developed are along the west flank of the great Appalachian uplift, extending from western New York to central Kentucky; also on the crest of the great Cincinnati uplift, extending from central Kentucky northward into northwestern Ohio and central Indiana; and in southeastern Kansas. The areas thus briefly described include the main natural gas fields which, in 1902, produced 99.5 per cent of the entire output of the United States.

Natural gas is found also in limited quantities in California, Utah, Colorado, South Dakota, Missouri, Texas, and Louisiana, and a considerable amount has been produced in these states, although the pools lack the area, volume, and force of those found in the Appalachian, Lima-Indiana, and Kansas fields.

East of the Mississippi river natural gas is found in the rock formation of the Paleozoic age, extending from the highest Carboniferous strata down to the stratum that is lower than the Trenton limestone, while in the West and Southwest the fields containing the gas are much more recent in the geological scale.

The reservoirs in which natural gas is usually found are composed of porous sandstone or limestone. In some cases a limited quantity of the gas has been found in shales, but this gas may be regarded as having gradually accumulated from the underlying rock formation. Almost invariably the large reservoirs have been developed in the strata on or near the crests of the anticlinal or rock waves, while petroleum has been generally collected on the lower horizon; and frequently salt water is found at a still lower level. Sometimes, however, the gas fields are entirely isolated from the petroleum producing areas. There are three leading requisites necessary for the accumulation of natural gas in merchantable quantity. These are as follows:

First. An open or porous strata capable of storing the gas under pressure.

Second. A slate or shale covering of this porous

strata to seal in the upper surface and the fractures of the strata saturated with natural gas.

Third. A sufficient flexure or relief of the strata to enable the separation of the salt water and the petroleum from the natural gas.

In order that the production of the gas may be profitable, the reservoirs must be packed with high pressure gas over a large area.

The original rock pressure has been found in very many instances to equal the hydrostatic weight of a column of water of a height equal to the distance from the point where the reservoir is pierced, to the surface. If it takes 2.3 feet of head of water to equal 1 pound to the square inch, or 43 pounds to the hundred feet, then a depth of 1,000 feet will equal 430 pounds to the square inch. This proportion of the depth to the pressure has been proven to be quite near the actual results obtained.

The rock pressure and the output of gas wells are usually measured when the well is new and they are at their maximum. Even the longest life of a gas well is short, and the rock pressure decreases with every foot of natural gas taken out. It is not usual for wells having the greatest rock pressure to produce the greatest volume of natural gas, as an open pebble sand gives up its stored products more rapidly than a sand of closer texture; therefore the more open the texture of the strata, the shorter but more vigorous will probably be the life of the pool. Many pools that were most vigorous are almost entirely destitute of natural gas to-day. The gas in some of them has been so far removed by gas pumps that when they are opened the air flows into the vacuum in the porous strata once packed with high pressure gas. In many virgin fields, especially in the beds of streams, innumerable small vents and bleeders are often found, from which there is an escape of more or less natural gas in the form of bubbles. Against the hydrostatic pressure the bubbles find vent, and escape into the air. As the pressure decreases, the water usually climbs up toward the more elevated portion of the reservoir. These innumerable vents, during the ages that have passed, have acted as safety valves, and have allowed the escape of many millions of cubic feet of gas into the atmosphere. The contents of the known reservoirs are probably but a small fraction of the gas that has been dissipated in the air.

The search for and the production of petroleum, moreover, has caused a great loss of natural gas, since frequently the gas is found in the higher portion of the sand containing the petroleum, and is tapped before the petroleum is reached. In many cases the natural gas has been allowed to flow into the atmosphere and be wasted until the pressure was sufficiently exhausted to permit drilling to proceed.

In the most important fields of Pennsylvania, the original rock pressure varied from 375 to 1,000 pounds to the square inch, the average being about 700 pounds. The output of some of the largest wells in the state ranged from 7,500,000 to 25,000,000 cubic feet in twenty-four hours. A well producing about 1,000,000 cubic feet is considered a good well.

Some of the original wells in the Trenton field in Ohio gave large outputs when first opened. In the vicinity of Findlay and Bairdstown several very large wells were developed during the early history of the field, when the original rock pressure was about 450 pounds to the square inch, and several wells near the location named produced from 5,000,000 to 17,000,000 cubic feet in twenty-four hours. Now there is an average of less than 20 pounds of pressure.

The more recently developed field in Knox county near Mt. Vernon, Ohio, contains a number of wells with an output of from 5,000,000 to 9,000,000 cubic feet in twenty-four hours, the original rock pressure being about 680 pounds to the square inch. The gas in this field is found in the Clinton limestone, at a depth of about 1,850 feet.

Nearly all the natural gas produced in Indiana comes from the Trenton limestone. The wells at first were generally large producers, the output ranging from 1,000,000 to 10,000,000 cubic feet in twenty-four hours. The original rock pressure was 325 pounds to the square inch; it is now less than 70 pounds, and even this light pressure is being rapidly diminished. There are localities where the original pressure is exhausted.

In West Virginia there are a number of powerful gas wells, the productive sands of which are deeply buried. The Big Moses well, on Indian creek, Tyler county, was in its day one of the very largest wells known, and for a few years delivered immense quantities of gas. The estimated output of this well when first opened was 35,000,000 cubic feet per day. Its life was only about two years, the nearness of petroleum deposits, which were soon after developed, allowing the escape of gas and a great decline in pressure soon followed. There are numerous deep wells in West Virginia that have a rock pressure of over 1,000 pounds to the square inch; in some instances 1,500 pounds is recorded. A number of deposits of natural gas have been found in three or more distinct sands or horizons; the deepest wells measure about 3,200 feet. During the year 1900 a very large natural gas well was drilled near Goodhope, in the southern part of Harrison county. This originally had an output of 45,000,000 cubic feet per day. There are numerous wells in this section, and in the western portion of Marion and Monongalia counties there are many with a capacity of from 1,000,000 to 15,000,000 cubic feet. Wetzel county also contains powerful gas wells with a depth of from 2,700 to 3,100 feet.

Southeastern Kansas has developed very fair natural gas wells of good endurance, the rock pressure of which is from 280 to 335 pounds to the square inch.

Many of them have a volume of over 7,000,000 cubic feet per day, the depth being about 900 feet.

Historical.—The existence of natural gas was discovered through the observation of bubbles in springs and streams, many of which would sustain a flame for an indefinite period. These springs and natural vents were known to the early pioneers, while for centuries before they had been known to the Indians, who viewed them with a certain amount of awe and veneration, since they cast a weird light at night upon their camping grounds.

The white men drilling wells for salt brine were in many instances surprised by the outburst of imprisoned natural gas when their crude drills penetrated the sealed-in reservoirs. These outbursts were often of sufficient violence to blow out the drilling tools, and in some instances they ignited and destroyed the primitive drilling plant.

In subsequent years the search for petroleum developed many pools of natural gas of high pressure, and in the early development of petroleum the finding of this gas was considered a dangerous and unwelcome discovery, although it was known and utilized in a few localities long before the first well was drilled for petroleum in 1859.

Natural gas has been developed almost entirely in the northeastern portion of the United States, there being only a few wells, comparatively, in the west and southwest portions. In Canada some has been found, a part of which has been consumed in the United States. Although natural gas is distributed largely over the entire globe, its development and use outside of the United States and Canada has been insignificant. There is at present a small consumption of natural gas in England, in Sussex county. Holland makes use of it for the partial illumination of two small villages on the Zuyder Zee. Galicia, Roumania, Russia, India, Persia, and Japan use it in a limited way in the operation of petroleum wells and in refineries.

One of the most noted natural gas vents or springs located by the pioneers was on the northern bank of the Kanawha river, in West Virginia; this spring was visited in 1776 by General Washington, who was greatly impressed by the phenomenon. There was also a well-known gas spring on the Big Sandy river 50 miles above its mouth; and numerous springs were known to exist on what has been called the St. Marys uplift, which extends 25 miles north from Burning Springs on the Little Kanawha river. In the early history wells drilled for salt water in the area extending from the Cumberland river, Ky., to above the mouth of the Kiskiminitas on the Allegheny river, very often developed large flows of natural gas. In some cases the flow of these wells was persistent, in other cases it was soon exhausted.

The earliest economic use of natural gas in this country was, in all probability, in 1821, when it was used in the lighting of the village of Fredonia, Chautauqua county, N. Y. On the banks of the Canadaway creek, on which Fredonia is situated, a well 1½ inches in diameter was drilled to a depth of 27 feet, and from this was obtained a flow of natural gas sufficient for 30 burners, the light of each of which was considered to be equal to that of two good candles. Several years later, in 1825, a small gasometer was introduced, and afterwards a number of shallow wells were drilled, and from these more or less natural gas was secured. In 1871 a well developed a very large flow of natural gas when at the depth of 1,200 feet it pierced the Corniferous limestone.

A well dug for water at Findlay, Ohio, in 1838 produced large quantities of natural gas near the crest of the great Cincinnati uplift. The gas was collected and conveyed into the house of Mr. Daniel Foster, where it was utilized for nearly fifty years, until the regular development of the great Findlay gas field began in November, 1884.

In 1841 natural gas was developed in association with salt brine in a well drilled on the Kanawha river in West Virginia, near where an original gas spring was located. The pressure was sufficient to force the salt brine up into a large hogshead where the salt and gas were separated. The salt brine was diverted into salt pans and the gas conducted to the furnaces underneath, where it was successfully used as fuel for the evaporation of the salt water.

More or less gas was developed on Oil creek, Pa., and in the surrounding section, by the wells drilled in the search for petroleum in the winter of 1859 and 1860. Some of these wells produced gas only, and others produced both gas and petroleum. For several years it was the common practice to conduct the gas to a safe distance and there consume it to get it out of the way. The high price of coal and wood and the extremely poor roads, finally induced some of the more venturesome to try to burn it under boilers. This experiment was so great a success that natural gas became a most efficient substitute for coal and wood. In its early application, however, numerous fires and explosions were caused by overpressure, because at that time no automatic method of regulating the pressure was known.

One of the first applications of natural gas for fuel purposes was in the year 1868, when a manufacturing company in Erie, Pa., drilled a well 600 feet deep into the Devonian shale. This well produced a considerable amount of gas when first opened, but the output gradually declined. Many wells that were sufficiently large to supply one or two dwellings were afterwards drilled in this locality.

Near Titusville, Pa., in 1872, thirteen years after the drilling of the first oil well, a powerful natural gas well was drilled on the Newton farm, 5½ miles north of the town. The gas from this well was conveyed into the town by a 2-inch gas main, which furnished 250

consumers with light and fuel. Afterwards the original line was reinforced by a second one 3¼ inches in diameter. The two lines maintained a steady pressure and a satisfactory supply. This was the first natural gas plant which supplied light and heat in any large and permanent quantity by methods and appliances similar to those in use to-day. It is looked upon as the beginning of the industry which has since assumed such large proportions.

During the year 1873 natural gas was successfully introduced for fuel and light at numerous localities in Venango, Butler, and Armstrong counties. It was also introduced at Leechburg, in Armstrong county, in the same year, the supply being obtained from an abandoned well drilled for oil in 1871, and was successfully applied in heating and puddling furnaces.

Iron mills at Etna, near Pittsburg, Pa., were the first large mills to be supplied by a gas line of any considerable length. The supply was used for years. This line was built in 1875, and extended from the iron mills to the Harvey well, near Lardens mills in Butler county, a distance of 17 miles. This well was one of the largest known at that time.

By the close of 1883 several pipe lines were supplying the manufacturing establishments and the domestic service in Pittsburg, Pa., the supply being from the Murrysville pool, in Westmoreland county, which had been developed several years previously. In 1885 the Grapeville and the Speechley pools were first developed. The increase in its use was remarkable, and a number of pools in Washington, Butler, and Beaver counties were opened up and connected by pipe lines. In 1886 the gas field at Findlay, Ohio, began to be prominent. Afterwards a large field in Indiana was developed. The development of these large reservoirs of natural gas, hitherto unknown, seemed to impress the general public and many of the operators of natural gas fields with the idea that these reservoirs were practically inexhaustible. The fact that the quantity of gas withdrawn from any of the large fields by one or two wells decreases the volume and pressure very slowly caused a false impression as to the extent of the reservoirs. As the fields were developed, however, and many wells reached the gas reservoirs, the decline in the pressure became more rapid and noticeable.

In Pennsylvania, Ohio, and Indiana immense quantities of gas were consumed in wasteful and extravagant display, which in numerous instances almost turned night into day. This extravagance was not realized until the fields began to be seriously depleted. In the mills and factories the application of gas as a fuel was made in a wasteful and unscientific manner; at least double the quantity of gas necessary to do a given amount of work was consumed.

In 1890 and 1891 many reforms tending to improve methods of storing, transporting, and consuming natural gas were inaugurated. The meter was introduced, which at once made it to the interest of the consumer to see that consumption was economical. The wells were controlled from the head office by telephones, so that when the supply was more than enough the gates at the wells were shut. The wells were watched more vigilantly, salt water was kept out with more care, and leaks and joints and all pipe connections were carefully examined and repaired. The use of large pipes by many of the gas companies began about this time, enabling them to send larger quantities to points of consumption at reduced pressure.

Uses.—Natural gas is used principally as a source of light and heat in domestic service. It is employed extensively in industrial establishments for many purposes, notably in the manufacture of glass, in the generation of steam, puddling of iron, in roasting ores, in heating furnaces, and in the manufacture of steel, and it is also utilized as a source of power in the gas engine, in drilling and operating oil and gas wells, and in pumping oil. The heat value stored in natural gas is greater than that caused by any artificial combination of carbon and hydrogen, and is a perfect fuel as it issues from its original rock-sealed reservoirs. No preparation is necessary for its combustion and no residue is left. It is not affected by ordinary temperature and it is easily distributed by pipes to points of consumption. It is a most economical source of light and power, and an ideal household fuel.

The illuminating properties of natural gas vary in different localities, because of the difference in the percentage of the heavier hydrocarbon, ethane (C_2H_6). All the natural gas found adjacent to petroleum fields has a larger proportion of ethane than the gas farther removed, and therefore the candlepower is considerably greater. Ordinary natural gas, if consumed with a common tip at the rate of 7 or 8 cubic feet per hour, will yield about 6 or 7 candlepower. In an ordinary Argand burner with chimney, it will give about 12 candlepower in consuming 5 to 6 cubic feet per hour. When natural gas is consumed in contact with a mantle of alkaline earth (thoria, etc.), the result is the cheapest and best illuminant known. When the price of natural gas is 25 cents per 1,000 cubic feet, and 50 candlepower is obtained from a consumption of 2½ cubic feet per hour, the cost per candlepower per hour is only 0.00125 of a cent.

There were 510,000 domestic consumers of natural gas during 1902, and it is estimated that in the western portions of New York and Pennsylvania, in central and western West Virginia, and in Ohio, Indiana, and Kansas, not less than 4,500,000 persons received the benefit of natural gas used as a fuel and an illuminant. Over 8,000 manufacturing establishments were also supplied.

The introduction of natural gas into the household, for which it is eminently fitted, has been accomplished without personal inconvenience or loss of life, except in very rare cases. The risk from fire is less than when wood and coal are used. There have been some cases of asphyxiation when a stove has been burned in a room without a flue connection, as it has been found by

experiment that combustion under these conditions is imperfect, especially so if the air in the room becomes more or less saturated with carbonic acid and the vapors of water, the result being the formation of poisonous carbonic oxide.

The calorific value of natural gas varies slightly in different localities, as the amounts of carbon and hydrogen vary. Those natural gases which contain the highest percentage of carbon give the best results in evaporating water. The standard used in measuring the evaporation of water is called the British Thermal Unit, written B. T. U., and is the amount of heat necessary to raise 1 pound of pure water 1° F. at or near 39°, which is the temperature of the maximum density of water. The quantity of air necessary for the perfect combustion of natural gas varies from 10.4 to 10.8 parts of air to 1 part of natural gas. The products of combustion are water and carbonic acid.

The ultimate heat units in any fuel are not all available for the conversion of water into steam, a proportion being lost by radiation and in causing sufficient draft to supply the fresh air that is required to keep up the combustion. A number of tests have fully demonstrated that when ordinary care is taken in burning natural gas under boilers in actual service, 1 cubic foot of natural gas will do the work equivalent to the evaporation of 1 pound of water at and above 212° F. Since 20 cubic feet of ordinary natural gas weigh 1 pound, 1 pound of natural gas will evaporate 20 pounds of water, while, under similar conditions, 1 pound of petroleum will evaporate only 16 pounds of water, and 1 pound of good coal will evaporate but 10 pounds of water; therefore 10 cubic feet of gas is equal to 1 pound of coal, or 20,000 cubic feet will equal 1 ton of coal.

Only two articles have been made directly from natural gas; they are lampblack and gas coke. Lampblack is still made, but gas coke ceased to become a product when natural gas as a fuel was consumed in an economical manner. In isolated districts, where it is difficult to convey the natural gas to market, numerous wells have been made profitable by the conversion of the gas into lampblack. The process is extremely wasteful, as the amount of carbon actually secured is probably not more than one-twentieth of the carbon contained in the gas consumed. In the manufacture of lampblack or carbon black a great number of small jets are made to impinge upon a pipe, through which there is a circulation of water to keep it cold. The carbon is deposited on the pipes in very thin films and accumulates very slowly. Automatic scrapers and brushes are arranged to collect the deposit, so that the flames can have the clean, cold surface of the pipes upon which to deposit a fresh supply. The lampblack thus secured is said to be the very finest, and is used extensively at home and abroad.

Gas coke is a product of the imperfect combustion of natural gas when the unconsumed portion is highly heated. Under such condition the gas is decomposed and pure carbon is deposited. Generally the deposit was obtained from the fire boxes of the heating furnaces used in the manufacture of wrought iron, and found a ready sale for use in the manufacture of electric light carbons. It is similar in appearance to the coke formed from coal, and has a metallic ring when struck with a hammer.

The measurement of the output of gas wells.—To ascertain the outflow of a gas well in cubic feet per hour it is necessary to determine the momentum, either by the application of the Pitot tube or, if the pressure is greater than 5 pounds, by the use of an accurate steam gauge. In using the Pitot tube one end of a shoot pipe is placed at right angles to the flow from the well and as nearly even with the orifice of the pipe as possible—one-third of the diameter from the outer edge. Leading away from this small nipple there is an elbow and a piece of pipe attached to a siphon gauge, in which the gas presses against the water or mercury. There is also a scale attached to the gauge showing the inches and tenths of an inch of the height of the column caused by the momentum. This method of application and the formula for determining the flow were first applied by Prof. S. W. Robinson, of the Ohio State University.

Compressors.—The pressure in most of the original fields at first was ample to convey large quantities of gas a number of miles through medium sized pipes. In after years a gradual reduction in the pressure made it necessary to install powerful compressing machinery. At first gas was used in the generation of steam as a motive power; afterwards the most successful and economical compressors were those in which gas was exploded directly in the cylinder.

Many of these compressor plants installed by the natural gas companies are models of the highest mechanical efficiency, some of the individual compressors developing as much as 2,000 horsepower and weighing from 250 to 500 tons. The more recent ones are so constructed as to use natural gas engines instead of steam engines for motive power. By the operation of compressors with the gas engine there is a saving of from 40 to 50 per cent in the amount of gas used, as compared with that consumed under boilers supplying double expansion engines. One of the first gas compressor plants using natural gas as a motive power is in use at Halsey, McKean county, Pa. This plant consists of four horizontal gas cylinders, in which natural gas is exploded, each having a diameter of 25 inches and a stroke of 4 feet. These cylinders are set tandem, two on each side of the main shaft, which carries two 13-foot fly wheels and operates four compressor cylinders. Two of these cylinders are high-stage compressors and two are low-stage compressors, the former being 15 inches in diameter and the latter 31 inches in diameter; the stroke is 2 feet. The main dimensions are: Length, 75 feet, and breadth at fly wheel, 18 feet. In this engine one horsepower per hour is produced by the consumption of 9 cubic feet of natural gas.

The natural gas engine.—Since the first successful

use of the natural gas engine about ten years ago, its application has been rapid as well as eminently successful; wherever natural gas could be secured this engine has been installed, and has fully demonstrated its economy and reliability. One of its greatest triumphs is that it dispenses with the costly and extravagant boiler.

Its merits are fully demonstrated in its application to the pumping of petroleum wells and the operation of the smaller force pumps used in the transportation of the petroleum. Its general introduction into the petroleum producing fields has enabled the operator to pump economically small wells that otherwise could not be operated, and it has also enabled him to handle large quantities of water where petroleum must be secured at a small outlay. Petroleum wells are often pumped in clusters of from 5 to 25, the number varying according to the depth and other conditions. Where the wells are comparatively shallow, and not too far apart, they can be pumped readily and with small loss by means of rods operated by steam or gas engines. Formerly deep wells were operated by a single boiler in or near the center of a cluster of from 4 to 6 wells, each of which had a steam engine connected with steam pipes radiating from this boiler. The loss by condensation when this method was used was very great.

The gas engine has in many instances replaced the steam engine, the change often being effected by the removal of the steam cylinder and the substitution of a gas cylinder. The boiler is dispensed with. The gas engine will run unattended for hours, as it is only necessary that it be kept lubricated. The steam engines usually employed in petroleum operations are generally not well cared for, so that the steam used for the work accomplished is often extravagant. In ordinary practice the internal combustion engine, of which the natural-gas engine is a type, is most economical, and equals in effectiveness the triple expansion condensing engine. When the natural gas engine is operated in the most economical manner, there is a saving of nearly 50 per cent in fuel over that required to be consumed under boilers to operate high duty steam engines, and a saving of about 90 per cent over the consumption required for the ordinary steam engine.

Distribution of natural gas to the consumer.—Almost the entire production of natural gas is distributed to the consumers by wrought iron pipes, which vary from 1 inch to 20 inches in diameter. There are also in use a number of miles of riveted wrought iron pipes of a diameter of 3 feet. Lately many long lines have been constructed of pipe 18 and 20 inches in diameter. The pressure at the field end of these lines is in some instances as high as 400 pounds to the square inch, but it is usually from 100 to 200 pounds. Where the natural well pressure is not sufficient, it is increased by large compressors, before described.

Wrought iron pipes 6 inches and less in diameter are usually connected by collars with threaded joints. Recently the joints for the larger diameters have been made of sleeves of a larger diameter, between which and the pipe rubber packing is forced by flanges drawn together by bolts. This variety of joint is satisfactory in every way, and has a number of advantages over the screw couplings for larger diameters. It overcomes the trouble due to the expansion and contraction of the pipe line without a resort to fine bends; it enables the pipe to swing more or less; it adjusts itself to the inequalities of the surface; it cheapens the first cost, because no threads have to be cut; it is not so easily injured in transportation, and it is efficient in preventing disintegration by electrolysis in localities where electric roads are operated. Usually the main line pressure is reduced near the city or town line to a pressure of from 20 to 50 pounds, and the gas is fed into an intermediate system of pipes supplying the regulators that deliver the natural gas into the mains from which the consumers are supplied.

In the cities and towns there are two methods of distribution. The more common system is called the low pressure system, and usually carries a pressure of from 3½ to 7 ounces to the square inch. This system consists of a series of pipes from 2 to 12 inches in diameter laid in the street at a depth of from 2½ to 3 feet, the largest sizes being placed in the localities of the greatest consumption. To these pipes are connected the service pipes, which are usually from 1 to 1½ inches in diameter, and lead into the consumers' houses. Between the high pressure lines and the low, automatic regulators are placed, adjusted by weights and diaphragms, in such a manner that the pressure remains almost constant, even when more or less natural gas is conveyed from the high to the low pressure. A series of liquid seals are used in connection with most of the regulators, which prevent any pressure over 16 ounces on the low side from getting into the dwellings; the liquid seals will blow out when such pressure is reached.

Another system is that of placing a reducing valve inside or near each house, this valve being connected with a smaller pipe conveying a higher pressure which is reduced by an individual regulator to a pressure of from 4 to 6 ounces. The points of consumption are in many instances from 100 to 250 miles distant from the place of production.

The total length of pipes of all sizes from 2 inches up to 36 inches in diameter in use in the United States for conveying natural gas at the close of 1902 was 131,859,636 feet. This is equal to 24,973.41 miles—enough to more than girdle the earth at the equator.

Natural gas is usually sold to the consumer by the cubic foot, at a standard pressure of 4 ounces to the square inch, or 36 pounds to the square foot, at a temperature of 60° F. In many instances it is convenient to dispose of the gas to consumers at higher pressures, and then it is necessary to construct meters of proportional strength. The mean pressure of the atmosphere for the elevation at which most of the natural gas is sold is assumed to be 14.4 pounds to the square inch.

TABLE 8.—DETAILED

		United States.	California.	Illinois.	Indiana.
1	Number of wells	15,806	29	28	6,861
2	Number of operators	1,967	15	23	880
	Character of ownership:				
3	Individual	980	6	22	341
4	Firm	276	2	1	158
5	Incorporated company	651	6		337
6	Other form	60	1		44
	Salaried officials, clerks, etc.:				
7	Total number	1,923	10		580
8	Total salaries	$1,810,337	$14,940		$447,508
	General officers—				
9	Number	386	4		157
10	Salaries	$560,575	$6,600		$155,484
	Superintendents, managers, foremen, surveyors, etc.—				
11	Number	791	4		221
12	Salaries	$723,085	$7,080		$177,108
	Clerks—				
13	Number	746	2		202
14	Salaries	$526,677	$1,260		$114,916
	Wage-earners:				
15	Total average number	4,678	21		938
16	Total wages	$2,936,279	$10,800		$586,860
	Engineers, firemen, and other mechanics—				
17	Average number	1,547			354
18	Wages	$1,165,448			$272,555
	Boys under 16 years—				
19	Average number	2			
20	Wages	$625			
	All other wage-earners—				
21	Average number	3,129	21		584
22	Wages	$1,770,206	$10,800		$314,305
	Average number of wage-earners at specified daily rates of pay:				
	Engineers—				
23	$0.75 to $0.99	1			
24	$1.00 to $1.24	5			4
25	$1.25 to $1.49	4			4
26	$1.50 to $1.74	51			46
27	$1.75 to $1.99	39			20
28	$2.00 to $2.24	80			32
29	$2.25 to $2.49	38			17
30	$2.50 to $2.74	57			48
31	$2.75 to $2.99	14			6
32	$3.00 to $3.24	22			5
33	$3.25 to $3.49	3			1
34	$3.50 to $3.74	1			1
35	$3.75 to $3.99	26			1
36	$4.00 to $4.24	3			2
37	$4.25 and over	2			1
	Firemen—				
38	$1.25 to $1.49	14			12
39	$1.50 to $1.74	30			27
40	$1.75 to $1.99	30			6
41	$2.00 to $2.24	21			21
42	$2.25 to $2.49	19			2
43	$2.50 to $2.74	4			1
44	$3.50 to $3.74	1			
45	$4.00 to $4.24	1			
46	$4.25 and over	1			
	Machinists, blacksmiths, carpenters, and other mechanics—				
47	$0.50 to $0.74	1			1
48	$0.75 to $0.99	2			
49	$1.00 to $1.24	2			
50	$1.25 to $1.49	8			2
51	$1.50 to $1.74	51			7
52	$1.75 to $1.99	118			29
53	$2.00 to $2.24	429			21
54	$2.25 to $2.49	195			3
55	$2.50 to $2.74	121			8
56	$2.75 to $2.99	37			
57	$3.00 to $3.24	35			16
58	$3.25 to $3.49	5			
59	$3.50 to $3.74	14			4
60	$3.75 to $3.99	1			
61	$4.00 to $4.24	18			5
62	$4.25 and over	37			2
	Boys under 16 years—				
63	$0.75 to $0.99	1			
64	$1.00 to $1.24	1			
	All other wage-earners—				
65	$0.50 to $0.74	1			
66	$0.75 to $0.99	7			1
67	$1.00 to $1.24	20			7
68	$1.25 to $1.49	222	19		30
69	$1.50 to $1.74	1,098			258
70	$1.75 to $1.99	686	2		151
71	$2.00 to $2.24	560			67
72	$2.25 to $2.49	306			59
73	$2.50 to $2.74	144			8
74	$2.75 to $2.99	21			1
75	$3.00 to $3.24	10			2
76	$3.50 to $3.74	12			
77	$3.75 to $3.99	10			
78	$4.00 to $4.24	6			
79	$4.25 and over	26			

SUMMARY: 1902.

Kansas.	Kentucky.	Missouri.	New York.	Ohio.	Pennsylvania.	South Dakota.	Texas.	West Virginia.	All other states and territories.[1]	
414	117	13	612	1,352	5,408	6	14	949	3	1
57	19	9	108	417	363	3	5	63	5	2
12	11	8	73	340	157	1	4	4	1	3
3	2		6	12	78	1	1	12		4
37	6	1	29	59	126			46	4	5
5				6	2	1		1		6
43	32	1	76	241	718		1	221		7
$32,012	$31,250	$232	$63,015	$221,837	$769,042		$2,000	$225,501		8
19	11		11	33	119			32		9
$15,435	$18,780		$11,530	$55,630	$231,383			$65,733		10
13	13		33	82	305		1	119		11
$10,777	$8,990		$26,604	$78,990	$305,586		$2,000	$105,950		12
11	8	1	32	126	294			70		13
$5,800	$6,480	$232	$24,881	$87,217	$232,073			$53,818		14
100	59		121	699	2,115			634		15
$65,952	$27,560		$84,476	$441,581	$1,308,205			$410,845		16
36	7		99	403	518			130		17
$35,542	$5,420		$72,721	$278,152	$402,814			$98,244		18
2										19
$625										20
62	43		22	296	1,597			504		21
$29,785	$22,140		$11,755	$163,429	$905,391			$312,601		22
1										23
				1						24
										25
1	2			1	1					26
			2	1	14			2		27
1			1	6	40					28
			1	1	15			4		29
2				3	2			2		30
					9					31
					16			1		32
				1	1					33
										34
					25					35
				3	1			3		36
					1					37
					2					38
	1				2					39
			2	11	11					40
										41
					17					42
				1				2		43
					1					44
					1					45
								1		46
										47
				1	1					48
			1					1		49
1				1	2			2		50
3			15	2	10			14		51
4	1		6	23	44			11		52
3	2		23	153	178			49		53
2			7	158	14			11		54
2			30	17	48			16		55
			9	8	15			5		56
6			1	2	9			1		57
2				1	2					58
3				5	2					59
					1					60
2			1		7			3		61
3	1			3	26			2		62
1										63
1										64
					1					65
			2		3			1		66
			1	6	6					67
22	30			18	102			1		68
26			4	94	666			50		69
2			2	76	293			160		70
12			13	84	216			168		71
				5	182			60		72
	13			8	65			50		73
					9			11		74
				1	5			2		75
				2	9			1		76
					10					77
					6					78
				2	24					79

[1] Includes operators distributed as follows: Colorado, 3 (wells included with petroleum); Indian Territory, 1; Tennessee, 1 (2 wells).

TABLE 8.—DETAILED

		United States.	California.	Illinois.	Indiana.
	Average number of wage-earners employed during each month:				
	Men 16 years and over—				
80	January	3,819	21	.....	913
81	February	3,575	21	.....	875
82	March	3,631	21	.....	889
83	April	3,866	21	.....	911
84	May	4,111	21	.....	909
85	June	4,571	21	.....	929
86	July	4,681	21	.....	924
87	August	5,082	21	.....	941
88	September	5,668	21	.....	1,075
89	October	5,493	21	.....	1,031
90	November	5,330	21	.....	948
91	December	6,335	21	.....	911
	Boys under 16 years—				
92	January	2	.....	.....	.....
93	February	2	.....	.....	.....
94	March	2	.....	.....	.....
95	April	2	.....	.....	.....
96	May	2	.....	.....	.....
97	June	2	.....	.....	.....
98	July	2	.....	.....	.....
99	August	2	.....	.....	.....
100	September	2	.....	.....	.....
101	October	2	.....	.....	.....
102	November	2	.....	.....	.....
103	December	2	.....	.....	.....
	Contract work:				
104	Amount paid	$4,459,001	$12,300	$1,317	$1,046,444
105	Number of employees	3,268	2	12	1,267
	Miscellaneous expenses:				
106	Total	$5,912,257	$15,737	$34	$1,399,355
107	Royalties and rent of mine and mining plant	$2,533,895	.....	.....	$539,844
108	Rent of offices, taxes, insurance, interest, and other sundries	$3,378,362	$15,737	$34	$859,511
109	Cost of supplies and materials	$6,607,255	$13,698	.....	$1,028,358
110	Value of product	$30,867,863	$120,648	$1,844	$7,081,344
	Power:				
111	Total horsepower	104,107	233	.....	67,099
	Owned—				
	Engines—				
	Steam—				
112	Number	787	.....	.....	189
113	Horsepower	94,595	.....	.....	60,796
	Gas or gasoline—				
114	Number	300	3	.....	74
115	Horsepower	7,083	8	.....	4,288
	Other power—				
116	Number	12	.....	.....	9
117	Horsepower	2,162	.....	.....	2,000
	Rented—				
118	Electric, horsepower	225	225	.....	.....
119	Other kind, horsepower	42	.....	.....	15
	Electric motors owned—				
120	Number	6	1	.....	2
121	Horsepower	50	10	.....	10
122	Supplied to other establishments, horsepower	20	.....	.....	16

SUMMARY: 1902—Continued.

Kansas.	Kentucky.	Missouri.	New York.	Ohio	Pennsylvania.	South Dakota.	Texas.	West Virginia.	All other states and territories.	
79	49	.....	96	342	1,994	.....	.....	325	.....	80
78	49	.....	90	288	1,883	.....	.....	291	.....	81
78	49	.....	96	285	1,903	.....	.....	310	.....	82
80	49	.....	110	284	1,962	.....	.....	449	.....	83
99	50	.....	103	466	1,993	.....	.....	470	.....	84
98	50	.....	102	489	2,081	.....	.....	801	.....	85
109	49	.....	104	512	2,215	.....	.....	697	.....	86
111	49	.....	129	740	2,339	.....	.....	752	.....	87
117	53	.....	165	985	2,418	.....	.....	839	.....	88
128	53	.....	176	1,150	2,197	.....	.....	737	.....	89
99	52	.....	148	1,154	2,164	.....	.....	744	.....	90
100	48	.....	133	1,693	2,236	.....	.....	1,193	.....	91
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	92
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	93
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	94
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	95
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	96
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	97
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	98
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	99
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	100
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	101
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	102
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	103
$107,968	$9,297	$950	$77,904	$433,026	$1,745,500	$7,943	$18,812	$994,540	$3,000	104
128	22	7	97	415	988	5	17	298	10	105
$40,109	$112,794	$591	$127,530	$491,223	$2,899,633	.....	$2,612	$822,639	.....	106
$21,038	$8,725	.....	$32,439	$198,671	$1,223,278	.....	$2,082	$507,868	.....	107
$19,071	$104,069	$591	$95,091	$292,552	$1,676,355	.....	$580	$314,771	.....	108
$165,859	$37,197	$600	$39,920	$1,139,201	$2,687,228	.....	$125	$1,495,069	.....	109
$824,431	$365,611	$2,154	$346,471	$2,355,458	$14,352,183	$10,280	$14,953	$5,390,181	$2,305	110
230	649	.....	956	4,135	22,041	.....	22	8,742	.....	111
7	6	.....	5	33	296	.....	1	250	.....	112
218	600	.....	585	3,405	20,296	.....	22	8,673	.....	113
.....	2	.....	5	57	146	.....	.....	13	.....	114
.....	37	.....	371	565	1,745	.....	.....	69	.....	115
.....	1	.....	.....	2	.....	.....	.....	.....	.....	116
.....	12	.....	.....	150	.....	.....	.....	.....	.....	117
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	118
12	.....	.....	.....	15	.....	.....	.....	.....	.....	119
.....	.....	.....	.....	.....	3	.....	.....	.....	.....	120
.....	.....	.....	.....	.....	30	.....	.....	.....	.....	121
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STONE

STONE.

By George P. Merrill, Ph. D.

As early as the Seventh Census, statistics of the production of stone for building and decoration were shown. Under the name of "stone and marble quarries" a total of 1,144 quarries, with an output valued at $8,180,115, was reported. This, however, did not include the value of stone burned into lime, which was separately reported and amounted to $2,286,242. There were also 5 slate quarries, with a product valued at $29,056. Statistics for slate and marble quarries have been shown at each subsequent census, but the first systematic and fairly satisfactory report of the stone industry, as a whole, was begun under the direction of Dr. George W. Hawes at the time of the Tenth Census in 1880. The unfortunate death of Doctor Hawes, in the midst of his labors, prevented the carrying out of his plans as completely as might have been desired, but enough was accomplished to establish a basis for future work and furnish material for comparison.

It will be noted that since 1880 the increase in number of quarries was 4,239, and in value of products, $52,086,383. The industry has, therefore, practically quadrupled during the twenty-two years. No comparison can be made between the wages for 1880 and those for 1902, as wages were not reported in 1880; the increase in salaries and wages from 1889 to 1902, however, was $11,448,369, or 37.5 per cent.

The following table presents comparative statistics for all classes of stone for 1902, 1889, and 1880:

Table 1.—*Comparative summary: 1880 to 1902.*

	1902	1889 [1]	1880 [1]
Number of quarries	5,764	4,163	1,525
Number of operators	5,470	(2)	(2)
Salaried officials, clerks, etc.:			
Number	5,279	[3] 1,086	(2)
Salaries	$4,488,339	(4)	(2)
Wage-earners:			
Average number	71,156	[3] 81,288	[5] 39,723
Wages	$37,515,907	[4] $30,555,877	(2)
Miscellaneous expenses	$3,976,865	$2,293,706	(2)
Cost of supplies and materials	$10,739,736	$7,923,220	[6] $192,175
Value of product	[7] $70,462,438	[8] $53,035,620	$18,376,055

[1] Exclusive of silica sand.
[2] Not reported.
[3] Foremen included as wage-earners.
[4] Salaries included in wages.
[5] Greatest number employed.
[6] Value of explosives.
[7] The United States Geological Survey reports under "glass sand" (this is not included in stone) 943,135 short tons, valued at $807,797, which includes glass sand obtained from banks. Census figures for "silica sand," included in stone, are $421,289 for the value of the product, and embrace only the sand produced at sandstone quarries by crushing the rock. The production of stone reported by the Survey does not include limestone, valued at $210,798, consumed in the manufacture of cement.
[8] Includes bluestone, purchased by wholesale dealers, valued at $939,694.

Capital stock of incorporated companies.—Of the 5,470 operators of stone quarries, 754 were incorporated companies. Details of capitalization were reported by 675 of these, and are shown, by classes of stone, in the following table:

Table 2.—CAPITALIZATION OF INCORPORATED COMPANIES: 1902.

	Total.	Limestones and dolomites.	Marble.	Sandstones and quartzites.	Silica sand.	Siliceous crystalline rocks.	Slate.
Number of incorporated companies	754	344	45	119	10	176	60
Number reporting capitalization	675	311	43	104	9	158	55
Capital stock and bonds issued	$103,347,650	$35,509,735	$20,318,400	$16,219,850	$595,275	$19,380,825	$11,323,565
Capital stock:							
Total authorized—							
Number of shares	6,092,267	2,503,008	1,556,650	821,302	25,200	644,533	541,574
Par value	$107,193,740	$34,668,900	$20,414,000	$14,551,600	$635,000	$20,306,800	$16,617,440
Total issued—							
Number of shares	5,244,389	2,182,612	1,448,348	777,765	21,741	505,838	308,085
Par value	$89,516,050	$30,165,235	$17,609,900	$13,821,350	$554,175	$17,007,325	$10,358,065
Dividends paid	$1,762,332	$751,534	$239,250	$276,958	.....	$383,438	$111,154
Common—							
Authorized—							
Number of shares	5,760,783	2,445,658	1,519,950	820,802	25,200	639,973	309,200
Par value	$93,505,200	$30,594,400	$16,744,000	$14,526,600	$635,000	$19,848,300	$11,156,900
Issued—							
Number of shares	5,121,478	2,141,391	1,413,768	777,353	21,741	502,293	264,932
Par value	$82,362,025	$27,554,775	$14,151,900	$13,800,750	$554,175	$16,650,325	$9,650,100
Dividends paid	$1,562,452	$681,353	$189,250	$275,732	.....	$383,438	$32,679
Preferred—							
Authorized—							
Number of shares	331,484	57,350	36,700	500	.....	4,560	232,374
Par value	$13,688,540	$4,074,500	$3,670,000	$25,000	.....	$458,500	$5,460,540
Issued—							
Number of shares	122,911	41,221	34,580	412	.....	3,545	43,153
Par value	$7,154,025	$2,610,460	$3,458,000	$20,600	.....	$357,000	$707,965
Dividends paid	$199,880	$70,181	$100,000	$1,224	.....	.....	$28,475
Bonds:							
Authorized—							
Number	46,213	10,433	8,758	3,900	411	20,220	2,491
Par value	$18,386,100	$6,206,500	$4,475,000	$2,586,000	$41,100	$3,752,000	$1,325,500
Issued—							
Number	28,683	8,822	4,874	2,542	411	10,250	1,784
Par value	$13,831,600	$5,344,500	$2,708,500	$2,398,500	$41,100	$2,373,500	$965,500
Interest paid	$576,901	$258,362	$93,290	$98,485	$2,466	$89,873	$34,425
Assessments levied	$176,950	$2,000	$15,000	$3,000	.....	$153,500	$3,450

Capital stock and funded debt amounting to $103,347,650 was reported for all classes of stone, of which $35,509,735, or 34.4 per cent, was invested in quarries of limestones and dolomites; $20,318,400, or 19.7 per cent, in marble quarries; $19,380,825, or 18.7 per cent, in quarries of siliceous crystalline rocks; $16,219,850, or 15.7 per cent, in quarries of sandstones and quartzites; $11,323,565, or 11 per cent, in slate quarries; and $595,275, or five-tenths of 1 per cent, in quarries of silica sand.

The following table shows the number of operators, grouped by value of product, with the percentages the number and value are of the totals:

TABLE 3.—*Operators by value of product: 1902.*

PRODUCT PER OPERATOR.	OPERATORS.		VALUE OF PRODUCT.[1]	
	Number.	Per cent of total.	Amount.	Per cent of total
Total	5,470	100.0	$71,204,313	100.0
Less than $500	1,789	32.7	322,752	0.4
$500 but less than $1,000	498	9.1	357,244	0.5
$1,000 but less than $10,000	1,868	34.2	7,386,264	10.4
$10,000 but less than $50,000	1,004	18.3	22,580,841	31.7
$50,000 but less than $100,000	188	3.4	13,612,105	19.1
$100,000 but less than $250,000	100	1.8	16,548,981	23.3
$250,000 but less than $500,000	20	0.4	8,280,936	11.6
$500,000 and over	3	0.1	2,115,190	3.0

[1] Includes abrasive materials valued at $741,875 produced by operators of stone quarries, but not included in the value shown in Table 1.

Although not clearly shown by the statistics, it is nevertheless true that there exists in the stone industry the same tendency toward the concentration of capital and the formation of stock companies as in other branches of trade, though possibly not to the same extent. This is due not altogether to the desire for combination with a view to controlling trade, but in part at least to a change which has taken place in the character of the industry. The introduction of machinery, often of an expensive type, for both quarrying and dressing, renders necessary a larger initial outlay than in the earlier days of the industry when hand labor alone was employed. The fact, too, that the quarrier in many cases now contracts not merely to furnish the stone, but to furnish it cut and ready for its definite position in the structure, even if he does not contract to set it in place as well, involves a larger capitalization and supply of available funds.

Of the operators shown in the foregoing table 5.7 per cent reported a product valued at $50,000 or more, the value of their combined product constituting 57 per cent of the total; 94.3 per cent reported a product valued at less than $50,000, their combined value of product constituting 43 per cent of the total.

Employees and wages.—The following table shows the average number of wage-earners employed each month:

TABLE 4.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	49,859
February	50,216
March	60,019
April	72,695
May	79,029
June	81,622
July	83,313
August	83,907
September	82,811
October	79,809
November	70,852
December	59,740

The minimum number, 49,859, was reported for January, and the maximum, 83,907, for August. The variation in the numbers employed during the summer and winter months is readily explained when it is remembered that quarrying is an outdoor pursuit and the severity of the northern winters practically puts a stop to all building and outdoor work. The comparatively recent developments in the Southern states, where the climatic conditions are less severe, have rendered this discrepancy much less marked than in times past.

In Table 5 the figures for the number of wage-earners at specified daily rates of pay in the several kinds of stone quarries are combined, and the totals for all stone quarries are given for the different classes of employees. In addition to the average number of wage-earners included in each rate group, the percentages which these numbers form of their respective totals are shown.

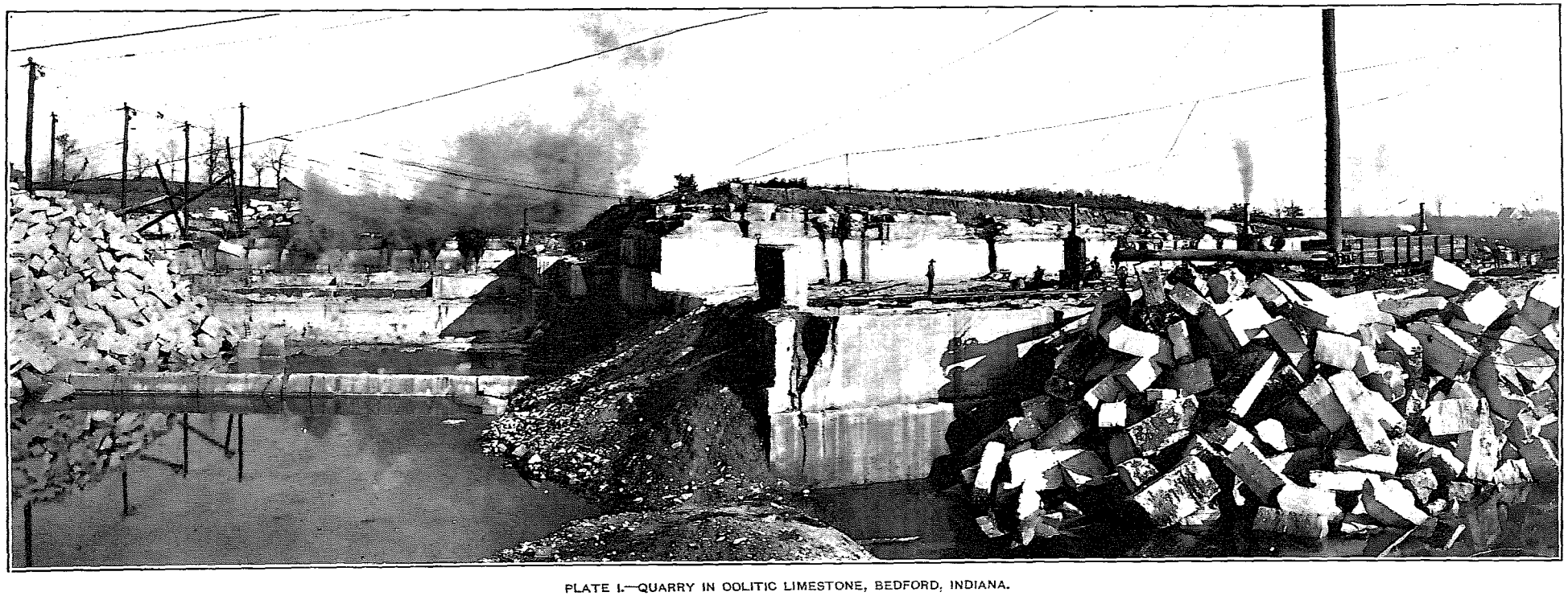


PLATE I.—QUARRY IN OOLITIC LIMESTONE, BEDFORD, INDIANA.

TABLE 5.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1] 71,156	100.0	2,540	100.0	933	100.0	2,976	100.0	49,945	100.0	731	100.0	14,031	100.0
Less than 0.50	70	0.1	.....	.....	.....	.....	.....	.....	.....	.....	69	9.4	1	(2)
0.50 to 0.74	458	0.6	5	0.2	4	0.4	2	0.1	100	0.2	257	35.2	90	0.7
0.75 to 0.99	1,186	1.7	10	0.4	13	1.4	18	0.6	606	1.2	233	31.9	306	2.2
1.00 to 1.24	6,548	9.2	68	2.7	45	4.8	55	1.8	4,774	9.5	157	21.5	1,449	10.3
1.25 to 1.49	13,238	18.6	193	7.6	114	12.2	216	7.3	8,463	16.9	11	1.5	4,241	30.2
1.50 to 1.74	17,309	24.3	333	13.1	218	23.4	334	11.2	11,523	23.1	3	0.4	4,898	34.9
1.75 to 1.99	10,747	15.1	279	11.0	331	35.5	383	12.9	8,500	17.0	1	0.1	1,253	8.9
2.00 to 2.24	9,050	12.7	853	33.6	111	11.9	572	19.2	6,416	12.8	.....	.....	1,098	7.8
2.25 to 2.49	2,914	4.1	274	10.8	33	3.5	395	13.3	1,976	4.0	.....	.....	236	1.7
2.50 to 2.74	2,813	4.0	295	11.6	43	4.6	369	12.4	1,886	3.8	.....	.....	220	1.6
2.75 to 2.99	2,136	3.0	89	3.5	11	1.2	273	9.2	1,723	3.4	.....	.....	40	0.3
3.00 to 3.24	2,715	3.8	106	4.2	6	0.7	238	8.0	2,233	4.5	.....	.....	132	0.9
3.25 to 3.49	790	1.1	15	0.6	3	0.3	60	2.0	701	1.4	.....	.....	11	0.1
3.50 to 3.74	695	1.0	9	0.3	.....	.....	39	1.3	632	1.3	.....	.....	15	0.1
3.75 to 3.99	54	0.1	5	0.2	.....	.....	4	0.1	43	0.1	.....	.....	2	(2)
4.00 to 4.24	284	0.4	4	0.1	1	0.1	16	0.5	234	0.5	.....	.....	29	0.2
4.25 and over	149	0.2	2	0.1	.....	.....	2	0.1	135	0.3	.....	.....	10	0.1

[1] Includes 5,963 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

The 71,156 wage-earners shown above as employed in stone quarries constituted almost one-eighth (12.2 per cent) of the total number reported in 1902 by all the mines and quarries of the United States. The rates of pay were somewhat lower for stone quarries than for all minerals combined, the range of wages for the bulk (79.9 per cent) of those employed in stone quarries having been from $1 to $2.24, while of the total for all minerals 80.8 per cent received between $1 and $2.74 per day. The difference in wages is more clearly shown, perhaps, in the following comparison: When the figures for all minerals are combined it is found that 57.2 per cent of the total number were paid $2 per day or over, while 42.8 per cent were paid less than $2. In stone quarries, on the other hand, only 30.4 per cent of the wage-earners received $2 per day or over, 69.6 per cent of them having been paid less than $2.

Of the 71,156 wage-earners 49,945 (about seven-tenths) were returned as quarrymen and stonecutters. The greatest concentration of these wage-earners was between rates $1 and $2.24, 79.3 per cent of the total number being included. The next four groups, including those who received from $2.25 to $3.24 per day, constituted 15.7 per cent of the total number. Thus it is seen that 95 per cent of the quarrymen and stonecutters were paid between $1 and $3.24 per day.

The total number of engineers employed in stone quarries in 1902 was 2,540, the range of wages for 80.1 per cent of them being from $1.50 to $2.74 per day. There were 933 firemen reported, 83 per cent of whom received between $1.25 and $2.24 per day. About one-third of all the engineers are included in the single rate group, $2 to $2.24, while 35.5 per cent of the firemen are included in the group, $1.75 to $1.99. There is less concentration in the figures for machinists and other mechanics, the range of wages for 2,780 of them—93.4 per cent of the total number—being from $1.25 to $3.24 per day.

The number of boys under 16 years employed in stone quarries was 731, only 1 per cent of the total number of wage-earners. Of these boys, 69 were paid less than 50 cents a day and 647 were paid between 50 cents and $1.24.

Under the head of "all other wage-earners" are included 14,031 employees, more than three-fourths of whom received from $1 to $1.74 per day and 16.7 per cent received from $1.75 to $2.24.

Supplies, materials, and miscellaneous expenses.—As shown in Table 37, the total amount expended for supplies and materials was $10,739,736. Of this amount, $5,403,912, or 50.3 per cent, was expended in quarrying limestones and dolomites; $2,493,065, or 23.2 per cent, in quarrying siliceous crystalline rocks; $1,298,190, or 12.1 per cent, in quarrying sandstones and quartzites; $825,822, or 7.7 per cent, at marble quarries; $680,361, or 6.3 per cent, at slate quarries; and $38,386, or four-tenths of 1 per cent, in connection with the production of silica sand.

Miscellaneous expenses amounted to $3,976,865, of which total $1,156,754, or 29.1 per cent, was paid for royalties and rent of quarrying plants, and $2,820,111, or 70.9 per cent, for rent of offices, taxes, and other sundries.

Mechanical power.—The total primary power reported aggregated 178,878 horsepower, of which 167,744, or 93.8 per cent, was applied through 4,265 steam engines, and 1,378, or seven-tenths of 1 per cent, through 92 gas or gasoline engines. Fifty-six water wheels furnished 6,731 horsepower, or 3.8 per cent; under "other power," 2,114 horsepower, or 1.2 per cent, was reported; and 911 horsepower, or five-tenths of 1 per cent, was rented from other establishments.

There were, in addition, 97 electric motors owned by the operators reporting them, having a total horsepower of 3,521. Of these, 35 with a horsepower of 769 were used in the production of limestones and dolomites; 32 with 2,220 horsepower, in the production of marble; and 23 with 442 horsepower, in the production of siliceous crystalline rocks.

Production.—The value of the annual production of all classes of stone from 1890 to 1902 is shown in the following table:

TABLE 6.—*Value of annual production of stone: 1890 to 1902.*[1]

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Value of product.	YEAR.	Value of product.
1890	$53,035,620	1897	$36,070,651
1891	47,294,746	1898	38,441,354
1892	48,721,625	1899	44,090,670
1893	38,985,573	1900	48,008,739
1894	37,065,030	1901	60,275,762
1895	34,688,816	1902	[2]69,830,351
1896	31,346,171		

[1] Exclusive of glass sand, which was not reported by the Geological Survey during the years here shown except in 1902, when it was not included with stone.

[2] Exclusive of limestone, valued at $210,798, used in the manufacture of cement.

The values increased and decreased alternately from 1891 to the close of 1895, and there was a further decrease in 1896, when the lowest value was reported. Since 1896 there has been a steady increase. These fluctuations of value were distributed through all classes of stone.

Discussing the period covered by this table, a decline in the production of granite, limestone, and sandstone began in 1891. The production of slate declined in 1893, but increased a little in 1894. The production of marble fell off in 1893. The return to more prosperous conditions began in 1897, and by 1902 the earlier output had been equaled or exceeded for all classes of stone but sandstones and quartzites, the value of which for 1902 was still below its value for 1890.

Table 37 presents detailed statistics of all classes of stone for 1902.

CLASSIFICATION AND OCCURRENCE.

The matter of the classification of such rocks as are here considered has from the very beginning been one of difficulty, and one which has not yet been solved in a thoroughly satisfactory manner. As a compromise between the minute subdivisions desired by the scientists and the extremely general and often erroneous classification of the quarrymen, the following division has been adopted, which is essentially that followed in 1880:

1. *Limestones and dolomites.*—These are all sedimentary and bedded rocks, composed essentially of lime carbonate, or the mixed carbonates of lime and magnesia. Such have been found to pass into each other by insensible gradations, certain quarries in the states of the Mississippi valley producing at the same time material which, if classed on purely chemical grounds, would be relegated to both divisions. Obviously a too close adherence to scientific principles would lead to confusion, and hence all are here grouped together.

2. *Marble.*—Here are included stones identical in composition with those noted under limestones and dolomites, but which through changes, mainly physical, have come to possess properties rendering them desirable for high-grade building or ornamental work. As with the last, they are variable in composition. The marbles of the Rutland, Vt., area, for instance, are largely limestone, while those of the Berkshire county, Mass., area are largely dolomite. With the marbles are also included a small series of serpentinous rocks, which are likewise utilized for decorative purposes.

3. *Sandstones and quartzites.*—The rocks here brought together are composed essentially of consolidated sands. They are made over, as it were, from the detritus of preexisting rocks. Those classed as "quartzites" are sandstones which have been rendered more or less crystalline through the deposition of silica between the original sand particles, as is the case with the "jasper" of Sioux Falls, S. Dak., or the Potsdam sandstone of St. Lawrence county, N. Y. The tuffs and other volcanic fragmental rocks are also here included.

4. *Silica sand.*—This is crushed sandstone, used in the manufacture of glass and for other purposes.

5. *Siliceous crystalline rocks.*—Here are included the true granites and syenites, together with the trappean rocks, such as are often designated as black granites; the gneisses, or so-called striped or bastard granites; the mica schists; and melaphyre, basalt, andesite, and other volcanic rocks.

6. *Slate.*—This is an argillaceous rock, which, through compression and shearing, has been more or less metamorphosed and rendered fissile, by virtue of which property it may be split into sheets suitable for roofing and other purposes.

Occurrence.—In this connection the following statement relative to the possible resources of the various states of the Union and their present development is not without interest. The list shows the rocks which are known to occur in each state in quantities sufficient for quarrying. The names in small capitals indicate those which were actually quarried during 1902.

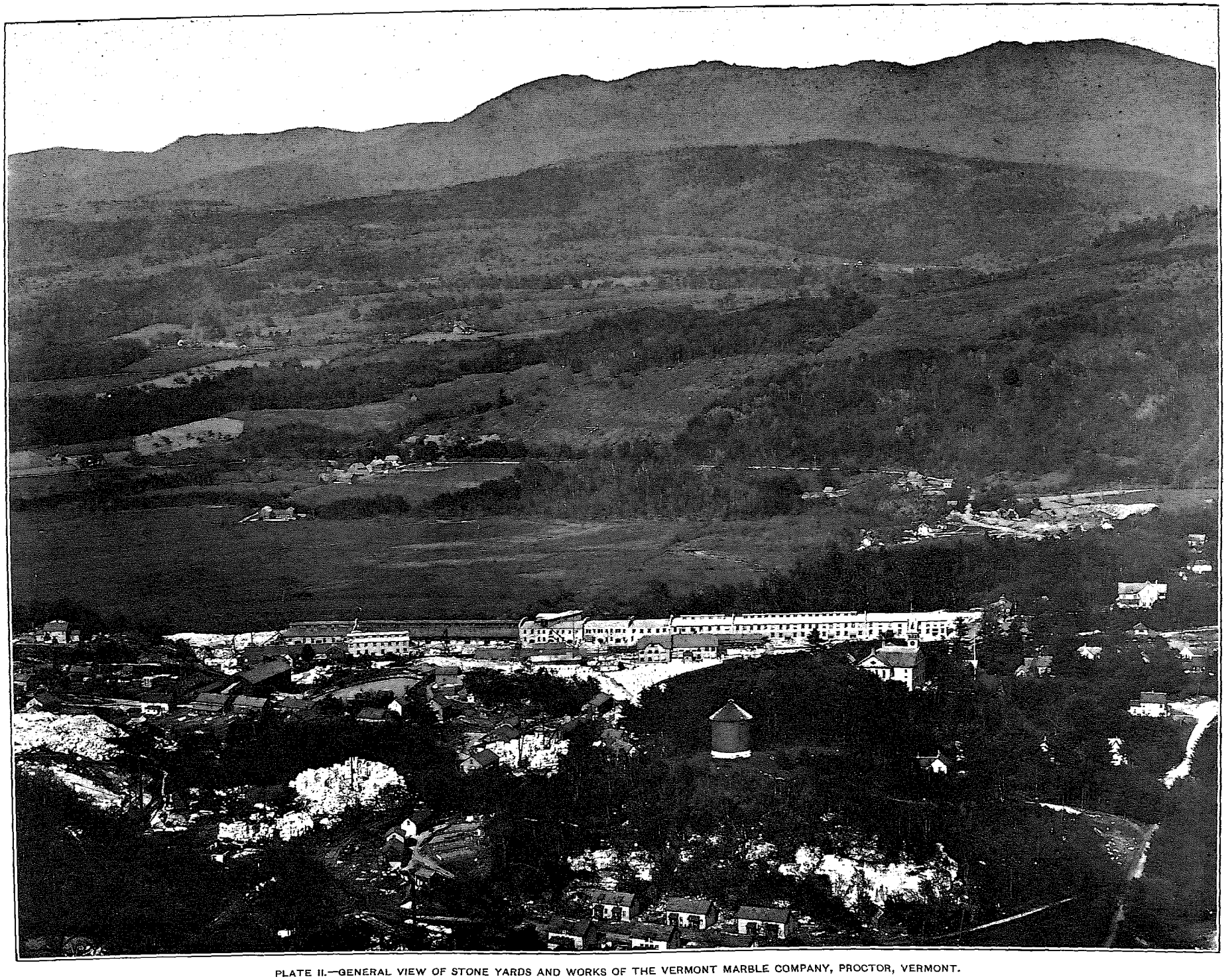


PLATE II.—GENERAL VIEW OF STONE YARDS AND WORKS OF THE VERMONT MARBLE COMPANY, PROCTOR, VERMONT.

STATE OR TERRITORY.	Present and prospective resources.
Alabama	Granite, LIMESTONE, MARBLE, SANDSTONE, slate.
Arizona	Dolomite, GRANITE, onyx marble, SANDSTONE, trappean rocks, volcanic rocks, and tuffs.
Arkansas	ELAEOLITE SYENITE, GRANITE, LIMESTONE, marble, SANDSTONE, SLATE.
California	GRANITE, LIMESTONE, MARBLE, SANDSTONE, SLATE, TRAPPEAN ROCKS, VERD ANTIQUE MARBLE, VOLCANIC ROCKS, and TUFFS.
Colorado	GRANITE, LIMESTONE, marble, QUARTZITE, SANDSTONE, TRAPPEAN ROCKS, VOLCANIC ROCKS, and TUFFS.
Connecticut	DIABASE, GNEISS, GRANITE, LIMESTONE, MARBLE, SANDSTONE, verd antique marble.
Delaware	GABBRO, GNEISS, limestone, quartzite, serpentine.
Florida	LIMESTONE (shell and oolitic).
Georgia	GNEISS, GRANITE, LIMESTONE, MARBLE, SANDSTONE, SLATE, VERD ANTIQUE MARBLE.
Idaho	Dolomite, GRANITE, LIMESTONE, marble, SANDSTONE, TRAPPEAN ROCKS, volcanic rocks, and tuffs.
Illinois	DOLOMITE, LIMESTONE, SANDSTONE.
Indian Territory	Dolomite, GRANITE, LIMESTONE, sandstone.
Indiana	DOLOMITE, LIMESTONE, SANDSTONE.
Iowa	DOLOMITE, LIMESTONE, SANDSTONE.
Kansas	DOLOMITE, LIMESTONE, SANDSTONE.
Kentucky	DOLOMITE, LIMESTONE, SANDSTONE.
Louisiana	Limestone, sandstone.
Maine	GNEISS, GRANITE, LIMESTONE, sandstone, SLATE, TRAPPEAN ROCKS, verd antique marble.
Maryland	GNEISS, GRANITE, LIMESTONE, MARBLE, SANDSTONE, SLATE, verd antique marble.
Massachusetts	GNEISS, GRANITE, LIMESTONE, MARBLE, SANDSTONE, slate, TRAPPEAN ROCKS, VERD ANTIQUE MARBLE.
Michigan	DOLOMITE, gneiss, GRANITE, LIMESTONE, SANDSTONE, slate.
Minnesota	DOLOMITE, gneiss, GRANITE, LIMESTONE, quartzite, SANDSTONE, slate.
Mississippi	Limestone, sandstone.
Missouri	DIABASE, DOLOMITE, GRANITE, LIMESTONE, SANDSTONE.
Montana	DOLOMITE, gneiss, GRANITE, LIMESTONE, MARBLE, SANDSTONE, trappean rocks, volcanic rocks, and tuffs.
Nebraska	DOLOMITE, LIMESTONE, SANDSTONE.
Nevada	Dolomite, granite, limestone, marble, SANDSTONE, slate, trappean rocks, VOLCANIC ROCKS, and tuffs.
New Hampshire	GNEISS, GRANITE, limestone, slate.
New Jersey	DIABASE, DOLOMITE, GNEISS, GRANITE, LIMESTONE, marble, SANDSTONE, SLATE.
New Mexico	Granite, limestone, MARBLE, SANDSTONE, trappean rocks, verd antique marble, volcanic rocks, and tuffs.
New York	DOLOMITE, GNEISS, GRANITE, LIMESTONE, MARBLE, NORITE, SANDSTONE, SLATE, TRAPPEAN ROCKS, verd antique marble.
North Carolina	Dolomite, GNEISS, GRANITE, LIMESTONE, marble, SANDSTONE, serpentine, slate, trappean rocks.
North Dakota	Dolomite, limestone, sandstone.
Ohio	DOLOMITE, LIMESTONE, SANDSTONE.
Oklahoma	DOLOMITE, LIMESTONE, SANDSTONE.
Oregon	DOLOMITE, GRANITE, LIMESTONE, SANDSTONE, trappean rocks, volcanic rocks, and tuffs.
Pennsylvania	DIABASE, DOLOMITE, GNEISS, GRANITE, LIMESTONE, MARBLE, SANDSTONE, SLATE, SERPENTINE.
Rhode Island	Dolomite, GNEISS, GRANITE, limestone.
South Carolina	Gneiss, GRANITE, limestone.
South Dakota	LIMESTONE, QUARTZITE, SANDSTONE.
Tennessee	Granite, LIMESTONE, MARBLE, SANDSTONE slate.
Texas	GRANITE, LIMESTONE, marble, SANDSTONE, slate, trappean rocks, volcanic rocks and tuffs.
Utah	GRANITE, LIMESTONE, MARBLE, ONYX MARBLE, SANDSTONE, trappean rocks, volcanic rocks, and tuffs.
Vermont	DOLOMITE, gneiss, GRANITE, LIMESTONE, MARBLE, SLATE, verd antique marble.
Virginia	Diabase, DOLOMITE, gneiss, GRANITE, LIMESTONE, marble, SANDSTONE, SLATE.
Washington	GRANITE, LIMESTONE, MARBLE, SANDSTONE, trappean rocks, VERD ANTIQUE MARBLE, volcanic rocks, and tuffs.
West Virginia	Calcareous tufa, LIMESTONE, SANDSTONE, travertine.
Wisconsin	DOLOMITE, gneiss, GRANITE, LIMESTONE, SANDSTONE.
Wyoming	Granite, LIMESTONE, marble, SANDSTONE, trappean rocks, volcanic rocks, and tuffs.

A critical examination of the foregoing statement shows that the siliceous crystalline rocks, marbles, and slates are limited in their distribution mainly to the areas east of the Appalachians, those bordering along the Great Lakes, and those west of the front range of the Rocky mountains. The sandstones and limestones, on the other hand, are more widely distributed, although found best developed for quarry purposes in the great interior regions of the Mississippi valley. These points will be brought out in greater detail in the discussion of the various classes of stone.

The importance of a study of the stone resources of the various states is being gradually recognized, and reports covering the subject with more or less completeness were issued by Ohio and Minnesota in 1884, New York in 1888, Arkansas in 1890, Indiana and Pennsylvania in 1896, Maryland and Wisconsin in 1898, and Georgia in 1902.

LIMESTONES AND DOLOMITES.

The rocks brought together here differ from those included under the head of marble not so much in composition as in physical properties. They represent the limestones and dolomites of the ordinary unmetamorphosed type, such as are lacking in qualities rendering them susceptible for a high grade of ornamental work, but suitable, it may be, for building. As will be noted, a large proportion of the material quarried under this name was utilized for other than structural purposes.

Table 7 presents comparative statistics for this industry for 1902 and 1889.

TABLE 7.—*Comparative summary: 1902 and 1889.*

	1902	1889
Number of quarries	3,246	1,954
Number of operators	3,137	(1)
Salaried officials, clerks, etc.:		
Number	2,231	[2] 433
Salaries	$1,843,747	(3)
Wage-earners:		
Average number	31,547	[2] 30,211
Wages	$14,750,638	[3] $10,121,985
Contract work	$36,381	(1)
Miscellaneous expenses	$1,440,081	$743,483
Cost of supplies and materials	$5,403,912	$4,227,246
Value of product	[4] $30,441,801	$19,095,179

[1] Not reported.
[2] Foremen included as wage-earners.
[3] Salaries included in wages.
[4] The report of the United States Geological Survey does not include limestone, valued at $210,798, consumed in the manufacture of cement.

Statistics for 1880 are not suitable for comparison, since the census returns for that year excluded all material not used for building purposes and did not differentiate between limestones and marbles. (See Table 12.)

The number of quarries has increased by 1,292, or 66.1 per cent, since 1889, the amount paid in salaries and wages has increased $6,472,400, or 63.9 per cent, and the value of products $11,346,622, or 59.4 per cent. Of the 3,137 operators reported for 1902, 2,282 were individuals, 480 firms, 344 incorporated companies, and 31 cooperative associations and other forms of organization.

In 1902 development work was reported at 3 quarries—2 in California and 1 in Wisconsin. Four salaried officials, clerks, etc., received $2,800, and there were 33 wage-earners to whom $10,430 was paid in wages. Miscellaneous expenses were $1,075, and supplies and materials cost $5,250.

Employees and wages.—In 1902 the 31,547 wage-earners formed 93.4 per cent of the total number of employees and the $14,750,638 paid them as wages was 88.9 per cent of the total amount expended in salaries and wages. In addition, $36,381 was paid for contract work, which gave employment to 137 persons.

The following table presents the average number of wage-earners employed during each month:

TABLE 8.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	22,581
February	22,410
March	27,638
April	33,077
May	35,084
June	35,959
July	36,447
August	36,965
September	36,621
October	34,947
November	30,604
December	26,231

The greatest number of wage-earners, 36,965, was reported for August, and the least, 22,410, for February; thus the variation was 14,555, or 46.1 per cent of the yearly average number, 31,547. This yearly average is 44.3 per cent of the total for all classes of stone.

The following table shows the number of wage-earners at certain specified daily rates of pay by occupations and also the percentages which these numbers form of the total number in the class:

TABLE 9.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1]31,547	100.0	940	100.0	358	100.0	935	100.0	22,036	100.0	258	100.0	7,020	100.0
Less than 0.50	16	0.1	.....	.....	.....	.....	.....	.....	.....	.....	16	6.2	.....	.....
0.50 to 0.74	196	0.6	.....	.....	1	0.3	.....	.....	35	0.2	95	36.8	65	0.9
0.75 to 0.99	389	1.2	.....	.....	1	0.3	2	0.2	215	1.0	84	32.6	87	1.2
1.00 to 1.24	4,126	13.1	17	1.8	13	3.6	25	2.7	3,106	14.1	60	23.2	905	12.9
1.25 to 1.49	7,870	24.9	57	6.1	68	19.0	77	8.2	5,450	24.7	3	1.2	2,215	31.6
1.50 to 1.74	9,195	29.1	166	17.7	130	36.3	159	17.0	6,232	28.3	.....	.....	2,508	35.7
1.75 to 1.99	4,944	15.7	113	12.0	83	23.2	110	11.8	4,011	18.2	.....	.....	627	8.9
2.00 to 2.24	2,637	8.4	288	30.6	35	9.8	207	22.1	1,631	7.4	.....	.....	476	6.8
2.25 to 2.49	885	2.8	119	12.7	10	2.8	147	15.7	578	2.6	.....	.....	31	0.5
2.50 to 2.74	580	1.8	101	10.7	12	3.3	96	10.3	317	1.4	.....	.....	54	0.8
2.75 to 2.99	193	0.6	45	4.8	4	1.1	72	7.7	66	0.3	.....	.....	6	0.1
3.00 to 3.24	218	0.7	25	2.7	1	0.3	24	2.6	144	0.6	.....	.....	24	0.3
3.25 to 3.49	114	0.4	4	0.4	.....	.....	3	0.3	105	0.5	.....	.....	2	(2)
3.50 to 3.74	121	0.4	2	0.2	.....	.....	9	1.0	106	0.5	.....	.....	4	0.1
3.75 to 3.99	1	(2)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	(2)
4.00 to 4.24	58	0.2	1	0.1	.....	.....	3	0.3	39	0.2	.....	.....	15	0.2
4.25 and over	4	(2)	2	0.2	.....	.....	1	0.1	1	(2)	.....	.....	.....	.....

[1] Includes 3,772 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

As shown by the above table, 28,772 wage-earners, 91.2 per cent of the total number, received between $1 and $2.24 per day. Of the quarrymen and stonecutters, 20,430, or 92.7 per cent, are included between the same rates. There is little need for highly skilled workmen in limestone quarries, and consequently the rates paid are practically the same as those paid in all trades for unskilled labor.

The rates paid to engineers and to machinists and other mechanics were somewhat higher than those for other wage-earners; 83.7 per cent of the engineers received from $1.50 to $2.74 per day, and 76.9 per cent of the machinists and other mechanics were included between the same rates. The range of wages for over three-fourths (78.5 per cent) of the firemen reported was between $1.25 and $1.99 per day.

In all, only 258 boys under 16 years were reported, which number is less than 1 per cent of the total number of wage-earners. Of these boys, 16 were paid less than 50 cents a day, and 239 were paid from 50 cents to $1.24. The boys reported were not employed in any one locality. There were 51 in Indiana, 36 in Virginia, and 33 in Pennsylvania. The others were distributed in small groups through a large number of states.

Under "all other wage-earners" are included 7,020 men, 22.3 per cent of the total number. The rates paid to these employees differ very little from those for quarrymen and stonecutters. About four-fifths (5,628, or 80.2 per cent) of those classed as "all other wage-earners" received between $1 and $1.74 per day, and 1,103, or 15.7 per cent, received from $1.75 to $2.24.

Supplies, materials, and miscellaneous expenses.—Supplies and materials, of which a large amount was fuel for lime burning, cost $5,403,912. The amount paid for royalties and rent of quarrying plants was $422,693, or 29.4 per cent of the total miscellaneous expenses; $1,017,388, or 70.6 per cent, was paid for rent of offices, taxes, insurance, and other sundries.

Mechanical power.—The total primary power reported aggregated 64,500 horsepower, of which 61,547, or 95.4 per cent, was applied through 1,703 steam engines; 1,031, or 1.6 per cent, through 59 gas or gasoline engines; and 502, or eight-tenths of 1 per cent, by 15 water wheels. Under "other power" 1,221 horsepower, or 1.9 per cent, was reported. There were in addition 35 electric motors with an aggregate horsepower of 769. Rented horsepower aggregated 199, or three-tenths of 1 per cent.

Production.—The following table shows the annual value of the production of limestones and dolomites from 1890 to 1902:

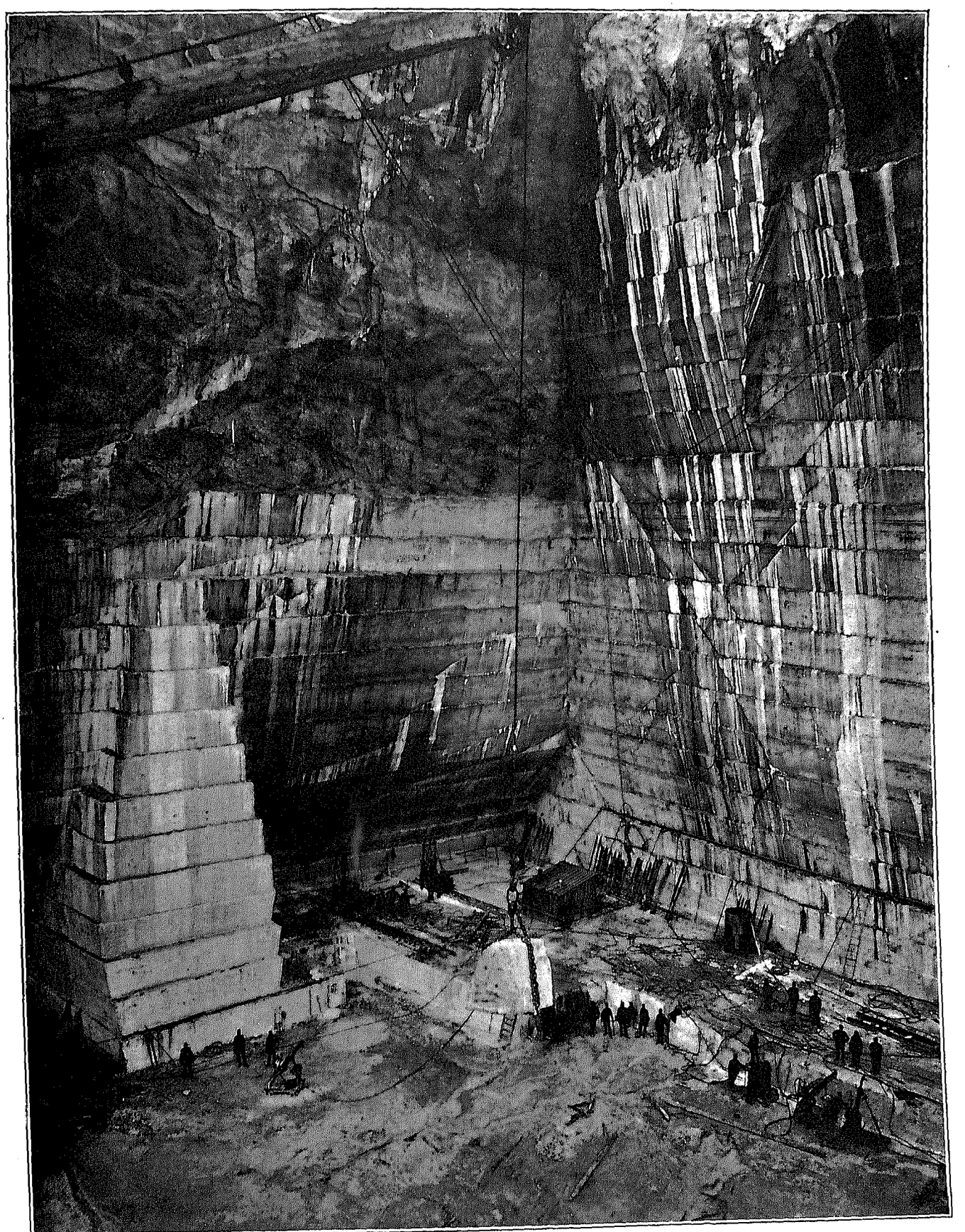


PLATE III.—INTERIOR VIEW OF MARBLE QUARRY, PROCTOR, VERMONT.

TABLE 10.—*Value of annual production of limestones and dolomites: 1890 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Total.	YEAR.	Total.
1890	$19,095,179	1897	$14,822,661
1891	15,792,000	1898	16,039,056
1892	18,342,000	1899	18,757,963
1893	13,947,223	1900	20,354,019
1894	16,512,904	1901	26,406,897
1895	15,308,755	1902	30,441,801
1896	13,022,637		

There was a decrease in value of product from 1890 to 1891, an increase in 1892, a decrease again in 1893, with an advance in 1894 and a slight falling off in 1895. In 1896 the retrograde movement in value reached its lowest point. The increase since then has been constant.

The following table shows the value of the annual production of limestones and dolomites, classified by uses, 1894 to 1902:

TABLE 11.—*Limestones and dolomites, classified by uses: 1894 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	VALUE OF PRODUCT.		Blast furnace flux.	All other uses.
	Building.	Made into lime.		
1894	$7,382,055	$8,610,607	$520,242	(1)
1895	7,350,248	6,588,822	1,369,685	(1)
1896	5,491,227	6,327,900	1,203,510	(1)
1897	7,029,295	6,390,487	1,402,879	(1)
1898	4,154,158	6,886,549	1,834,090	$3,164,259
1899	5,075,158	6,983,067	2,580,799	4,118,939
1900	4,330,706	6,797,496	3,687,394	5,538,423
1901	5,219,310	8,204,054	4,659,836	8,323,697
1902	5,563,084	9,335,618	5,271,252	10,271,847

[1] Not reported.

The total value of the output for 1902 was $30,441,801, of which only $5,563,084 was utilized for building purposes, the remainder being used for flagging, curbing, lime burning, roadmaking, rubble, riprap, flux, etc. The largest single item, which amounted to $9,335,618, was for lime burning, and the second, that of $5,271,252, was for flux in metallurgical operations. A large amount was also used for macadam, not so much on account of its suitability as because of its cheapness, the almost complete absence of siliceous, and especially trappean, rocks from the Mississippi valley states necessarily limiting the selection to either limestone or sandstone.

The detailed statistics of this industry for 1902 are shown in Table 38.

Occurrence.—Rocks of this type, though occurring in every state of the Union, are found in their maximum development in the states of the Mississippi valley, where the agents of metamorphism have exercised but little influence and the rocks have retained their original sedimentary character. In some instances rocks of this class are of a highly fossiliferous nature. Such, however, are not as a rule utilized for building purposes, but rather for lime burning, etc. Those utilized for architectural purposes are principally of the fine grained homogeneous type, such as the dolomitic limestones of Lemont, Ill., or of the oolitic type, such as the stones so extensively developed in the region of Bedford, Ind. These stones work readily under the tool, and when free from injurious constituents are admirably adapted for elaborate structures where much carved work is required. This is especially true of the stone at Bedford, where the conditions are particularly favorable for quarrying, the beds having retained very nearly their original horizontality. The quarry development is extensive, as is evident from the illustration given in Plate I. The ease with which these stones are removed by the aid of machinery from the quarry bed, and the readiness with which they may be worked, as well as their satisfactory colors, have rendered them general favorites for building purposes and they have found their way into the larger cities all over the country.

MARBLE.

The stones here included under the head of marble are mainly those composed of carbonate of lime, or the mixed carbonates of lime and magnesia, in other words, limestones and dolomites, which, owing to their color and physical properties, are suitable for high-grade building and ornamental purposes.

It should be stated that no sharp line can be drawn between what is popularly known as marble and the common limestones and dolomites, as what is or what is not suitable for decoration must depend largely upon the taste of the individual. The stones here included are, however, those which are sold as marble, and in two instances serpentinous rock—the so-called verd antique marble.

The following table is a comparative summary of the marble industry from 1870 to 1902.

TABLE 12.—*Comparative summary: 1902, 1889, 1880, and 1870.*

	1902	1889	1880[1]	1870
Number of quarries	83	103	616	(2)
Number of operators	75	74	(2)	[3]22
Salaried officials, clerks, etc.:				
Number	352	[4]96	(2)	(2)
Salaries	$341,021	(5)	(2)	(2)
Wage-earners:				
Average number	4,070	[4]4,433	[6]15,646	795
Wages	$2,212,640	[5]$1,809,211	(2)	$442,270
Miscellaneous expenses	$382,877	$210,272	(2)	(2)
Cost of supplies and materials	$825,822	$655,586	[7]$61,408	$96,916
Value of product	$5,044,182	$3,488,170	$6,856,681	$804,300

[1] Includes limestones and dolomites; statistics for marble can not be separated.
[2] Not reported.
[3] Establishments.
[4] Foremen included as wage-earners.
[5] Salaries included in wages.
[6] Greatest number employed.
[7] Value of explosives.

In the published statistics of the census of 1880 no discrimination was made between the two classes of rocks. The writer, knowing the character of the output of the various quarries, estimated the value pro-

duced that year at $2,044,225 which, it will be observed by reference to Table 12, was increased to $3,488,170 in 1889 and to $5,044,182 in 1902.

There were 83 quarries in operation during 1902 with 352 salaried officials, clerks, etc., and 4,070 wage-earners, while in 1889 there were 103 quarries with 254 salaried officials, clerks, etc., and 4,275 wage-earners. The decrease in the number of active quarries is very probably due to the consolidation and incorporation of companies. The apparent decrease in the number of wage-earners may be accounted for by the different methods pursued by the several censuses in obtaining the average number employed; also by the introduction of machinery and improved methods in quarrying. That this decrease is only apparent, seems all the more probable when it is taken into consideration that both the amount paid as wages and the value of the marble produced increased to a marked degree during each census year.

There were 10 quarries reported as being developed by as many operators, 8 of whom were incorporated companies and had issued capital stock and bonds to the amount of $5,031,500. Six of these quarries were located in Washington, and there was 1 each in California, Kentucky, Montana, and Utah. These gave employment to 7 salaried officials and 25 wage-earners, who received $22,405 in salaries and wages. From these 10 quarries supplies and materials to the amount of $5,218, and miscellaneous expenses to the amount of $2,550, was reported.

There were 114 quarries reported idle during 1902 and these were controlled by 114 operators, 53 of whom were incorporated companies. Capital stock and bonds were issued to the amount of $9,127,250 by 25 of these companies.

Capital stock of incorporated companies.—Of the 75 operators of productive quarries, 45 were incorporated companies. Forty-three of these made returns showing a capital stock of $17,609,900 and a bonded indebtedness of $2,708,500. The details are shown in the following table:

TABLE 13.—CAPITALIZATION OF INCORPORATED COMPANIES: 1902.

	United States.	California.	Georgia.	Massachusetts.	New York.	Pennsylvania.	Tennessee.	Vermont.	Washington.	All other states and territories.[1]
Number of incorporated companies	45	2	5	3	7	2	8	9	5	4
Number reporting capitalization	43	2	4	3	6	2	8	9	5	4
Capital stock and bonds issued	$20,318,400	$687,000	$4,200,000	$398,100	$745,000	$275,800	$1,175,000	$9,113,500	$3,504,000	$220,000
Capital stock:										
Total authorized—										
Number of shares	1,556,650	210,000	54,000	6,500	7,100	6,500	8,650	81,700	1,180,500	1,700
Par value	$20,414,000	$750,000	$5,400,000	$450,000	$710,000	$325,000	$865,000	$7,970,000	$3,684,000	$260,000
Total issued—										
Number of shares	1,448,348	147,000	33,000	5,262	6,940	4,016	8,250	79,280	1,163,300	1,300
Par value	$17,609,900	$687,000	$3,300,000	$376,100	$694,000	$200,800	$825,000	$7,803,000	$3,504,000	$220,000
Dividends paid	$239,250	.....	.....	.....	$11,250	.....	$6,000	$222,000	.....	.....
Common—										
Authorized—										
Number of shares	1,519,950	210,000	37,500	6,500	7,100	6,500	8,650	61,500	1,180,500	1,700
Par value	$16,744,000	$750,000	$3,750,000	$450,000	$710,000	$325,000	$865,000	$5,950,000	$3,684,000	$260,000
Issued—										
Number of shares	1,413,768	147,000	18,500	5,262	6,940	4,016	8,250	59,200	1,163,300	1,300
Par value	$14,151,900	$687,000	$1,850,000	$376,100	$694,000	$200,800	$825,000	$5,795,000	$3,504,000	$220,000
Dividends paid	$139,250	.....	.....	.....	$11,250	.....	$6,000	$122,000	.....	.....
Preferred—										
Authorized—										
Number of shares	36,700	.....	16,500	.....	.....	.....	.....	20,200	.....	.....
Par value	$3,670,000	.....	$1,650,000	.....	.....	.....	.....	$2,020,000	.....	.....
Issued—										
Number of shares	34,580	.....	14,500	.....	.....	.....	.....	20,080	.....	.....
Par value	$3,458,000	.....	$1,450,000	.....	.....	.....	.....	$2,008,000	.....	.....
Dividends paid	$100,000	.....	.....	.....	.....	.....	.....	$100,000	.....	.....
Bonds:										
Authorized—										
Number	8,758	.....	1,180	50	650	75	350	6,453	.....	.....
Par value	$4,475,000	.....	$900,000	$25,000	$110,000	$75,000	$350,000	$3,015,000	.....	.....
Issued—										
Number	4,874	.....	1,180	44	510	75	350	2,715	.....	.....
Par value	$2,708,500	.....	$900,000	$22,000	$51,000	$75,000	$350,000	$1,310,500	.....	.....
Interest paid	$93,290	.....	$30,000	$1,320	.....	$6,000	$21,000	$34,970	.....	.....
Assessments levied	$15,000	.....	$15,000	.....	.....	.....	.....	.....	.....	.....

[1] Includes incorporated companies distributed as follows: Alabama, 1; Maryland, 2; New Mexico, 1.

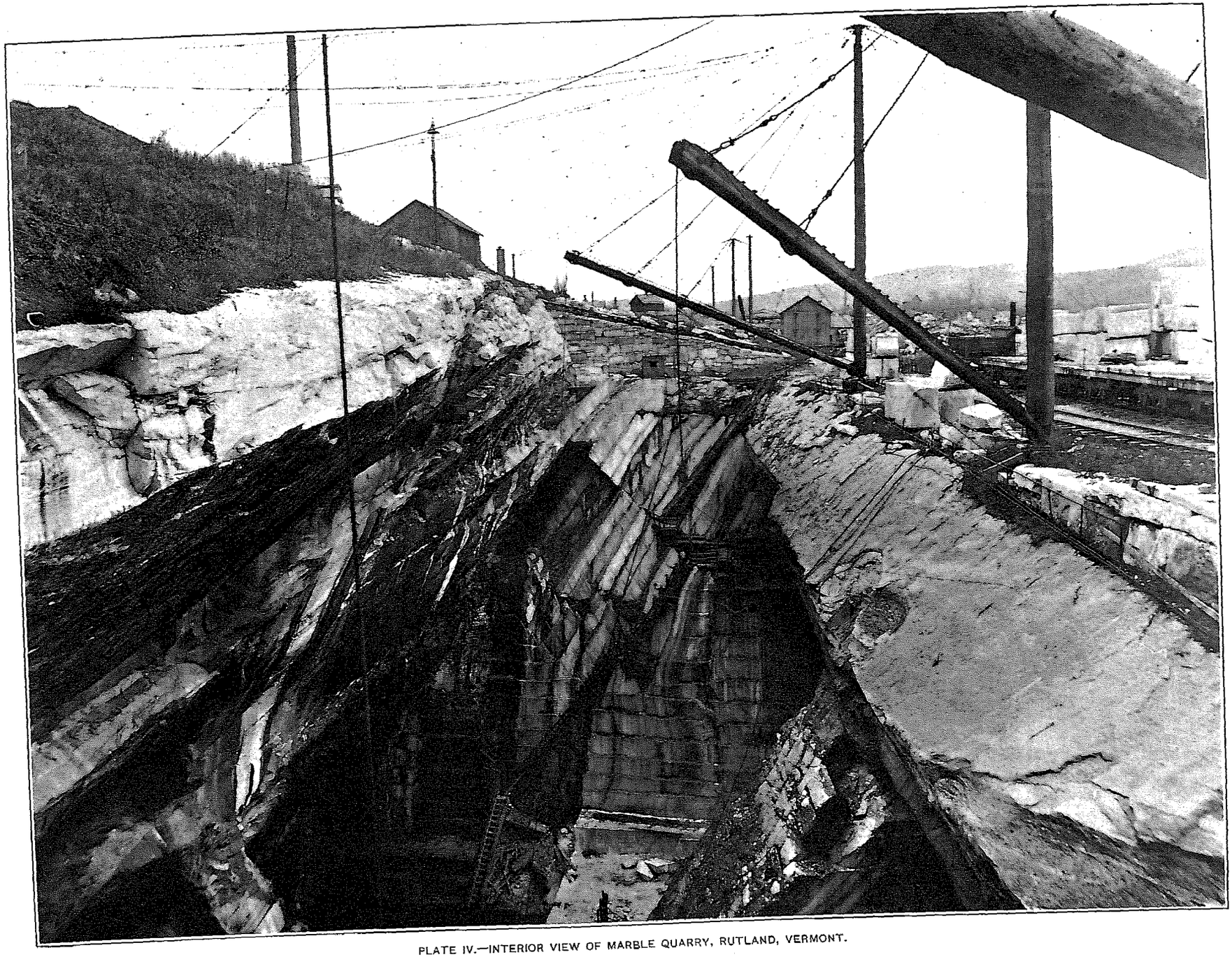


PLATE IV.—INTERIOR VIEW OF MARBLE QUARRY, RUTLAND, VERMONT.

The value of the capital stock and bonds issued by the Vermont companies constitutes 44.9 per cent of the total; by the Georgia companies, 20.7 per cent; by the Washington companies, 17.2 per cent; and by the Tennessee companies, 5.8 per cent. The par value of the capital stock issued was 86.3 per cent of the total authorized. The dividends paid amounted to 3.8 per cent of the total stock on which they were declared.

The production of the mines operated by the 45 incorporated companies, including the 2 not reporting details of capitalization, was valued at $4,469,791, or 88.6 per cent of the total value.

Employees and wages.—The 4,070 wage-earners constituted 92 per cent of the salaried employees and wage-earners, and their wages were 86.6 per cent of the total salaries and wages. Vermont led with 51 per cent of the wage-earners; Tennessee was second, with 14.9 per cent; New York was third, 11.5 per cent; and Georgia was fourth, with 7.6 per cent.

The following table shows the average number of wage-earners employed each month:

TABLE 14.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	3,574
February	3,618
March	3,880
April	4,090
May	4,316
June	4,184
July	4,186
August	4,228
September	4,430
October	4,275
November	4,119
December	3,940

September was the month during which the largest number of wage-earners, 4,430, was employed, although the variation during the year was not great. The smallest number, 3,574, was employed in January.

The following table shows the distribution of wage-earners according to daily rates of pay, by occupations:

TABLE 15.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1] 4,070	100.0	113	100.0	80	100.0	324	100.0	2,513	100.0	22	100.0	1,018	100.0
Less than 0.50	6	0.1									6	27.3		
0.50 to 0.74	17	0.4	1	0.9					1	(2)	14	63.6	1	0.1
0.75 to 0.99	61	1.5			4	5.0	1	0.3	12	0.5			44	4.3
1.00 to 1.24	558	13.7	8	7.1	20	25.0	2	0.6	468	18.6			60	5.9
1.25 to 1.49	963	23.7	25	22.1	4	5.0	88	27.2	585	23.3			261	25.6
1.50 to 1.74	858	21.1	12	10.6	13	16.2	50	15.4	438	17.4	2	9.1	343	33.7
1.75 to 1.99	286	7.0	7	6.2	19	23.8	22	6.8	146	5.8			92	9.0
2.00 to 2.24	293	7.2	30	26.5	11	13.8	34	10.5	150	6.0			68	6.7
2.25 to 2.49	182	4.5	6	5.3	5	6.2	78	24.1	35	1.4			58	5.7
2.50 to 2.74	294	7.2	15	13.3			23	7.1	199	7.9			57	5.6
2.75 to 2.99	159	3.9	1	0.9	1	1.2	2	0.6	141	5.6			14	1.4
3.00 to 3.24	130	3.2	6	5.3	3	3.8	7	2.2	112	4.4			2	0.2
3.25 to 3.49	82	2.0					4	1.2	78	3.1				
3.50 to 3.74	57	1.4					10	3.1	47	1.9				
3.75 to 3.99	4	0.1	1	0.9			1	0.3	2	0.1				
4.00 to 4.24	15	0.4	1	0.9			2	0.6	4	0.2			8	0.8
4.25 and over	105	2.6							95	3.8			10	1.0

[1] Includes 17 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

The range of wages for employees in marble quarries was very wide. In 1902 there were 84 wage-earners getting less than $1 per day, and 105 receiving $4.25 and over. Between these extremes the employees were distributed in comparatively small groups, except between the rates from $1 to $1.74, where 58.5 per cent of the total number were included.

The quarrymen and stonecutters constituted 61.7 per cent of the total number of wage-earners reported. The wide range noticeable in the figures for all occupations combined is due almost entirely to the great variation in the rates paid to the quarrymen and stonecutters. More than half (59.3 per cent) of the total number were included in the three wage groups from $1 to $1.74, but most of the remainder were distributed in small groups from $1.75 to $4.25 and over. The difference between the wages paid to quarrymen and those paid to highly skilled stonecutters is very apparent in the figures presented.

The range of wages for the bulk of the engineers was from $1 to $2.74 per day, 91.1 per cent of the total number being included between those rates. Of the firemen nine-tenths received between $1 and $2.49, while 91.1 per cent of the machinists and other mechanics received from $1.25 to $2.74. Of the 22 boys under 16 years reported, 20 were paid less than 75 cents a day.

Under "all other wage-earners" are included 1,018 workmen. Almost six-tenths of these—59.3 per cent—were employed at rates between $1.25 and $1.74. Of the others 10.2 per cent received between 75 cents and $1.24 per day, and 27 per cent received from $1 75 to $2.74.

Supplies, materials, and miscellaneous expenses.—The cost of supplies and materials was reported as $825,822, which was the largest item of expense other than wages. Of the $382,877 expended for miscellaneous expenses, $317,492, or 82.9 per cent, was paid for rent of offices, taxes, insurance, interest, and other sundries, and $65,385, or 17.1 per cent, was expended for royalties and rent of quarrying plant.

Mechanical power.—The total horsepower reported was 14,286, of which 10,748, or 75.2 per cent, was applied through 191 steam engines, and 3,413, or 23.9 per cent, was supplied by 15 water wheels. The remainder was classified as "other power." The total power was reported by 60 operators, Vermont leading with 53.1 per cent.

Production.—The annual production of marble from 1890 to 1902 is shown in the following table:

TABLE 16.—*Value of annual production of marble: 1890 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Total.	YEAR.	Total.
1890	$3,488,170	1897	$3,870,584
1891	3,610,000	1898	3,629,540
1892	3,705,000	1899	4,011,681
1893	2,411,000	1900	4,267,253
1894	3,199,585	1901	4,965,699
1895	2,825,719	1902	5,044,182
1896	2,859,136		

The gradual increase shown in 1890, 1891, and 1892 was followed by the great depression of 1893. An increase of $788,585 was shown for 1894, while in 1895 the value of production decreased to $2,825,719. This period of fluctuation was followed by a steady increase, except in 1898, until, in 1902, the value of product reached $5,044,182.

The following table shows the value of the annual production of marble, classified by uses, 1896 to 1902:

TABLE 17.—*Marble, classified by uses: 1896 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	VALUE OF PRODUCT.					
	Rough, all uses.	Dressed.				All other uses.
		Building.	Monumental.	Ornamental.	Interior decoration.	
1896	$583,690	$1,036,163	$813,146	$65,365	$329,804	$30,968
1897	477,856	1,074,646	1,547,469	9,010	576,983	184,620
1898	690,240	968,353	1,613,742	23,904	304,714	28,987
1899	640,535	1,176,208	1,650,155	92,942	389,040	62,801
1900	491,813	1,080,969	2,019,474	13,754	555,092	106,151
1901	591,667	1,236,023	1,948,892	126,576	1,008,482	54,059
1902	2,276,629	1,038,102	956,870	7,300	679,913	85,368

The following table shows the value of product of the principal marble producing states for 1902 and 1889, and ranks them according to these values:

TABLE 18.—*Production of marble, by principal states ranked by value of product: 1902 and 1889.*

STATE.	1902		1889	
	Value.	Rank.	Value.	Rank.
Vermont	$2,628,164	1	$2,169,560	1
Georgia	660,517	2	196,250	4
New York	577,298	3	354,197	3
Tennessee	518,256	4	419,467	2
Massachusetts	165,489	5	.....	.....
Pennsylvania	160,423	6	.....	.....
California	92,298	7	87,030	5
Washington	61,176	8	.....	.....

In the number of quarries and value of output Vermont ranked first among the marble producing states in 1902. This has been the case since the very inception of the industry, though the proportional difference in output is being continually lessened as developments are made in other states. While the value of the product of Vermont has increased rather than diminished, the state in 1902 produced only 52.1 per cent of the output of the United States instead of 62.2 per cent, as in 1889. Other differences are equally marked. These are due mainly to the remarkable developments in Georgia, whereby the product was increased from $196,250 in 1889 to $660,517 in 1902; to the reopening of the long abandoned quarries in Berkshire county, Mass.; to developments near Avondale, in Chester county, Pa., in Adams and Stevens counties, Wash., and minor developments in Montana and Utah.

Occurrence.—The matter of the geographic distribution of marbles throughout the United States is of considerable economic importance. It will be noted by reference to Table 39 that a very large proportion of them are to be found in states bordering along the Appalachian mountain system. Recent developments show that materials of the same nature exist in the states west of the front range of the Rocky mountains, but thus far little more than development work has been done except in California and Washington. The entire region lying between the Appalachians and the front range of the Rocky mountains to the westward is quite unsupplied with anything that can properly be designated as marble, the geological conditions which were instrumental in producing the necessary alteration from the common limestone having here been inoperative.

With reference to the above distribution the following statement as to color, texture, and uses may be added, beginning with the most northerly of the marble producing states:

Vermont.—Marbles of a holocrystalline granular structure, varying from pure white to white veined with blue-gray and greenish to dark clouded blue-gray, occur in a somewhat interrupted belt extending throughout the entire length of the western part of the state. The

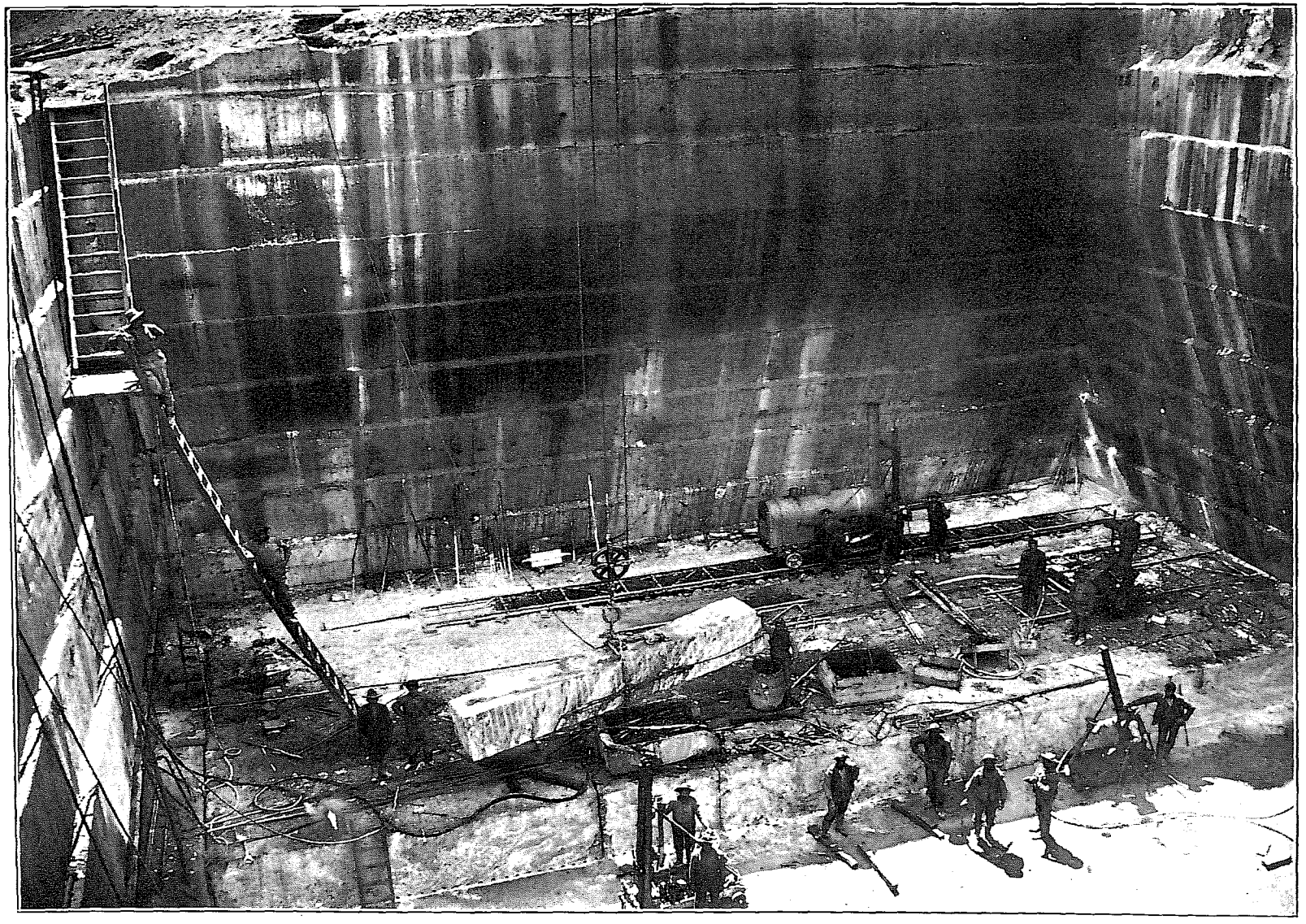


PLATE V.—INTERIOR VIEW OF MARBLE QUARRY NEAR TATE, PICKENS COUNTY, GEORGIA.

quarry industry is developed to the greatest extent in Rutland county. Views showing the present condition of quarries at West Rutland and Proctor are given in Plates II, III, and IV. The stone is used for building, monumental, and decorative work. Chocolate, red, and variegated forms, used for tiling and interior decoration, are found in the vicinity of Mallet bay.

Massachusetts.—Holocrystalline rather coarsely granular building marbles of a white color are found in the various towns of Berkshire county.

New York.—Coarsely crystalline white and grayish dolomitic marbles, which are used mainly for building purposes, occur in Westchester and St. Lawrence counties.

Pennsylvania.—Holocrystalline granular marbles of a white and gray color, used mainly for building purposes, come from Montgomery and Chester counties.

Maryland.—Holocrystalline granular white marbles, used for general building purposes, are quarried in Baltimore county.

Georgia.—Holocrystalline coarsely granular white clouded and pink marbles, used mainly for building but also for interior decoration and monumental work, occur in Cherokee and Pickens counties. (See Plate V.)

Tennessee.—Pink, gray, and chocolate and white mottled stone, used almost wholly for interior decoration, is found in the region about Knoxville and Rogersville, in eastern Tennessee.

Washington.—A peculiar green or green-white mottled stone, consisting of an admixture of lime and magnesian carbonates, brucite, and serpentine, is being developed near Spokane, and worked into various art objects, such as vases, urns, and bowls, an entirely new departure in marble work.

A very large proportion of the marbles used for interior decoration, and, indeed, almost the entire supply of the verd antiques, are still imported, Italy, Africa, and Greece furnishing the largest amounts, although of late a considerable quantity has been brought from Norway. This importation is due in part to the more desirable quality of the material, and in part to the cheapness of foreign labor and low ocean freight rates.

A detailed summary showing the statistics of the marble industry for 1902 is given in Table 39.

SANDSTONES AND QUARTZITES.

Under the head of sandstones and quartzites, is included a widely variable series of rocks, composed, as the name suggests, largely of siliceous sand, which, through the influence of cementing materials or natural compression, has become sufficiently indurated to be utilized for building purposes. With them are also included certain rocks of similar origin but which, through the deposition of a siliceous cement, have become partially recrystallized and are known as quartzites. The so-called "Potsdam sandstone" of New York and the "jasper" of Sioux Falls, S. Dak., are good examples of this latter type. Here, too, are included the "bluestones" of New York and Pennsylvania, so widely used for flagging purposes, and the volcanic tuffs.

The following table presents comparative statistics for this industry for 1902, 1889, and 1880.

TABLE 19.—*Comparative summary: 1902, 1889, and 1880.*

	1902	1889	1880
Number of quarries	1,304	1,020	502
Number of operators	1,211	(1)	(1)
Salaried officials, clerks, etc.:			
Number	847	[2] 260	(1)
Salaries	$713,579	(3)	(1)
Wage-earners:			
Average number	10,448	[2] 18,458	[4] 9,567
Wages	$6,153,060	[3] $6,785,214	(1)
Contract work	$500	(1)	(1)
Miscellaneous expenses	$878,780	$641,874	(1)
Cost of supplies and materials	$1,298,190	$1,311,789	[5] $27,571
Value of product	$10,601,171	[6] $12,505,663	$4,780,391

[1] Not reported.
[2] Foremen are included as wage-earners.
[3] Salaries are included in wages.
[4] Greatest number employed.
[5] Value of explosives.
[6] Includes bluestone, valued at $939,694, purchased by wholesale dealers.

There has been an actual increase in the number of quarries in operation, but this is due to the opening of small rural quarries, and is not accompanied by an increase in any of the expenditures except those classed as miscellaneous.

Employees and wages.—The total number of salaried officials and wage-earners was 11,295, the wage-earners contributing 10,448, or 92.5 per cent of this number. Their wages were $6,153,060, or 89.6 per cent of the total salaries and wages.

The following table shows the average number of wage-earners employed during each month:

TABLE 20.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	5,727
February	5,794
March	7,765
April	10,405
May	12,778
June	13,406
July	13,368
August	13,152
September	12,705
October	11,980
November	10,506
December	7,790

The greatest number given employment for any one month was 13,406 in June; the least number was 5,727 in January. Sandstone quarries can not be operated during severe winter weather, as the stone must be quarried without an excess of moisture or frost, in order that it may weather well.

In the following table the distribution of wage-earners, according to daily rates of pay, is shown for the several classes of employees. The number receiving certain specified rates is given for each class, and also the percentages which these numbers form of the total number in their respective classes:

TABLE 21.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1] 10,448	100.0	529	100.0	241	100.0	478	100.0	7,117	100.0	76	100.0	2,007	100.0
Less than 0.50	4	(2)									4	5.3		
0.50 to 0.74	40	0.4	3	0.6			1	0.2	9	0.1	26	34.2	1	0.1
0.75 to 0.99	60	0.6	3	0.6	1	0.4	6	1.3	20	0.3	25	32.9	5	0.2
1.00 to 1.24	292	2.8	12	2.3	2	0.8	10	2.1	125	1.8	18	23.7	125	6.2
1.25 to 1.49	1,195	11.4	12	2.3	13	5.4	20	4.2	587	8.3	2	2.6	561	28.0
1.50 to 1.74	2,437	23.3	50	9.4	18	7.5	34	7.1	1,569	22.0			766	38.1
1.75 to 1.99	1,796	17.2	31	5.8	178	73.9	142	29.7	1,177	16.5	1	1.3	267	13.3
2.00 to 2.24	2,215	21.2	236	44.6	20	8.3	89	18.6	1,697	23.8			173	8.6
2.25 to 2.49	484	4.6	46	8.7	4	1.7	36	7.6	328	4.6			70	3.5
2.50 to 2.74	446	4.3	68	12.8	3	1.2	51	10.7	293	4.1			31	1.5
2.75 to 2.99	259	2.5	22	4.2	1	0.4	24	5.0	211	3.0			1	0.1
3.00 to 3.24	654	6.3	34	6.4			44	9.2	573	8.1			3	0.2
3.25 to 3.49	110	1.1	7	1.3			13	2.7	90	1.3				
3.50 to 3.74	314	3.0	3	0.6			3	0.6	304	4.3			4	0.2
3.75 to 3.99	26	0.2					3	0.6	23	0.3				
4.00 to 4.24	86	0.8	2	0.4	1	0.4	2	0.4	81	1.1				
4.25 and over	30	0.3							30	0.4				

[1] Includes 822 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

The range of wages for men employed in sandstone and quartzite quarries is not wide. Of the 10,448 wage-earners reported, 7,643, or 73.1 per cent, received between $1.25 and $2.24 per day. A very few, only 3.8 per cent, were paid less than $1.25, and the balance, 2,409, or 23.1 per cent, were distributed in small groups between $2.25 and $4.25. It will be noticed that there was a greater concentration of the several classes of wage-earners at a few rate groups in sandstone and quartzite quarries than in other stone quarries.

More than two-thirds of all the wage-earners were classed as quarrymen and stonecutters, 7,117 men having been reported under that head. More than six-tenths of them (62.3 per cent) were included in the three rate groups between $1.50 and $2.24. Those who received less than $1.50 per day numbered 741, and constituted 10.5 per cent of the total number, while 1,799 men, or 25.4 per cent, were distributed in small groups between $2.25 and $3.74.

The engineers, of whom 529 were reported, show a marked concentration at $2 a day, 236, or 44.6 per cent, being included in the single rate group, $2 to $2.24. For firemen an even greater concentration is shown, but at the next lower rate group; of the 241 firemen reported, 178, or 73.9 per cent, were paid between $1.75 and $1.99 per day. A wider range of wages is indicated by the figures for machinists and other mechanics. For them, too, the greatest concentration occurs in the $1.75 and $2 groups, but 14.9 per cent of them were paid less than $1.75 per day and 13.5 per cent received $3 or over.

Less than 1 per cent of the wage-earners were boys under 16 years, only 76 in all having been reported. Most of these boys were fairly well paid, 69 of them having received between 50 cents and $1.24 per day, and only 4 of them getting less than 50 cents.

Under the head of "all other wage-earners" are included 2,007 men, almost one-fifth of the total number reported. The range of wages for 1,594, or 79.4 per cent, was from $1.25 to $1.99 per day.

Supplies, materials, and miscellaneous expenses.—The comparative ease with which sandstone may be removed from the quarry bed, by the aid of modern machinery, tends largely to reduce the expenditure for supplies and materials, the cost of which in 1902 was $1,298,190. The total amount paid for miscellaneous expenses was $878,780, of which the amount paid for royalties and rent of quarrying plants formed 22.3 per cent, and rent of offices, taxes, insurance, and other sundries, 77.7 per cent.

Mechanical power.—The total primary power reported was 25,652 horsepower. Of this amount 789 steam engines contributed 24,631 horsepower, or 96 per cent; 7 gas or gasoline engines, 72 horsepower, or three-tenths of 1 per cent; 6 water wheels, 885 horsepower, or 3.5 per cent. The remainder was "other power." In addition 6 electric motors, with a total of 60 horsepower, were used during the census year by the operators who generated their own electricity.

Production.—The annual production of sandstones and quartzites from 1890 to 1902 is shown in the following table:

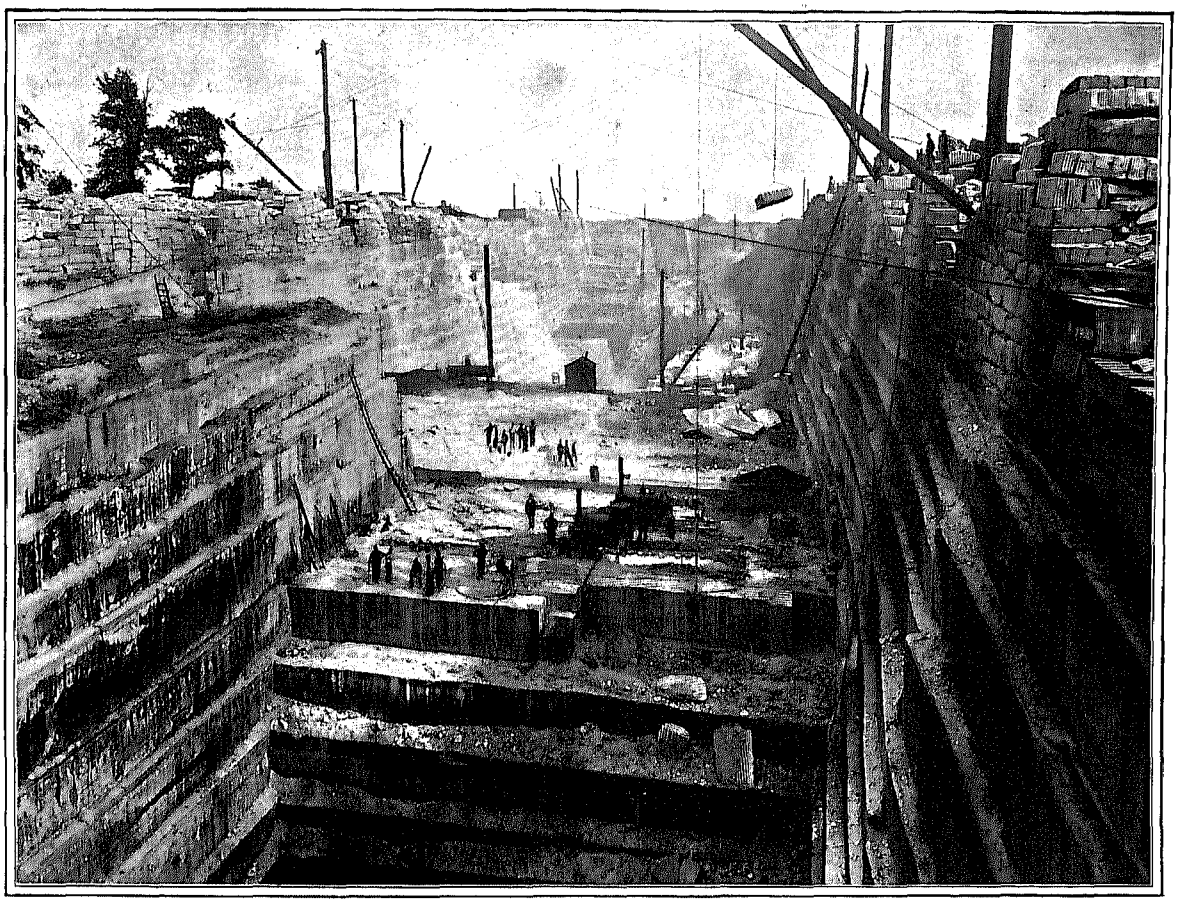


PLATE VI.—FIG. 1. VIEW NEAR WESTERN END OF GREAT CANYON SANDSTONE QUARRY, AMHERST, OHIO.

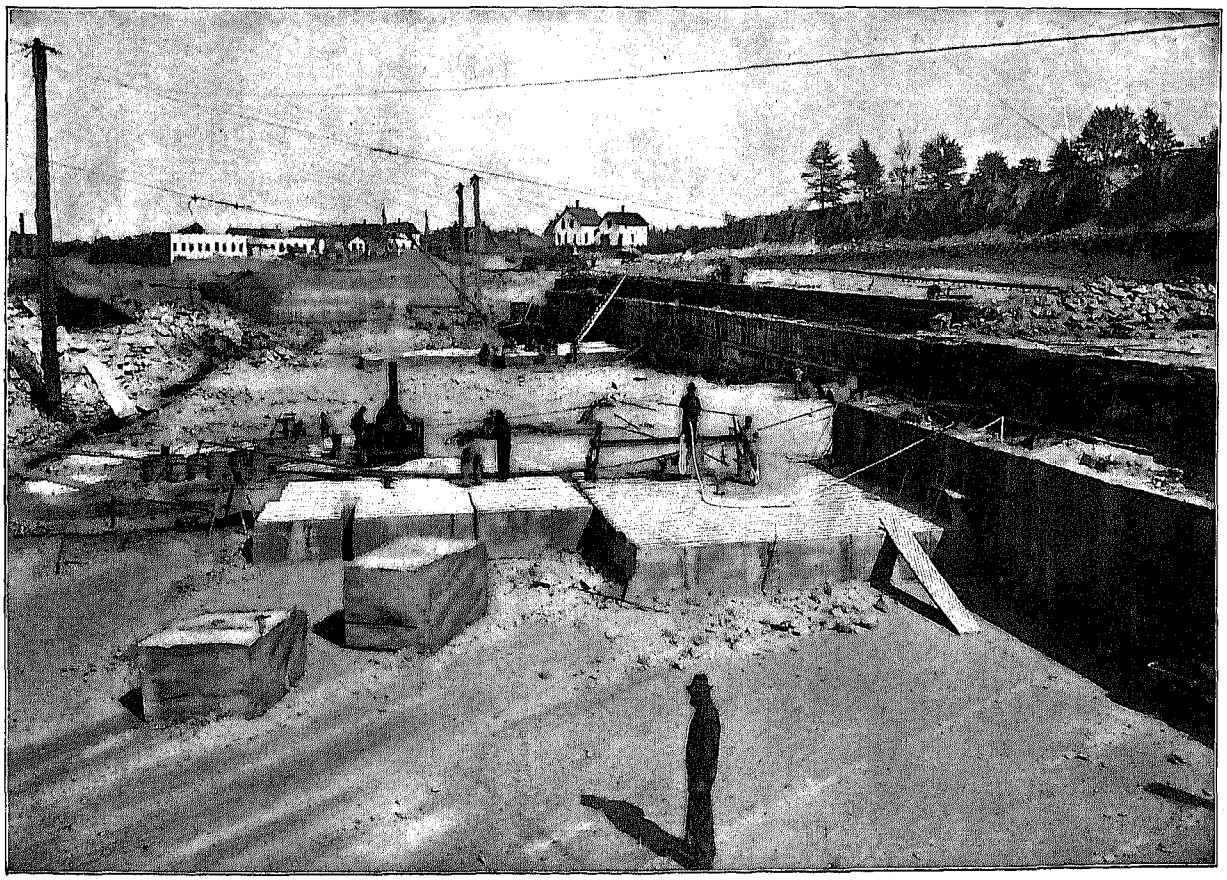


PLATE VI.—FIG. 2. VIEW OF SANDSTONE QUARRY AT BEREA, OHIO.

TABLE 22.—*Value of annual production of sandstones and quartzites: 1890 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Total.	YEAR.	Total.
1890	$12,505,663	1897	$4,965,445
1891	10,200,000	1898	5,724,412
1892	9,915,500	1899	5,739,954
1893	5,295,151	1900	[1]6,471,384
1894	4,855,847	1901	[1]8,138,680
1895	4,961,314	1902	[1]10,601,171
1896	4,773,199		

[1] Does not include grindstones and whetstones.

The minimum production for the thirteen years was reached in 1896, when the product was valued at $4,773,199. The maximum was in 1890, when the value of the product was $12,505,663, or $1,904,492 more than the value for 1902.

The following table shows the value of products, classified by uses, from 1899 to 1902:

TABLE 23.—*Sandstones and quartzites, classified by uses: 1899 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	VALUE OF PRODUCT.			
	Building.		Flagging.	All other uses.
	Rough.	Dressed.		
1899	$1,998,032	$2,003,523	[1]$1,487,810	$236,030
1900	1,778,322	2,207,699	[1]2,071,887	413,476
1901	.....	[2]4,875,973	1,026,499	2,236,208
1902	3,119,236	2,888,248	1,142,699	3,450,988

[1] Includes curbing. [2] Includes rough building.

Of the $10,601,171 given as the total value of products in 1902, $6,007,484 was the value of the stone used for building purposes, the remainder being the value of the stone disposed of as riprap, rubble, paving, flagging, and crushed stone for road ballast, etc. A comparatively small amount was crushed and utilized as sand for glassmaking, as noted under "silica sand."

A comparison of the figures for 1889 and 1902 shows that the values increased more than elevenfold in Arizona and Texas, about sixfold in Idaho, fivefold in Wyoming, threefold in Arkansas and West Virginia, and twofold or more in California, Minnesota, Montana, Tennessee, and Utah. In 14 states the values decreased during these years. The largest per cents of decrease are as follows: New Mexico, 93; Connecticut, 86; Iowa, 81; Colorado, 70; Missouri, 63; and Washington, 59. There was a falling off of over 30 per cent in New Jersey and Ohio, and for Kansas, Massachusetts, and New York the decrease was between 25 and 30 per cent.

For comparative purposes the following table is given, showing the rank in value of product by states and territories for 1902 and 1889:

TABLE 24.—*Sandstones and quartzites, by principal states and territories ranked by value of product: 1902 and 1889.*

STATE OR TERRITORY.	1902		1889	
	Value.	Rank.	Value.	Rank.
Pennsylvania	$2,800,108	1	$1,986,894	3
Ohio	2,078,754	2	3,046,656	1
New York	1,408,699	3	2,005,740	2
Massachusetts	487,366	4	649,097	6
California	462,328	5	175,598	11
West Virginia	423,532	6	140,687	14
New Jersey	406,726	7	605,859	7
Colorado	366,161	8	1,224,098	4
Minnesota	347,472	9	131,979	15
Wisconsin	207,086	10	183,958	10
Michigan	188,073	11	246,570	8
Texas	165,565	12	14,651	27
Connecticut	128,579	13	920,061	5
Kentucky	128,470	14	117,940	16
South Dakota	110,789	15	93,570	17
Arizona	107,910	16	9,146	29
Kansas	105,509	17	149,289	13
Utah	105,011	18	48,306	20
Wyoming	90,691	19	16,760	26
Arkansas	85,917	20	25,074	24
Montana	85,152	21	31,648	23
Missouri	56,990	22	155,557	12
Alabama	42,706	23	43,965	22
Indiana	37,593	24	43,983	21
Illinois	32,200	25	17,896	25
Washington	30,725	26	75,936	19
Maryland	15,405	27	10,605	28
Iowa	15,061	28	80,251	18
Idaho	13,777	29	2,490	31
New Mexico	12,291	30	186,804	9
Tennessee	7,670	31	2,722	30
Nevada	6,115	32	.....	.....

A detailed summary showing the statistics of the industry for 1902 is given in Table 40.

Occurrence.—The sandstones are among the most variable and widely distributed of American building material. Those which have been most sought on account of their color and working qualities are the red-brown Triassic stones of the eastern United States, the light-gray to buff Carboniferous stones of the Mississippi valley, of which the so-called "Berea grit" is a familiar type, and the New York and Pennsylvania bluestones, utilized mainly for flagging purposes.

The sandstones are for the most part comparatively easy to work and, next to the granites, have been more generally employed for structural purposes than any other of our natural building materials. They are found interstratified with rocks of all geological horizons from the Cambrian down to the Tertiary and occupying all positions with relation to horizontality. In the mountainous regions the deposits are naturally more or less distorted and occupy more or less inclined positions. In the region of the Mississippi valley, where the geological agencies have been much less violent, the beds retain their original horizontal position and afford admirable facilities for quarry operations upon a large scale. It is upon these beds that some of the largest quarries in the country have been opened. Figures 1 and 2, Plate VI, show the position of the stone and the remarkable natural facilities for extraction as well as the great amount of development which has taken place at Amherst and Berea, Ohio.

SILICA SAND.

Silica or siliceous sand includes not only sand suitable for the manufacture of glass, but also a large quantity designated as engine and furnace sand and sand for other uses, it being impossible to separate the statistics. Of the value of product, $50,811 is for sand produced at regular sandstone quarries, being the waste or scrap stone crushed. In such instances the statistics of salaries, wages, and other expenditures, not being separable, have been included with those for sandstones and quartzites. At the census of 1880, glass sand was separately reported. Thirty-three mines were shown, at which 332 employees received wages amounting to $96,598, and the value of the product was $239,095. At the Eleventh Census, "sand for glass" was included with sandstone.

The following table is a summary for 1902:

TABLE 25.—*Summary: 1902.*

Number of quarries	26
Number of operators	20
Salaried officials, clerks, etc.:	
Number	35
Salaries	$27,228
Wage-earners:	
Average number	335
Wages	$149,114
Contract work	100
Miscellaneous expenses	$18,776
Cost of supplies and materials	$38,386
Product:	
Quantity (short tons)	445,903
Value	[1] $421,289

[1] The United States Geological Survey reports under "glass sand" (which is not included with the statistics for stone) 943,185 short tons, valued at $807,797, which includes glass sand obtained from banks. Census figures include only the sand produced at sandstone quarries by crushing the rock.

Of the 26 quarries, 10 were in Ohio, 14 in Pennsylvania, and 2 in West Virginia, the statistics of the last named being included with those of Pennsylvania to avoid disclosing the business of individual operators. These quarries were controlled by 20 operators, 5 of whom were individuals, 5 firms, and 10 incorporated companies; 7 of these companies were reported from Pennsylvania.

Employees and wages.—The 335 wage-earners constituted 90.5 per cent of the salaried employees and wage-earners, and the $149,114 paid as wages was 84.6 per cent of the total salaries and wages. The average number of wage-earners employed each month is shown in the detailed summary, Table 41. The greatest number, 380, was reported for September, and the least, 264, for February. This table shows also the average number of wage-earners at specified daily rates of pay by occupations. Of the 335 wage-earners, 261, or 77.9 per cent, were reported as receiving from $1.25 to $1.74 per day. There were 149, or 44.5 per cent, employed as quarrymen at rates ranging from 75 cents to $2.24 per day. The crushing of the stone entailed the employment of a large number of laborers and other workmen, who were reported as "all other wage-earners" and numbered 154, or 46 per cent, of the total. Silica sand is the only subdivision of the stone industry in which no boys under 16 years of age were reported.

Supplies, materials, and miscellaneous expenses.—Supplies and materials costing $38,386 were reported, $13,598, or 35.4 per cent of the total, having been expended in Ohio. The miscellaneous expenses amounted to $18,776, of which $8,373, or 44.6 per cent, was for royalties and rent of quarrying plants, and $10,403, or 55.4 per cent, for rent of offices, insurance, and other sundries. Of the total, $11,210, or 59.7 per cent, was reported from Pennsylvania and West Virginia, and $7,566, or 40.3 per cent, from Ohio.

Mechanical power.—The total power owned was reported as 2,000 horsepower, of which 805 was reported from Ohio and 1,195 from Pennsylvania. Of this total, 1,980 horsepower was supplied by 33 steam engines, 16 of which were in Ohio.

Production.—The United States Geological Survey has not published annual statistics of glass sand except for 1885 and 1902, and these statistics are not comparable with those of the census, because they include sand from pits and banks as well as that crushed at sandstone quarries.

Chief among the sand producing states, in 1902, was Pennsylvania, where sand was found in all forms. This state was followed closely by Ohio, where deposits were generally those of sandstone requiring crushing and screening. A small quantity was reported from West Virginia.

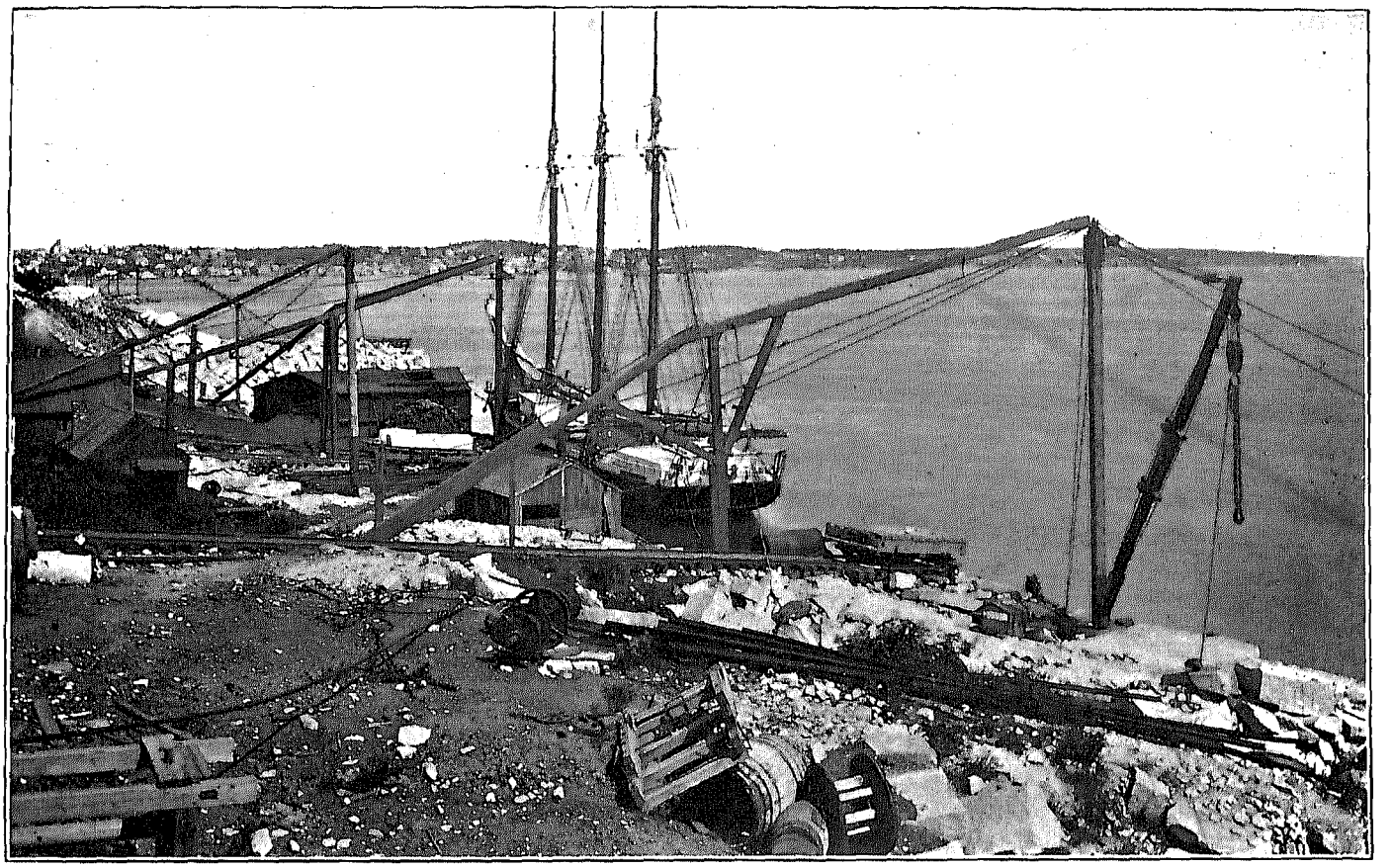
The 16 quarries shown for Pennsylvania (including the 2 in West Virginia) produced 312,982 tons, or 70.2 per cent of the total production, the value being $269,015, or 63.9 per cent of the total value. Of this amount, 127,520 tons, valued at $105,367, was glass sand; 31,500 tons, valued at $24,000, building sand; 15,241 tons, valued at $18,896, furnace sand; and 138,721 tons, having a value of $120,752, was consumed for other purposes.

The 10 quarries in Ohio produced 132,921 tons, or 28.1 per cent of the total quantity; the value was $152,274, or 36.1 per cent of the total value. Of this quantity, 60,396 tons, valued at $59,348, was furnace sand; 20,036 tons, valued at $24,896, glass sand; 3,750 tons, valued at $3,000, engine sand; and 48,739 tons, valued at $65,030, was used for other purposes.

Occurrence.—Silica or siliceous sand is known to exist in several states as a sandstone, requiring crushing and screening; as a stone that readily disintegrates when exposed to the action of the elements, and needs only washing or burning to reduce the amount of organic matter and other impurities; or as beds of pure sand, requiring no treatment to prepare it for use.

Sand used in the manufacture of glass consists mainly of silica with alumina, and it may be iron, soda, lime, and potash in small and varying quantities. The value of the sand depends on its freedom from such impurities as tend to produce a discoloration of the glass.

A summary presenting detailed statistics of the silica sand industry, by states, for 1902, is given in Table 41.



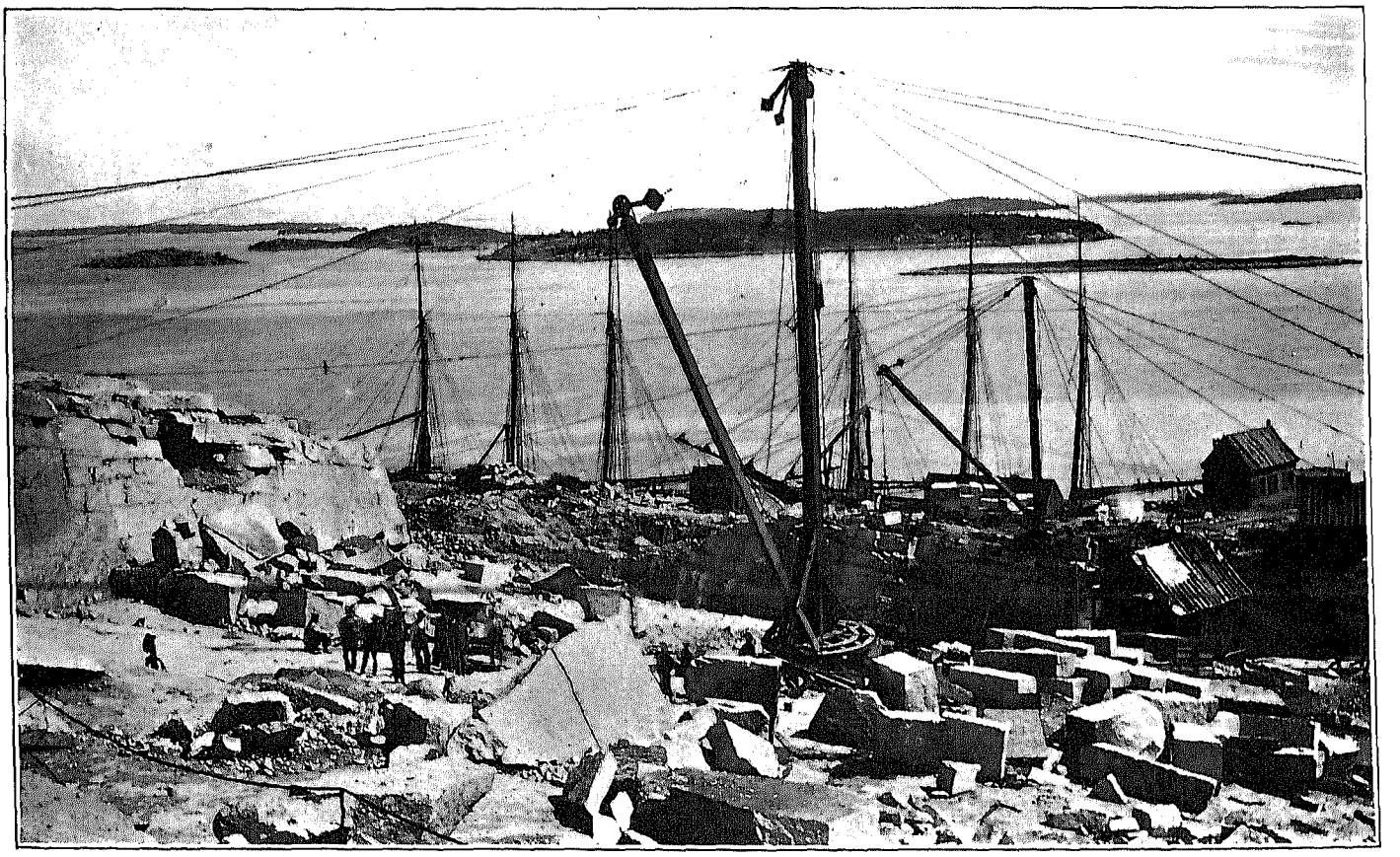


PLATE VII.—GRANITE QUARRY AT CROTCH ISLAND, MAINE (TWO VIEWS).

PLATE VIII.—STEAM DRILL USED IN STONE QUARRYING.

SILICEOUS CRYSTALLINE ROCKS.

Under this classification is grouped a somewhat variable series of rocks, including not merely the true granites, but also the gneisses (the so-called striped, stratified, or bastard granites of the quarrymen), the syenites, the black granites or traps (diabases and gabbros), diorites, basalts, and andesites, and, in a few instances, the mica schists.

The varying mineral character and structural features of these rocks are noted below:

Granite.—A crystalline, granular, massive rock, consisting essentially of quartz, orthoclase, and mica or hornblende, with other minerals, as apatite and magnetite occurring in microscopic quantities.

Gneiss.—A rock differing from granite in that the various constituents are arranged in more or less parallel layers, giving the rock a banded or foliated appearance. It is often called stratified or bastard granite by the quarrymen.

Syenite.—A rock, limited in quantity, differing from granite only in the absence of quartz as an essential constituent, i. e., one consisting of orthoclase with one or more of the minerals of the mica, amphibole, or pyroxene group.

Elaeolite (nepheline) syenite.—A rock differing from syenite in that the mineral elaeolite (nepheline) wholly or in part replaces the feldspar. The "granite" near Hot Springs, Ark., is a good example of this rock.

Diabase and gabbro.—Rocks consisting essentially of augite or hypersthene and plagioclase feldspars with accessory apatite, magnetite, and frequently black mica. These are hard and massive rocks, often very dark gray to almost black in color, and in the case of the gabbro at Pleasant river, Me., known as black granite. In the majority of cases they are used only for road material.

Diorite.—A rock consisting essentially of hornblende or mica and plagioclase feldspar with other minerals in smaller proportions. In America this rock is little used for building material.

Basalt.—A lava composed essentially of augite and plagioclase feldspar. It occurs mainly in the Western states.

Andesite.—A rock composed of augite or hornblende and plagioclase feldspar. It is a lava, and its occurrence is limited mainly to the Western states.

Mica schist.—A rock composed essentially of quartz and mica, but with a pronounced schistose structure. It is little used for general building owing, in part, to its poor working qualities.

The statistics for siliceous crystalline rocks were separately presented at the censuses of 1880 and 1889. In the following table the statistics for these years and those for 1902 are shown for the purpose of comparison:

TABLE 26.—*Comparative summary: 1880 to 1902.*

	1902	1889	1880
Number of quarries	906	874	313
Number of operators	853	814	(1)
Salaried officials, clerks, etc.:			
Number	1,377	[2] 222	(1)
Salaries	$1,227,885	(3)	(1)
Wage-earners:			
Average number	18,836	[2] 22,091	[4] 11,477
Wages	$11,072,996	[3] $9,620,485	(1)
Miscellaneous expenses	$810,206	$437,051	(1)
Cost of supplies and materials	$2,493,065	$1,446,485	[5] $70,397
Value of product	$18,257,944	$14,464,095	$5,188,998

[1] Not reported.
[2] Foremen included in wage-earners.
[3] Salaries included in wages.
[4] Greatest number employed.
[5] Value of explosives.

The increase in the number of quarries was 561, or 179.2 per cent, from 1880 to 1889, and 32, or 3.7 per cent, from 1889 to 1902. This difference in percentage of increase is due partly to the tendency toward combination noted in the discussion of Table 2. The value of the product of these quarries increased $9,275,097, or 178.7 per cent, from 1880 to 1889, and $3,793,849, or 26.2 per cent, from 1889 to 1902.

Development work was reported at 4 quarries located 1 each in California, Connecticut, Missouri, and New York. These quarries were controlled by 4 operators, 3 of them being incorporated companies. The capital stock and bonds issued by 2 of these companies amounted to $19,500. These 4 quarries gave employment to 83 wage-earners, who received $44,640 in wages.

There were 313 quarries reported idle during 1902. These were controlled by 313 operators.

Employees and wages.—The total number of salaried officials, clerks, etc., and wage-earners was 20,213, and they received $12,300,881 in salaries and wages. The wage-earners formed 93.2 per cent of this number, and their wages amounted to 90 per cent of the total.

Table 27 presents the average number of wage-earners employed during each month.

TABLE 27.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	12,442
February	12,828
March	14,933
April	18,882
May	20,350
June	21,589
July	22,678
August	22,843
September	22,331
October	22,019
November	19,348
December	15,789

The foregoing table shows that the number of employees was greatest in August, when 22,843 wage-earners were given employment, and the least in January, for which month 12,442 were reported. This

inconstancy of operation is explained in the discussion of Table 4.

The following table shows, for the several classes of employees, the number receiving certain specified rates of pay, and also the percentages which these numbers form of the total number in the class:

TABLE 28.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1] 18,836	100.0	658	100.0	164	100.0	1,094	100.0	14,474	100.0	206	100.0	2,240	100.0
Less than 0.50	37	0.2	.....	.....	.....	.....	.....	.....	.....	.....	36	17.5	1	([2])
0.50 to 0.74	133	0.7	1	0.2	3	1.8	1	0.1	52	0.4	56	27.2	20	0.9
0.75 to 0.99	573	3.0	5	0.8	7	4.3	9	0.8	350	2.4	49	23.8	153	6.8
1.00 to 1.24	1,282	6.8	11	1.7	6	3.7	18	1.6	958	6.6	59	28.6	230	10.3
1.25 to 1.49	2,096	11.1	17	2.6	18	11.0	25	2.3	1,583	10.9	5	2.4	448	20.0
1.50 to 1.74	3,546	18.8	53	8.0	25	15.2	73	6.7	2,655	18.3	1	0.5	739	33.0
1.75 to 1.99	3,046	16.2	89	13.5	33	20.1	85	7.8	2,648	18.3	.....	.....	190	8.5
2.00 to 2.24	2,483	13.2	225	34.2	32	19.5	199	18.2	1,758	12.2	.....	.....	269	12.0
2.25 to 2.49	692	3.7	96	14.6	9	5.5	107	9.8	435	3.0	.....	.....	45	2.0
2.50 to 2.74	1,141	6.1	93	14.1	23	14.0	185	16.9	814	5.6	.....	.....	26	1.2
2.75 to 2.99	1,364	7.2	20	3.0	4	2.5	172	15.7	1,163	8.0	.....	.....	5	0.2
3.00 to 3.24	1,608	8.5	37	5.6	2	1.2	158	14.4	1,318	9.1	.....	.....	93	4.2
3.25 to 3.49	480	2.5	3	0.5	2	1.2	38	3.5	428	3.0	.....	.....	9	0.4
3.50 to 3.74	199	1.1	4	0.6	.....	.....	15	1.4	175	1.2	.....	.....	5	0.2
3.75 to 3.99	23	0.1	4	0.6	.....	.....	.....	.....	18	0.1	.....	.....	1	([2])
4.00 to 4.24	125	0.7	.....	.....	.....	.....	9	0.8	110	0.8	.....	.....	6	0.3
4.25 and over	9	0.1	.....	.....	.....	.....	.....	.....	9	0.1	.....	.....	.....	.....

[1] Includes 528 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

The figures presented in the above table indicate a wide range in the daily rates of pay. Of the total number reported, 743, or 3.9 per cent, received less than $1 per day, and 836, or 4.5 per cent, received $3.25 per day or over. For the remaining 17,257 wage-earners, constituting 91.6 per cent of the total number, the range of wages was from $1 to $3.24 per day.

About three-fourths (76.8 per cent) of all the wage-earners reported were classified as quarrymen and stonecutters. Their rates conform very closely to those for all occupations combined, 92 per cent of the total number having received between $1 and $3.24 per day, as compared with 91.6 per cent for all occupations combined. An examination of the figures for quarrymen and stonecutters shows a marked concentration at the rates from $1.25 to $2.24 per day, then a slight falling off, and again a concentration for the rates from $2.75 to $3.24 per day. This indicates the difference between the rates paid to quarrymen and those paid to stonecutters, who are more skilled than the quarrymen.

There were 658 engineers reported, of whom 503, or 76.4 per cent, received between $1.75 and $2.74 per day. The range of wages for 65.8 per cent of the firemen was from $1.25 to $2.24 per day, 9.8 per cent having received less than $1.25, and 24.4 per cent, $2.25 or over. Rates were considerably higher for machinists and other mechanics, three-fourths of them having been paid from $2.00 to $3.24 per day.

The number of boys under 16 years reported was 206, of whom 91 were in the New England states and 46 were in South Carolina and Georgia. The rates of pay for 164 of these boys were between 50 cents and $1.24 per day; of the others, 36 received less than 50 cents and 6 received $1.25 or over.

The group of "all other wage-earners" includes 2,240 men, or 11.9 per cent of the total number of wage-earners reported. The range of wages for 2,029 of them was from 75 cents to $2.24 per day. The number receiving $1.50 per day was probably greater than that at any other rate, since the wage group, $1.50 to $1.74, includes a much larger number than is included in any other group.

Supplies, materials, and miscellaneous expenses.—The total cost of supplies and materials was $2,493,065. Of this amount $509,702, or 20.5 per cent, was expended in Massachusetts; $272,888, or 10.9 per cent, in Vermont; and $217,548, or 8.7 per cent, in Maine. Smaller amounts were reported from the other states.

The amount paid for royalties and rent of quarrying plants was $194,892, or 24.1 per cent of the total, and $615,314, or 75.9 per cent, was paid for rent of offices, taxes, and other sundries.

Mechanical power.—Primary power aggregating 46,986 horsepower was reported; 44,189, or 94 per cent, was applied through 950 steam engines; 275, or six-tenths of 1 per cent, was generated by 26 gas or gasoline engines; and 1,506, or 3.2 per cent, by 15 water wheels. Under "other power," 510 horsepower, or 1.1 per cent, was reported. The rented horsepower was 506, or 1.1 per cent, of which 471 was electric. In addition, 23 electric motors, having a capacity of 442 horsepower, were owned by the operators reporting them.

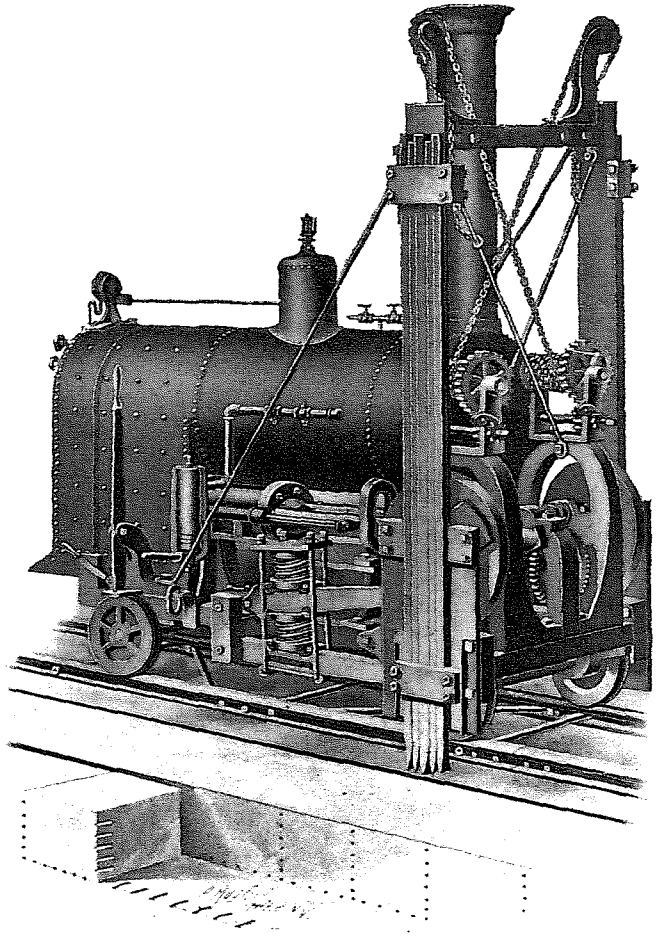


PLATE IX.—DOUBLE GANG MARBLE AND LIMESTONE CHANNELING MACHINE.

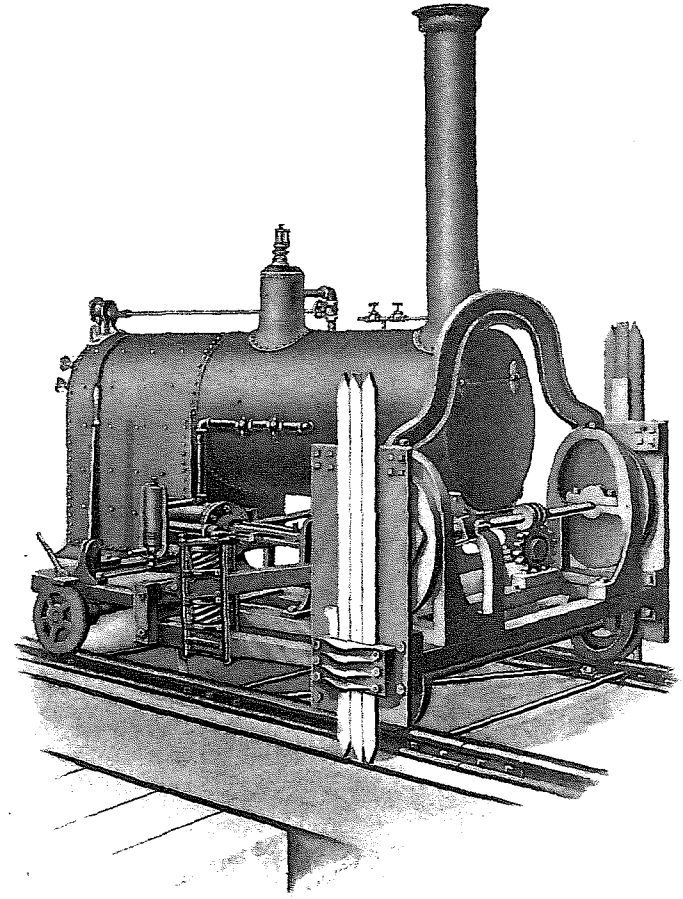


PLATE X.—DOUBLE GANG SANDSTONE CHANNELING MACHINE.

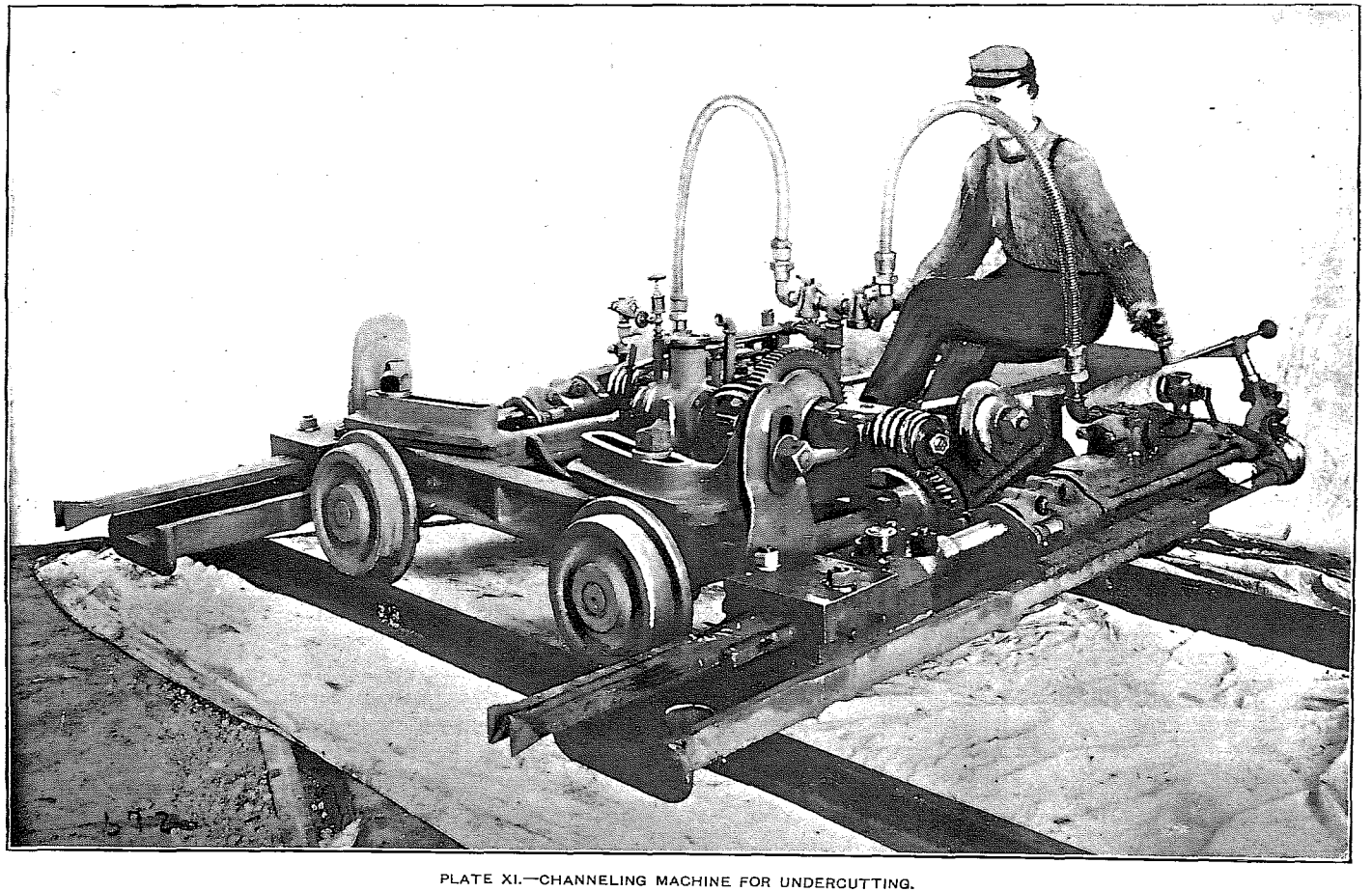


PLATE XI.—CHANNELING MACHINE FOR UNDERCUTTING.

Production.—The following table shows the production of siliceous crystalline rocks, classified by uses, 1896 to 1902:

TABLE 29.—VALUE OF ANNUAL PRODUCTION OF SILICEOUS CRYSTALLINE ROCKS, CLASSIFIED BY USES: 1896 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	VALUE OF PRODUCT.						
	Rough, all uses.	Dressed.		Made into paving blocks.	Curbing.	Crushed, all uses.	All other uses.
		Building.	Monumental.				
1896	$2,232,682	$2,232,077	$1,437,065	$1,231,729	$166,392	$514,550	$130,499
1897	2,363,031	2,565,636	1,414,502	1,140,417	160,195	991,867	269,427
1898	1,826,865	1,874,980	1,462,598	854,151	583,407	1,592,925	1,129,480
1899	2,351,931	2,625,289	1,687,967	969,499	545,655	2,044,797	1,393,201
1900	2,455,276	3,233,224	1,598,842	1,006,296	593,209	2,571,899	1,216,871
1901	3,486,574	3,781,294	1,457,557	1,821,431	670,703	3,003,443	1,755,959
1902	[1] 4,433,152	4,859,750	2,284,765	1,523,776	823,846	3,211,780	1,120,885

[1] Includes building stone valued at $2,175,082, monumental stone valued at $1,714,156, and stone for other uses valued at $543,914.

Of the total value of product, $18,257,944, in 1902, a value of $7,034,832 was used for building purposes and $3,998,911 for monumental work. The remaining material to the value of $7,224,201 was utilized for a variety of purposes, but especially for paving blocks and as crushed stone for macadam. The introduction of machinery has rendered possible the utilization of the granites and other hard rocks in monumental work to an extent that was quite impossible when the stone was dressed by hand. The use of stone for macadam is largely a development of the past twenty years, and the demand for it for this purpose has caused the great increase in the number of quarries of trappean rock. This demand for crushed stone likewise enables the quarries worked mainly for building or monumental stone to dispose of their waste. The material used for macadam depends, however, to a considerable extent on the kind of rock that is available in neighboring sources. While the trappean rocks have proved most desirable for this purpose, the total absence of material of this type from the great interior Mississippi valley has caused the substitution largely of limestone and, in some cases, of sandstone.

The following table shows the value of product of siliceous crystalline rocks from 1890 to 1902:

TABLE 30.—*Value of annual production of siliceous crystalline rocks: 1890 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	Value of product.	YEAR.	Value of product.
1890	$14,464,095	1897	$8,905,075
1891	13,867,000	1898	9,324,406
1892	12,642,000	1899	11,618,339
1893	8,808,934	1900	12,675,617
1894	10,029,156	1901	15,976,961
1895	8,894,828	1902	18,257,944
1896	7,944,994		

The value of the product decreased from 1890 to 1894, then increased, declining again in 1895 and 1896, since which time it has constantly increased.

As shown in Table 42, there were 204 quarries in Massachusetts and 110 in Maine. The number of quarries in the other states varied from 74 in Vermont to 1 each in Arizona and Nevada. Indian Territory also reported 1. In the following comparative table the values of the products for 1902, 1889, and 1880 are given, and the states are ranked according to these values.

TABLE 31.—*Production of siliceous crystalline rocks, by principal states ranked by value of product: 1902, 1889, and 1880.*

STATE.	1902		1889		1880	
	Value.	Rank.	Value.	Rank.	Value.	Rank.
Massachusetts	$3,451,397	1	$2,503,503	1	$1,329,315	1
Maine	2,659,450	2	2,225,839	2	1,175,286	2
Vermont	1,570,423	3	581,870	9	59,675	13
New Hampshire	1,147,097	4	727,531	7	303,066	6
California	1,137,679	5	1,329,018	3	172,450	9
New Jersey	948,474	6	425,673	12	99,000	11
Connecticut	812,141	7	1,061,202	4	407,225	4
Georgia	803,778	8	752,481	6	64,480	12
Maryland	758,203	9	447,489	11	224,000	7
Rhode Island	734,623	10	931,216	5	623,000	3
Pennsylvania	661,062	11	623,252	8	211,454	8
New York	651,014	12	222,773	17	10,000	17
South Carolina	598,848	13	47,614	20	.....	.....
Minnesota	478,989	14	356,782	13	13,075	15
Wisconsin	369,187	15	266,095	16	.....	.....
North Carolina	338,750	16	146,627	19	.....	.....
Virginia	282,046	17	332,548	14	331,928	5
Delaware	276,753	18	211,194	18	12,600	16
Missouri	157,708	19	500,642	10	110,000	10
Washington	147,273	20	.....	.....	1,044	18
Montana	77,050	21	.....	.....	.....	.....
Colorado	66,023	22	314,673	15	41,400	14
Texas	60,003	23	22,550	22	.....	.....
Oregon	38,429	24	44,150	21	.....	.....
Arkansas	12,115	25	.....	.....	.....	.....
Utah	1,479	26	8,700	23	.....	.....

Massachusetts and Maine occupied in 1902 the same relative position that they held at the Tenth and Eleventh censuses. California, however, dropped from the third to the fifth place in the list, while Vermont advanced from the ninth to the third, and New Hampshire from the seventh to the fourth. The changes in rank are due in some cases to a decrease in production, as in the case of California, and in others to an increase, as in the case of Vermont and New Hampshire. Georgia, which made such a remarkable increase between

the Tenth and Eleventh censuses, causing it to advance from twelfth to sixth in rank, has dropped to eighth, although there has been an actual increase in the product.

The detailed statistics of the industry for 1902 are given in Table 42.

During the early history of the industry, when railroads were few, transportation of material as heavy as stone was largely by water. Hence it naturally followed that quarries situated close to the water's edge, like those of Vinalhaven and Crotch Island, Me. (see Plate VII), had a great advantage, and for a long time practically controlled the market. With the multiplicity of railroads, however, and the growing demand of inland cities remote from waterways, inland quarries at first wholly inaccessible have become important factors, and as a consequence the coast states have, to a considerable extent, lost prestige.

Of the quarries developed during the last decade, on account of the quality as well as quantity of material they furnish, those in the vicinity of Barre, Vt., and Montello, Wis., are of greatest interest. The quarry near Montello furnishes a beautiful, compact, dark red-brown granite admirably adapted for monumental work.

SLATE.

The materials brought together in this report under the head of slate are argillaceous rocks, which, through the process of shearing and incidental chemical activity, have undergone a partial metamorphism, resulting in the development of a pronounced tendency to split along certain planes, which may or may not be parallel with the original bedding, into thin sheets suitable for roofing purposes. It is necessarily a consequence that such are restricted to the regions of pronounced earth movements, such as have resulted in the formation of mountain ranges.

The decrease in the number of quarries since 1889 has not been attended by a decrease in any of the other items and is largely due to consolidation of interests.

The apparent decrease in the number of wage-earners is due to the methods employed by the various censuses in finding the average and in part to the introduction of machinery. The steady increase in the amount paid as wages indicates that the difference shown in the "average number" is not due to an actual decrease in the number of wage-earners. The production increased $2,213,538, or 63.6 per cent, from 1889 to 1902.

Census statistics for slate quarries were shown as early as 1850, when the value of product was reported as $29,056, the number of quarries being 5. At the census of 1860, there were 22 quarries, with a production valued at $287,150. The census of 1870 was the first at which the mining industries were separately shown. The following comparative summary includes the statistics from 1870 to 1902:

TABLE 32.—*Comparative summary: 1870 to 1902.*

	1902	1889	1880	1870
Number of quarries	199	212	94	(1)
Number of operators	174	(1)	(1)	[2]101
Salaried officials, clerks, etc.:				
Number	437	[3]75	(1)	(1)
Salaries	$334,879	(4)	(1)	(1)
Wage-earners:				
Average number	5,920	[3]6,095	[5]3,033	1,749
Wages	$3,177,459	[4]$2,218,982	(1)	$815,731
Miscellaneous expenses	$446,145	$261,026	(1)	(1)
Cost of supplies and materials	$680,361	$282,114	[6]$32,799	$119,501
Value of product	$5,696,051	$3,482,513	$1,529,985	$1,311,492

[1] Not reported.
[2] Establishments.
[3] Foremen included in wage-earners.
[4] Salaries included in wages.
[5] Greatest number employed.
[6] Value of explosives.

There were 3 quarries, all in Pennsylvania, for which development work was reported for 1902. One salaried employee received a salary of $900 and 13 wage-earners were paid $4,952 in wages.

The total capital stock and bonded indebtedness in the slate industry amounted to $11,323,565, of which Pennsylvania reported $3,356,940, or 29.7 per cent; Maine, $1,645,800, or 14.5 per cent; New York, $1,018,500, or 9.0 per cent; Maryland, $316,300, or 2.8 per cent; Vermont, $275,600, or 2.4 per cent; New Jersey, $77,000, or seven-tenths of 1 per cent; and all other states $4,633,425, or 40.9 per cent.

Employees and wages.—There were 6,357 salaried employees and wage-earners, who were paid $3,512,338; of this number the 5,920 wage-earners formed 93.1 per cent, and the $3,177,459 paid them in wages was 90.5 per cent of the total salaries and wages.

The following table shows the average number of wage-earners employed during each month:

TABLE 33.—*Average number of wage-earners employed during each month: 1902.*

MONTH.	Wage-earners.
January	5,265
February	5,362
March	5,468
April	5,898
May	6,136
June	6,143
July	6,302
August	6,353
September	6,344
October	6,223
November	5,947
December	5,659

The largest number of wage-earners, 6,353, was reported for August, and the least, 5,265, for January, a variation of 1,088.

In the following table, the distribution of wage-earners, according to daily rates of pay, is given by occupations:

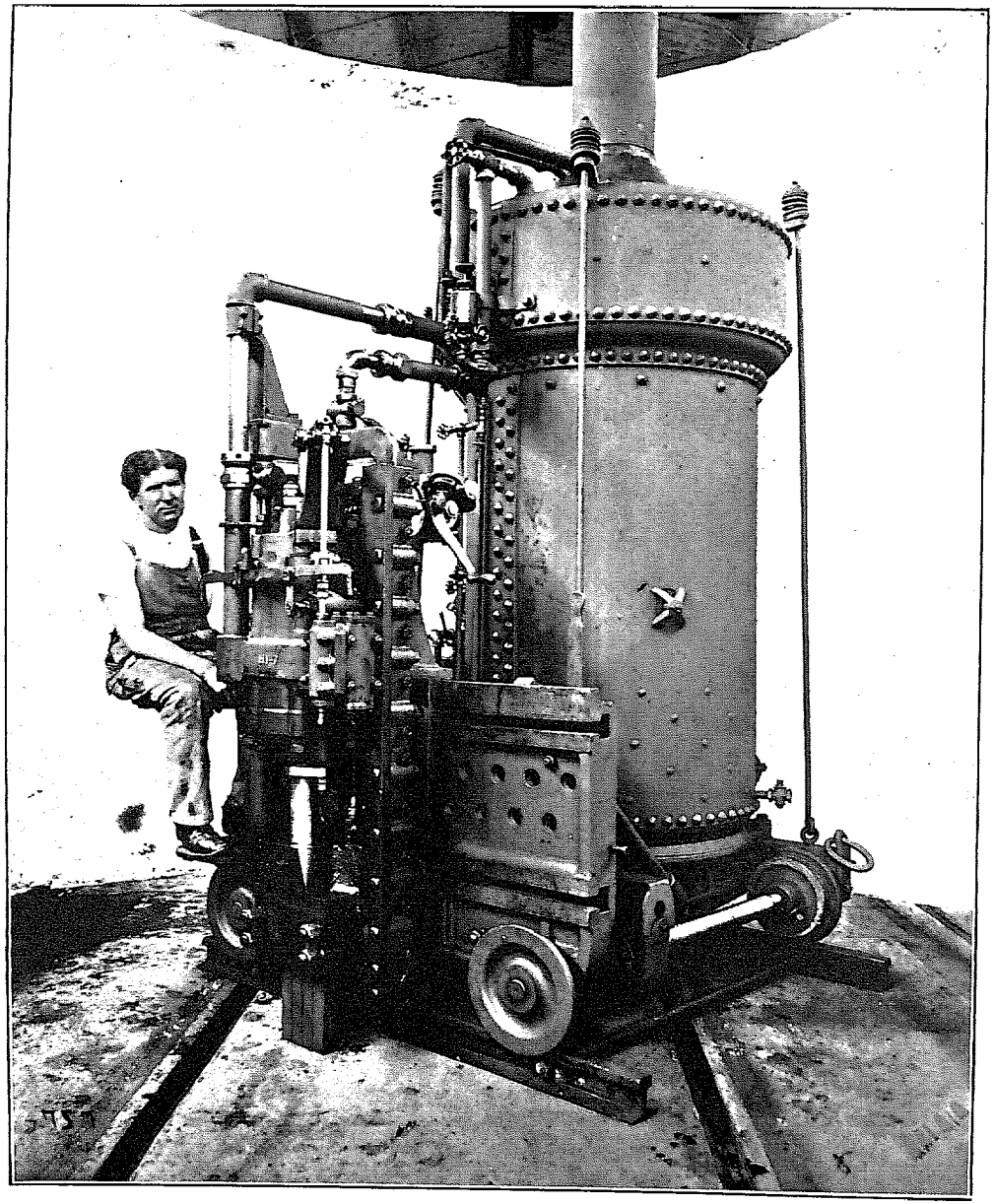


PLATE XII.—TRACK CHANNELER, WITH BOILER.

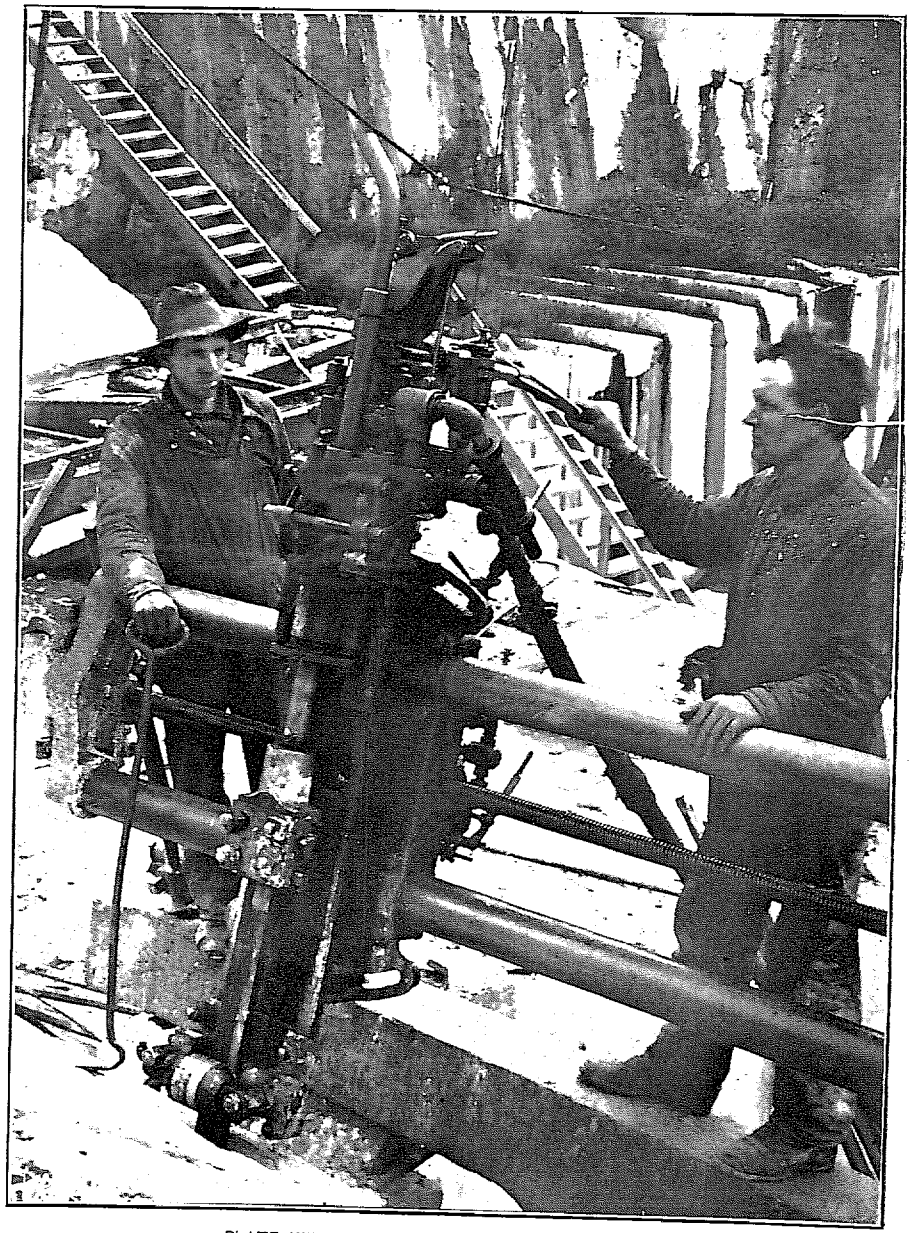


PLATE XIII.—QUARRY BAR CHANNELING MACHINE.

TABLE 34.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY OCCUPATIONS: 1902.

RATE PER DAY (DOLLARS).	ALL OCCUPATIONS.		ENGINEERS.		FIREMEN.		MACHINISTS, BLACKSMITHS, CARPENTERS, AND OTHER MECHANICS.		QUARRYMEN AND STONECUTTERS.		BOYS UNDER 16 YEARS.		ALL OTHER WAGE-EARNERS.	
	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.	Average number.	Per cent of total.
Total	[1] 5,920	100.0	279	100.0	87	100.0	137	100.0	3,656	100.0	169	100.0	1,592	100.0
Less than 0.50	7	0.1									7	4.1		
0.50 to 0.74	72	1.2							3	0.1	66	39.1	3	0.2
0.75 to 0.99	101	1.7	2	0.7					7	0.2	75	44.4	17	1.1
1.00 to 1.24	290	4.9	20	7.2	4	4.6			117	3.2	20	11.8	129	8.1
1.25 to 1.49	983	16.6	81	29.0	11	12.7	6	4.4	185	5.1	1	0.6	699	43.9
1.50 to 1.74	1,145	19.4	48	17.2	29	33.3	17	12.4	588	16.1			463	29.1
1.75 to 1.99	658	11.1	38	13.6	18	20.7	22	16.0	505	13.8			75	4.7
2.00 to 2.24	1,369	23.1	61	21.9	13	14.9	39	28.5	1,160	31.7			96	6.0
2.25 to 2.49	671	11.3	7	2.5	5	5.8	27	19.7	600	16.4			32	2.0
2.50 to 2.74	349	5.9	16	5.7	5	5.8	13	9.5	263	7.2			52	3.3
2.75 to 2.99	161	2.7	1	0.4	1	1.1	3	2.2	142	3.9			14	0.9
3.00 to 3.24	105	1.8	4	1.4			5	3.6	86	2.3			10	0.6
3.25 to 3.49	4	0.1	1	0.4	1	1.1	2	1.5						
3.50 to 3.74	4	0.1					2	1.5					2	0.1
3.75 to 3.99														
4.00 to 4.24														
4.25 and over	1	(2)					1	0.7						

[1] Includes 800 wage-earners paid in accordance with the amount of work done, for whom average daily earnings are shown.
[2] Less than one-tenth of 1 per cent.

As shown by the above table, the range of wages for practically all of the employees in slate quarries was from $1 to $2.74 per day, 5,465, or 92.3 per cent of the total number, having been reported at rates between those limits.

Quarrymen and stonecutters to the number of 3,656 were reported. Of these 2,853, or 78 per cent were paid from $1.50 to $2.49 per day. Of the remainder 302, or 8.3 per cent, received between $1 and $1.49 per day, and 491, or 13.4 per cent, received from $2.50 to $3.24. Probably a greater number were employed at $2 per day than at any other single rate, as the group $2 to $2.24 includes 1,160 men, constituting 31.7 per cent of the total number.

The range of wages for 228 engineers, 81.7 per cent of the total number reported, was between $1.25 and $2.24 per day, and of the 87 firemen, 71 were included between the same rates. The rates of pay for 118 machinists and other mechanics, out of a total of 137, were between $1.50 and $2.74 per day.

The boys under 16 years employed in slate quarries in 1902 numbered 169. Of these, 115 were reported from Pennsylvania and 38 from Vermont. The rates for 141 of these boys, constituting 83.5 per cent of the whole number, were between 50 and 99 cents per day.

The group of "all other wage-earners" formed slightly more than one-fourth of all the wage-earners reported. Their wages ranged from 50 cents to $3.74 per day, but 74.7 per cent of them received from $1.25 to $1.74, the proportion at lower or higher rates being comparatively small.

The following table shows the distribution of wage-earners according to daily rates of pay, by states:

TABLE 35.—DISTRIBUTION OF WAGE-EARNERS ACCORDING TO DAILY RATES OF PAY, BY PRINCIPAL STATES: 1902.

[Each cumulative percentage shows the proportion of the total number receiving a wage as great as, or greater than, the lowest wage of the given wage group.]

RATE PER DAY (DOLLARS).	UNITED STATES.			PENNSYLVANIA.			VERMONT.			ALL OTHER STATES.		
	Average number.	Per cent of total.	Cumulative percentage.	Average number	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.	Average number.	Per cent of total.	Cumulative percentage.
Total	5,920	100.0		3,426	100.0		1,639	100.0		855	100.0	
Less than 0.50	7	0.1	100.0	1	(1)	100.0				6	0.7	100.0
0.50 to 0.74	72	1.2	99.9	59	1.7	99.9	3	0.2	100.0	10	1.2	99.3
0.75 to 0.99	101	1.7	98.7	53	1.5	98.3	28	1.7	99.8	20	2.4	98.1
1.00 to 1.24	290	4.9	97.0	95	2.8	96.8	43	2.6	98.1	152	17.8	95.7
1.25 to 1.49	983	16.6	92.1	778	22.7	94.0	122	7.4	95.5	83	9.7	77.9
1.50 to 1.74	1,145	19.4	75.5	514	15.0	71.3	455	27.8	88.1	176	20.6	68.2
1.75 to 1.99	658	11.1	56.1	287	8.4	56.3	289	17.6	60.3	82	9.6	47.6
2.00 to 2.24	1,369	23.1	45.0	642	18.7	47.9	507	30.9	42.7	220	25.7	38.0
2.25 to 2.49	671	11.3	21.9	477	13.9	29.2	157	9.6	11.8	37	4.3	12.3
2.50 to 2.74	349	5.9	10.6	273	8.0	15.3	27	1.7	2.2	49	5.7	8.0
2.75 to 2.99	161	2.7	4.7	154	4.5	7.3	4	0.2	0.5	3	0.4	2.3
3.00 to 3.24	105	1.8	2.0	88	2.6	2.8	3	0.2	0.3	14	1.6	1.9
3.25 to 3.49	4	0.1	0.2	3	0.1	0.2	1	0.1	0.1			0.3
3.50 to 3.74	4	0.1	0.1	2	0.1	0.1				2	0.2	0.3
3.75 to 3.99			(1)									0.1
4.00 to 4.24			(1)									0.1
4.25 and over	1	(1)	(1)							1	0.1	0.1

[1] Less than one-tenth of 1 per cent.

In the above table separate statistics are presented for Pennsylvania and Vermont only. These two states gave employment to 5,065 wage-earners, or 85.6 per cent of the total number employed in slate quarries in the United States. On the whole, there was comparatively little difference between the rates of pay in the two states. The range of wages for the bulk of employees was greater in Pennsylvania than in Vermont. In the latter state 76.3 per cent of the wage-earners received between $1.50 and $2.24 per day, while in Pennsylvania only 42.1 per cent were included within those rates. In Pennsylvania, on the other hand, there were 28.7 per cent receiving less than $1.50, as compared with 11.9 per cent in Vermont, and 29.2 per cent receiving $2.25 or over, as compared with 11.8 per cent in Vermont.

The 855 wage-earners reported under "all other states" were scattered through 7 states, the number reported in the individual states being too small to warrant separate presentation. It will be seen, however, that taking these states as a group the rates of pay were lower than those for either Pennsylvania or Vermont.

Supplies, materials, and miscellaneous expenses.—The total amount expended for supplies and materials was $680,361; of this amount Pennsylvania reported 61.4 per cent; Vermont, 23.9 per cent; Maine, 4 per cent; Virginia, 3.1 per cent; Maryland, 2.6 per cent; New York, 2.4 per cent; and all other states 2.6 per cent.

Of the total miscellaneous expenses $269,267, or 60.4 per cent was paid for royalties and rent of quarrying plants, and $176,878, or 39.6 per cent, for rent of offices, taxes, and other sundries.

Mechanical power.—The total horsepower reported was 25,454; of this amount 24,649, or 96.8 per cent, was applied through 599 steam engines; 425, or 1.7 per cent, was furnished by 5 water wheels; 185, or seven-tenths of 1 per cent by other mechanism; and 195, or eight-tenths of 1 per cent, was rented electric power.

Production.—In the following table the annual production of slate is classified by uses for the years from 1890 to 1902:

TABLE 36.—*Value of annual production of slate, classified by uses: 1890 to 1902.*

[United States Geological Survey, "Mineral Resources of the United States."]

YEAR.	PRODUCT.			
	Total value.	Roofing slate.		Mill stock.
		Number of squares.	Value.	Value.
1890	$3,482,513	835,625	$2,797,904	$684,609
1891	3,825,746	893,312	3,125,410	700,336
1892	4,117,125	953,000	3,396,625	720,500
1893	2,523,173	621,939	2,209,049	314,124
1894	2,790,324	738,222	2,301,138	489,186
1895	2,698,700	729,927	2,351,509	347,191
1896	2,746,205	673,304	2,263,748	482,457
1897	3,524,614	1,001,448	3,097,452	427,162
1898	3,723,540	916,239	3,129,390	594,150
1899	3,962,733	1,100,513	3,454,817	507,916
1900	4,240,466	1,194,048	3,596,182	644,284
1901	4,787,525	1,304,379	4,114,410	673,115
1902	5,696,051	1,435,168	4,950,428	745,623

The year of greatest depression was 1893, when the value of the product was $2,523,173. There was an increase in 1894, but a slight decrease in 1895. A gradual increase followed from that time until 1902, when the value of all slate produced was $5,696,051. Of this output material to the value of $4,950,428 was utilized for roofing, and the remainder, to the value of $745,623, for minor purposes. It is worthy of note that in 1890 the value of the slate utilized for roofing purposes was $2,797,904, and that for all other purposes, $684,609. This indicates that no important new uses for slate have been found and that developments have been largely in the line of roofing materials.

Ranked by value of product first place was held by Pennsylvania, second by Vermont, and third by Maine, followed by Virginia, New York, and Maryland in the order named.

Table 43, at the end of this report, presents detailed statistics of the industry for 1902.

Occurrence.—Nearly the entire commercial supply of roofing slates comes from states bordering upon the Appalachian mountain system. The prevailing color of the material is of a blue-gray to nearly black tint, though certain of the Vermont quarries produce a green and purplish slate. The supply of red slate is at present limited wholly to a few quarries in eastern New York.

Except in California, there have been during the past ten years no developments of great significance, long established quarries in the states mentioned still furnishing the major part of the material. The quarries in Maine are situated wholly in Piscataquis county, those in Vermont along the western part of the state, bordering on the New York line, the developments of particular note being in the towns of Castleton, Fair Haven, Pawlet, Poultney, and Wells. In New York they are found in the closely adjacent towns of Granville and Middle Granville and other towns in Washington county. The slates of New Jersey occur in Sussex and Warren counties; in Pennsylvania, particularly in Lehigh, Northampton, and York counties. The Maryland output is still derived wholly from the northern part of Harford county, in the well known Peach Bottom area.

Uses.—The slates are utilized to a very large extent for the production of roofing materials, for which purpose they are split into sheets from one-eighth to three-sixteenths of an inch in thickness and trimmed into rectangular slabs varying in size from 3 by 7 to 14 by 24 inches. The price of these slabs is usually dependent upon the number required for a "square," that is, a space 10 feet square, or containing an area of 100 square feet. Besides being used for roofing, slates are utilized for billiard tables, mantels, floor tiles, steps, flagging, blackboards, sinks and stationary washtubs, electrical switchboards, and in the manufacture of school slates and pencils. Incidentally it may be mentioned that there has of late years been something of a demand for roof-

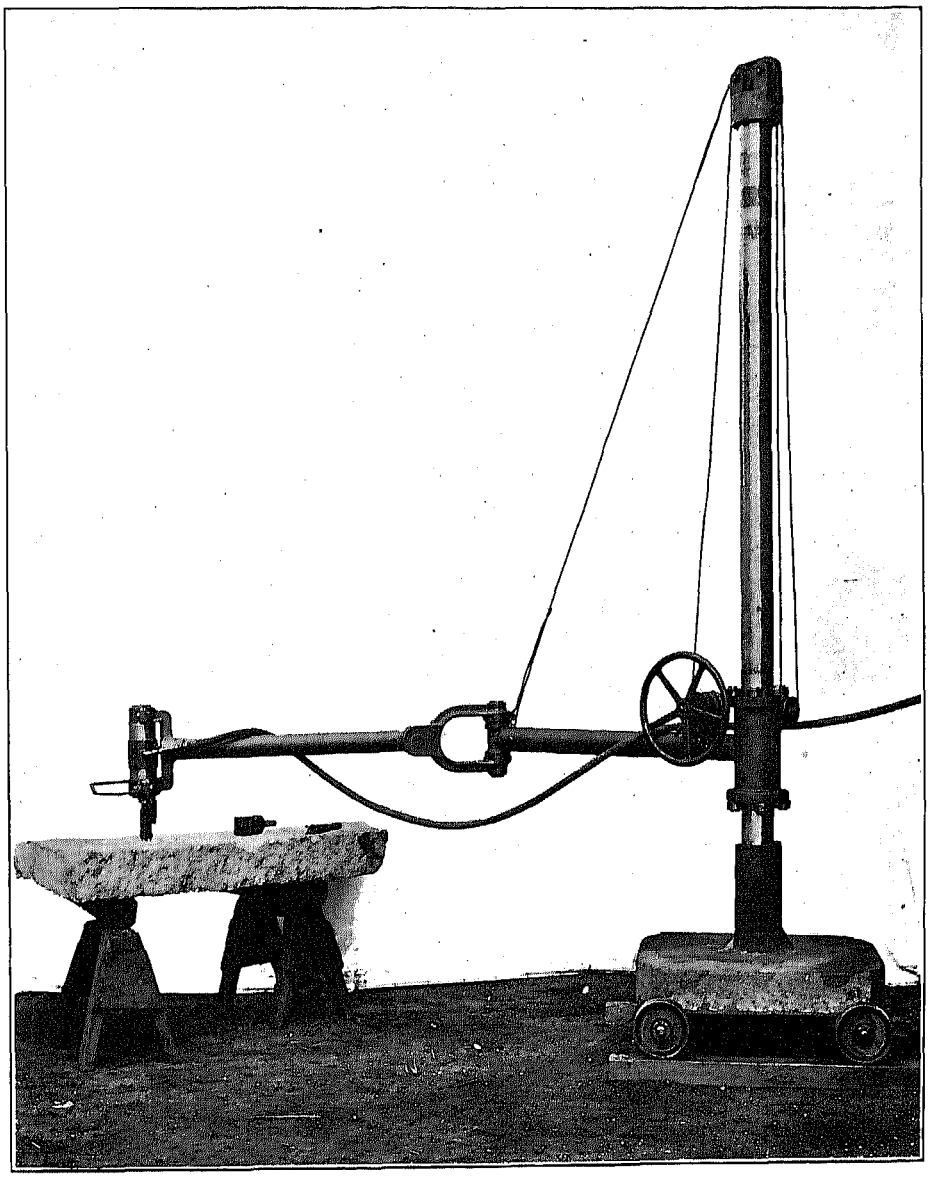


PLATE XIV.—PNEUMATIC STONE SURFACING MACHINE.

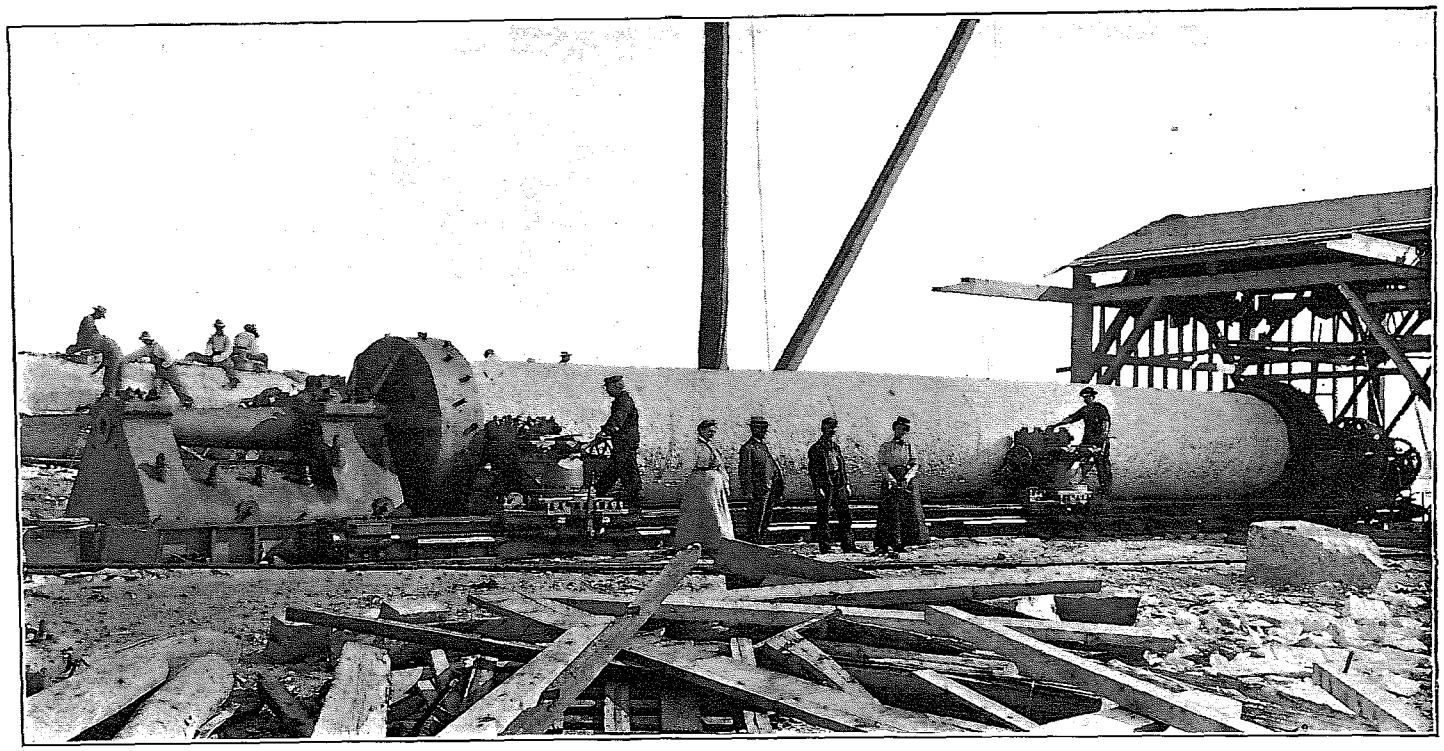


PLATE XV.—LARGE GRANITE COLUMN-CUTTING LATHE AT VINALHAVEN, MAINE.

Weight, 135 tons; swings 6 feet 6 inches by 60 feet in length, with 8 cutters. View of first column being turned in lathe.

ing slates of such thickness as to simulate tiles, some of the quarries actually furnishing material split into sheets of the ordinary sizes, but 1 inch or more in thickness. The practice of "marbleizing" slate for mantels has been largely discontinued.

QUARRYING AND STONE DRESSING MACHINES.

In the earlier days of the stone industry hand methods were employed almost exclusively in the work of quarrying and dressing. The past twenty years has, however, witnessed the introduction of machinery at a rate which is probably fully comparable with that in any other industry. The old method of drilling and blasting, formerly applied to all classes of rocks, is now done away with excepting in the very hardest and toughest of materials, or where, as in the case of the trappean rocks, the material is to be utilized only for road metal. Even where drilling and blasting are now resorted to, it is the custom to drill a series of holes in the line along which it is desired the stone shall break; these holes are then charged somewhat lightly and fired simultaneously. In this way the force of the explosion is delivered along a considerable surface and the danger of shattering the material through the sudden jar is reduced to a minimum. This process is at present largely limited to granitic rocks which are too hard to be quarried by means of the channeling machines.

The drill commonly employed for this work consists in its simplest form of a steam cylinder, mounted upon a tripod, with the drill attached directly to the piston. Since a flexible hose is used to convey steam from the boiler, this form of drill can be carried to any part of the quarry. Numerous adaptations of this drill have been put upon the market by various makers. A common form is that shown in Plate VIII. On soft stone, like sandstone, or granitic rocks with well-developed rift and grain, drills of this kind are utilized in what is known as plug-and-feather splitting. Here a series of holes of a diameter and depth depending upon the character of the rock are drilled at intervals along the line at which it is desired to break the stone. Long metal wedges or plugs are then driven into the holes and the material is split away in fairly regular blocks. This method is used to a considerable extent in the harder Ohio sandstones. During the census year, 3,847 steam drills of various makes were reported as in use.

Channeling machines are utilized in the case of rocks of the nature of marble, limestone, and the softer sandstone, since they would be liable to injury through blasting, and since it is desired to remove the materials from the quarry bed with a minimum amount of waste and in such size and shape that they may be cut into suitable dimensions. One of the earliest of these machines upon the market was the Wardwell channeling machine, a cut of which is shown in Plate IX. Various modifications of this have since been made, as shown in Plates X, XI, and XII. These later adaptations make it possible to cut a channel at any desired angle. There were 724 of these machines of various makes reported in use during the census year. What is known as the quarry bar, answering the same purpose as the channeling machine, but without the locomotive attachment, is shown in Plate XIII. A machine based on the same principle for undercutting, or gadding, is in common use in the marble quarries of Vermont. A diamond drill machine is used for similar purposes. There were 153 machines of various makes adapted to this work reported in operation during the census year.

An attempt has been made to introduce the so-called helicoidal saw for quarrying the softer rocks, as limestone and marble. The attempt seems to have been only partially successful, except in the larger limestone quarries of the Middle West, owing apparently to the large amount of labor necessary for putting the saw in position and the waste involved in cutting out the corners in which the pulleys are to run. The returns from all the quarries report only 32 of these saws actually in use. The saw, as is well known, consists of a twisted iron-wire rope, generally three-sixteenths of an inch in diameter, running over sliding pulleys, the abrading material being either sand or chilled iron, as the case may be.

After the stone is removed from the quarry bed it is worked into the desired shape and size by a process dependent largely upon the hardness of the stone. Formerly a block after being reduced to an approximately rectangular form by means of hand plug-and-feather splitting, was still further reduced by pitching tools, followed when necessary by such implements as the point, ax, pean hammer, and bushhammer. Pneumatic tools are gradually replacing these hand implements. What is known as the pneumatic surfacing machine is shown in Plate XIV. This and the other machines mentioned below are in use in the stone yards and workshops in towns and cities, as well as at the larger quarries, and statistics as to number are not available. Lathes and planers are utilized very extensively on the softer stones, and in some of the works on hard stones as well. Indeed, the production of cylindrical columns by the old hand method has been almost entirely superseded by the use of lathes similar to those used in turning metals. A monster machine of this type is shown in Plate XV. Specially adapted forms of lathes are also used in turning grindstones at the Ohio sandstone quarries. Planers thus utilized differ so little from those employed in planing metal that they need no special notice here. Attention should, however, be called to the circular planer which is used in working out curved surfaces. Except on the harder stone, like granite and quartzite, saws are extensively used for splitting up material into rectangular masses and slabs where smooth, even surfaces are desired. Those most in use are the old time reciprocating saws

consisting of a band of soft iron set in a frame and fed with sand, chilled iron, or shot, as the case may be. Circular saws are also utilized in some cases. A circular saw with diamond teeth is occasionally employed. In working slate a steel circular saw with teeth similar to that used in sawing lumber is employed. In handling the material in the yards and shops traveling cranes are used much as in iron and steel works.

TABLE 37.—DETAILED SUMMARY, BY CLASSES: 1902.

	Total.	Limestones and dolomites.	Marble.	Sandstones and quartzites.	Silica sand.	Siliceous crystalline rocks.	Slate.
Number of quarries	5,764	3,246	83	1,304	26	996	199
Number of operators	5,470	3,137	75	1,211	20	853	174
Character of ownership:							
Individual	3,524	2,282	15	759	5	436	27
Firm	1,129	480	14	324	5	219	87
Incorporated company	754	344	45	119	10	176	60
Other form	63	31	1	9	.....	22	.....
Salaried officials, clerks, etc.:							
Total number	5,279	2,231	352	847	35	1,377	437
Total salaries	$4,488,339	$1,843,747	$341,021	$713,579	$27,228	$1,227,885	$334,879
General officers—							
Number	699	336	51	101	9	136	66
Salaries	$1,058,095	$509,139	$99,260	$154,521	$10,240	$220,180	$64,755
Superintendents, managers, foremen, surveyors, etc.—							
Number	3,295	1,359	197	531	18	923	267
Salaries	$2,620,861	$1,011,374	$180,783	$408,486	$13,108	$799,195	$207,915
Clerks—							
Number	1,285	536	104	215	8	318	104
Salaries	$809,383	$323,234	$60,978	$150,572	$3,880	$208,510	$62,209
Wage-earners:							
Total average number	71,156	31,547	4,070	10,448	335	18,836	5,920
Total wages	$37,515,907	$14,750,638	$2,212,640	$6,153,060	$149,114	$11,072,996	$3,177,459
Engineers, firemen, and other mechanics—							
Average number	6,449	2,233	517	1,248	32	1,916	503
Wages	$4,018,840	$1,354,053	$295,524	$779,149	$18,140	$1,300,178	$271,796
Quarrymen and stonecutters—							
Average number	49,945	22,036	2,513	7,117	149	14,474	3,656
Wages	$26,975,570	$10,250,034	$1,418,332	$4,420,075	$66,074	$8,665,190	$2,155,865
Boys under 16 years—							
Average number	731	258	22	76	.....	206	169
Wages	$160,440	$56,804	$3,756	$17,142	.....	$46,434	$36,304
All other wage-earners—							
Average number	14,031	7,020	1,018	2,007	154	2,240	1,592
Wages	$6,361,057	$3,089,747	$495,028	$936,694	$64,900	$1,061,194	$713,494
Average number of wage-earners at specified daily rates of pay:							
Engineers—							
Less than $0.50	.....	.....	.....	.....	.....	.....	.....
$0.50 to $0.74	5	.....	1	3	.....	1	.....
$0.75 to $0.99	10	.....	.....	3	.....	5	2
$1.00 to $1.24	68	17	8	12	.....	11	20
$1.25 to $1.49	193	57	25	12	1	17	81
$1.50 to $1.74	333	166	12	50	4	53	48
$1.75 to $1.99	279	113	7	31	1	89	38
$2.00 to $2.24	853	288	30	236	13	225	61
$2.25 to $2.49	274	119	6	46	.....	96	7
$2.50 to $2.74	295	101	15	68	2	93	16
$2.75 to $2.99	89	45	1	22	.....	20	1
$3.00 to $3.24	106	25	6	34	.....	37	4
$3.25 to $3.49	15	4	.....	7	.....	3	1
$3.50 to $3.74	9	2	.....	3	.....	4	.....
$3.75 to $3.99	5	.....	1	.....	.....	4	.....
$4.00 to $4.24	4	1	1	2	.....	.....	.....
$4.25 and over	2	2	.....	.....	.....	.....	.....
Firemen—							
Less than $0.50	.....	.....	.....	.....	.....	.....	.....
$0.50 to $0.74	4	1	.....	.....	.....	3	.....
$0.75 to $0.99	13	1	4	1	.....	7	.....
$1.00 to $1.24	45	13	20	2	.....	6	4
$1.25 to $1.49	114	68	4	13	.....	18	11
$1.50 to $1.74	218	130	13	18	3	25	29
$1.75 to $1.99	331	83	19	178	.....	33	18
$2.00 to $2.24	111	35	11	20	.....	32	13
$2.25 to $2.49	33	10	5	4	.....	9	5
$2.50 to $2.74	43	12	.....	3	.....	23	5
$2.75 to $2.99	11	4	1	1	.....	4	1
$3.00 to $3.24	6	1	3	.....	.....	2	.....
$3.25 to $3.49	3	.....	.....	.....	.....	2	1
$3.50 to $3.74	.....	.....	.....	.....	.....	.....	.....
$3.75 to $3.99	.....	.....	.....	.....	.....	.....	.....
$4.00 to $4.24	1	.....	.....	1	.....	.....	.....
$4.25 and over	.....	.....	.....	.....	.....	.....	.....
Machinists, blacksmiths, carpenters, and other mechanics—							
Less than $0.50	.....	.....	.....	.....	.....	.....	.....
$0.50 to $0.74	2	.....	.....	1	.....	1	.....
$0.75 to $0.99	18	2	1	6	.....	9	.....
$1.00 to $1.24	55	25	2	10	.....	18	.....
$1.25 to $1.49	216	77	88	20	.....	25	6
$1.50 to $1.74	334	159	50	34	1	73	17
$1.75 to $1.99	383	110	22	142	2	85	22
$2.00 to $2.24	572	207	34	89	4	199	39
$2.25 to $2.49	395	147	78	36	.....	107	27
$2.50 to $2.74	369	96	23	51	1	185	13
$2.75 to $2.99	273	72	2	24	.....	172	3
$3.00 to $3.24	288	24	7	44	.....	158	5
$3.25 to $3.49	60	3	4	13	.....	38	2
$3.50 to $3.74	39	9	10	3	.....	15	2
$3.75 to $3.99	4	.....	1	3	.....	.....	.....
$4.00 to $4.24	16	3	2	2	.....	9	.....
$4.25 and over	2	1	.....	.....	.....	.....	1

TABLE 37.—DETAILED SUMMARY, BY CLASSES: 1902—Continued.

	Total.	Limestones and dolomites.	Marble.	Sandstones and quartzites.	Silica sand.	Siliceous crystalline rocks.	Slate.
Average number of wage-earners at specified daily rates of pay—Continued.							
Quarrymen and stonecutters—							
Less than $0.50	.....	.....	.....	.....	.....	.....	.....
$0.50 to $0.74	100	35	1	9	.....	52	3
$0.75 to $0.99	606	215	12	20	2	350	7
$1.00 to $1.24	4,774	3,106	468	125	.....	958	117
$1.25 to $1.49	8,463	5,450	585	587	73	1,583	185
$1.50 to $1.74	11,523	6,232	438	1,569	41	2,655	588
$1.75 to $1.99	8,500	4,011	146	1,177	13	2,648	505
$2.00 to $2.24	6,416	1,631	150	1,697	20	1,758	1,160
$2.25 to $2.49	1,976	578	35	328	.....	435	600
$2.50 to $2.74	1,886	317	199	293	.....	814	263
$2.75 to $2.99	1,723	66	141	211	.....	1,163	142
$3.00 to $3.24	2,233	144	112	573	.....	1,318	86
$3.25 to $3.49	701	105	78	90	.....	428	.....
$3.50 to $3.74	632	106	47	304	.....	175	.....
$3.75 to $3.99	43	.....	2	23	.....	18	.....
$4.00 to $4.24	234	39	4	81	.....	110	.....
$4.25 and over	135	1	95	30	.....	9	.....
Boys under 16 years—							
Less than $0.50	69	16	6	4	.....	36	7
$0.50 to $0.74	257	95	14	26	.....	56	66
$0.75 to $0.99	233	84	.....	25	.....	49	75
$1.00 to $1.24	157	60	.....	18	.....	59	20
$1.25 to $1.49	11	3	.....	2	.....	5	1
$1.50 to $1.74	3	.....	2	.....	.....	1	.....
$1.75 to $1.99	1	.....	.....	1	.....	.....	.....
All other wage-earners—							
Less than $0.50	1	.....	.....	.....	.....	1	.....
$0.50 to $0.74	90	65	1	1	.....	20	3
$0.75 to $0.99	306	87	44	5	.....	153	17
$1.00 to $1.24	1,449	905	60	125	.....	230	129
$1.25 to $1.49	4,241	2,215	261	561	57	448	699
$1.50 to $1.74	4,898	2,508	343	766	79	730	463
$1.75 to $1.99	1,253	627	92	267	2	190	75
$2.00 to $2.24	1,098	476	68	173	16	269	96
$2.25 to $2.49	236	81	58	70	.....	45	32
$2.50 to $2.74	220	54	57	31	.....	26	52
$2.75 to $2.99	40	6	14	1	.....	5	14
$3.00 to $3.24	132	24	2	3	.....	93	10
$3.25 to $3.49	11	2	.....	.....	.....	9	.....
$3.50 to $3.74	15	4	.....	4	.....	5	2
$3.75 to $3.99	2	1	.....	.....	.....	1	.....
$4.00 to $4.24	29	15	8	.....	.....	6	.....
$4.25 and over	10	.....	10	.....	.....	.....	.....
Average number of wage-earners employed during each month:							
Men 16 years and over—							
January	49,288	22,381	3,546	5,693	270	12,289	5,109
February	49,638	22,206	3,593	5,766	264	12,605	5,144
March	59,357	27,391	3,855	7,719	335	14,755	5,302
April	71,961	32,808	4,064	10,338	343	18,674	5,734
May	78,240	34,807	4,294	12,673	365	20,138	5,963
June	80,826	35,690	4,165	13,301	341	21,362	5,967
July	82,467	36,153	4,166	13,257	332	22,433	6,126
August	83,070	36,677	4,208	13,041	366	22,602	6,176
September	81,989	36,332	4,409	12,609	380	22,092	6,167
October	79,019	34,667	4,255	11,897	365	21,788	6,047
November	70,131	30,347	4,100	10,428	328	19,147	5,781
December	59,114	26,009	3,921	7,742	331	15,615	5,496
Boys under 16 years—							
January	571	200	28	34	.....	153	156
February	578	204	25	28	.....	163	158
March	662	247	25	46	.....	178	166
April	734	269	26	67	.....	208	164
May	789	277	22	105	.....	212	173
June	796	269	19	105	.....	227	176
July	846	294	20	111	.....	245	176
August	837	288	20	111	.....	241	177
September	822	289	21	96	.....	239	177
October	790	280	20	83	.....	231	176
November	721	257	19	78	.....	201	166
December	626	222	19	48	.....	174	163
Contract work:							
Amount paid	$36,981	$36,381	.....	$500	$100	.....	.....
Number of employees	140	137	.....	1	2	.....	.....
Miscellaneous expenses:							
Total	$3,976,865	$1,440,081	$382,877	$878,780	$18,776	$810,206	$446,145
Royalties and rent of quarrying plant	$1,156,754	$422,693	$65,385	$196,144	$8,373	$194,892	$269,267
Rent of offices, taxes, insurance, interest, and other sundries	$2,820,111	$1,017,388	$317,492	$682,636	$10,403	$615,314	$176,878
Cost of supplies and materials	$10,739,736	$5,403,912	$825,822	$1,298,190	$38,386	$2,493,065	$680,361
Value of product:							
Total	$70,462,438	$30,441,801	$5,044,182	$10,601,171	$421,289	$18,257,944	$5,696,051
Rough—							
Building	$5,294,318	.....	.....	$3,119,236	.....	$2,175,082	.....
Monumental	$1,714,156	.....	.....	.....	.....	$1,714,156	.....
Other uses	[1] $2,820,543	.....	[1] $2,276,629	.....	.....	$543,914	.....
Dressed—							
Building	$14,349,184	$5,563,084	$1,038,102	$2,888,248	.....	$4,859,750	.....
Interior decoration	$679,913	.....	$679,913	.....	.....	.....	.....
Monumental	$3,241,625	.....	$956,870	.....	.....	$2,284,755	.....
Ornamental	$7,300	.....	$7,300	.....	.....	.....	.....
Other uses	$85,368	.....	$85,368	.....	.....	.....	.....
Crushed—							
Concrete	$2,661,692	$1,600,664	.....	$326,467	.....	$734,561	.....
Railroad ballast, etc.	$3,583,780	$2,661,081	.....	$347,869	.....	$574,780	.....
Roadmaking, macadam, etc.	$5,235,537	$2,890,985	.....	$442,113	.....	$1,902,439	.....

[1] Includes marble valued at $2,276,629 which was sold in the rough for all purposes.

TABLE 37.—DETAILED SUMMARY, BY CLASSES: 1902—Continued.

	Total.	Limestones and dolomites.	Marble.	Sandstones and quartzites.	Silica sand.	Siliceous crystalline rocks.	Slate.
Value of product—Continued.							
Blast furnace flux	$5,271,252	$5,271,252	.....	.....	.....	.....	.....
Curbing	$1,828,468	$331,968	.....	$672,654	.....	$823,846	.....
Flagging	$1,437,267	$241,688	.....	$1,142,699	.....	$52,880	.....
Ganister	$112,600	.....	.....	$112,600	.....	.....	.....
Lime burned	$9,335,618	$9,335,618	.....	.....	.....	.....	.....
Paving blocks	$2,651,393	.....	.....	$527,617	.....	$1,523,776	.....
Riprap	$1,096,584	$508,157	.....	$269,269	.....	$319,158	.....
Rubble	$2,242,524	$1,096,729	.....	$645,619	.....	$500,176	.....
Sand—							
Building	$24,000	.....	.....	.....	$24,000	.....	.....
Engine	$3,000	.....	.....	.....	$3,000	.....	.....
Furnace	$78,244	.....	.....	.....	$78,244	.....	.....
Glass	$130,263	.....	.....	.....	$130,263	.....	.....
Other uses	$185,782	.....	.....	.....	$185,782	.....	.....
Slate—							
Roofing	$4,950,428	.....	.....	.....	.....	.....	$4,950,428
Other uses	$745,623	.....	.....	.....	.....	.....	$745,623
Sold to cement manufacturers	$210,798	$210,798	.....	.....	.....	.....	.....
Sold to lime burners	$237,393	$237,393	.....	.....	.....	.....	.....
Other uses	$847,835	$492,384	.....	$106,780	.....	$248,671	.....
Power:							
Total horsepower	178,878	64,500	14,286	25,652	2,000	46,986	25,454
Owned—							
Engines—							
Steam—							
Number	4,265	1,703	191	789	33	950	599
Horsepower	167,744	61,547	10,748	24,631	1,980	44,189	24,649
Gas or gasoline—							
Number	92	59	.....	7	.....	26	.....
Horsepower	1,378	1,031	.....	72	.....	275	.....
Water wheels—							
Number	56	15	15	6	.....	15	5
Horsepower	6,731	502	3,413	885	.....	1,506	425
Other power—							
Number	59	25	2	8	1	19	4
Horsepower	2,114	1,221	125	53	20	510	185
Rented—							
Electric, horsepower	775	102	.....	7	.....	471	195
Other power, horsepower	136	97	.....	4	.....	35	.....
Electric motors owned—							
Number	97	35	32	6	.....	23	1
Horsepower	3,521	769	2,220	60	.....	442	30
Supplied to other establishments, horsepower	28	3	.....	.....	.....	25	.....

TABLE 38.—LIMESTONES AND DOLOMITES—DETAILED

		United States.	Alabama.	Arkansas.	California.	Colorado.	Connecticut.	Florida.
1	Number of quarries	3,246	33	13	17	11	12	6
2	Number of operators	3,137	29	12	14	9	7	6
	Character of ownership:							
3	Individual	2,282	12	5	5	5	2	4
4	Firm	480	4	4	5		4	2
5	Incorporated company	344	13	3	4	4	1	
6	Other form	31						
	Salaried officials, clerks, etc.:							
7	Total number	2,231	63	16	7	6	18	3
8	Total salaries	$1,843,747	$54,597	$7,864	$9,400	$6,566	$18,830	$2,410
	General officers—							
9	Number	336	11				4	
10	Salaries	$509,139	$17,000				$11,500	
	Superintendents, managers, foremen, surveyors, etc.—							
11	Number	1,359	34	13	7	5	9	3
12	Salaries	$1,011,374	$25,847	$6,784	$9,400	$5,666	$4,370	$2,410
	Clerks—							
13	Number	536	18	3		1	5	
14	Salaries	$323,234	$12,250	$1,080		$900	$2,960	
	Wage-earners:							
15	Total average number	31,547	1,002	119	281	188	135	87
16	Total wages	$14,750,638	$354,718	$43,680	$163,130	$127,747	$66,765	$28,054
	Engineers, firemen, and other mechanics—							
17	Average number	2,233	90	6	2	3	6	6
18	Wages	$1,354,053	$42,869	$2,591	$1,629	$2,625	$3,550	$3,008
	Quarrymen and stonecutters—							
19	Average number	22,036	552	83	184	157	66	64
20	Wages	$10,250,034	$191,949	$29,987	$101,253	$110,052	$31,120	$18,756
	Boys under 16 years—							
21	Average number	258	23	1		2		
22	Wages	$56,804	$3,716	$150		$740		
	All other wage-earners—							
23	Average number	7,020	337	29	95	26	63	17
24	Wages	$3,089,747	$116,184	$10,952	$60,248	$14,330	$32,095	$6,290
	Average number of wage-earners at specified daily rates of pay:							
	Engineers—							
25	$1.00 to $1.24	17						1
26	$1.25 to $1.49	57	3	5				
27	$1.50 to $1.74	166	21	1				
28	$1.75 to $1.99	113						1
29	$2.00 to $2.24	288	1				3	1
30	$2.25 to $2.49	119						
31	$2.50 to $2.74	101						
32	$2.75 to $2.99	45	1			1		
33	$3.00 to $3.24	25						
34	$3.25 to $3.49	4						
35	$3.50 to $3.74	2						
36	$4.00 to $4.24	1						
37	$4.25 and over	2						
	Firemen—							
38	$0.50 to $0.74	1						
39	$0.75 to $0.99	1						
40	$1.00 to $1.24	13	3					
41	$1.25 to $1.49	68	13					
42	$1.50 to $1.74	130	3					
43	$1.75 to $1.99	83						1
44	$2.00 to $2.24	35						
45	$2.25 to $2.49	10						
46	$2.50 to $2.74	12						
47	$2.75 to $2.99	4						
48	$3.00 to $3.24	1						
	Machinists, blacksmiths, carpenters, and other mechanics—							
49	$0.75 to $0.99	2						
50	$1.00 to $1.24	25	5					1
51	$1.25 to $1.49	77	5					
52	$1.50 to $1.74	159	18					
53	$1.75 to $1.99	110	3				1	
54	$2.00 to $2.24	207	9		1		2	
55	$2.25 to $2.49	147	2					
56	$2.50 to $2.74	96	1		1	1		1
57	$2.75 to $2.99	72						
58	$3.00 to $3.24	24	2			1		
59	$3.25 to $3.49	3						
60	$3.50 to $3.74	9						
61	$4.00 to $4.24	3						
62	$4.25 and over	1						
	Quarrymen and stonecutters—							
63	$0.50 to $0.74	35	5					
64	$0.75 to $0.99	215	18					27
65	$1.00 to $1.24	3,106	319	55				34
66	$1.25 to $1.49	5,450	194	6	81			1
67	$1.50 to $1.74	6,232	4	20			61	
68	$1.75 to $1.99	4,011	11		14	60	3	
69	$2.00 to $2.24	1,631		2	62	23	1	1
70	$2.25 to $2.49	578			5	24		
71	$2.50 to $2.74	317			22	16	1	
72	$2.75 to $2.99	66						1
73	$3.00 to $3.24	144				21		
74	$3.25 to $3.49	105						
75	$3.50 to $3.74	106	1			13		
76	$4.00 to $4.24	39						
77	$4.25 and over	1						
	Boys under 16 years—							
78	Less than $0.50	16	1					
79	$0.50 to $0.74	95	20	1				
80	$0.75 to $0.99	84	2					
81	$1.00 to $1.24	60				2		
82	$1.25 to $1.49	3						

SUMMARY, BY STATES AND TERRITORIES: 1902.

Georgia.	Idaho.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Maine.	Maryland.	Massachusetts.	Michigan.	Minnesota.	Missouri.	
8	14	160	160	244	115	70	11	102	11	30	75	142	1
8	13	150	156	241	115	69	11	100	8	29	74	136	2
4	8	85	80	197	88	37	2	84	2	19	54	74	3
1	5	23	38	31	19	12	5	6	4	2	14	29	4
3	...	35	38	8	8	15	4	9	2	8	3	31	5
...	...	7	...	5	...	5	...	1	...	...	3	2	6
15	...	284	266	76	32	68	16	53	17	62	83	155	7
$6,752	...	$270,025	$238,186	$46,775	$20,011	$48,405	$13,236	$31,289	$12,606	$49,264	$80,219	$129,291	8
1	...	66	36	7	6	5	1	12	1	15	11	24	9
$1,260	...	$88,535	$70,260	$8,150	$3,360	$9,700	$1,000	$11,250	$413	$17,083	$23,800	$37,610	10
11	...	138	155	58	18	58	14	25	15	32	49	93	11
$4,352	...	$123,330	$120,663	$34,011	$13,311	$36,530	$11,876	$12,390	$11,293	$23,195	$43,037	$66,514	12
3	...	80	75	11	8	5	1	16	1	15	23	38	13
$1,140	...	$58,160	$47,263	$4,614	$3,340	$2,175	$360	$7,649	$900	$8,986	$13,382	$25,167	14
152	6	3,178	2,834	680	566	774	591	430	203	665	723	1,484	15
$42,516	$3,964	$1,737,363	$1,399,829	$357,249	$288,347	$319,700	$288,512	$159,793	$99,740	$325,379	$448,501	$752,178	16
6	...	277	435	35	25	71	23	33	9	62	65	113	17
$2,274	...	$191,051	$260,840	$20,198	$17,379	$38,926	$14,454	$14,274	$5,129	$37,367	$45,543	$69,422	18
109	6	2,248	1,967	547	461	637	213	284	87	446	518	880	19
$30,171	$3,964	$1,232,175	$953,593	$288,555	$235,410	$258,132	$119,752	$105,332	$41,287	$217,079	$322,657	$477,756	20
3	...	13	51	9	...	6	...	11	...	2	4	10	21
$324	...	$2,943	$12,757	$2,411	...	$1,155	...	$1,928	...	$600	$1,015	$2,551	22
34	...	640	381	89	80	60	355	102	107	155	136	431	23
$9,747	...	$311,194	$172,639	$46,085	$35,558	$21,487	$154,306	$38,259	$53,324	$70,333	$79,286	$202,449	24
1	...	2	...	...	...	...	...	2	...	...	...	...	25
1	...	1	8	...	...	2	...	11	...	...	...	...	26
...	...	3	22	2	...	6	...	2	3	1	...	6	27
...	...	7	27	2	1	4	...	...	1	1	1	4	28
...	...	47	59	14	6	12	9	3	1	13	1	17	29
...	...	28	20	2	3	...	2	...	...	3	10	9	30
...	...	33	10	1	1	1	...	1	1	...	17	12	31
...	...	8	3	...	...	...	...	...	...	...	3	5	32
...	...	5	1	...	2	...	...	...	...	...	1	3	33
...	...	2	...	...	...	...	...	...	...	...	...	...	34
...	...	1	...	...	...	...	...	...	...	...	...	1	35
...	...	1	...	...	...	...	...	...	...	...	...	...	36
...	...	1	1	...	...	...	...	...	...	...	...	...	37
...	...	...	...	...	...	...	...	...	...	...	...	...	38
...	...	...	...	...	...	...	...	...	...	...	...	...	39
...	...	...	...	...	...	...	...	1	...	...	...	...	40
...	...	...	15	...	...	4	...	...	...	...	...	9	41
...	...	10	48	5	...	3	...	...	1	2	...	7	42
...	...	16	6	1	...	...	4	...	...	17	1	2	43
...	...	9	6	...	...	...	5	...	...	1	...	3	44
...	...	3	...	...	...	...	...	...	...	...	...	...	45
...	...	2	1	...	...	...	...	...	...	...	...	1	46
...	...	...	...	...	...	...	...	...	...	...	2	2	47
...	...	...	...	1	...	...	...	...	...	...	...	...	48
...	...	...	...	...	...	...	...	...	...	...	...	...	49
3	...	...	...	...	...	4	...	2	...	...	1	...	50
...	...	...	3	...	...	3	...	8	...	...	...	5	51
1	...	11	24	1	...	7	...	1	...	...	2	8	52
...	...	6	37	2	...	5	...	...	...	1	2	6	53
...	...	16	27	4	6	12	2	2	...	21	14	5	54
...	...	23	63	...	2	2	...	...	2	...	1	1	55
...	...	16	16	...	1	6	1	...	...	1	7	6	56
...	...	20	27	...	...	...	...	...	...	1	...	1	57
...	...	5	2	...	3	...	...	...	...	...	2	...	58
...	...	...	2	...	...	...	...	...	...	...	...	...	59
...	...	1	4	...	...	...	...	...	...	...	...	...	60
...	...	...	2	...	...	...	...	...	...	...	...	...	61
...	...	...	1	...	...	...	...	...	...	...	...	...	62
...	...	...	...	...	...	1	...	1	...	...	...	...	63
54	...	1	7	...	...	2	...	...	...	...	...	1	64
51	...	5	44	10	3	220	...	143	...	10	1	12	65
4	...	44	716	7	50	245	...	54	...	3	1	147	66
...	1	612	768	148	214	102	39	83	70	330	24	163	67
...	...	1,157	143	281	142	10	150	...	13	40	275	204	68
...	2	389	100	107	12	21	24	...	...	55	79	181	69
...	2	10	73	18	16	5	...	...	...	...	28	82	70
...	1	1	48	19	1	9	...	1	...	8	56	61	71
...	...	...	17	...	2	16	...	...	...	...	...	13	72
...	...	3	18	5	6	5	...	1	4	...	25	10	73
...	...	12	9	...	...	...	...	1	...	...	24	...	74
...	...	3	16	1	14	1	...	...	...	...	...	6	75
...	...	11	7	1	1	...	...	...	...	...	5	...	76
...	...	...	1	...	...	...	...	...	...	...	...	...	77
3	...	1	1	...	...	...	...	...	...	...	...	...	78
...	...	4	12	1	...	3	...	9	...	...	2	3	79
...	...	7	20	4	...	3	...	...	...	...	1	2	80
...	...	1	17	4	...	...	...	2	...	2	...	5	81
...	...	...	1	...	...	...	...	...	...	...	1	...	82

TABLE 38.—LIMESTONES AND DOLOMITES—DETAILED

		United States.	Alabama.	Arkansas.	California.	Colorado.	Connecticut.	Florida.
	Average number of wage-earners at specified daily rates of pay—Continued.							
	All other wage-earners—							
83	$0.50 to $0.74	65	8					
84	$0.75 to $0.99	87	10					
85	$1.00 to $1.24	905	219	10				10
86	$1.25 to $1.49	2,215	39	12			1	1
87	$1.50 to $1.74	2,508	43	6	8	8	37	6
88	$1.75 to $1.99	627	6			15	24	
89	$2.00 to $2.24	476	12		65		1	
90	$2.25 to $2.49	31			2			
91	$2.50 to $2.74	54		1	20	3		
92	$2.75 to $2.99	6						
93	$3.00 to $3.24	24						
94	$3.25 to $3.49	2						
95	$3.50 to $3.74	4						
96	$3.75 to $3.99	1						
97	$4.00 to $4.24	15						
	Average number of wage-earners employed during each month:							
	Men 16 years and over—							
98	January	22,381	899	127	264	186	102	101
99	February	22,206	917	112	266	185	102	105
100	March	27,391	938	121	272	185	109	109
101	April	32,808	979	122	282	185	114	102
102	May	34,807	988	133	286	184	114	63
103	June	35,690	1,009	133	289	187	113	62
104	July	36,153	997	96	290	188	156	61
105	August	36,677	1,009	131	290	188	158	61
106	September	36,332	1,015	134	290	187	163	60
107	October	34,667	1,012	107	285	185	162	109
108	November	30,347	1,007	108	285	186	165	105
109	December	26,009	978	92	273	186	162	103
	Boys under 16 years—							
110	January	200	23	1		2		
111	February	204	23	1		2		
112	March	247	23	1		2		
113	April	269	23	1		2		
114	May	277	23	1		2		
115	June	269	23	1		2		
116	July	294	23	1		2		
117	August	288	23	1		2		
118	September	289	23	1		2		
119	October	280	23	1		2		
120	November	257	23	1		2		
121	December	222	23	1		2		
	Contract work:							
122	Amount paid	$36,381			$4,000			
123	Number of employees	137			10			
	Miscellaneous expenses:							
124	Total	$1,440,081	$25,954	$1,716	$15,790	$5,886	$9,028	$2,208
125	Royalties and rent of quarrying plant	$422,693	$2,079		$8,825	$2,907	$1,320	$1,350
126	Rent of offices, taxes, insurance, interest, and other sundries.	$1,017,388	$23,875	$1,716	$6,965	$2,979	$7,708	$858
127	Cost of supplies and materials	$5,403,912	$149,012	$32,579	$111,564	$21,440	$64,346	$14,769
	Value of product:							
128	Total	$30,441,801	$759,617	$113,163	$521,093	$203,700	$205,371	$63,571
129	Building	$5,563,084	$37,358	$1,900	$17,250			$11,000
130	Flagging	$241,688						
131	Curbing	$331,968	$1,275	$1,500	$250			
132	Lime burned	$9,335,618	$235,568	$82,853	$395,995	$46,345	$203,899	$37,963
133	Sold to lime burners	$237,398				$521		
	Crushed—							
134	Concrete	$1,600,664	$2,500		$24,375			
135	Railroad ballast, etc	$2,661,081	$2,500	$7,000	$1,625			$1,350
136	Roadmaking, macadam, etc	$2,890,985	$7,890	$15,510	$900			$9,658
137	Rubble	$1,096,729	$1,735		$5,250			
138	Riprap	$508,157	$5,726	$4,350	$1,400			$3,600
139	Blast furnace flux	$5,271,252	$465,065		$5,250	$155,484	$1,472	
140	Sold to cement manufacturers	$210,798			$24,250			
141	Other uses	$492,384		$50	$44,548	$1,350		
	Power:							
142	Total horsepower	64,500	1,293	59		75	171	8
	Owned—							
	Engines—							
	Steam—							
143	Number	1,703	26	3		1	12	1
144	Horsepower	61,547	1,263	59		75	169	8
	Gas or gasoline—							
145	Number	59					1	
146	Horsepower	1,031					2	
	Water wheels—							
147	Number	15						
148	Horsepower	502						
	Other power—							
149	Number	25	3					
150	Horsepower	1,221	30					
	Rented—							
151	Electric, horsepower	102						
152	Other kinds, horsepower	97						
	Electric motors owned—							
153	Number	35						
154	Horsepower	769						
155	Supplied to other establishments, horsepower	3						

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Georgia.	Idaho.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Maine.	Maryland.	Massachusetts.	Michigan.	Minnesota.	Missouri.	
.....	.....	.....	1	.....	.....	1	.....	2	.....	.....	1	.....	83
17	.....	1	2	.....	.....	8	.....	1	.....	.....	.....	11	84
17	.....	7	24	.....	26	6	20	62	2	6	.....	4	85
.....	.....	77	146	1	8	40	210	26	.....	2	1	175	86
.....	.....	360	129	59	24	3	80	.....	85	131	15	139	87
.....	.....	183	33	15	14	2	20	.....	15	9	7	48	88
.....	.....	12	39	11	12	.....	24	.....	5	3	105	31	89
.....	.....	.....	.....	.....	.....	.....	1	.....	.....	4	.....	4	90
.....	.....	.....	4	.....	1	.....	.....	11	.....	.....	.....	5	91
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	92
.....	.....	.....	3	3	.....	.....	.....	.....	.....	.....	3	1	93
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	94
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	95
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	96
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	97
159	2	2,082	1,651	381	254	319	329	347	162	550	337	866	98
155	2	2,074	1,676	359	278	329	328	368	158	534	292	887	99
154	.....	2,835	2,545	505	486	572	362	512	170	571	450	1,298	100
166	4	3,375	3,126	729	604	767	601	606	202	678	770	1,448	101
172	6	3,499	3,388	803	663	898	602	567	214	712	935	1,497	102
170	13	3,560	3,359	818	699	944	916	371	212	719	949	1,546	103
146	11	3,600	3,471	807	746	1,065	928	347	223	731	999	1,545	104
120	11	3,698	3,279	830	741	1,163	916	392	234	758	978	1,684	105
137	9	3,715	3,350	898	743	1,120	931	394	226	753	936	1,734	106
128	7	3,627	3,137	863	663	849	460	434	214	729	889	1,742	107
142	5	3,263	2,534	635	545	680	373	362	214	665	650	1,556	108
139	2	2,652	1,880	424	370	510	346	328	207	556	443	1,285	109
3	.....	6	34	7	.....	.....	.....	14	.....	2	1	7	110
3	.....	6	34	6	.....	2	.....	14	.....	2	1	7	111
3	.....	9	46	7	.....	8	.....	16	.....	2	3	10	112
3	.....	12	53	7	.....	8	.....	16	.....	2	5	11	113
3	.....	14	57	9	.....	7	.....	16	.....	2	5	12	114
3	.....	15	60	9	.....	7	.....	3	.....	2	5	12	115
3	.....	17	66	10	.....	9	.....	2	.....	2	6	12	116
3	.....	17	58	12	.....	7	.....	3	.....	2	6	11	117
3	.....	17	64	15	.....	7	.....	3	.....	2	6	10	118
3	.....	16	55	12	.....	7	.....	16	.....	2	5	10	119
3	.....	15	47	8	.....	7	.....	15	.....	2	4	11	120
3	.....	12	38	6	.....	3	.....	14	.....	2	1	7	121
.....	.....	.....	.....	$60	$300	$900	.....	.....	.....	.....	$1,000	$14,595	122
.....	.....	.....	.....	2	6	8	.....	.....	.....	.....	3	61	123
$3,848	$110	$233,379	$196,907	$22,518	$24,378	$14,443	$87,613	$20,841	$10,192	$36,464	$46,880	$51,506	124
$2,527	.....	$36,439	$17,273	$6,108	$14,089	$6,461	$5,248	$6,363	$112	$300	$21,241	$17,952	125
$821	$110	$196,940	$179,634	$16,410	$10,289	$7,982	$32,365	$14,478	$10,080	$36,164	$25,639	$33,554	126
$17,905	$1,265	$451,908	$499,764	$71,361	$51,342	$54,809	$226,694	$135,560	$133,609	$89,689	$84,294	$262,222	127
$111,589	$15,074	$3,232,123	$2,865,691	$640,984	$670,536	$593,747	$745,132	$453,030	$339,349	$657,072	$838,357	$1,697,139	128
$4,295	.....	$640,443	$1,813,577	$195,009	$175,374	$124,467	.....	$16,953	$12,378	$58,707	$451,368	$429,115	129
$17,500	.....	$70,491	$75,659	$6,893	$7,315	$1,395	.....	.....	.....	$200	$25,481	$536	130
.....	.....	$39,296	$117,077	$2,374	$5,675	$45,773	.....	$1,575	.....	$489	$7,260	$32,444	131
$71,724	$13,049	$485,644	$312,189	$134,051	$7,358	$15,893	$742,132	$326,417	$324,480	$208,232	$75,870	$515,780	132
.....	.....	.....	.....	$95	.....	.....	.....	$5,834	.....	$98,000	$1,344	.....	133
.....	.....	$232,439	$38,563	$29,000	$10,585	$26,137	.....	$4,600	$1,093	$49,430	$62,500	$168,229	134
$12,310	.....	$399,537	$55,740	$21,298	$354,721	$176,032	.....	$17,161	.....	$40,810	.....	$141,185	135
.....	.....	$588,796	$180,188	$103,074	$18,598	$125,048	.....	$74,205	.....	$56,261	$65,744	$193,327	136
.....	.....	$353,699	$97,916	$144,339	$79,709	.....	.....	.....	.....	$3,101	$106,693	$147,151	137
.....	.....	$154,624	$15,346	$32,588	$9,292	$22,500	.....	$22	.....	$5,740	$33,447	$43,998	138
$5,760	$2,025	$214,881	$187,265	.....	.....	$15,487	$1,000	$3,263	$1,398	$32,246	.....	$14,065	139
.....	.....	$9,515	.....	.....	.....	.....	.....	.....	.....	$35,692	$7,590	.....	140
.....	.....	$42,758	$32,171	$1,263	$1,849	$41,105	$2,000	$3,000	.....	$68,164	$1,150	$11,309	141
146	.....	9,266	10,466	1,541	1,009	1,743	714	743	120	1,449	1,343	2,926	142
3	.....	268	297	65	31	45	15	32	8	28	52	109	143
146	.....	9,146	10,103	1,513	1,009	1,743	714	727	120	1,446	1,250	2,766	144
.....	.....	3	3	3	.....	.....	.....	.....	.....	1	3	8	145
.....	.....	42	60	18	.....	.....	.....	.....	.....	3	48	110	146
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	147
.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	148
.....	.....	1	2	.....	.....	.....	.....	1	.....	.....	2	.....	149
.....	.....	78	303	.....	.....	.....	.....	16	.....	.....	45	.....	150
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	151
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	152
.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	5	153
.....	.....	.....	140	.....	.....	.....	.....	.....	.....	.....	.....	80	154
.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	155

TABLE 38.—LIMESTONES AND DOLOMITES—DETAILED

		Montana.	Nebraska.	New Jersey.	New York.	North Carolina.	Ohio.	Oklahoma.
1	Number of quarries	10	33	27	181	4	259	12
2	Number of operators	10	33	25	178	4	249	12
	Character of ownership:							
3	Individual	6	21	17	123	3	171	11
4	Firm	2	9	4	32		47	1
5	Incorporated company	2	3	4	20	1	29	
6	Other form				3		2	
	Salaried officials, clerks, etc.:							
7	Total number	4	12	15	174	1	205	4
8	Total salaries	$4,091	$8,001	$11,301	$166,459	$600	$155,451	$3,035
	General officers—							
9	Number	1		3	27		30	
10	Salaries	$600		$3,700	$53,777		$41,715	
	Superintendents, managers, foremen, surveyors, etc.—							
11	Number	3	10	11	109	1	113	3
12	Salaries	$3,491	$7,001	$7,151	$87,568	$600	$84,192	$2,315
	Clerks—							
13	Number		2	1	38		62	1
14	Salaries		$1,000	$450	$25,114		$29,544	$720
	Wage-earners:							
15	Total average number	91	178	187	2,422	17	3,065	46
16	Total wages	$70,078	$95,935	$80,654	$1,234,742	$4,727	$1,454,328	$22,277
	Engineers, firemen, and other mechanics.—							
17	Average number		9	10	205	1	210	2
18	Wages		$5,938	$4,528	$144,956	$340	$131,232	$2,003
	Quarrymen and stonecutters—							
19	Average number	89	127	115	1,346	14	2,246	40
20	Wages	$68,206	$68,705	$51,100	$667,484	$4,087	$1,032,612	$18,960
	Boys under 16 years—							
21	Average number		2		12		8	1
22	Wages		$615		$2,689		$1,801	$105
	All other wage-earners—							
23	Average number	2	40	62	859	2	601	3
24	Wages	$1,872	$20,677	$24,966	$399,613	$300	$288,683	$1,209
	Average number of wage-earners at specified daily rates of pay:							
	Engineers—							
25	$1.00 to $1.24					1		
26	$1.25 to $1.49				2		3	
27	$1.50 to $1.74				11		21	
28	$1.75 to $1.99			1	8		29	
29	$2.00 to $2.24		1		24		28	
30	$2.25 to $2.49		1		9		3	
31	$2.50 to $2.74				8		4	
32	$2.75 to $2.99				1		20	
33	$3.00 to $3.24		1		4		1	1
34	$3.25 to $3.49						1	
35	$3.50 to $3.74							
36	$4.00 to $4.24							
37	$4.25 and over							
	Firemen—							
38	$0.50 to $0.74							
39	$0.75 to $0.99							
40	$1.00 to $1.24				1			
41	$1.25 to $1.49			1	5			
42	$1.50 to $1.74			1	7		20	
43	$1.75 to $1.99			1	9		6	
44	$2.00 to $2.24				3		1	
45	$2.25 to $2.49				2		4	
46	$2.50 to $2.74				1			
47	$2.75 to $2.99							
48	$3.00 to $3.24							
	Machinists, blacksmiths, and other mechanics—							
49	$0.75 to $0.99							
50	$1.00 to $1.24			1				
51	$1.25 to $1.49			4	4		3	
52	$1.50 to $1.74				32		20	
53	$1.75 to $1.99				19		6	
54	$2.00 to $2.24		6	1	15		21	
55	$2.25 to $2.49				14		3	
56	$2.50 to $2.74				13		4	1
57	$2.75 to $2.99				5		10	
58	$3.00 to $3.24				5		1	
59	$3.25 to $3.49				1			
60	$3.50 to $3.74				2		1	
61	$4.00 to $4.24							
62	$4.25 and over							
	Quarrymen and stonecutters—							
63	$0.50 to $0.74					3		
64	$0.75 to $0.99				1		3	
65	$1.00 to $1.24	2	1	1	153	11	71	6
66	$1.25 to $1.49			71	125		266	
67	$1.50 to $1.74	4	4	21	587		1,041	28
68	$1.75 to $1.99		117	18	251		173	1
69	$2.00 to $2.24		1	3	129		88	1
70	$2.25 to $2.49	65	4	1	23			
71	$2.50 to $2.74				12		2	1
72	$2.75 to $2.99	2			2		1	
73	$3.00 to $3.24	10			12			
74	$3.25 to $3.49				89		1	
75	$3.50 to $3.74				2			3
76	$4.00 to $4.24				10			
77	$4.25 and over							
	Boys under 16 years—							
78	Less than $0.50				1			
79	$0.50 to $0.74				3		2	
80	$0.75 to $0.99		1		6		4	1
81	$1.00 to $1.24		1		2		2	
82	$1.25 to $1.49							

[1] Includes operators distributed as follows: Nevada, 1; Rhode Island, 2; South Carolina, 1.

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Oregon.	Pennsylvania.	South Dakota.	Tennessee.	Texas.	Utah.	Vermont.	Virginia.	Washington.	West Virginia.	Wisconsin.	Wyoming.	All other states and territories.[1]	
7	907	10	51	35	16	14	37	12	174	216	3	4	1
6	896	10	44	34	15	13	28	12	167	207	3	4	2
1	768	9	25	19	5	11	12	1	157	151	1	3	3
4	90	.....	11	13	6	1	6	4	6	33	2	1	4
1	37	1	7	2	4	1	10	7	4	22	.....	.....	5
.....	1	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	6
1	287	1	37	30	7	12	63	22	31	82	.....	3	7
$1,200	$228,826	$1,278	$27,826	$21,393	$2,295	$7,953	$35,459	$35,701	$27,259	$58,353	.....	$1,540	8
.....	39	.....	5	.....	.....	3	6	6	2	14	.....	.....	9
.....	$55,025	.....	$7,800	.....	.....	$2,500	$5,800	$15,601	$4,800	$16,900	.....	.....	10
1	178	1	26	24	3	6	46	11	22	51	.....	3	11
$1,200	$129,112	$1,278	$17,426	$17,859	$915	$3,973	$25,323	$15,300	$18,799	$31,852	.....	$1,540	12
.....	70	.....	6	6	4	3	11	5	7	17	.....	.....	13
.....	$44,689	.....	$2,600	$3,534	$1,380	$1,480	$4,336	$4,800	$3,660	$9,601	.....	.....	14
19	6,934	55	698	275	103	156	890	147	1,068	1,062	7	79	15
$10,102	$2,881,295	$43,714	$222,475	$124,272	$77,296	$65,083	$290,979	$87,850	$426,401	$539,169	$5,640	$26,456	16
4	281	1	34	19	3	10	38	12	53	68	.....	6	17
$1,948	$159,555	$900	$14,888	$12,707	$2,739	$4,630	$18,847	$8,892	$24,967	$39,280	.....	$2,574	18
9	5,104	48	538	192	83	83	607	77	800	944	7	58	19
$5,254	$2,104,138	$39,600	$175,024	$84,156	$62,977	$33,943	$197,621	$49,388	$321,255	$474,194	$5,640	$16,650	20
.....	33	.....	17	4	.....	.....	36	.....	9	1	.....	.....	21
.....	$9,010	.....	$2,557	$1,154	.....	.....	$6,336	.....	$2,037	$210	.....	.....	22
6	1,516	6	109	60	17	63	269	58	206	49	.....	15	23
$2,900	$608,592	$3,214	$30,006	$26,255	$11,580	$26,510	$68,175	$29,570	$78,142	$25,485	.....	$7,232	24
.....	4	.....	3	.....	.....	1	.....	.....	2	.....	.....	.....	25
.....	8	.....	2	1	.....	1	5	.....	3	.....	.....	1	26
1	35	.....	2	.....	.....	2	4	.....	14	8	.....	1	27
.....	12	.....	1	.....	.....	.....	2	.....	.....	10	.....	1	28
.....	34	.....	.....	2	.....	1	1	1	2	7	.....	.....	29
.....	24	.....	.....	.....	.....	.....	1	.....	.....	4	.....	.....	30
.....	4	.....	.....	1	.....	.....	1	.....	1	5	.....	.....	31
.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	32
.....	3	1	.....	.....	1	.....	.....	1	.....	.....	.....	.....	33
.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	34
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	38
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	39
.....	.....	.....	.....	.....	.....	.....	3	.....	5	.....	.....	.....	40
.....	12	.....	1	.....	.....	.....	2	.....	6	.....	.....	.....	41
.....	17	.....	1	.....	.....	.....	.....	.....	1	4	.....	.....	42
.....	10	.....	.....	6	.....	.....	.....	.....	.....	3	.....	.....	43
.....	4	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	44
.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45
.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	.....	.....	46
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	47
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	48
.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	49
1	1	.....	2	.....	.....	1	1	.....	1	1	.....	.....	50
.....	19	.....	10	.....	.....	1	5	.....	6	.....	.....	1	51
.....	13	.....	7	1	.....	.....	5	.....	5	3	.....	.....	52
.....	9	.....	.....	.....	.....	2	1	.....	.....	9	.....	1	53
.....	26	.....	2	1	.....	.....	4	1	2	7	.....	.....	54
.....	31	.....	.....	1	.....	.....	.....	.....	1	1	.....	.....	55
1	7	.....	1	2	1	.....	3	1	.....	4	.....	.....	56
.....	5	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	57
.....	.....	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	58
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	59
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	60
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	61
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62
.....	1	1	4	.....	.....	.....	3	.....	1	.....	.....	15	63
.....	36	.....	21	.....	.....	.....	7	.....	.....	3	.....	34	64
1	857	.....	440	67	1	17	530	.....	29	9	3	.....	65
1	2,480	.....	64	32	.....	47	56	.....	718	29	.....	8	66
.....	788	.....	1	51	2	11	.....	.....	4	450	.....	1	67
2	502	.....	.....	15	1	6	.....	27	48	397	.....	.....	68
2	232	.....	.....	16	33	2	1	19	.....	42	3	.....	69
3	172	12	.....	4	9	.....	.....	21	.....	1	.....	.....	70
.....	1	35	1	.....	3	.....	5	10	.....	2	1	.....	71
.....	2	.....	.....	.....	.....	.....	4	.....	.....	6	.....	.....	72
.....	.....	.....	.....	.....	16	.....	.....	.....	.....	2	.....	.....	73
.....	.....	.....	.....	.....	18	.....	.....	.....	.....	1	.....	.....	74
.....	33	.....	7	3	.....	.....	1	.....	.....	2	.....	.....	75
.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	76
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	77
.....	2	.....	3	.....	.....	.....	4	.....	.....	.....	.....	.....	78
.....	3	.....	12	.....	.....	.....	19	.....	.....	1	.....	.....	79
.....	7	.....	2	2	.....	.....	13	.....	9	.....	.....	.....	80
.....	20	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	81
.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82

TABLE 38.—LIMESTONES AND DOLOMITES—DETAILED

		Montana.	Nebraska.	New Jersey.	New York.	North Carolina.	Ohio.	Oklahoma.
	Average number of wage-earners at specified daily rates of pay—Continued.							
	All other wage-earners—							
83	$0.50 to $0.74				5	2	1	
84	$0.75 to $0.99				3		5	
85	$1.00 to $1.24			2	34		4	
86	$1.25 to $1.49		1	52	255		128	
87	$1.50 to $1.74		4	2	421		392	3
88	$1.75 to $1.99		34	4	47		25	
89	$2.00 to $2.24			1	65		44	
90	$2.25 to $2.49				15			
91	$2.50 to $2.74			1	3			
92	$2.75 to $2.99				1		1	
93	$3.00 to $3.24	2	1		10			
94	$3.25 to $3.49						1	
95	$3.50 to $3.74							
96	$3.75 to $3.99							
97	$4.00 to $4.24							
	Average number of wage-earners employed during each month:							
	Men 16 years and over—							
98	January	83	55	187	1,347		2,344	34
99	February	83	75	188	1,355	6	2,230	15
100	March	83	128	224	1,806	12	2,682	26
101	April	103	207	233	2,553	6	3,002	68
102	May	97	191	218	2,844	6	3,375	65
103	June	97	233	164	2,934	6	3,611	53
104	July	98	224	193	2,994	30	3,593	51
105	August	98	220	192	3,013	30	3,751	51
106	September	95	225	170	2,959	30	3,576	52
107	October	89	218	161	2,885	30	3,406	67
108	November	83	186	159	2,508	24	2,518	41
109	December	83	150	155	1,722	24	2,596	27
	Boys under 16 years—							
110	January		2		12		4	
111	February		2		12		5	
112	March		2		12		6	
113	April		2		12		7	2
114	May		2		12		9	2
115	June		2		12		9	2
116	July		2		15		11	2
117	August		2		15		11	2
118	September		2		13		9	1
119	October		2		12		10	1
120	November		2		11		8	
121	December		2		6		7	
	Contract work:							
122	Amount paid					$8,000	$7,276	
123	Number of employees					30	16	
	Miscellaneous expenses:							
124	Total	$829	$2,760	$7,833	$142,206	$763	$139,648	$840
125	Royalties and rent of quarrying plant		$823	$3,869	$28,662	$488	$41,223	$200
126	Rent of offices, taxes, insurance, interest, and other sundries.	$829	$1,937	$3,964	$113,544	$275	$98,425	$640
127	Cost of supplies and materials	$8,035	$11,173	$23,044	$451,876	$3,888	$560,462	$6,737
	Value of product:							
128	Total	$104,725	$145,473	$188,650	$2,503,536	$23,153	$3,204,998	$50,541
129	Building	$6,375	$46,910	$4,450	$480,141		$329,808	$22,562
130	Flagging	$1,400	$150		$3,420		$5,604	$7,783
131	Curbing		$85		$857		$4,718	$4,540
132	Lime burned	$8,775	$150	$123,478	$561,228	$2,090	$1,082,277	$25
133	Sold to lime burners		$400		$43,531		$62,218	
	Crushed—							
134	Concrete		$25,182	$580	$302,489		$180,300	
135	Railroad ballast, etc		$12,510		$267,189		$317,281	$9,000
136	Roadmaking, macadam, etc		$15,050		$514,916	$21,063	$454,170	
137	Rubble	$175	$24,114		$95,026		$32,163	$1,570
138	Riprap		$16,515		$5,806		$46,786	
139	Blast furnace flux	$88,000	$4,407	$53,142	$92,849		$630,325	
140	Sold to cement manufacturers			$7,000	$84,415		$3,280	
141	Other uses				$51,669		$56,068	$2,061
	Power:							
142	Total horsepower	75	284	135	6,497	80	8,461	52
	Owned—							
	Engines—							
	Steam—							
143	Number	1	7	4	117	3	217	2
144	Horsepower	15	280	135	6,172	80	7,619	52
	Gas or gasoline—							
145	Number		1		2		17	
146	Horsepower		4		15		418	
	Water wheels—							
147	Number	1			7		1	
148	Horsepower	60			245		12	
	Other power—							
149	Number						4	
150	Horsepower						328	
	Rented—							
151	Electric, horsepower						52	
152	Other power, horsepower				65		32	
	Electric motors owned—							
153	Number				9		1	
154	Horsepower				228		4	
155	Supplied to other establishments, horsepower							

[1] Includes operators distributed as follows: Nevada, 1; Rhode Island, 2; South Carolina, 1.

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Oregon.	Pennsylvania.	South Dakota.	Tennessee.	Texas.	Utah.	Vermont.	Virginia.	Washington.	West Virginia.	Wisconsin.	Wyoming.	All other states and territories.[1]	
	22		21				1						83
	1		26	1						1			84
1	181	1	62			2	175		30				85
	758	2		28		37	33	8	168	2		9	86
	476			19	2	20		17	1	18			87
	63			7		4		20	7	25			88
5	10	2		4	9			9		1		6	89
	4							1					90
		1			1			3					91
					4								92
				1									93
					1								94
													95
	1												96
										2			97
2	5,721	58	528	141	68	124	790	117	962	657	7	35	98
6	5,688	63	521	164	62	128	757	122	908	666	7	35	99
13	6,266	58	617	215	74	136	878	132	959	823	7	58	100
25	7,152	63	667	260	81	162	918	139	1,101	1,121	7	80	101
32	7,441	48	723	301	83	160	857	136	1,098	1,306	7	95	102
32	7,483	50	741	433	80	173	832	132	1,103	1,362	7	95	103
29	7,494	50	787	391	103	160	901	137	1,076	1,333	7	95	104
30	7,577	52	785	414	118	167	922	140	1,072	1,302	7	95	105
31	7,579	50	769	231	138	174	872	144	1,104	1,242	7	89	106
13	7,465	50	743	244	151	172	851	161	1,133	1,134	7	95	107
9	6,818	60	685	228	150	166	784	206	1,117	1,024	7	94	108
6	6,128	58	606	230	128	150	886	198	1,075	762	7	82	109
	27		14	3			30		8				110
	29		15	3			29		8				111
	29		18	5			37		8				112
	31		18	5			38		9	2			113
	33		16	4			36		10	2			114
	35		16	4			36		9	2			115
	35		17	4			43		10	2			116
	39		18	4			41		9	2			117
	38		18	4			39		10	2			118
	36		18	4			36		9				119
	32		18	4			35		9				120
	32		18	4			32		9				121
					$250								122
					1								123
$120	$260,428	$366	$11,462	$8,458	$4,457	$5,810	$24,898	$8,498	$8,144	$47,052	$2	$6,346	124
	$168,747	$26	$5,749	$2,570	$1,080	$2,750	$6,659	$902	$376	$3,675		$4,300	125
$120	$91,681	$340	$5,713	$5,888	$3,377	$3,060	$18,239	$7,596	$7,768	$43,377	$2	$2,046	126
$4,220	$972,605	$10,455	$101,195	$34,222	$75,046	$116,301	$126,956	$28,425	$78,146	$290,150	$225	$26,619	127
$20,133	$5,458,433	$86,605	$482,033	$228,662	$186,663	$225,703	$535,118	$213,814	$616,366	$1,351,058	$6,340	$74,464	128
	$209,215	$775	$57,399	$69,327	$3,900	$4,500	$41,355		$25	$296,998	$90		129
	$8,971		$180	$6,620					$400	$6,780			130
	$4,572		$3,257	$8,700						$50,251			131
$20,133	$1,429,643	$21,300	$235,615	$82,500	$99,463	$219,306	$241,984	$186,070	$181,608	$549,357	$2,250	$72,924	132
	$16,690								$8,760				133
	$358,578	$9,600	$5,518	$18,593			$11,580		$2,200	$36,593			134
	$575,244		$56,317	$400			$7,875		$153,696	$29,950		$350	135
	$215,533		$8,878		$400	$1,387			$1,455	$218,934			136
	$4,419	$180	$3,045	$8,765		$385				$44,234			137
	$42,092		$2,264	$2,325					$163	$59,573			138
	$2,461,426	$54,750	$108,860	$23,432	$82,840	$125	$220,001	$22,239	$268,059	$50,946	$4,000	$1,190	139
	$38,146						$1,000						140
	$98,904		$700	$8,000			$11,318	$5,505		$7,442			141
50	9,415	50	593	285		224	420	75	1,875	2,777		80	142
1	196	1	22	18		10	16	1	24	63		4	143
50	8,855	50	590	285		134	420	8	1,845	2,620		80	144
	11		1					1		4			145
	191		3					15		102			146
	2					1				2			147
	50					70				55			148
	7					1		2	2				149
	319					20		52	30				150
													151
													152
	12					1							153
	302					15							154
													155

TABLE 39.—MARBLE—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1902.

	United States.	California.	Georgia.	Massachusetts.	New York.	Pennsylvania.	Tennessee.	Vermont.	Washington.	All other states and territories.[1]
Number of quarries	83	5	5	8	14	3	11	22	5	10
Number of operators	75	5	5	8	13	3	10	16	5	10
Character of ownership:										
Individual	15	1			3		2	5		4
Firm	14	2		5	2	1		2		2
Incorporated company	45	2	5	3	7	2	8	9	5	4
Other form	1				1					
Salaried officials, clerks, etc.:										
Total number	352	13	24	13	34	8	38	195	12	15
Total salaries	$341,021	$9,297	$23,050	$12,468	$40,634	$7,465	$37,430	$184,877	$10,400	$15,400
General officers—										
Number	51	1	4	2	5	2	9	20	6	2
Salaries	$99,260	$1,800	$8,700	$2,400	$11,800	$3,360	$14,200	$47,050	$4,550	$5,400
Superintendents, managers, foremen, surveyors, etc.—										
Number	197	10	14	10	19	5	25	102	4	8
Salaries	$180,783	$7,122	$11,030	$9,318	$22,382	$3,505	$20,790	$95,186	$4,850	$7,100
Clerks										
Number	104	2	6	1	10	1	4	73	2	5
Salaries	$60,978	$375	$3,320	$750	$6,452	$600	$2,440	$42,641	$1,500	$2,900
Wage-earners:										
Total average number	4,070	50	310	130	469	169	607	2,074	63	198
Total wages	$2,212,640	$39,951	$105,709	$72,730	$332,086	$95,623	$218,764	$1,206,208	$46,099	$95,470
Engineers, firemen, and other mechanics—										
Average number	517	7	70	26	71	15	42	256	14	16
Wages	$295,524	$6,800	$30,010	$18,076	$52,556	$8,035	$18,066	$142,913	$11,228	$7,840
Quarrymen and stonecutters—										
Average number	2,513	32	163	71	307	78	412	1,244	39	172
Wages	$1,418,332	$26,782	$53,554	$38,242	$242,981	$54,322	$139,888	$748,217	$30,271	$84,075
Boys under 16 years—										
Average number	22	2	6			3	3	6	1	1
Wages	$3,756	$921	$840			$500	$360	$900	$100	$135
All other wage-earners—										
Average number	1,018	9	71	33	91	78	150	568	9	9
Wages	$495,028	$5,448	$21,305	$16,412	$36,549	$32,766	$60,450	$314,178	$4,500	$3,420
Average number of wage-earners at specified daily rates of pay:										
Engineers—										
$0.50 to $0.74	1		1							
$1.00 to $1.24	8		1				6	1		
$1.25 to $1.49	25		18			1	4			2
$1.50 to $1.74	12		1		3	3	2			3
$1.75 to $1.99	7			1	1			5		
$2.00 to $2.24	30		6	3	9			12		
$2.25 to $2.49	6			1	3	1			1	
$2.50 to $2.74	15			2				12		1
$2.75 to $2.99	1		1							
$3.00 to $3.24	6	3	1						2	
$3.75 to $3.99	1				1					
$4.00 to $4.24	1				1					
Firemen—										
$0.75 to $0.99	4		3				1			
$1.00 to $1.24	20		15				5			
$1.25 to $1.49	4									4
$1.50 to $1.74	13				3	3	2	4		1
$1.75 to $1.99	19							19		
$2.00 to $2.24	11				5			6		
$2.25 to $2.49	5			1	1				3	
$2.75 to $2.99	1								1	
$3.00 to $3.24	3								3	
Machinists, blacksmiths, carpenters, and other mechanics—										
$0.75 to $0.99	1		1							
$1.00 to $1.24	2		2							
$1.25 to $1.49	88		9			1		78		
$1.50 to $1.74	50		3	1	6	2	19	16		3
$1.75 to $1.99	22				5	1	2	14		
$2.00 to $2.24	34			7	6	1	1	18		1
$2.25 to $2.49	78	1	5	1	5	1		62	3	
$2.50 to $2.74	23		2	9	5			7		
$2.75 to $2.99	2				1			1		
$3.00 to $3.24	7	1	1		2	1		1		1
$3.25 to $3.49	4				4					
$3.50 to $3.74	10				9				1	
$3.75 to $3.99	1				1					
$4.00 to $4.24	2	2								
Quarrymen and stonecutters—										
$0.50 to $0.74	1									1
$0.75 to $0.99	12	1	9				1	1		
$1.00 to $1.24	468		115		2		344	5		2
$1.25 to $1.49	585		22	5	58	14	53	325		108
$1.50 to $1.74	438		17	49	59	20		260		33
$1.75 to $1.99	146	2			30			114		
$2.00 to $2.24	150			8	26		2	95	18	1
$2.25 to $2.49	35			3	10			6	5	11
$2.50 to $2.74	199	6			8		12	168	5	
$2.75 to $2.99	141							141		
$3.00 to $3.24	112	20		1	2			87	2	
$3.25 to $3.49	78	2		1		31		42	2	
$3.50 to $3.74	47	1		4	18	8			1	15
$3.75 to $3.99	2								2	
$4.00 to $4.24	4								3	1
$4.25 and over	95				94				1	
Boys under 16 years—										
Less than $0.50	6		4				1			1
$0.50 to $0.74	14		2			3	2	6	1	
$1.50 to $1.74	2	2								

[1] Includes operators distributed as follows: Alabama, 1; Arkansas, 1; Connecticut, 1; Maryland, 2; Montana, 1; New Mexico, 2; Utah, 2.

TABLE 39.—MARBLE—DETAILED SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

	United States.	California.	Georgia.	Massachusetts.	New York.	Pennsylvania.	Tennessee.	Vermont.	Washington.	All other states and territories.
Average number of wage-earners at specified daily rates of pay—Continued.										
All other wage-earners—										
$0.50 to $0.74	1								1	
$0.75 to $0.99	44		37					7		
$1.00 to $1.24	60	1	31		2			18	2	6
$1.25 to $1.49	261	2	3		70	58		128		
$1.50 to $1.74	343	1		31	15	20	150	121	3	2
$1.75 to $1.99	92				3			89		
$2.00 to $2.24	68	3						65		
$2.25 to $2.49	58							55	2	1
$2.50 to $2.74	57	2		2	1			52		
$2.75 to $2.99	14							14		
$3.00 to $3.24	2							1	1	
$4.00 to $4.24	8							8		
$4.25 and over	10							10		
Average number of wage-earners employed during each month:										
Men 16 years and over—										
January	3,546	29	466	107	211	112	601	1,775	80	165
February	3,593	38	419	110	224	127	601	1,832	77	165
March	3,855	42	368	112	239	132	601	2,097	78	191
April	4,064	43	331	119	361	149	604	2,210	49	198
May	4,294	36	302	130	521	160	604	2,283	58	200
June	4,165	19	255	136	535	181	604	2,178	52	205
July	4,166	67	252	141	554	180	606	2,114	52	200
August	4,208	61	259	141	577	188	606	2,095	56	225
September	4,409	65	253	143	630	230	606	2,194	60	228
October	4,255	67	245	145	633	198	607	2,097	49	214
November	4,100	56	241	138	593	185	604	2,001	68	214
December	3,921	53	262	138	550	150	604	1,940	65	159
Boys under 16 years—										
January	28	2	9			3	3	6	3	2
February	25	2	7			3	3	5	3	2
March	25	2	7			3	3	5	3	2
April	26	2	8			3	3	6	3	1
May	22	2	8			3	3	6		
June	19	2	5			3	3	6		
July	20	2	5			3	3	7		
August	20	2	5			3	3	6		1
September	21	2	5			3	3	7		1
October	20	2	5			3	3	6		1
November	19	2	4			3	3	6		1
December	19	2	4			3	3	6		1
Miscellaneous expenses:										
Total	$382,877	$6,487	$68,557	$7,837	$31,283	$4,274	$11,268	$226,103	$9,350	$17,718
Royalties and rent of quarrying plant	$65,385	$900	$15,412	$460	$6,025	$300	$6,100	$27,663		$8,525
Rent of offices, taxes, insurance, interest, and other sundries	$317,492	$5,587	$53,145	$7,377	$25,258	$3,974	$5,168	$198,440	$9,350	$9,193
Cost of supplies and materials	$825,822	$10,317	$77,205	$18,324	$100,705	$28,430	$18,725	$523,075	$22,349	$26,692
Value of product:										
Total	$5,044,182	$92,298	$660,517	$165,489	$577,298	$160,423	$518,256	$2,628,164	$61,176	$180,561
Rough—										
All purposes	$2,276,629	$33,198	$597,017	$51,695	$167,005	$22,446	$257,837	$1,056,132	$9,103	$82,196
Dressed—										
Building	$1,038,102		$50,000	$81,394	$267,013	$110,977		$433,265	$31,873	$63,580
Monumental	$956,870	$4,000	$7,500		$143,080	$24,000	$9,000	$758,390		$10,900
Ornamental	$7,300	$100		$6,000	$200					$1,000
Interior decoration	$679,913	$55,000	$6,000	$15,056			$240,419	$321,689	$19,200	$22,549
Other uses	$85,368			$11,344		$8,000	$11,000	$58,688	$1,000	$336
Power owned:										
Total horsepower	14,286	150	1,302	1,027	1,061	960	1,245	7,586	170	785
Engines—										
Steam—										
Number	191	3	56	17	14	12	21	50	6	12
Horsepower	10,748	150	1,302	840	885	960	1,245	4,411	170	785
Water wheels—										
Number	15			2	2			11		
Horsepower	3,413			187	176			3,050		
Other power—										
Number	2							2		
Horsepower	125							125		
Electric motors owned—										
Number	32	3		1	5	14		9		
Horsepower	2,220	80		40	140	300		1,660		

TABLE 40.—SANDSTONES AND QUARTZITES—DETAILED

		United States.	Alabama.	Arizona.	Arkansas.	California.	Colorado.	Connecticut.
1	Number of quarries	1,304	7	4	18	15	51	7
2	Number of operators	1,211	7	4	17	[1]11	47	7
	Character of ownership:							
3	Individual	759	5	2	12	4	26	2
4	Firm	324	1	1	2	3	15	2
5	Incorporated company	119	1	1	3	3	5	3
6	Other form	9					1	
	Salaried officials, clerks, etc.:							
7	Total number	847	6	9	11	8	33	15
8	Total salaries	$713,579	$2,650	$16,775	$5,806	$11,840	$28,704	$13,554
	General officers—							
9	Number	101		3	2	1	3	5
10	Salaries	$154,521		$10,250	$870	$2,000	$4,200	$4,000
	Superintendents, managers, foremen, surveyors, etc.—							
11	Number	531	5	3	7	7	23	9
12	Salaries	$408,486	$2,250	$4,575	$4,073	$9,840	$19,756	$8,954
	Clerks—							
13	Number	215	1	3	2		7	1
14	Salaries	$150,572	$400	$1,950	$863		$4,748	$600
	Wage-earners:							
15	Total average number	10,448	58	32	111	363	343	142
16	Total wages	$6,158,060	$30,523	$24,922	$52,170	$269,433	$237,905	$73,939
	Engineers, firemen, and other mechanics—							
17	Average number	1,248	3	3	9	24	14	21
18	Wages	$779,149	$1,778	$2,550	$4,760	$23,312	$11,145	$12,180
	Quarrymen and stonecutters—							
19	Average number	7,117	50	19	96	288	304	111
20	Wages	$4,420,075	$26,295	$16,372	$44,710	$211,679	$209,957	$57,559
	Boys under 16 years—							
21	Average number	76						
22	Wages	$17,142						
	All other wage-earners—							
23	Average number	2,007	5	10	6	51	25	10
24	Wages	$936,694	$2,450	$6,000	$2,700	$34,412	$16,803	$4,200
	Average number of wage-earners at specified daily rates of pay:							
	Engineers—							
25	$0.50 to $0.74	3						
26	$0.75 to $0.99	3						
27	$1.00 to $1.24	12		1				
28	$1.25 to $1.49	12			1			
29	$1.50 to $1.74	50			3			1
30	$1.75 to $1.99	31						1
31	$2.00 to $2.24	236	1		1			
32	$2.25 to $2.49	46						5
33	$2.50 to $2.74	68			1	2	4	
34	$2.75 to $2.99	22						
35	$3.00 to $3.24	34				12	1	
36	$3.25 to $3.49	7		1				
37	$3.50 to $3.74	3				1		
38	$4.00 to $4.24	2				1		
	Firemen—							
39	$0.75 to $0.99	1						
40	$1.00 to $1.24	2						
41	$1.25 to $1.49	13						
42	$1.50 to $1.74	18			1			4
43	$1.75 to $1.99	178						2
44	$2.00 to $2.24	20					2	1
45	$2.25 to $2.49	4						
46	$2.50 to $2.74	3						
47	$2.75 to $2.99	1						
48	$4.00 to $4.24	1				1		
	Machinists, blacksmiths, carpenters, and other mechanics—							
49	$0.50 to $0.74	1						
50	$0.75 to $0.99	6	1					
51	$1.00 to $1.24	10						
52	$1.25 to $1.49	20			1			
53	$1.50 to $1.74	34						3
54	$1.75 to $1.99	142						2
55	$2.00 to $2.24	89						1
56	$2.25 to $2.49	36					1	
57	$2.50 to $2.74	51	1			3	1	1
58	$2.75 to $2.99	24			1		2	
59	$3.00 to $3.24	44				1	3	
60	$3.25 to $3.49	13						
61	$3.50 to $3.74	3						
62	$3.75 to $3.99	3		1		1		
63	$4.00 to $4.24	2				2		
	Quarrymen and stonecutters—							
64	$0.50 to $0.74	9						
65	$0.75 to $0.99	20						
66	$1.00 to $1.24	125		1	12		8	3
67	$1.25 to $1.49	587	24	1	41			2
68	$1.50 to $1.74	1,569	10		20		39	38
69	$1.75 to $1.99	1,177		1	13	25	30	64
70	$2.00 to $2.24	1,697				130	36	2
71	$2.25 to $2.49	328	12			3	64	1
72	$2.50 to $2.74	293		8	5	18	80	
73	$2.75 to $2.99	211					32	
74	$3.00 to $3.24	573			5	112	9	
75	$3.25 to $3.49	90						1
76	$3.50 to $3.74	304	4	8				
77	$3.75 to $3.99	23						
78	$4.00 to $4.24	81					2	
79	$4.25 and over	30					4	
	Boys under 16 years—							
80	Less than $0.50	4						
81	$0.50 to $0.74	26						
82	$0.75 to $0.99	25						
83	$1.00 to $1.24	18						
84	$1.25 to $1.49	2						
85	$1.75 to $1.99	1						

[1] Includes 1 operator in Hawaii.

SUMMARY, BY STATES AND TERRITORIES: 1902.

Idaho.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Maryland.	Massachusetts.	Michigan.	Minnesota.	
11	18	9	32	19	9	5	19	9	13	1
10	18	9	32	18	9	5	15	8	12	2
7	12	5	25	18	2	5	8		6	3
2	5	3	6	2	2		4	1	3	4
1		1	1	3	4		1	7	3	5
	1				1		2			6
1	2	6	1	3	16	2	35	21	18	7
$1,232	$1,200	$4,650	$360	$3,400	$10,270	$1,148	$25,536	$23,470	$18,654	8
		1		2	1			4	4	9
		$1,200		$2,400	$720			$7,100	$6,700	10
1	2	3	1	1	14	2	24	11	12	11
$1,232	$1,200	$2,100	$360	$1,000	$8,950	$1,148	$19,274	$10,020	$11,300	12
		2			1		11	6	2	13
		$1,350			$600		$6,262	$6,350	$654	14
7	22	41	12	137	166	12	342	151	305	15
$4,655	$10,295	$19,567	$5,586	$67,260	$63,589	$5,394	$222,977	$86,108	$215,068	16
	3	6		5	19	2	31	21	28	17
	$1,050	$3,096		$2,726	$8,394	$864	$21,788	$14,218	$18,654	18
7	19	24	12	87	96	9	297	124	276	19
$4,655	$9,245	$10,949	$5,586	$42,734	$38,678	$4,368	$194,194	$69,840	$196,014	20
		1		2	1	1		3		21
		$228		$375	$50	$162		$640		22
		10		43	50		14	3	1	23
		$5,294		$21,425	$16,467		$7,000	$1,410	$400	24
										25
	1									26
		1							1	27
	1				4					28
				2	4	1	1			29
		2			2					30
		1					1	2	1	31
				1			7	2	4	32
							3	1	1	33
							1			34
							6	2		35
							2			36
										37
										38
										39
										40
										41
					2			1		42
								1		43
								3	1	44
										45
										46
										47
										48
										49
					1					50
	1	1			1				1	51
						1				52
				1	2					53
					1					54
		1		1	2		1	6	4	55
							2	2	11	56
							3	1	1	57
							3			58
							1		1	59
										60
									1	61
									1	62
										63
			1	2						64
	1		1	1					1	65
		11	1	1	4					66
	7	3	1	9	84				10	67
	2	2	2	32	6	9	10	9	1	68
1	2	3	3	35			4	68	96	69
2	6	3	2	3			259	42	65	70
	1							5	7	71
4				4	1		1		1	72
										73
									46	74
									11	75
		2			1		2		18	76
			1						12	77
							21		8	78
										79
				1	1					80
						1		2		81
		1		1				1		82
										83
										84
										85

TABLE 40.—SANDSTONES AND QUARTZITES—DETAILED

		United States.	Alabama.	Arizona.	Arkansas.	California.	Colorado.	Connecticut.
	Average number of wage-earners at specified daily rates of pay—Continued.							
	All other wage-earners—							
86	$0.50 to $0.74	1						
87	$0.75 to $0.99	5	1					
88	$1.00 to $1.24	125						
89	$1.25 to $1.49	561						10
90	$1.50 to $1.74	766	2		6			
91	$1.75 to $1.99	267						
92	$2.00 to $2.24	173	2	10		50	14	
93	$2.25 to $2.49	70					11	
94	$2.50 to $2.74	31				1		
95	$2.75 to $2.99	1						
96	$3.00 to $3.24	3						
97	$3.50 to $3.74	4						
	Average number of wage-earners employed during each month:							
	Men 16 years and over—							
98	January	5,693	67	31	61	353	199	46
99	February	5,766	67	31	47	346	268	52
100	March	7,719	67	31	57	355	324	93
101	April	10,338	44	31	68	364	360	162
102	May	12,673	63	31	93	378	381	219
103	June	13,301	71	31	96	390	362	223
104	July	13,257	71	31	91	384	378	208
105	August	13,041	50	31	108	376	369	207
106	September	12,609	55	31	134	378	405	187
107	October	11,897	55	31	219	362	382	189
108	November	10,428	43	37	193	325	375	115
109	December	7,742	43	37	165	345	313	53
	Boys under 16 years—							
110	January	34						
111	February	28						
112	March	46						
113	April	67						
114	May	105						
115	June	105						
116	July	111						
117	August	111						
118	September	96						
119	October	83						
120	November	78						
121	December	48						
	Contract work:							
122	Amount paid	$500						
123	Number of employees	1						
	Miscellaneous expenses:							
124	Total	$878,780	$1,535	$9,005	$1,530	$14,758	$12,089	$6,881
125	Royalties and rent of quarrying plant	$196,144	$1,480		$350	$6,130	$4,631	$95
126	Rent of offices, taxes, insurance, interest, and other sundries.	$682,636	$55	$9,005	$1,180	$8,628	$7,458	$6,786
127	Cost of supplies and materials	$1,298,190	$5,230	$50,220	$7,915	$80,967	$36,196	$14,668
	Value of product:							
128	Total	$10,601,171	$42,706	$107,910	$85,917	$469,016	$366,161	$128,579
	Building—							
129	Rough	$3,119,236		$9,570	$8,374	$80,038	$93,116	$123,634
130	Dressed	$2,888,248	$14,252	$75,000	$1,420	$123,240	$15,267	$4,945
	Crushed—							
131	Roadmaking, macadam, etc.	$442,113				$44,438		
132	Railroad ballast, etc	$347,869			$38,475	$4,000	$65,000	
133	Concrete	$326,467	$200		$6,271	$146,000	$6,008	
134	Ganister	$112,600						
135	Riprap	$269,269	$8,727	$4,800	$415	$71,090	$2,347	
136	Rubble	$646,619	$16,675	$18,300	$3,115	$210	$37,998	
137	Paving	$527,617			$9,810		$718	
138	Flagging	$1,142,699			$2,979		$101,486	
139	Curbing	$672,654			$14,878		$42,607	
140	Other uses	$106,780	$2,852	$240	$180		$1,614	
	Power:							
141	Total horsepower	25,652	20	80	320	439	195	564
	Owned—							
	Engines—							
	Steam—							
142	Number	789	1	3	9	18	9	11
143	Horsepower	24,631	20	80	317	429	195	564
	Gas or gasoline—							
144	Number	7			1			
145	Horsepower	72			3			
	Water wheels—							
146	Number	6						
147	Horsepower	885						
	Other power—							
148	Number	8				1		
149	Horsepower	53				10		
	Rented—							
150	Electric, horsepower	7						
151	Other power, horsepower	4						
	Electric motors owned—							
152	Number	6						
153	Horsepower	60						

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Idaho.	Illinois.	Indiana.	Iowa.	Kansas.	Kentucky.	Maryland.	Massachusetts.	Michigan.	Minnesota.	
										86
					1		1			87
		2			25					88
		1		4	24			1		89
		1		8			6	2	1	90
		6		30			7			91
										92
										93
				1						94
										95
										96
										97
4	3	31	9	92	160	3	176	49	132	98
5	3	31	10	92	169		227	42	134	99
7	17	31	9	131	169	14	204	50	202	100
5	27	47	12	146	169	18	234	174	216	101
5	37	47	13	140	169	15	371	251	357	102
17	37	48	8	152	169	13	388	244	360	103
7	35	47	11	146	202	18	426	240	357	104
5	29	47	12	153	202	14	508	233	361	105
4	26	47	17	160	202	13	469	150	358	106
4	23	35	16	154	126	12	437	132	427	107
10	19	35	14	134	125	12	368	116	420	108
11	8	34	13	120	118		296	95	336	109
				2		1		3		110
				2		1		3		111
				2		1		3		112
				2		1		3		113
		1		2		1		3		114
		1		2		1		3		115
		2		2	2	1		3		116
		2		2	2	1		3		117
		2		2	2	1		3		118
		2		2	2	1		3		119
		1		2	2	1		3		120
		1		2	2	1		3		121
										122
										123
$615	$1,946	$1,706	$527	$5,790	$928	$51	$35,440	$20,642	$45,740	124
$6	$1,193	$928	$272	$2,367	$27		$19,882	$5,235	$7,471	125
$609	$753	$778	$255	$3,423	$901	$51	$15,558	$15,407	$38,269	126
$352	$1,955	$3,040	$527	$13,944	$10,165	$1,152	$59,486	$13,793	$13,158	127
$13,777	$32,200	$37,593	$15,061	$105,509	$128,470	$15,405	$487,366	$188,073	$347,472	128
$7,823	$21,185	$24,565	$9,044	$10,157	$47,775	$7,210	$93,197	$136,280	$30,796	129
$434	$4,100	$5,564	$775	$2,080	$5,600		$96,595	$23,600	$70,935	130
	$25	$1,000	$750		$5,000	$10	$256,273		$5,400	131
				$42,050	$50,000	$4,500				132
			$35			$1,455	$40,256		$15,699	133
										134
	$1,000	$450				$545		$800	$4,061	135
$5,520	$2,925	$1,069	$3,157	$6,162		$1,035	$1,000	$27,393	$29,351	136
	$2,400	$240		$275	$1,075				$140,726	137
	$160	$120	$75	$21,124	$7,420				$225	138
		$4,585		$23,561	$4,900		$45		$43,659	139
	$405		$1,225	$100	$6,700	$650			$6,620	140
	46	128	12	137	1,350	25	883	530	1,653	141
	4	4	1	7	14	1	22	18	14	142
	46	120	12	137	1,350	25	883	530	828	143
										144
										145
									3	146
									825	147
		1								148
		8								149
										150
										151
									1	152
									15	153

TABLE 40.—SANDSTONES AND QUARTZITES—DETAILED

		Missouri.	Montana.	Nevada.	New Jersey.	New Mexico.	New York.	Ohio.
1	Number of quarries	10	8	3	22	7	377	115
2	Number of operators	10	8	3	22	7	364	91
	Character of ownership:							
3	Individual	5	6	2	12	6	228	38
4	Firm	3	1		4	1	128	28
5	Incorporated company	2	1		6		8	25
6	Other form			1				
	Salaried officials, clerks, etc.:							
7	Total number	7	2		28		86	200
8	Total salaries	$3,375	$3,900		$17,847		$67,463	$218,590
	General officers—							
9	Number	3			2		6	40
10	Salaries	$715			$185		$12,000	$75,695
	Superintendents, managers, foremen, surveyors, etc.—							
11	Number	4	1		16		64	85
12	Salaries	$2,660	$2,100		$12,302		$46,488	$72,653
	Clerks—							
13	Number		1		10		16	75
14	Salaries		$1,800		$5,360		$8,975	$70,242
	Wage-earners:							
15	Total average number	56	57	2	418	8	1,284	2,363
16	Total wages	$31,989	$52,117	$1,583	$232,480	$6,515	$785,694	$1,171,674
	Engineers, firemen, and other mechanics—							
17	Average number	10	7		28		69	618
18	Wages	$5,276	$6,400		$15,681		$41,987	$354,295
	Quarrymen and stonecutters—							
19	Average number	34	29	2	358	8	1,065	1,019
20	Wages	$21,475	$29,117	$1,583	$202,345	$6,515	$676,412	$506,539
	Boys under 16 years—							
21	Average number	1			2		8	18
22	Wages	$124			$400		$2,120	$3,840
	All other wage-earners—							
23	Average number	11	21		30		142	708
24	Wages	$5,114	$16,600		$14,054		$65,175	$307,000
	Average number of wage-earners at specified daily rates of pay:							
	Engineers—							
25	$0.50 to $0.74				1			
26	$0.75 to $0.99							1
27	$1.00 to $1.24	1			1		5	1
28	$1.25 to $1.49	1						3
29	$1.50 to $1.74				6		2	10
30	$1.75 to $1.99	1			1		3	11
31	$2.00 to $2.24	1	1		2		11	199
32	$2.25 to $2.49				2		4	14
33	$2.50 to $2.74				2		5	7
34	$2.75 to $2.99		1					
35	$3.00 to $3.24		1					
36	$3.25 to $3.49		1		2			
37	$3.50 to $3.74							
38	$4.00 to $4.24							
	Firemen—							
39	$0.75 to $0.99							
40	$1.00 to $1.24						1	
41	$1.25 to $1.49						1	6
42	$1.50 to $1.74	1					2	4
43	$1.75 to $1.99	1			1			152
44	$2.00 to $2.24	1			2			4
45	$2.25 to $2.49							4
46	$2.50 to $2.74							
47	$2.75 to $2.99							
48	$4.00 to $4.24							
	Machinists, blacksmiths, carpenters, and other mechanics—							
49	$0.50 to $0.74							1
50	$0.75 to $0.99				1			
51	$1.00 to $1.24	1					2	2
52	$1.25 to $1.49	1			2		1	4
53	$1.50 to $1.74				3		1	19
54	$1.75 to $1.99						5	127
55	$2.00 to $2.24						10	40
56	$2.25 to $2.49				1		4	5
57	$2.50 to $2.74				1		9	2
58	$2.75 to $2.99						3	1
59	$3.00 to $3.24	1						
60	$3.25 to $3.49		2					1
61	$3.50 to $3.74		1					
62	$3.75 to $3.99							
63	$4.00 to $4.24							
	Quarrymen and stonecutters—							
64	$0.50 to $0.74						1	
65	$0.75 to $0.99					1	3	1
66	$1.00 to $1.24		1				10	21
67	$1.25 to $1.49	2			72		58	58
68	$1.50 to $1.74	6			131		138	554
69	$1.75 to $1.99	10	3		55	1	201	117
70	$2.00 to $2.24	10			22		345	196
71	$2.25 to $2.49		1		14		91	41
72	$2.50 to $2.74		2	2	9	2	26	9
73	$2.75 to $2.99		7		3		28	5
74	$3.00 to $3.24	3	1		32	1	88	5
75	$3.25 to $3.49		2		1		25	3
76	$3.50 to $3.74				7		44	5
77	$3.75 to $3.99					3		
78	$4.00 to $4.24	3			8		7	4
79	$4.25 and over		12		4			
	Boys under 16 years—							
80	Less than $0.50	1						1
81	$0.50 to $0.74						3	8
82	$0.75 to $0.99				2		2	3
83	$1.00 to $1.24						1	6
84	$1.25 to $1.49						2	
85	$1.75 to $1.99							

[1] Includes operators distributed as follows: Georgia, 1; Nebraska, 1; North Carolina, 2; Oklahoma, 1; Oregon, 1; Virginia, 2.

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Pennsylvania.	South Dakota.	Tennessee.	Texas.	Utah.	Washington.	West Virginia.	Wisconsin.	Wyoming.	All other states and territories.[1]	
283	12	3	13	10	3	110	62	12	8	1
258	12	3	13	6	3	100	62	12	8	2
161	9		8	3	2	82	49	9	5	3
70	1	2	4		1	18	8	2	1	4
26	1		1	3			5	1	3	5
1	1	1								6
252	4	3	11	6	4	38	13	3	3	7
$177,786	$2,833	$1,140	$8,689	$6,720	$4,100	$18,965	$9,129	$2,038	$1,755	8
23							1			9
$25,286							$1,200			10
170	3	2	9	3	3	33	9	1	3	11
$122,455	$2,353	$780	$7,489	$4,500	$3,600	$15,865	$6,654	$800	$1,755	12
59	1	1	2	3	1	5	3	2		13
$30,045	$480	$360	$1,200	$2,220	$500	$3,100	$1,275	$1,238		14
2,864	94	10	191	65	32	453	199	74	34	15
$1,779,993	$69,509	$4,086	$100,399	$50,225	$23,297	$272,123	$109,066	$58,897	$14,082	16
253	8	2	13	4	4	19	17	4	3	17
$178,818	$6,800	$780	$9,105	$3,250	$3,095	$12,071	$9,431	$4,353	$1,267	18
1,956	81	8	156	35	27	255	179	55	31	19
$1,298,887	$59,928	$3,306	$81,782	$30,150	$19,642	$182,789	$98,427	$45,578	$12,815	20
25	1			1		11	1			21
$5,876	$150			$150		$2,919	$108			22
630	4		22	25	1	168	2	15		23
$296,412	$2,631		$9,562	$16,675	$500	$74,344	$1,100	$8,966		24
							1		1	25
1										26
							1			27
1				1						28
18						1			1	29
6						2	2			30
9			1			1	3		1	31
6							1			32
34			4		2	1	1			33
19							1			34
6			4	1				1		35
				1						36
	1						1			37
								1		38
			1							39
1										40
4			1				1			41
2							1			42
20						1				43
6										44
										45
1						2				46
	1									47
										48
										49
3										50
							1			51
10										52
4							1			53
5						2				54
16		1	1			5				55
9						1				56
21	1	1			1	2	2			57
11	1		1		1					58
34						1		2		59
5	4			1						60
1										61
										62
										63
1						1	2		1	64
1			2	1				1	6	65
30		7		1		2	4	2	6	66
199			2		3	8	3			67
381	1		97			32	34	1	14	68
260	8		38	2		60	74	1	2	69
434	48		3	1		50	34	3	1	70
56				7	12	5	2	6		71
98	6	1			5	10			1	72
107	6			10		12		1		73
154			2	4	7	51	21	32		74
31	2		5			8		1		75
191				1		9	5	7		76
			7							77
13				8		7				78
	10									79
										80
8	1			1		1	1			81
10						5				82
6						5				83
										84
1										85

TABLE 40.—SANDSTONES AND QUARTZITES—DETAILED

		Missouri.	Montana.	Nevada.	New Jersey.	New Mexico.	New York.	Ohio.
	Average number of wage-earners at specified daily rates of pay—Continued.							
	All other wage-earners—							
86	$0.50 to $0.74							
87	$0.75 to $0.99						1	1
88	$1.00 to $1.24				2			65
89	$1.25 to $1.49	9			12		14	225
90	$1.50 to $1.74				9		111	302
91	$1.75 to $1.99	1			3		9	53
92	$2.00 to $2.24				2		3	38
93	$2.25 to $2.49		11				3	23
94	$2.50 to $2.74		10		2			
95	$2.75 to $2.99						1	
96	$3.00 to $3.24	1						1
97	$3.50 to $3.74							
	Average number of wage-earners employed during each month:							
	Men 16 years and over—							
98	January	36	51		294	5	376	1,516
99	February	30	54		345	6	419	1,269
100	March	40	59		384	6	551	1,766
101	April	52	61		518	6	1,056	2,375
102	May	76	63		553	8	1,737	2,818
103	June	84	66	4	514	13	2,043	2,851
104	July	75	63	4	510	10	1,995	2,845
105	August	63	62	4	484	8	1,861	2,802
106	September	62	58	3	422	12	1,778	2,721
107	October	56	60	3	404	10	1,613	2,680
108	November	50	48	3	345	6	1,246	2,512
109	December	36	39	3	219	6	637	1,985
	Boys under 16 years—							
110	January				2		2	10
111	February				2		2	2
112	March	2			2		2	10
113	April	1			2		5	15
114	May	2			2		13	23
115	June	1			2		17	15
116	July	2			2		14	26
117	August	1			2		14	26
118	September	2			2		8	25
119	October	1			2		8	26
120	November				2		9	26
121	December				2		2	12
	Contract work:							
122	Amount paid							
123	Number of employees							
	Miscellaneous expenses:							
124	Total	$621	$3,882	$351	$18,352	$536	$104,493	$437,827
125	Royalties and rent of quarrying plant	$92	$3,044	$351	$13,647		$31,309	$16,595
126	Rent of offices, taxes, insurance, interest, and other sundries.	$529	$838		$4,705	$536	$73,184	$421,232
127	Cost of supplies and materials	$7,664	$5,810	$250	$36,080	$370	$108,159	$526,521
	Value of product:							
128	Total	$56,990	$85,152	$6,115	$406,726	$12,291	$1,408,699	$2,078,754
	Building—							
129	Rough	$32,880	$4,822	$2,383	$232,051	$6,800	$279,009	$1,067,938
130	Dressed	$15,323	$61,158		$81,145	$2,125	$271,430	$211,972
	Crushed—							
131	Roadmaking, macadam, etc				$50		$50,447	$1,554
132	Railroad ballast, etc	$900					$3,795	$75
133	Concrete	$450	$750		$30,880		$5,310	$6,675
134	Ganister							$1,595
135	Riprap	$345	$3,795				$5,452	$21,853
136	Rubble	$3,001	$4,462	$3,657	$59,777	$50	$18,583	$44,471
137	Paving					$360	$264,858	$750
138	Flagging	$881	$390		$2,200	$756	$230,158	$664,659
139	Curbing	$1,710	$2,435	$75		$950	$272,831	$43,077
140	Other uses	$1,500	$7,340		$623	$1,250	$6,826	$14,135
	Power:							
141	Total horsepower	320	89		614		2,062	8,708
	Owned—							
	Engines—							
	Steam—							
142	Number	15	3		29		76	212
143	Horsepower	320	85		614		2,017	8,634
	Gas or gasoline—							
144	Number						1	3
145	Horsepower						15	44
	Water wheels—							
146	Number						1	2
147	Horsepower						30	30
	Other power—							
148	Number							
149	Horsepower							
	Rented—							
150	Electric, horsepower							
151	Other power, horsepower		4					
	Electric motors owned—							
152	Number						1	2
153	Horsepower						1	22

[1] Includes operators distributed as follows: Georgia, 1; Nebraska, 1; North Carolina, 2; Oklahoma, 1; Oregon, 1; Virginia, 2.

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Pennsylvania.	South Dakota.	Tennessee.	Texas.	Utah.	Washington.	West Virginia.	Wisconsin.	Wyoming.	All other states and territories.[1]	
				1						86
										87
23	1					6		1		88
186						75				89
219			22		1	76				90
160						6	2			91
37	2				2		13			92
				21				1		93
14				3						94
										95
1										96
	1					3				97
1,606	70	5	81	40	12	127	29		29	98
1,600	78	5	138	49		175	42	3	29	99
2,279	86	5	246	55	24	287	112	24	34	100
2,897	112	5	236	54	37	474	240	100	38	101
3,400	110	6	252	81	43	535	276	107	38	102
3,565	115	6	246	83	45	585	324	112	36	103
3,574	101	18	229	80	42	611	279	125	44	104
3,578	101	18	168	88	39	615	280	117	48	105
3,498	102	13	161	80	37	606	273	110	37	106
3,223	98	13	171	70	35	593	218	68	28	107
2,725	86	13	179	50	47	491	195	62	29	108
2,123	57	13	185	38	23	205	108	60	18	109
9						5				110
10						6				111
15						9				112
26						12				113
42	2					14				114
45	2					14	2			115
39	2			2		14				116
38	2			2		14	2			117
29	2			2		14	2			118
19	2			2		11	2			119
17				2		11	2			120
11				2		8	2			121
										122
										123
$108,608	$4,669	$329	$7,644	$4,460	$350	$17,533	$3,632	$2,291	$4,019	124
$51,792	$2,259		$5,415	$840		$14,756	$817	$1,310	$3,850	125
$56,816	$2,410	$329	$2,229	$3,620	$350	$2,777	$2,815	$981	$169	126
$208,883	$9,703	$660	$21,261	$5,070	$4,315	$28,500	$17,169	$4,337	$670	127
$2,800,108	$110,789	$7,670	$165,565	$105,011	$30,725	$423,532	$207,086	$90,691	$34,052	128
$491,235	$19,970	$6,950	$4,832	$63,529	$2,500	$104,601	$54,892	$14,003	$28,577	129
$1,425,724	$22,192	$600	$28,090	$265	$15,225	$193,157	$85,353	$26,448	$4,324	130
$30,742			$16,300			$3,995	$83	$25,000	$1,046	131
$129,591	$168					$8,685	$630			132
$18,972			$25,907			$12,361	$51	$9,162	$25	133
$92,471							$18,534			134
$62,927	$3,652		$59,919		$8,000	$3,323	$5,436	$332		135
$202,295	$24,447		$7,000		$5,000	$79,030	$29,760	$10,096	$80	136
$26,985	$39,260			$35,000			$160	$5,000		137
$104,521				$2,200		$2,745		$600		138
$174,184	$500		$22,850	$4,010		$15,635	$112	$50		139
$40,461	$600	$120	$757	$7			$12,575			140
5,647	58		262	120	117	481	526	121	145	141
240	3		17	5	3	24	17	3	6	142
5,695	58		252	120	105	481	508	121	145	143
1							1			144
2							8			145
										146
										147
1			1		1		3			148
10			10		12		3			149
							7			150
										151
							2			152
							22			153

TABLE 41.—SILICA SAND—DETAILED SUMMARY, BY STATES: 1902.

	United States.	Ohio.	Pennsylvania.
Number of quarries	26	10	16
Number of operators	20	7	[1] 13
Character of ownership:			
Individual	5	2	3
Firm	5	2	3
Incorporated company	10	3	7
Salaried officials, clerks, etc.:			
Total number	35	18	17
Total salaries	$27,228	$13,988	$13,240
General officers—			
Number	9	7	2
Salaries	$10,240	$7,040	$3,200
Superintendents, managers, foremen, surveyors, etc.—			
Number	18	7	11
Salaries	$13,108	$5,508	$7,600
Clerks—			
Number	8	4	4
Salaries	$3,880	$1,440	$2,440
Wage-earners:			
Total average number	335	155	180
Total wages	$149,114	$69,675	$79,439
Engineers, firemen, and other mechanics—			
Average number	32	11	21
Wages	$18,140	$6,769	$11,371
Quarrymen—			
Average number	149	70	79
Wages	$66,074	$32,028	$34,046
All other wage-earners—			
Average number	154	74	80
Wages	$64,900	$30,878	$34,022
Average number of wage-earners at specified daily rates of pay:			
Engineers—			
$1.25 to $1.49	1	.....	1
$1.50 to $1.74	4	1	3
$1.75 to $1.99	1	.....	1
$2.00 to $2.24	13	5	8
$2.50 to $2.74	2	2	.....
Firemen—			
$1.50 to $1.74	3	.....	3
Machinists, blacksmiths, carpenters, and other mechanics—			
$1.50 to $1.74	1	.....	1
$1.75 to $1.99	2	1	1
$2.00 to $2.24	4	2	2
$2.50 to $2.74	1	.....	1
Quarrymen—			
$0.75 to $0.99	2	2	.....
$1.25 to $1.49	73	21	52
$1.50 to $1.74	41	25	16
$1.75 to $1.99	13	12	1
$2.00 to $2.24	20	10	10
All other wage-earners—			
$1.25 to $1.49	57	31	26
$1.50 to $1.74	79	43	36
$1.75 to $1.99	2	.....	2
$2.00 to $2.24	16	.....	16
Average number of wage-earners employed during each month:			
Men 16 years and over—			
January	270	128	142
February	264	122	142
March	335	154	181
April	343	147	196
May	365	169	196
June	341	145	196
July	332	136	196
August	366	170	196
September	380	176	204
October	365	186	179
November	328	162	166
December	331	165	166
Contract work:			
Amount paid	$100	$100	.....
Number of employees	2	2	.....
Miscellaneous expenses:			
Total	$18,776	$7,566	$11,210
Royalties and rent of quarrying plant	$8,373	$3,139	$5,234
Rent of offices, taxes, insurance, interest, and other sundries	$10,403	$4,427	$5,976
Cost of supplies and materials	$38,386	$13,598	$24,788
Product:			
Total quantity (short tons)	445,903	132,921	312,982
Total value	$421,289	$152,274	$269,015
Glass sand—			
Quantity (short tons)	147,556	20,036	127,520
Value	$130,263	$24,896	$105,367
Engine sand—			
Quantity (short tons)	3,750	3,750	.....
Value	$3,000	$3,000	.....
Furnace sand—			
Quantity (short tons)	75,637	60,396	15,241
Value	$78,244	$59,348	$18,896
Building sand—			
Quantity (short tons)	31,500	.....	31,500
Value	$24,000	.....	$24,000
Other uses—			
Quantity (short tons)	187,460	48,739	138,721
Value	$185,782	$65,030	$120,752
Power owned:			
Total horsepower	2,000	805	1,195
Steam—			
Engines—			
Number	33	16	17
Horsepower	1,980	785	1,195
Other power—			
Number	1	1	.....
Horsepower	20	20	.....

[1] Includes 2 operators in West Virginia.

TABLE 42.—SILICEOUS CRYSTALLINE ROCKS—DETAILED

		United States.	Arkansas.	California.	Colorado.	Connecticut.	Delaware.	Georgia.	Maine.	Maryland.	Massachusetts.	Minnesota.	Missouri.
1	Number of quarries	906	3	64	10	49	6	26	110	17	204	27	11
2	Number of operators	853	3	62	10	44	6	24	103	13	194	26	9
	Character of ownership:												
3	Individual	436	1	35	5	25	2	10	54	5	125	9	2
4	Firm	219	2	14		8	2	8	31	3	29	11	2
5	Incorporated company	176		13	5	9	2	6	18	5	25	4	5
6	Other form	22				2					15	2	
	Salaried officials, clerks, etc.:												
7	Total number	1,377	2	38	7	87	16	45	163	65	279	36	16
8	Total salaries	$1,227,885	$1,650	$45,054	$6,345	$75,682	$15,307	$34,536	$158,516	$67,925	$248,512	$40,719	$11,634
	General officers—												
9	Number	136		4		10	3	4	13	17	14	4	1
10	Salaries	$220,180		$10,360		$12,529	$6,000	$5,205	$20,048	$32,376	$33,295	$6,000	$800
	Superintendents, managers, foremen, surveyors, etc.—												
11	Number	923	1	27	6	60	8	32	108	33	202	27	12
12	Salaries	$799,195	$750	$29,134	$5,325	$52,062	$6,551	$24,621	$101,890	$27,897	$175,671	$31,520	$8,616
	Clerks—												
13	Number	318	1	7	1	17	5	9	42	15	63	5	3
14	Salaries	$208,510	$900	$5,560	$1,020	$11,091	$2,756	$4,710	$36,578	$7,652	$39,546	$3,199	$2,198
	Wage-earners:												
15	Total average number	18,836	10	920	46	943	335	724	2,832	817	3,395	414	179
16	Total wages	$11,072,996	$4,260	$687,058	$34,082	$535,334	$153,150	$382,559	$1,867,200	$435,372	$2,045,340	$317,622	$104,624
	Engineers, firemen, and other mechanics—												
17	Average number	1,916	1	58	5	122	30	59	297	98	366	41	23
18	Wages	$1,300,178	$600	$48,334	$4,000	$80,890	$19,177	$43,778	$207,172	$61,233	$257,398	$31,178	$17,725
	Quarrymen and stonecutters—												
19	Average number	14,474	9	708	38	666	173	538	2,254	616	2,513	321	131
20	Wages	$8,665,190	$3,660	$545,358	$28,395	$388,704	$79,616	$300,176	$1,512,164	$338,181	$1,555,632	$257,711	$79,296
	Boys under 16 years—												
21	Average number	206		3		7	8	24	34	15	22	1	8
22	Wages	$46,434		$964		$1,605	$2,500	$3,278	$10,271	$2,968	$5,726	$69	$1,095
	All other wage-earners—												
23	Average number	2,240		151	3	148	124	103	247	88	494	51	17
24	Wages	$1,061,194		$93,002	$1,687	$64,135	$51,857	$35,327	$137,593	$32,990	$226,584	$28,664	$6,508
	Average number of wage-earners at specified daily rates of pay:												
	Engineers—												
25	$0.50 to $0.74	1											
26	$0.75 to $0.99	5							1				
27	$1.00 to $1.24	11				1		2			1	1	
28	$1.25 to $1.49	17		1		3	1				1		
29	$1.50 to $1.74	53				3	1	2	7	5	7	1	
30	$1.75 to $1.99	89	1	1		3	1		8	10	19	1	2
31	$2.00 to $2.24	225		5		30			29	15	46	3	3
32	$2.25 to $2.49	96		7		6	1	1	11		26	1	
33	$2.50 to $2.74	93		1	2	3	1	1	3	2	43	3	1
34	$2.75 to $2.99	20		2					6		7	1	1
35	$3.00 to $3.24	37		12	1	1		2	1	1	6		1
36	$3.25 to $3.49	3							1		1		1
37	$3.50 to $3.74	4					1				1	1	
38	$3.75 to $3.99	4					3						
	Firemen—												
39	$0.50 to $0.74	3											
40	$0.75 to $0.99	7				1	1	2			1		
41	$1.00 to $1.24	6				1		1		1			
42	$1.25 to $1.49	18						4	1				
43	$1.50 to $1.74	25					1	1	6	4	2		
44	$1.75 to $1.99	33				1			11		2		
45	$2.00 to $2.24	32				3	3	2	2	1	4		1
46	$2.25 to $2.49	9					3				1		1
47	$2.50 to $2.74	23		1					5	1	1	1	1
48	$2.75 to $2.99	4									2		
49	$3.00 to $3.24	2											
50	$3.25 to $3.49	2								2			
	Machinists, blacksmiths, carpenters, and other mechanics—												
51	$0.50 to $0.74	1											
52	$0.75 to $0.99	9								2			
53	$1.00 to $1.24	18				2	1			5		1	
54	$1.25 to $1.49	25		1		2	1	1	1	3	1		
55	$1.50 to $1.74	73				8		1	10	8	6		
56	$1.75 to $1.99	85				6	2	3	22	2	8	3	
57	$2.00 to $2.24	199		4		8		4	44	11	18	5	1
58	$2.25 to $2.49	107		1		6	4		31		22		1
59	$2.50 to $2.74	185		3	1	5	4	1	33	1	61	2	2
60	$2.75 to $2.99	172		1		14	1	3	60	1	41		1
61	$3.00 to $3.24	158		12	1	14		21	4	12	34	3	1
62	$3.25 to $3.49	38						4		11	1	13	5
63	$3.50 to $3.74	15		2		1		3			2	1	
64	$4.00 to $4.24	9		4							1		
	Quarrymen and stonecutters—												
65	$0.50 to $0.74	52						7		5	2	1	
66	$0.75 to $0.99	350			1			59		19	2		
67	$1.00 to $1.24	958				9		106	2	8	37		
68	$1.25 to $1.49	1,583	3	2		36	45	128	47	230	86		25
69	$1.50 to $1.74	2,655	6	2		222	107	29	573	195	389	7	27
70	$1.75 to $1.99	2,648		56		177	16	2	584	17	689	4	15
71	$2.00 to $2.24	1,758		210		64	4		187	5	449	117	27
72	$2.25 to $2.49	435		54	6	8	1	22	101		131	11	9
73	$2.50 to $2.74	811		253	31	9		4	155	1	174	17	1
74	$2.75 to $2.99	1,163		17		77		22	217		388		
75	$3.00 to $3.24	1,318		24		47		87	351	48	202	15	1
76	$3.25 to $3.49	428				17		36	28	46	8	129	26
77	$3.50 to $3.74	175		1				28	9	46	5	17	
78	$3.75 to $3.99	18									1	3	
79	$4.00 to $4.24	110		89				8		1			
80	$4.25 and over	9											

[1] Includes operators distributed as follows: Arizona, 1; Idaho, 2; Indian Territory, 1; Nevada, 1.

SUMMARY, BY STATES AND TERRITORIES: 1902.

Montana.	New Hampshire.	New Jersey.	New York.	North Carolina.	Oregon.	Pennsylvania.	Rhode Island.	South Carolina.	Texas.	Utah.	Vermont.	Virginia.	Washington.	Wisconsin.	All other states and territories.[1]	
3	51	49	22	30	10	44	19	15	8	5	74	17	9	18	5	1
3	49	46	22	27	10	43	19	14	8	5	68	17	8	15	5	2
2	25	14	8	14	5	25	9	5	6	3	28	10	3	2	4	3
1	13	14	7	10	3	8	8	3	1	2	32	3	1	2	1	4
.....	11	18	7	2	2	8	2	6	1	.....	8	4	4	11	.....	5
.....	.....	.....	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
1	87	92	47	31	3	58	54	41	8	.....	128	21	20	30	2	7
$1,420	$65,648	$64,508	$42,942	$23,578	$2,590	$60,877	$55,310	$32,841	$8,400	.....	$104,655	$12,904	$11,948	$31,284	$3,120	8
.....	7	10	5	2	1	14	7	4	1	.....	3	1	1	10	.....	9
.....	$4,875	$10,525	$4,006	$2,270	$1,000	$28,520	$15,650	$4,300	$1,800	.....	$4,000	$800	$865	$15,456	.....	10
1	62	61	30	24	2	32	23	30	6	.....	89	17	16	12	2	11
$1,420	$52,618	$43,185	$30,299	$18,625	$1,590	$26,009	$21,208	$23,068	$5,400	.....	$77,645	$11,434	$9,631	$9,906	$3,120	12
.....	18	21	12	5	.....	12	24	7	1	.....	36	3	3	8	.....	13
.....	$8,655	$10,798	$8,637	$2,683	.....	$6,348	$18,452	$5,473	$1,200	.....	$23,010	$670	$1,452	$5,922	.....	14
21	1,219	947	655	615	35	703	638	815	56	1	1,505	469	137	391	14	15
$26,488	$791,196	$433,166	$357,329	$222,868	$25,454	$341,720	$421,608	$351,046	$41,184	$330	$958,950	$190,322	$95,949	$236,495	$11,690	16
3	154	86	57	51	3	58	83	71	6	.....	150	36	23	33	2	17
$3,738	$99,251	$54,417	$37,162	$24,974	$2,027	$37,697	$56,015	$48,896	$4,869	.....	$105,944	$17,460	$14,890	$19,853	$2,000	18
16	1,024	780	553	454	23	577	448	661	40	1	1,139	384	106	289	12	19
$21,250	$677,549	$346,544	$300,518	$173,794	$17,143	$275,627	$317,577	$282,492	$31,847	$330	$703,110	$152,296	$76,946	$189,584	$9,690	20
.....	8	6	12	8	.....	1	.....	22	1	.....	20	5	.....	1	.....	21
.....	$2,323	$1,218	$2,927	$1,300	.....	$240	.....	$3,158	$150	.....	$5,442	$1,050	.....	$150	.....	22
2	33	75	33	102	9	67	107	61	9	.....	196	44	8	68	.....	23
$1,500	$12,073	$30,987	$16,722	$22,800	$6,284	$28,156	$48,016	$16,500	$4,318	.....	$144,454	$19,516	$4,613	$26,908	.....	24
.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25
.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	1	1	.....	.....	26
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	4	.....	1	.....	27
.....	.....	1	.....	3	.....	2	.....	.....	.....	.....	.....	3	.....	2	.....	28
.....	4	3	1	2	.....	5	1	4	.....	.....	2	4	.....	1	.....	29
.....	13	8	2	1	.....	1	10	.....	.....	.....	4	1	1	2	.....	30
.....	18	10	7	2	1	7	13	6	1	.....	24	2	1	2	.....	31
.....	11	7	4	.....	2	1	1	.....	1	.....	13	.....	3	.....	.....	32
.....	3	3	4	.....	.....	6	1	10	.....	.....	6	.....	.....	.....	.....	33
.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	34
.....	1	4	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	3	1	35
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36
.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38
.....	.....	.....	.....	1	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	39
.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	40
.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	41
.....	.....	2	.....	8	.....	.....	.....	.....	.....	.....	.....	1	1	1	.....	42
.....	1	3	2	.....	.....	.....	2	.....	.....	.....	2	1	.....	.....	.....	43
.....	1	1	2	.....	.....	9	1	.....	.....	.....	3	2	.....	.....	.....	44
.....	1	3	3	.....	.....	1	.....	4	.....	.....	3	.....	1	.....	.....	45
.....	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	46
.....	.....	2	.....	.....	.....	.....	.....	10	1	.....	.....	.....	.....	.....	.....	47
.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	48
.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	49
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	51
.....	.....	.....	2	1	.....	.....	.....	1	.....	.....	.....	1	1	1	.....	52
.....	3	.....	.....	5	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	53
.....	.....	.....	.....	3	.....	.....	1	4	.....	.....	2	2	1	2	.....	54
.....	15	6	5	6	.....	.....	1	2	.....	.....	2	1	2	.....	.....	55
.....	16	5	3	1	.....	1	1	1	1	.....	6	2	2	.....	.....	56
.....	14	12	8	8	.....	7	12	10	.....	.....	19	4	1	9	.....	57
.....	11	3	1	.....	.....	3	6	.....	.....	.....	10	4	2	2	.....	58
.....	12	6	1	8	.....	6	16	1	1	.....	17	2	.....	2	.....	59
.....	16	2	1	.....	.....	5	13	.....	.....	.....	12	.....	.....	1	.....	60
.....	12	2	2	.....	.....	1	3	14	.....	.....	20	.....	1	1	.....	61
1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	62
.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	3	.....	1	63
1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	.....	64
.....	.....	.....	1	27	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	65
.....	.....	1	5	29	.....	.....	3	208	.....	.....	2	21	.....	.....	.....	66
.....	1	64	1	286	1	10	4	246	.....	.....	17	171	.....	.....	.....	67
.....	33	300	137	28	.....	249	26	38	.....	.....	84	129	.....	7	.....	68
.....	174	324	109	35	3	188	45	23	1	1	132	24	.....	43	1	69
.....	350	16	82	5	.....	60	52	.....	13	.....	401	3	4	102	.....	70
.....	67	29	144	21	8	21	53	.....	1	.....	258	.....	52	38	3	71
.....	15	.....	2	.....	3	7	8	.....	1	.....	29	.....	24	2	1	72
.....	24	34	.....	19	1	6	26	.....	10	.....	7	10	7	22	3	73
.....	169	.....	18	.....	.....	7	96	.....	.....	.....	175	.....	.....	27	.....	74
5	149	11	43	4	4	5	118	84	.....	.....	63	25	6	25	1	75
.....	27	.....	.....	.....	.....	18	10	40	.....	.....	18	.....	2	23	.....	76
6	5	1	9	.....	.....	10	3	13	13	.....	2	1	3	.....	3	77
.....	1	.....	2	.....	.....	1	2	.....	.....	.....	1	.....	7	.....	.....	78
.....	6	.....	.....	.....	3	.....	1	.....	1	.....	.....	.....	1	.....	.....	79
5	3	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	80

TABLE 42.—SILICEOUS CRYSTALLINE ROCKS—DETAILED

		United States.	Arkansas.	California.	Colorado.	Connecticut.	Delaware.	Georgia.	Maine.	Maryland.	Massachusetts.	Minnesota.	Missouri.
	Average number of wage-earners at specified daily rates of pay—Continued.												
	Boys under 16 years—												
81	Less than $0.50	36		1				14		4	1	1	2
82	$0.50 to $0.74	56				1		9	3	5	4		4
83	$0.75 to $0.99	49				6		1	13	4	8		1
84	$1.00 to $1.24	59		1			8		16	1	9		1
85	$1.25 to $1.49	5		1					1	1			
86	$1.50 to $1.74	1							1				
	All other wage-earners—												
87	Less than $0.50	1											
88	$0.50 to $0.74	20								1	1		
89	$0.75 to $0.99	153				1			1	3	9		
90	$1.00 to $1.24	230		1		19	18	63	1	1	16		6
91	$1.25 to $1.49	448		1		47	40	40	7	80	93	2	7
92	$1.50 to $1.74	739		3		74	59		119	1	296	19	3
93	$1.75 to $1.99	190		1	3		7		46	1	38	7	
94	$2.00 to $2.24	269		145		7			33	1	24	20	
95	$2.25 to $2.49	45							24		6		
96	$2.50 to $2.74	26							5		4		1
97	$2.75 to $2.99	5							2		1		
98	$3.00 to $3.24	93							8		4	2	
99	$3.25 to $3.49	9											
100	$3.50 to $3.74	5											
101	$3.75 to $3.99	1									1		
102	$4.00 to $4.24	6							1		1	1	
	Average number of wage-earners employed during each month:												
	Men 16 years and over—												
103	January	12,289	10	810	25	433	84	447	2,080	610	2,388	370	66
104	February	12,665	10	789	26	402	101	464	2,269	592	2,348	417	78
105	March	14,755	10	782	46	501	261	553	2,460	774	2,614	422	109
106	April	18,674	10	884	45	904	342	626	2,934	781	3,568	443	123
107	May	20,138	10	887	45	1,087	460	651	3,115	854	3,385	461	145
108	June	21,362	10	893	51	1,239	469	709	3,264	884	3,965	426	148
109	July	22,433	10	952	60	1,371	486	754	3,310	933	4,133	415	248
110	August	22,602	10	946	60	1,387	330	903	3,400	931	3,922	411	254
111	September	22,092	10	992	54	1,360	387	855	3,235	864	3,942	418	252
112	October	21,788	10	1,041	50	1,189	400	912	3,091	859	3,994	414	260
113	November	19,147	10	1,046	50	828	346	826	2,519	795	3,539	387	205
114	December	15,615	10	982	40	528	258	700	1,899	747	2,683	372	164
	Boys under 16 years—												
115	January	153		2		7		19	26	8	20		2
116	February	163		2		8		22	32	8	20		2
117	March	178		2		6	9	23	28	13	18		3
118	April	208		2		9	9	24	32	17	23		3
119	May	212		2		10	9	23	34	17	23	2	4
120	June	227		3		10	9	26	38	17	26	2	4
121	July	245		4		10	10	29	38	17	27	2	13
122	August	241		4		8	10	29	41	17	23	2	13
123	September	239		4		5	10	25	41	19	23	2	13
124	October	231		4		4	10	25	38	19	22	2	14
125	November	201		4		4	10	23	33	15	20		13
126	December	174		3		3	10	20	27	13	19		12
	Miscellaneous expenses:												
127	Total	$810,206	$945	$39,232	$2,930	$31,859	$19,688	$32,588	$66,413	$43,856	$211,745	$12,028	$8,256
128	Royalties and rent of quarrying plant.	$194,892	$760	$18,039	$65	$8,308	$7,598	$8,701	$6,036	$11,430	$19,471	$1,502	$5,350
129	Rent of offices, taxes, insurance, interest, and other sundries.	$615,314	$185	$21,193	$2,865	$23,551	$12,090	$23,887	$60,377	$32,426	$192,274	$10,526	$2,906
130	Cost of supplies and materials	$2,493,065	$650	$115,429	$4,720	$118,231	$18,126	$188,278	$217,548	$107,435	$509,702	$52,273	$32,104
	Value of product:												
131	Total	$18,257,944	$12,115	$1,137,679	$66,023	$812,141	$276,753	$803,778	$2,659,450	$758,203	$3,451,397	$478,989	$157,708
	Rough—												
132	Building	$2,175,082	$50	$230,988	$47,752	$117,802	$20,040	$30,159	$485,217	$139,856	$400,842	$17,154	$3,000
133	Monumental	$1,714,156	$215	$34,992	$8,770	$28,862		$45,814	$52,836	$15,825	$412,172	$80,656	$27,051
134	Other uses	$543,914		$8,455		$3,929	$4,593	$12,330	$12,720	$4,150	$123,399	$2,700	
	Dressed—												
135	Building	$4,859,750	$600	$133,574	$1,800	$200,262	$2,407	$99,213	$1,435,803	$323,239	$965,342	$181,089	$29,283
136	Monumental	$2,284,755		$43,855	$1,513	$66,899		$18,565	$155,305	$17,500	$381,872	$154,825	$2,185
	Crushed—												
137	Concrete	$734,561		$116,400		$54,552	$10,934	$7,047	$1,784	$54,704	$97,584	$1,500	$19,241
138	Railroad ballast, etc	$574,780	$2,000	$13,861		$2,250	$57,291	$10,122	$90	$26,535	$50,795	$1,525	
139	Roadmaking, macadam, etc.	$1,902,439	$9,000	$135,842	$3,750	$238,261	$41,237	$26,741	$8,070	$74,522	$278,656	$12,635	$18,803
140	Paving blocks	$1,523,776		$144,160		$34,579	$9,675	$151,779	$354,530	$30,521	$358,398	$3,280	$42,359
141	Curbing	$823,846	$75	$28,205		$23,080	$4,701	$317,164	$112,290	$35,955	$111,184	$15,340	$6,900
142	Flagging	$52,880		$495		$371		$12,533	$10,238	$7,301	$15,614	$480	
143	Rubble	$500,176	$175	$24,635	$2,438	$8,468	$61,066	$50,870	$6,318	$9,055	$224,187	$6,605	
144	Riprap	$319,158		$48,099		$32,426	$63,300		$13,077	$2,250	$26,460	$1,200	$3,451
145	Other uses	$248,671		$174,118		$400	$909	$21,441	$11,172	$16,790	$4,892		$5,435
	Power:												
146	Total horsepower	46,986	20	1,241	108	5,948	1,153	718	5,325	1,710	8,672	1,636	718
	Owned—												
	Engines—												
	Steam—												
147	Number	950	1	44	2	84	12	16	134	49	62	32	22
148	Horsepower	44,189	20	1,210	40	5,930	1,043	712	4,928	1,697	8,458	665	718
	Gas or gasoline—												
149	Number	26		1	1	2			4	2	1	6	
150	Horsepower	275		6	3	18			27	13	12	90	
	Water wheels—												
151	Number	15							2			2	
152	Horsepower	1,506							300			543	
	Other power—												
153	Number	19		1			5		3		3	3	
154	Horsepower	510		10			110		70		167	33	
	Rented—												
155	Electric, horsepower	471		15	65			6			35	305	
156	Other power, horsepower.	35											
	Electric motors owned—												
157	Number	23		1				1	5	1	2	1	
158	Horsepower	442		20				20	85	15	30	15	
159	Supplied to other establishments, horsepower.	25							25				

[1] Includes operators distributed as follows: Arizona, 1; Idaho, 2; Indian Territory, 1; Nevada, 1.

SUMMARY, BY STATES AND TERRITORIES: 1902—Continued.

Montana.	New Hampshire.	New Jersey.	New York.	North Carolina.	Oregon.	Pennsylvania.	Rhode Island.	South Carolina.	Texas.	Utah.	Vermont.	Virginia.	Washington.	Wisconsin.	All other states and territories.[1]	
.....	.....	.....	.....	8	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	81
.....	1	5	.....	.....	.....	.....	.....	17	1	.....	4	1	.....	1	.....	82
.....	1	.....	9	.....	.....	.....	.....	.....	.....	.....	2	4	.....	.....	.....	83
.....	6	1	3	.....	.....	1	.....	.....	.....	.....	12	.....	.....	.....	.....	84
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	85
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	86
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	87
.....	.....	.....	.....	.....	.....	.....	1	16	.....	.....	.....	.....	1	.....	.....	88
.....	2	.....	2	102	.....	2	19	8	.....	.....	1	3	.....	.....	.....	89
.....	21	4	.....	.....	.....	4	2	10	.....	.....	17	12	.....	35	.....	90
.....	1	45	7	.....	.....	45	3	16	.....	.....	11	2	.....	1	.....	91
.....	5	17	22	.....	.....	14	58	4	9	.....	19	.....	.....	17	.....	92
.....	2	8	.....	.....	.....	1	7	3	.....	.....	27	26	.....	13	.....	93
.....	1	.....	.....	.....	3	.....	10	3	.....	.....	19	.....	1	2	.....	94
.....	1	.....	.....	.....	6	.....	3	1	.....	.....	3	.....	1	.....	.....	95
2	.....	.....	.....	.....	.....	1	1	.....	.....	.....	7	1	.....	4	.....	96
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	97
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	79	.....	.....	.....	.....	98
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	.....	.....	.....	99
.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	100
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	101
.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	102
12	456	245	357	270	18	510	451	762	48	.....	1,266	282	27	260	2	103
16	570	300	305	340	24	498	475	762	52	.....	1,276	259	27	268	2	104
23	694	469	488	445	28	554	586	817	72	.....	1,330	385	44	271	14	105
27	1,222	976	619	705	37	688	599	848	51	.....	1,401	493	74	269	2	106
27	1,470	1,052	705	795	44	770	734	798	49	2	1,494	550	95	438	15	107
26	1,420	1,164	770	767	44	820	716	821	50	2	1,530	576	119	457	22	108
27	1,544	1,268	779	722	39	829	750	821	52	2	1,619	574	230	484	21	109
24	1,582	1,320	808	773	41	850	760	925	55	3	1,640	569	196	481	21	110
24	1,559	1,277	775	737	40	838	715	876	56	3	1,672	506	168	468	18	111
24	1,551	1,226	748	687	38	782	672	862	57	.....	1,667	518	250	469	17	112
11	1,459	1,123	732	543	35	713	628	645	56	.....	1,506	444	224	455	22	113
11	1,014	872	630	500	32	572	570	579	62	.....	1,416	412	190	360	12	114
.....	2	2	8	7	.....	1	.....	22	1	.....	19	5	.....	2	.....	115
.....	2	2	8	6	.....	1	.....	23	1	.....	19	5	.....	2	.....	116
.....	2	3	9	9	.....	1	.....	25	1	.....	19	5	.....	2	.....	117
.....	11	5	13	8	.....	1	.....	23	1	.....	20	5	.....	2	.....	118
.....	11	6	14	6	.....	1	.....	23	1	.....	20	5	.....	1	.....	119
.....	11	7	14	9	.....	1	.....	23	1	.....	20	5	.....	1	.....	120
.....	11	8	13	10	.....	1	.....	24	1	.....	21	5	.....	1	.....	121
.....	11	8	13	8	.....	1	.....	25	1	.....	21	5	.....	1	.....	122
.....	11	9	13	11	.....	1	.....	25	1	.....	21	5	.....	.....	.....	123
.....	11	9	13	8	.....	1	.....	25	1	.....	20	5	.....	.....	.....	124
.....	11	8	13	8	.....	1	.....	13	1	.....	19	5	.....	.....	.....	125
.....	2	5	13	6	.....	1	.....	13	1	.....	21	5	.....	.....	.....	126
$278	$26,719	$53,135	$29,157	$16,463	$977	$41,056	$22,898	$34,047	$2,304	$63	$70,653	$12,466	$2,644	$26,211	$1,595	127
.....	$2,372	$13,620	$10,180	$5,585	$600	$25,025	$13,643	$7,488	$1,295	.....	$17,039	$10,163	.....	$622	.....	128
$278	$24,347	$39,515	$18,977	$10,878	$377	$16,031	$9,255	$26,559	$1,009	$63	$53,614	$2,303	$2,644	$25,589	$1,595	129
$2,583	$132,122	$164,562	$94,299	$42,884	$1,496	$128,968	$71,908	$131,771	$5,095	$130	$272,888	$22,290	$21,264	$35,409	$900	130
$77,050	$1,147,097	$948,474	$651,014	$338,750	$38,429	$661,062	$734,623	$598,848	$60,003	$1,479	$1,570,423	$282,046	$147,273	$369,137	$18,000	131
$16,600	$148,579	$70,884	$131,549	$26,490	$3,931	$121,198	$18,798	$70,580	$10,345	$495	$28,845	$21,158	$9,870	$1,460	$840	132
$100	$57,335	$2,940	$1,500	$820	$2,750	$1,650	$111,752	$20,986	$17,135	$534	$756,007	$12,500	$4,304	$16,650	.....	133
.....	$8,564	$450	$975	$1,250	$1,000	$525	$750	$333,728	.....	.....	$23,896	.....	.....	$500	.....	134
$16,000	$471,337	$43,761	$175,904	$131,525	$5,460	$78,678	$120,767	$71,000	$3,439	.....	$289,567	$28,840	$12,057	$30,953	$7,850	135
$250	$289,400	.....	$7,180	$8,804	$2,000	$450	$438,967	$24,290	$29,084	$450	$453,187	$51,612	$11,953	$118,009	$6,600	136
.....	$8,012	$115,035	$94,442	$8,206	$1,100	$58,479	$2,560	$36,073	.....	.....	.....	$46,588	.....	.....	$320	137
.....	$1,750	$59,546	$30,126	$54,080	$1,550	$188,129	$42	$23,510	.....	.....	$3,025	$25,554	$22,974	$25	.....	138
.....	$16,788	$578,424	$193,435	$4,910	$11,500	$140,166	$12,808	$650	.....	.....	$3,348	$6,133	.....	$86,760	.....	139
.....	$101,548	$72,404	$6,562	$6,986	$6,400	$44,411	$14,657	$4,547	.....	.....	$2,855	$14,845	$5,000	$114,280	.....	140
$300	$22,328	.....	$827	$79,332	.....	$6,799	$5,478	$7,059	.....	.....	$5,770	$29,796	$10,273	.....	$990	141
.....	$340	.....	$640	$3,283	$375	.....	$160	$500	.....	.....	.....	$550	.....	.....	.....	142
.....	$810	$700	$6,874	$6,888	$1,550	$16,769	$2,974	$5,585	.....	.....	$2,000	$26,255	$34,054	$500	$1,400	143
$13,800	$17,056	$4,330	$1,000	$3,676	$813	$3,488	$621	.....	.....	.....	$108	$17,215	$36,788	.....	.....	144
.....	$3,250	.....	.....	$2,500	.....	$320	$4,289	$340	.....	.....	$1,815	$1,000	.....	.....	.....	145
30	2,534	3,157	2,383	1,095	135	2,228	1,406	930	130	.....	2,645	868	450	1,691	55	146
3	89	66	35	32	4	50	39	30	4	.....	72	32	13	22	1	147
30	2,497	3,087	2,333	1,095	129	2,188	1,344	910	130	.....	2,467	868	450	1,210	30	148
.....	2	.....	1	.....	1	1	1	.....	.....	.....	.....	.....	.....	3	.....	149
.....	27	.....	15	.....	6	25	12	.....	.....	.....	.....	.....	.....	21	.....	150
.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	5	.....	.....	4	.....	151
.....	10	.....	.....	.....	.....	15	.....	.....	.....	.....	178	.....	.....	460	.....	152
.....	.....	1	.....	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	153
.....	.....	50	.....	.....	.....	.....	50	20	.....	.....	.....	.....	.....	.....	.....	154
.....	.....	20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25	155
.....	.....	.....	35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	156
.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	1	.....	.....	157
.....	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	160	.....	22	.....	.....	158
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	159

TABLE 43.—SLATE—DETAILED SUMMARY, BY STATES: 1902.

	United States.	Maine.	Maryland.	New York.	Pennsylvania.	Vermont.	Virginia.	All other states.[1]
Number of quarries	199	7	6	11	91	76	4	4
Number of operators	174	7	6	11	84	58	4	4
Character of ownership:								
Individual	27	1		2	9	14	1	
Firm	87		1	6	43	35	2	
Incorporated company	60	6	5	3	32	9	1	1
Salaried officials, clerks, etc.:								
Total number	437	22	10	17	259	97	15	17
Total salaries	$334,879	$16,999	$4,520	$14,645	$190,555	$78,442	$11,490	$18,228
General officers—								
Number	66	4	3	2	49	4		4
Salaries	$64,755	$4,000	$900	$3,400	$43,215	$7,600		$5,040
Superintendents, managers, foremen, surveyors, etc.—								
Number	267	16	4	12	143	71	11	10
Salaries	$207,915	$11,324	$2,400	$9,625	$108,681	$55,597	$9,270	$11,018
Clerks—								
Number	104	2	3	3	67	22	4	3
Salaries	$62,209	$1,075	$1,220	$1,620	$38,659	$15,245	$2,220	$2,170
Wage-earners:								
Total average number	5,920	217	145	126	3,426	1,639	247	120
Total wages	$3,177,459	$110,818	$72,179	$69,561	$1,879,175	$874,263	$97,645	$73,818
Engineers, firemen, and other mechanics—								
Average number	503	19	9	12	326	103	12	22
Wages	$271,796	$9,842	$5,049	$6,535	$165,835	$62,527	$6,341	$15,667
Quarrymen and stonecutters—								
Average number	3,656	131	87	110	1,920	1,168	166	74
Wages	$2,155,865	$66,549	$48,995	$61,162	$1,218,390	$647,328	$70,077	$43,364
Boys under 16 years—								
Average number	169		5	2	115	38	7	2
Wages	$36,304		$1,089	$457	$24,304	$9,556	$648	$250
All other wage-earners—								
Average number	1,592	67	44	2	1,065	330	62	22
Wages	$713,494	$34,427	$17,046	$1,407	$470,646	$154,852	$20,579	$14,537
Average number of wage-earners at specified daily rates of pay:								
Engineers—								
$0.75 to $0.99	2				2			
$1.00 to $1.24	20				11	4	3	2
$1.25 to $1.49	81	3	1		70	6		1
$1.50 to $1.74	48	2	2	1	37	3		3
$1.75 to $1.99	38	1		8	10	18	1	
$2.00 to $2.24	61	2	3	2	23	31		
$2.25 to $2.49	7		1		1	5		
$2.50 to $2.74	16				5	7		4
$2.75 to $2.99	1							1
$3.00 to $3.24	4				2		1	1
$3.25 to $3.49	1				1			
Firemen—								
$1.00 to $1.24	4				2	1	1	
$1.25 to $1.49	11				11			
$1.50 to $1.74	29	3			23	1	1	1
$1.75 to $1.99	18	1			14	1	2	
$2.00 to $2.24	13	1	1		11			
$2.25 to $2.49	5				3	2		
$2.50 to $2.74	5				1	4		
$2.75 to $2.99	1					1		
$3.25 to $3.49	1				1			
Machinists, blacksmiths, carpenters, and other mechanics—								
$1.25 to $1.49	6				6			
$1.50 to $1.74	17				16		1	
$1.75 to $1.99	22	3			14	4	1	
$2.00 to $2.24	39	1	1	1	30	6		
$2.25 to $2.49	27	2			20	4	1	
$2.50 to $2.74	13				5	2		6
$2.75 to $2.99	3				2	1		
$3.00 to $3.24	5				4	1		
$3.25 to $3.49	2				1	1		
$3.50 to $3.74	2							2
$4.25 and over	1							1
Quarrymen and stonecutters—								
$0.50 to $0.74	3						3	
$0.75 to $0.99	7						6	1
$1.00 to $1.24	117				3	25	81	8
$1.25 to $1.49	185	5	5	2	84	78	4	7
$1.50 to $1.74	588	74	3	44	233	218	11	10
$1.75 to $1.99	505	18	7	28	218	234		
$2.00 to $2.24	1,160	26	71	33	515	457	26	32
$2.25 to $2.49	600	7	1	3	428	146	15	
$2.50 to $2.74	263				224	14	20	5
$2.75 to $2.99	142				141	1		
$3.00 to $3.24	86	1			74			11
Boys under 16 years—								
Less than $0.50	7				1		5	1
$0.50 to $0.74	66		4		56	3	2	1
$0.75 to $0.99	75			2	46	27		
$1.00 to $1.24	20				12	8		
$1.25 to $1.49	1		1					
All other wage-earners—								
$0.50 to $0.74	3				3			
$0.75 to $0.99	17				5	1	11	
$1.00 to $1.24	129	21			67	5	36	
$1.25 to $1.49	699		39		607	38	15	
$1.50 to $1.74	463	8	5		205	238		7
$1.75 to $1.99	75	11		1	31	32		
$2.00 to $2.24	96	19		1	63	13		
$2.25 to $2.49	32				25			7
$2.50 to $2.74	52	6			38			8
$2.75 to $2.99	14	2			11	1		
$3.00 to $3.24	10				8	2		
$3.50 to $3.74	2				2			

[1] Includes operators distributed as follows: Arkansas, 1; California, 1; Georgia, 1; New Jersey, 1.

TABLE 43.—SLATE—DETAILED SUMMARY, BY STATES: 1902—Continued.

	United States.	Maine.	Maryland.	New York.	Pennsylvania.	Vermont.	Virginia.	All other states.
Average number of wage-earners employed during each month:								
Men 16 years and over—								
January	5,109	185	137	110	2,991	1,411	194	81
February	5,144	190	129	102	3,008	1,447	180	88
March	5,302	201	114	52	3,113	1,494	234	94
April	5,734	220	129	51	3,356	1,610	267	101
May	5,963	227	150	118	3,394	1,666	296	112
June	5,967	217	152	131	3,355	1,735	260	117
July	6,126	221	148	157	3,472	1,750	240	138
August	6,176	229	148	160	3,489	1,741	259	150
September	6,167	229	151	161	3,495	1,730	250	151
October	6,047	226	149	157	3,457	1,663	262	133
November	5,781	244	152	146	3,318	1,577	229	115
December	5,496	215	121	143	3,284	1,388	209	136
Boys under 16 years—								
January	156	.....	4	2	107	37	5	1
February	158	.....	4	2	105	38	4	1
March	166	.....	4	2	114	38	7	1
April	164	.....	4	2	114	37	6	1
May	173	.....	5	2	119	38	8	1
June	176	.....	6	2	117	39	8	4
July	176	.....	6	2	117	39	8	4
August	177	.....	6	2	118	39	8	4
September	177	.....	6	2	119	38	8	4
October	176	.....	6	2	121	38	8	1
November	166	.....	5	2	112	38	8	1
December	163	.....	4	2	113	37	6	1
Miscellaneous expenses:								
Total	$446,145	$13,496	$5,523	$8,429	$312,186	$79,700	$24,366	$2,445
Royalties and rent of quarrying plant	$269,267	$593	$1,967	$3,492	$207,130	$53,794	$2,200	$91
Rent of offices, taxes, insurance, interest, and other sundries	$176,878	$12,903	$3,556	$4,937	$105,056	$25,906	$22,166	$2,354
Cost of supplies and materials	$680,361	$27,329	$18,078	$16,225	$417,773	$162,410	$20,964	$17,582
Product:								
Total value	$5,696,051	$206,558	$118,084	$126,718	$3,547,322	$1,464,918	$160,951	$71,500
Roofing slate—								
Quantity (squares)	1,435,168	26,468	22,569	21,165	908,206	400,029	42,731	14,000
Value	$4,950,428	$143,832	$117,155	$116,628	$3,001,545	$1,338,817	$160,951	$71,500
Mill stock value	$745,623	$62,726	$929	$10,090	$545,777	$126,101	.....	.....
Power:								
Total horsepower	25,454	800	584	1,452	16,954	4,599	685	380
Owned—								
Steam engines—								
Number	599	28	19	21	378	131	16	6
Horsepower	24,649	800	539	1,142	16,934	4,469	535	230
Water wheels—								
Number	5	.....	.....	3	.....	.....	.....	2
Horsepower	425	.....	.....	275	.....	.....	.....	150
Other power—								
Number	4	.....	.....	1	.....	.....	3	.....
Horsepower	185	.....	.....	35	.....	.....	150	.....
Rented—								
Electric, horsepower	195	.....	45	.....	20	130	.....	.....
Electric motors owned—								
Number	1	.....	.....	.....	.....	.....	.....	1
Horsepower	30	.....	.....	.....	.....	.....	.....	30