
STONE.

STONE

BY WILLIAM C. DAY.

SUMMARY.

The subdivisions treated as embracing the subject of stone are slate, marble, granite, sandstone, bluestone, and ordinary limestone, which is the commercial classification. This classification is adopted in preference to the purely scientific one as being more suitable for the purposes of the census. (a)

The value of all kinds of stone reported for the Eleventh Census is \$53,035,620, distributed as follows: granite, \$14,464,095; marble, \$3,488,170; sandstone, \$10,816,057; bluestone, \$1,689,606; slate, \$3,482,513; limestone, \$19,095,179. The number of quarries operated is given as 4,163, with 82,374 employes, at an expenditure for wages of \$30,555,877 and \$10,216,926 for supplies, materials, and other expenditures, making a total of \$40,772,803. The total capital invested is reported as \$90,212,433, distributed as follows: in land, \$53,835,548; buildings, fixtures, etc., \$10,818,309; tools, implements, etc., \$14,528,553; in cash, \$11,030,023. Compared with the Tenth Census, these figures show a wonderful growth of the stone industry throughout the United States.

It should be distinctly understood that the quantity of each kind of stone reported is limited to the product actually quarried and sold. It does not include either material quarried but not utilized nor the stone used by private individuals and not regularly sold. The value is the actual amount obtained by the quarrymen in the condition in which the stone first became a commercial article. The limestone, etc., for example, used for decorative purposes was valued at the price received for that purpose, while the product which was burned into lime was of correspondingly less value.

In collecting the statistics of stone in the United States it was thought best to subdivide the kinds of stone in accordance with commercial usages, thus serving the interests of the producers more perfectly than would be compatible with a strictly scientific classification. It is true, however, that there is no such great difference between the commercial and scientific classifications as would in any degree be detrimental to scientific interests, so that the latter have been observed as well as those of the quarrymen.

The subdivisions made are as follows: granite, marble, ordinary limestone, sandstone, bluestone, and slate. The scientific subdivisions which would most naturally suggest themselves are slate, limestone (including marble), crystalline siliceous rocks, and sandstone (including bluestone and grindstones). It appears, then, that in the classification herein adopted 6 subjects have been treated, rather than 4, as the strictly scientific classification would require.

The separation of limestone into ordinary limestone and marble was made because of the great diversity in the commercial interests of the 2 classes of producers involved consequent upon the very different uses to which ordinary limestone and marble are put. Scientifically, also, the distinction between ordinary limestone and marble is very definite and satisfactory, the dividing line being determined by the generally less pure and noncrystalline character of ordinary limestone and the pure homogeneous and crystalline constitution of marble, which, by processes of metamorphism, has been produced by change in structure from ordinary limestone.

The term "granite" as used would, from the scientific standpoint, be more properly substituted by the more comprehensive term "crystalline siliceous rocks", but from the commercial point of view "granite" is better, as being in common use; and the great bulk of the stone reported herein as granite is really true granite of one or other of the various subvarieties.

The following table, arranged according to kinds of stone, gives various totals for all of these kinds of stone in the United States. It is evident that the figures for limestone in all cases are decidedly greater than the corresponding figures for any other kind. Granite, in point of magnitude, stands second; sandstone, third; marble, fourth; slate, fifth, and bluestone sixth. The table shows that the total value of the stone product of the United States for 1889 is \$53,035,620; that it was produced from 4,163 quarries by 82,374 employes, to whom were paid \$30,555,877 in

a Special acknowledgments are due to Mr. C. H. Hardon, special agent, for services as chief clerk during the preparation of the directory of stone producers; to Mr. J. H. Humphries for services as chief clerk; to Mr. W. B. Smith for his field notes, particularly in New England, and his aid in tabulation; to Mr. Morris Ewert as consulting expert on stone from the commercial standpoint and for aid in collecting the data on bluestone, and to Mr. Eugene Leamy for services in the field and in the preparation of diagrams and maps.

wages. The total expense of producing the various products amounts to \$40,772,803, thus leaving a profit of \$12,262,817 to the producers. The total capital invested amounts to \$90,212,433. In 1880 the total number of quarries reported was 1,525, the value of the output was \$18,356,055, and the capital invested was \$25,414,497, so that the industry appears to be at present, approximately, three times as great. This fact alone would indicate that the work has been done with a great degree of thoroughness.

In connection with bluestone, it should be borne in mind that the figure \$1,689,606, representing the total value of the bluestone output, represents the value of stone regularly taken from definitely organized quarries, and also the amount which was purchased by wholesale dealers from men whose operations are irregular and scattering, and from whom no definite statistics as to labor, expenses, power, and capital could be obtained. The reason for this is given in detail in the report on bluestone. The value of the stone taken from the 217 bluestone quarries given in the table is \$749,912. The statistics as to labor, expense, power, and capital invested given for bluestone apply only, therefore, to the 217 regularly operated bluestone quarries.

RÉSUMÉ OF STATISTICS OF STONE PRODUCT IN THE UNITED STATES IN 1889.

KINDS OF STONE.	Number of quarries.	Total value.	LABOR—AVERAGE NUMBER OF EMPLOYÉS.							EXPENSES.			
			Total number employed.	Foremen.	Quarrymen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.	Total expenses.	Wages.	Supplies and materials.	Other expenditures.
Total	4, 163	\$53, 035, 620	82, 374	3, 590	40, 386	12, 017	23, 814	1, 481	1, 086	\$40, 772, 803	\$30, 555, 877	\$7, 923, 220	\$2, 293, 706
Granite	874	14, 404, 095	22, 313	815	10, 006	6, 585	4, 342	343	222	11, 504, 021	9, 620, 485	1, 446, 485	437, 051
Marble	103	3, 488, 170	4, 529	158	2, 185	1, 021	1, 013	56	96	2, 675, 069	1, 809, 211	655, 586	210, 272
Limestone	1, 954	10, 095, 179	30, 644	1, 470	16, 420	2, 037	9, 825	459	433	15, 092, 714	10, 121, 985	4, 227, 246	748, 483
Sandstone	803	10, 816, 057	16, 925	782	7, 746	1, 983	5, 912	250	252	8, 130, 295	6, 257, 580	1, 277, 004	595, 711
Bluestone	217	1, 689, 606	1, 793	144	778	109	736	18	8	608, 582	527, 634	34, 785	46, 163
Slate	212	3, 482, 513	6, 170	221	3, 251	282	1, 986	355	75	2, 762, 122	2, 218, 982	282, 114	261, 026

KINDS OF STONE.	POWER.				CAPITAL INVESTED.				
	Number of boilers.	Total horse power of boilers.	Horse power of water wheels.	Number of animals employed.	Total capital.	Land.	Buildings and fixtures.	Tools, implements, etc.	Cash.
Total	2, 544	72, 209	4, 297	14, 089	\$90, 212, 433	\$53, 835, 548	\$10, 818, 309	\$14, 528, 553	\$11, 030, 023
Granite	556	15, 119	80	2, 980	19, 115, 449	10, 897, 417	1, 580, 784	3, 731, 078	2, 906, 170
Marble	206	8, 022	3, 370	603	15, 092, 842	8, 828, 960	2, 130, 415	1, 876, 265	2, 257, 202
Limestone	926	21, 945	417	6, 982	27, 022, 325	14, 771, 200	4, 988, 207	4, 541, 622	2, 721, 295
Sandstone	553	15, 182	165	2, 851	17, 776, 467	11, 501, 100	1, 492, 850	3, 044, 557	1, 737, 060
Bluestone	12	169	.....	183	635, 757	428, 380	17, 015	106, 292	84, 070
Slate	291	11, 772	265	400	10, 569, 593	7, 408, 491	609, 038	1, 228, 738	1, 323, 326

The following table shows the value of the total product and also the total capital invested in all kinds of stone in the 5 general divisions of the United States (a):

VALUE OF PRODUCT OF ALL KINDS OF STONE AND CAPITAL INVESTED IN THE INDUSTRY.

DIVISIONS.	Value of product.	Capital invested.
Total	\$53, 035, 620	\$90, 212, 433
North Atlantic	27, 799, 838	44, 985, 462
South Atlantic	3, 195, 399	7, 825, 742
North Central	15, 778, 104	25, 562, 919
South Central	1, 588, 960	2, 341, 594
Western	4, 673, 319	9, 496, 716

a The states included in these divisions are as follows:

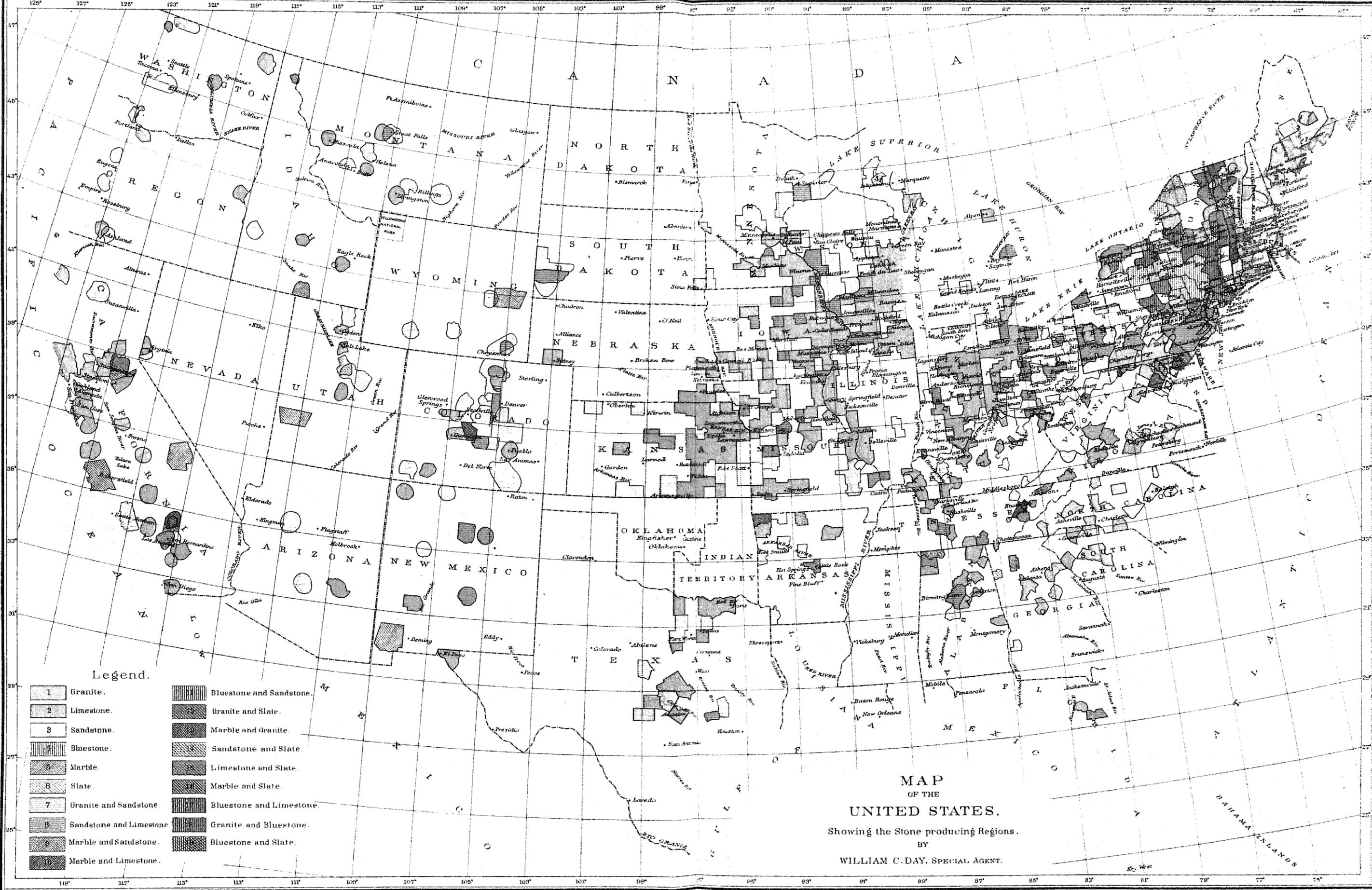
NORTH ATLANTIC DIVISION.—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania.

SOUTH ATLANTIC DIVISION.—Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida.

NORTH CENTRAL DIVISION.—Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Nebraska, Kansas.

SOUTH CENTRAL DIVISION.—Kentucky, Tennessee, Alabama, Texas, Arkansas.

WESTERN DIVISION.—Montana, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Idaho, Washington, Oregon, California.

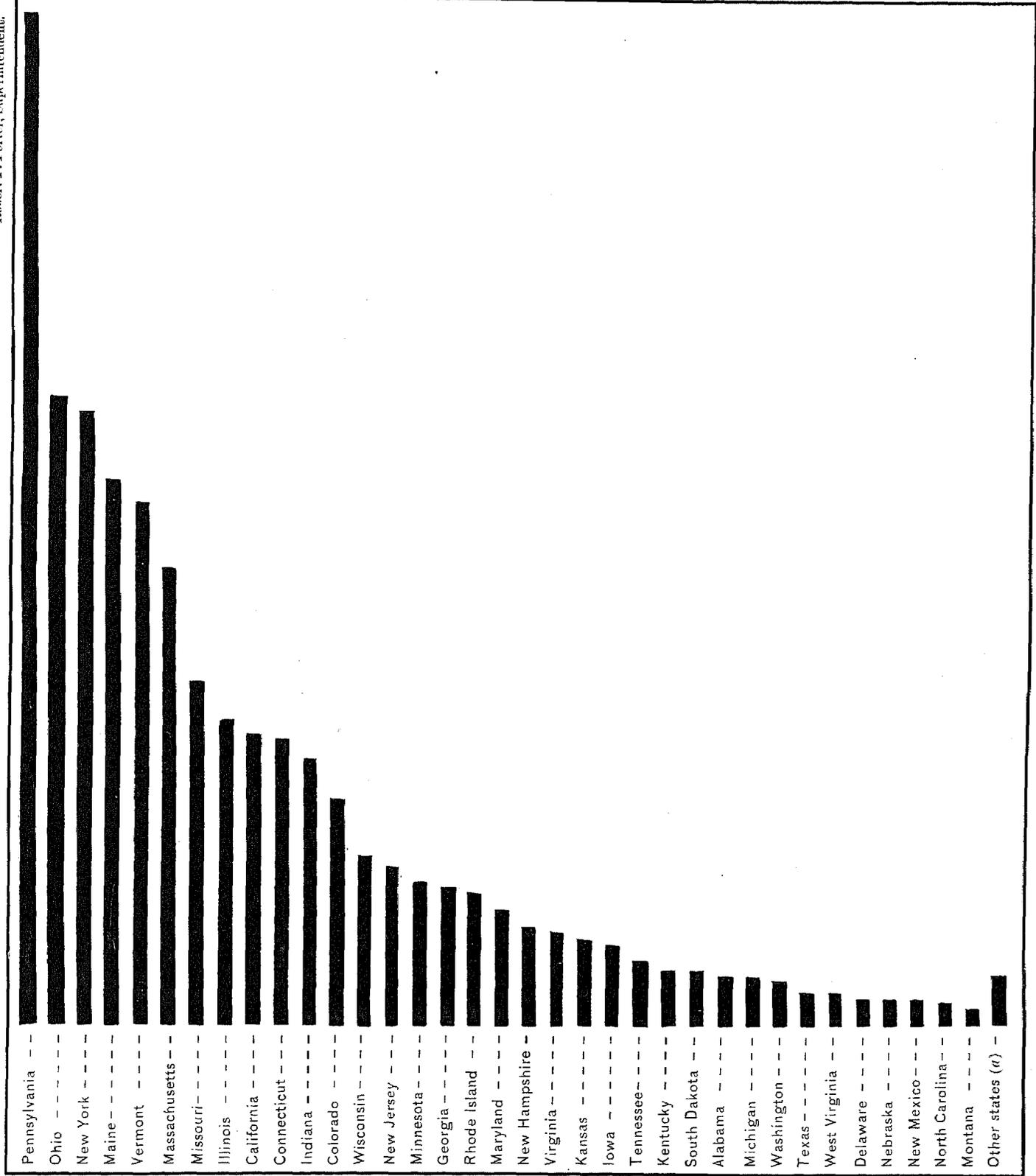


Legend.

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|----------------------------|--------------------------|
| 1 Granite. | Bluestone and Sandstone. |
| 2 Limestone. | Granite and Slate. |
| 3 Sandstone. | Marble and Granite. |
| 4 Bluestone. | Sandstone and Slate. |
| 5 Marble. | Limestone and Slate. |
| 6 Slate. | Marble and Slate. |
| 7 Granite and Sandstone. | Bluestone and Limestone. |
| 8 Sandstone and Limestone. | Granite and Bluestone. |
| 9 Marble and Sandstone. | Bluestone and Slate. |
| 10 Marble and Limestone. | |

MAP
OF THE
UNITED STATES,
Showing the Stone producing Regions.
BY
WILLIAM C. DAY, SPECIAL AGENT.

Eleventh Census of the United States.



RELATIVE RANK OF STATES FOR STONE OF ALL KINDS COMBINED.

See Appendix A, Tables 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

It is evident from the preceding table that the North Atlantic division stands at the head, both with reference to total value of output and total capital invested. The North Central division stands second, the Western division third, the South Atlantic fourth, and the South Central fifth.

The following table gives statistics relative to all kinds of stone combined according to states. The relative rank of the states according to each of the items included is also given. Pennsylvania holds first place with reference to all the items; Ohio stands second in number of quarries, total value of product, and number of employes and third in regard to the other items; New York stands third in value of product, number of quarries, and number of employes; Maine fourth in value of product, second in total wages, second in total expenses; and in total capital invested Vermont stands second. This rank is due largely to the heavy investments in marble property. Ohio stands third with respect to total capital, much of which is invested in the extensive sandstone quarries of the northern part of the state.

STATISTICS OF STONE OF ALL KINDS, 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	NUMBER OF QUARRIES		TOTAL VALUE OF PRODUCT.		TOTAL NUMBER OF EMPLOYES.		TOTAL WAGES, INCLUDING SALARIES PAID TO OFFICE FORCE.		TOTAL EXPENSES, INCLUDING WAGES AND ALL OTHER EXPENDITURES FOR QUARRIES.		TOTAL CAPITAL IN LAND.		TOTAL CAPITAL.	
	Rank.	Number.	Rank.	Amount.	Rank.	Number.	Rank.	Amount.	Rank.	Amount.	Rank.	Amount.	Rank.	Amount.
Total		4,162		\$53,035,620		82,374		\$30,555,877		\$40,772,803		\$53,835,548		\$90,212,433
Alabama	28	26	26	368,779	24	964	26	241,042	26	307,705	33	122,590	31	371,606
Arizona	42	3	42	13,309	43	17	42	6,042	42	7,742	42	29,900	43	37,075
Arkansas	31	17	39	48,674	37	144	39	27,192	39	36,895	40	43,900	41	69,801
California	11	120	9	2,126,515	11	2,434	10	1,171,367	10	1,592,430	6	3,141,310	6	4,727,953
Colorado	15	96	12	1,676,862	14	1,812	12	1,038,818	12	1,211,012	9	1,870,055	13	2,568,339
Connecticut	18	75	10	2,112,960	10	2,817	8	1,268,355	9	1,632,020	12	1,576,856	11	2,859,311
Delaware	41	5	31	211,194	34	253	32	116,216	29	191,662	43	13,200	39	104,545
Florida	45	2	43	7,256	41	37	44	1,485	44	2,505	44	.....	44	150
Georgia	22	41	16	990,217	16	1,711	18	497,433	18	649,083	5	2,451,914	7	4,017,799
Idaho	40	6	40	33,535	42	35	41	13,909	41	20,641	41	22,050	42	39,450
Illinois	13	114	8	2,268,503	9	3,286	9	1,256,634	8	1,718,746	8	2,032,625	8	3,369,016
Indiana	6	183	11	1,933,319	8	3,571	11	1,063,076	11	1,466,736	11	1,591,890	9	3,339,610
Iowa	8	154	22	611,114	19	1,396	22	386,156	20	593,479	20	576,785	18	1,187,447
Kansas	10	132	21	628,111	18	1,530	20	422,987	22	481,643	18	722,823	19	1,058,436
Kentucky	19	65	24	421,254	23	1,079	24	256,837	23	326,846	27	350,555	26	706,769
Maine	4	221	4	3,968,838	5	5,127	2	2,322,491	2	3,449,956	7	2,736,935	5	5,453,817
Maryland	20	65	18	872,778	17	1,566	19	496,790	17	697,831	15	1,155,675	15	2,010,520
Massachusetts	5	185	6	3,307,578	6	4,376	6	2,108,741	6	2,607,909	13	1,320,463	12	2,782,072
Michigan	33	15	27	347,522	27	514	28	158,305	28	198,094	28	347,102	21	892,195
Minnesota	14	102	15	1,102,008	12	1,995	14	718,290	15	895,612	16	1,099,067	16	1,888,155
Missouri	9	150	7	2,516,150	7	4,029	7	1,569,872	7	2,039,697	10	1,714,762	10	2,957,497
Montana	36	11	35	116,612	35	147	35	77,881	35	101,429	39	79,300	37	135,900
Nebraska	27	29	32	207,019	28	506	29	129,966	30	164,533	35	131,000	34	268,710
Nevada	44	2	44	3,329	44	16	43	2,850	43	3,221	37	101,000	40	101,576
New Hampshire	17	80	19	731,281	21	1,266	17	533,083	19	601,112	24	351,460	24	783,672
New Jersey	16	90	14	1,172,119	15	1,798	13	752,139	14	900,042	17	772,597	17	1,489,994
New Mexico	30	18	33	190,666	31	399	31	125,084	32	143,028	23	402,700	28	466,106
New York	3	404	3	4,418,143	3	6,295	4	2,150,168	5	2,811,679	4	3,534,070	4	5,697,329
North Carolina	29	24	34	158,027	30	444	33	108,634	33	133,537	32	160,777	32	325,130
Ohio	2	413	2	4,561,590	2	6,721	3	2,247,348	3	3,415,805	3	4,706,629	3	7,359,646
Oregon	39	7	36	93,574	39	78	37	45,010	37	67,083	36	103,500	38	131,100
Pennsylvania	1	775	1	7,319,199	1	13,336	1	4,299,157	1	5,744,884	1	8,682,594	1	13,418,712
Rhode Island	23	40	17	980,011	22	1,250	16	636,224	16	824,478	29	307,770	27	690,342
South Carolina	37	11	38	62,134	36	145	38	51,398	38	46,468	38	97,634	35	157,525
South Dakota	32	16	25	308,743	26	552	23	282,432	25	312,817	21	529,500	25	749,926
Tennessee	21	44	23	495,217	25	951	25	253,373	24	317,831	19	585,105	20	908,403
Texas	25	33	29	255,656	32	384	30	126,235	31	159,289	31	232,065	33	294,015
Utah	34	14	37	84,574	38	112	36	56,954	36	74,332	26	352,125	29	417,550
Vermont	7	167	5	3,789,769	4	5,192	5	2,147,055	4	2,976,035	2	6,235,114	2	11,779,703
Virginia	26	31	20	658,650	20	1,322	21	397,932	21	491,043	25	371,659	22	811,727
Washington	35	14	28	317,223	33	321	27	184,537	27	272,973	22	487,320	23	788,525
West Virginia	24	35	30	234,543	29	463	34	100,920	34	132,027	30	234,536	30	398,346
Wisconsin	12	119	13	1,264,016	13	1,899	15	677,166	13	1,018,245	14	1,294,458	14	2,495,221
Wyoming	38	8	41	17,120	40	75	40	18,903	40	23,577	34	131,048	36	143,148

GRANITE.

Of the various kinds of stone quarried in the United States granite is capable of the widest application when all the uses to which stone is put are considered. This statement applies, of course, not only to uses in which strength, power to resist disintegration, and permanency are essential, but also to those in which natural beauty and susceptibility to ornamentation and high polish are necessarily taken into account.

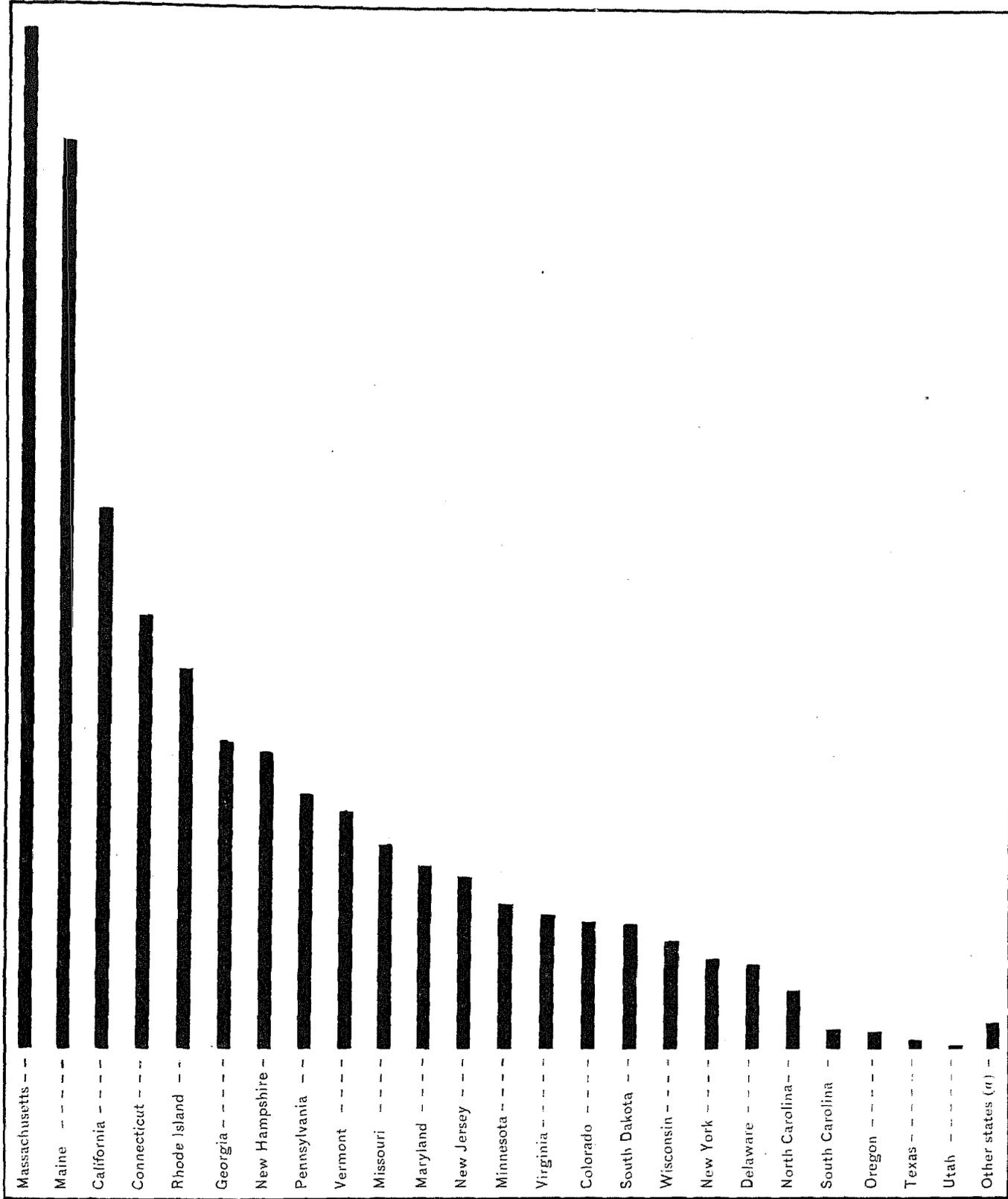
The purposes to which granite is now applied are much more numerous than they were a comparatively few years ago. The increase in the wealth of the country at large, as well as of individuals, has had much to do with this, especially in connection with uses involving ornamentation and fine finish. The great hardness of the stone and the consequent difficulty with which it is cut and polished make it when entirely finished decidedly expensive. Among wealthy people its costliness frequently determines its selection in preference to other kinds of stone, simply because the high price is an indication that nothing better can be had.

In this report the term "granite" is made to cover a much greater variety of stones than the strictly scientific use of the name would allow; in other words, it is used in its commercial rather than in its scientific sense. At the same time it is true that the great bulk of the granite herein reported is true granite of one subvariety or another. This broad classification is adopted for the purpose of making the report more significant, and consequently more valuable to stone producers, who in their business do not, as a rule, make fine distinctions between one kind of granite and another. Although variations in the nature and proportions of the minerals which constitute the granites have much to do in determining the adaptability of the stone to many purposes, still this fact is not made prominent by granite quarrymen in placing their products on the market. If by actual use a particular granite is found to do well for a certain purpose, it is, in general, correspondingly well received without inquiry as to its special constitution, which in reality determines its adaptability for such purpose.

The following list gives a general idea of the geographical distribution of granite, and indicates most of the particular kinds that have been or are now being quarried in the various localities mentioned:

GEOGRAPHICAL DISTRIBUTION OF GRANITE.

ARKANSAS.		GEORGIA.	
Hornblende-biotite granite	Pulaski county.	Muscovite granite	Dekalb county.
Elæolite syenite	Garland county.	Hornblende-biotite gneiss	Fulton county.
CALIFORNIA.		MAINE.	
Biotite granite	Placer county.	Biotite granite	Knox, York, Washington, Lincoln, Waldo, Oxford, Kennebec, and Hancock counties.
Hornblende-biotite granite	Placer and Sacramento counties.	Biotite gneiss	Lincoln, Franklin, and Androscoggin counties.
Hornblende granite	Placer county.	Muscovite-biotite granite	Kennebec, Waldo, and Franklin counties.
Quartz diorite	Placer county.	Hornblende-biotite granite	Penobscot and Knox counties.
Basalt	Solano, Sonoma, and Alameda counties.	Hornblende granite	Hancock county.
Andesite	Shasta county.	Olivine diabase	Washington county.
Andesitic tufa	Solano county.	Diabase	Washington and Knox counties.
Quartz porphyry	San Bernardino county.	MARYLAND.	
Basaltic tufa	Tehama county.	Biotite granite	Baltimore, Howard, and Montgomery counties.
COLORADO.		Biotite gneiss	Cecil and Baltimore counties.
Biotite granite	Clear Creek and Jefferson counties.	Gabbro	Baltimore county.
Muscovite gneiss	Clear Creek county.	MASSACHUSETTS.	
Diorite	Chaffee county.	Hornblende granite	Norfolk and Essex counties.
Rhyolite	Chaffee and Conejos counties.	Hornblende-biotite granite	Essex county.
Rhyolitic tufa	Douglas county.	Epidote granite	Norfolk county.
Basalt	Jefferson county.	Biotite granite	Norfolk, Middlesex, Bristol, Worcester, and Plymouth counties.
CONNECTICUT.		Biotite-muscovite granite	Worcester and Berkshire counties.
Biotite granite	Litchfield, New Haven, New London, and Fairfield counties.	Biotite gneiss	Franklin county.
Muscovite-biotite granite	Litchfield county.	Muscovite gneiss	Middlesex, Essex, Worcester, and Hampden counties.
Muscovite-biotite gneiss	Litchfield county.	Diabase	Middlesex and Hampden counties.
Biotite gneiss	Litchfield, New Haven, New London, Windham, Tolland, and Hartford counties.	Melaphyre	Suffolk county.
Hornblende-biotite gneiss	Middlesex and Fairfield counties.		
Diabase	New Haven county.		
DELAWARE.			
Augite-hornblende gneiss	Newcastle county.		



RELATIVE RANK OF STATES PRODUCING GRANITE.

^a Arkansas, Montana, Nevada, and Washington.

GEOGRAPHICAL DISTRIBUTION OF GRANITE—Continued.

MINNESOTA.	
Hornblende granite	Sherburne, Benton, and Lake counties.
Hornblende-mica granite	Benton county.
Quartz porphyry	Lake and Saint Louis counties.
Diabase	Saint Louis county.
Olivine diabase	Chisago county.
Gabbro	Saint Louis county.
MISSOURI.	
Hornblende-biotite granite	Iron and Saint François counties.
Granite	Iron county.
Olivine diabase	Iron county.
MONTANA.	
Hornblende-mica granite	Lewis and Clarke county.
NEVADA.	
Hornblende andesite	Washoe county.
NEW HAMPSHIRE.	
Biotite-muscovite granite	Merrimack, Cheshire, Hillsboro Grafton, Sullivan, and Strafford counties.
Biotite granite	Cheshire, Hillsboro, Grafton, and Rockingham counties.
Hornblende-biotite granite	Carroll county.
Muscovite-biotite gneiss	Cheshire and Hillsboro counties.
Biotite-epidote gneiss	Grafton county.
NEW JERSEY.	
Biotite gneiss	Passaic county.
Hornblende granite	Morris county.
Diabase	Hudson county.
NEW YORK.	
Biotite granite	Putnam county.
Hornblende-mica granite	Jefferson county.
Norite	Essex county.
Biotite gneiss	Westchester and Rockland counties.
NORTH CAROLINA.	
Biotite granite	Warren, Franklin, Gaston, Granville, Alamance, Davidson, Mecklenburg, Iredell, Forsyth, Guilford, Richmond, and Anson counties.
Muscovite granite	Warren county.
Granite	Rowan and Orange counties.
Biotite-muscovite granite	Rowan county.
Hornblende-biotite granite	Mecklenburg county.
Biotite gneiss	Cleveland, McDowell, Caldwell, Wilson, Stokes, Iredell, Wake, and Guilford counties.
Hornblende gneiss	Burke county.

OREGON.	
Granite	Jackson and Columbia counties.
Diabase	Linn county.
Basalt	Clackamas and Columbia counties.
Andesite	Multnomah county.
PENNSYLVANIA.	
Biotite gneiss	Philadelphia and Delaware counties.
Muscovite gneiss	Philadelphia and Berks counties.
Biotite-muscovite gneiss	Delaware county.
Diabase	Adams, York, Berks, and Lancaster counties.
Diorite	Berks county.
Hornblende gneiss	Philadelphia county.
RHODE ISLAND.	
Biotite granite	Washington, Kent, and Providence counties.
Granite	Washington county.
Biotite gneiss	Providence county.
Hornblende gneiss	Providence county.
SOUTH CAROLINA.	
Biotite granite	Fairfield, Charleston, Aiken, Lexington, Richland, Edgefield, and Newberry counties.
Hornblende-biotite granite	Fairfield county.
SOUTH DAKOTA.	
Granite	Minnehaha county.
TEXAS.	
Biotite granite	Burnet county.
Diorite	El Paso county.
UTAH.	
Hornblende-biotite granite	Salt Lake and Weber counties.
VERMONT.	
Biotite granite	Washington and Essex counties.
Muscovite granite	Windsor county.
Biotite-muscovite granite	Caledonia county.
Gabbro	
VIRGINIA.	
Biotite granite	Dinwiddie, Chesterfield, and Henrico counties.
Muscovite granite	Spottsylvania county.
Biotite gneiss	Campbell county.
Biotite schist	Fauquier county.
Diabase	Loudoun and Fauquier counties.
WASHINGTON.	
Granite	Stevens county.
WISCONSIN.	
Granite	Marquette county.
Hornblende granite	Marathon county.
Quartz porphyry	Green Lake county.
Biotite gneiss	Jackson county.

PRODUCTION.

The table of production, page 603, shows by states and territories the general condition of the granite industry. Granite was produced in 28 states and territories, 10 more than were included in the Tenth Census report. The total value of the output of the United States in 1889 was \$14,464,095, while according to the census of 1880 the total value amounted to \$5,188,998, a gain of \$9,275,097, or 179 per cent, in the decade.

The following table shows the relative standing, according to value of output, of the various productive states and territories in 1880 and 1889:

RANK OF STATES AND TERRITORIES ACCORDING TO THE VALUE OF GRANITE PRODUCT IN 1880 AND 1889.

Rank.	TENTH CENSUS.		Rank.	ELEVENTH CENSUS.	
	States and territories.	Value of output.		States and territories.	Value of output.
	Total	\$5, 188, 098		Total	\$14, 464, 095
1	Massachusetts.....	1, 329, 315	1	Massachusetts.....	2, 563, 503
2	Maine.....	1, 175, 286	2	Maine.....	2, 225, 839
3	Rhode Island.....	623, 000	3	California.....	1, 329, 018
4	Connecticut.....	407, 225	4	Connecticut.....	1, 061, 202
5	Virginia.....	331, 928	5	Rhode Island.....	931, 216
6	New Hampshire.....	303, 066	6	Georgia.....	752, 481
7	Maryland.....	224, 000	7	New Hampshire.....	727, 531
8	Pennsylvania.....	211, 454	8	Pennsylvania.....	623, 252
9	California.....	172, 450	9	Vermont.....	581, 870
10	Missouri.....	110, 000	10	Missouri.....	590, 642
11	New Jersey.....	99, 000	11	Maryland.....	447, 489
12	Georgia.....	64, 480	12	New Jersey.....	425, 673
13	Vermont.....	59, 675	13	Minnesota.....	356, 782
14	Colorado.....	41, 400	14	Virginia.....	332, 548
15	Minnesota.....	13, 075	15	Colorado.....	314, 673
16	Delaware.....	12, 600	16	South Dakota.....	304, 673
17	New York.....	10, 000	17	Wisconsin.....	266, 095
18	Washington.....	1, 044	18	New York.....	222, 773
			19	Delaware.....	211, 194
			20	North Carolina.....	146, 627
			21	South Carolina.....	47, 614
			22	Oregon.....	44, 150
			23	Texas.....	22, 550
			24	Utah.....	8, 700
				Other states (a).....	76, 000

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

It will be seen from the foregoing table that Massachusetts and Maine hold the same relative positions, namely, 1 and 2, that they did in 1880, and that to hold these positions the increase in value of output has been very great. A very notable increase in production has raised California from ninth place in the Tenth Census to third place in the Eleventh. Rhode Island has dropped from third to fifth place, thus putting it below Connecticut, which, by more than doubling its output, maintains fourth place. The production in Virginia has changed but very little in the last 10 years, so that, remaining constant in value of output, its position in the series has dropped from fifth to fourteenth place. In the case of Georgia a very striking increase raises it from twelfth to sixth place, thus placing it 1 position above the "Granite state", New Hampshire. The increase in production in Georgia is largely due to the extensive operations at Stone mountain, near Atlanta, which were begun only a few years ago. Operations in New Hampshire have resulted in an output of more than twice the value of that reported in 1880, but nevertheless it has fallen from sixth to seventh place. It is probable that the output in this state during 1890 will show a decided gain, owing to the fulfillment of a number of extensive contracts for Concord granite which have been recently made. Pennsylvania, by nearly tripling its output, maintains eighth place. The great increase in production in California is due to operations at the Folsom granite quarries. The granite produced at this locality is largely used on the spot in constructing a dam to be utilized by the Folsom Water Power Company. It has also been applied to the construction of a canal and the buildings of the power house of the state prison, located near the quarries. This work was done chiefly by convict labor. In Sonoma county granite is extensively quarried for paving blocks. This stone is really basalt, and has given unmistakable satisfaction for paving purposes. Most of the paving blocks of the state come from this county. Missouri maintains tenth place, but, as compared with the Tenth Census figures, the value of the output is more than quadrupled. This increase is due to extended operations at Graniteville, in Iron county, where a so-called red granite is produced, which has become quite popular in a number of large cities for building purposes. Colorado is in fifteenth place in the Eleventh Census. The growth in this state is due to increased activity in Douglas county, at points 30 to 35 miles south of Denver, where the variety known as rhyolite, commonly called lava stone, is produced. Remarkable activity is evident in Minnesota. The output in 1880 was comparatively insignificant, whereas that for 1889 amounts to nearly \$357,000. This notable increase is due chiefly to operations in Sherburne and Stearns counties, in the vicinity of Saint Cloud, and also at Sauk Rapids, in Benton county. Minnesota has made a stride in advance which will probably be permanent. Sixteenth place in the series is now held by South Dakota. Operations in this state date back only a few years, but

have developed rapidly. The most important producing locality is Sioux Falls, Minnehaha county, the product being sold under the commercial name of Sioux Falls granite. Indications point to the conclusion that South Dakota will hold its position in the series for some time to come. Although Delaware has fallen from sixteenth to nineteenth place, the increase in the value of production is very remarkable, namely, from \$12,600 in 1880 to \$211,194 in 1889. New York, with a product of \$10,000 in granite in 1880, shows an increase to \$222,773 in 1889. No figures for North Carolina appear in previous reports, but at present it holds twentieth place, with an output valued at \$146,627. South Carolina and Texas, neither of which appears in previous reports, give indications of promising future developments, although the present output is not great. Arkansas, although holding next to last place in the list of states for 1889, will doubtless show a much greater output in the course of a few years, owing to developments already made in the vicinity of Little Rock of what is known as Fourche Mountain granite, which is, strictly speaking, syenite.

The following table is presented for the sake of comparing the 18 states which were productive in 1880 with those of 1889, from which it appears that 94 per cent of the total value of the product of 1889 is the value of stone taken from the same states reported at the Tenth Census. In other words, the 10 states added during the past decade have contributed only 6 per cent of the value of the total output of the country.

COMPARISON OF GRANITE PRODUCT IN STATES PRODUCTIVE IN 1880 AND 1889.

STATES.	VALUE OF OUTPUT.		STATES.	VALUE OF OUTPUT.	
	1889.	1880.		1889.	1880.
Total.....	\$13,557,686	\$5,188,998	Missouri.....	\$509,642	\$119,000
Massachusetts.....	2,503,503	1,329,315	New Jersey.....	425,673	99,000
Maine.....	2,225,839	1,173,286	Georgia.....	752,481	64,489
Rhode Island.....	931,216	623,000	Vermont.....	581,870	59,675
Connecticut.....	1,061,202	467,225	Colorado.....	314,673	41,490
Virginia.....	332,548	331,928	Minnesota.....	356,782	13,075
New Hampshire.....	727,531	363,066	Delaware.....	211,194	12,630
Maryland.....	447,489	224,000	New York.....	222,773	10,000
Pennsylvania.....	623,252	211,454	California and Washington.....	1,339,018	173,494

From this comparison it is evident that the increase in production of states reported by the Tenth Census amounts to \$8,368,688, or 161 per cent. These tables did not include figures pertaining to quarries producing less than \$1,000 worth of stone in the census year; and inasmuch as the figures for the present census include all quarries regardless of magnitude, the following statement, showing the aggregates of granite quarries producing in each case less than \$1,000 worth in 1889, may be found of interest. It is evident that the total value of stone produced from these minor quarries is small, amounting to only \$27,745, or two-tenths of 1 per cent of the total output.

TOTALS FROM GRANITE QUARRIES PRODUCING LESS THAN \$1,000 WORTH OF STONE IN 1889.

STATES.	Value.	Wages.	Total expenses.	Total capital.
Total.....	\$27,745	\$24,168	\$29,427	\$107,375
California.....	1,750	1,325	1,526	4,690
Colorado.....	225	280	305	11,320
Connecticut.....	5,367	2,485	3,102	6,950
Delaware.....	700	300	1,068	5,920
Georgia.....	887	2,510	2,781	3,120
Maine.....	9,794	6,881	8,705	24,985
Massachusetts.....	2,969	1,761	2,541	11,920
Minnesota.....	338	1,237	1,353	3,750
New Jersey.....	689	2,075	3,241	6,750
North Carolina.....	350	110	110	65
Pennsylvania.....	4,745	4,204	4,755	28,895

It is noteworthy that the total expenses involved in the production of the granite reported in this table exceed the total value by nearly \$2,000. This is accounted for by the fact that many of these small enterprises were new, and probably in many cases short-lived.

GEOGRAPHICAL DISTRIBUTION.

For convenience, the country may be divided into 3 sections—eastern, middle, and western. The first includes the following states, named in order of the value of the product: Massachusetts, Maine, Connecticut, Rhode Island, Georgia, New Hampshire, Pennsylvania, Vermont, Maryland, New Jersey, Virginia, New York, Delaware, North Carolina, and South Carolina; the middle section includes Missouri, Minnesota, South Dakota, Wisconsin, and Arkansas; the western embraces California, Colorado, Montana, Oregon, Texas, Washington, Utah, and Nevada. From the following table the value of the output of the eastern section is seen to be \$11,240,812, or 77.72 per cent of the whole; that of the middle section \$1,433,192, or 9.91 per cent of the entire output, and of the western section \$1,790,091, or 12.38 per cent. In short, the great bulk of the granite output comes from the vicinity of the eastern coast of the United States. Intermediate between the eastern and middle sections is a continuous belt of states, extending from the northern to the southern boundaries of the United States, which is at present totally unproductive of granite. This section includes the states of Michigan, Iowa, Illinois, Indiana, Ohio, Kentucky, West Virginia, Tennessee, Mississippi, Louisiana, and Alabama.

VALUE OF GRANITE PRODUCED IN THE UNITED STATES IN 1889.

Eastern section	\$11, 240, 812
Middle section	1, 433, 192
Western section	1, 790, 091
Total	14, 464, 095

Further subdividing the eastern section into 2 portions, northern and southern, the former including only the New England states and the latter all states south of them, it appears that the New England states produced \$8,031,161 worth, or 55.52 per cent of the entire output of the country. In 1880 the same states produced 75.11 per cent of the total.

The following table shows the percentage of gain in each of the states, arranged in order of greatest gain, which were productive both in 1880 and 1889:

PERCENTAGE OF INCREASE OF STATES PRODUCING IN 1880.

	PER CENT.		PER CENT.
Minnesota	2, 628. 73	New Jersey	329. 97
New York	2, 127. 73	Pennsylvania	194. 75
Delaware	1, 576. 14	Connecticut	160. 59
Georgia	1, 067. 00	New Hampshire	140. 06
Vermont	875. 06	Maryland	99. 77
Washington	857. 85	Maine	89. 39
California	670. 67	Massachusetts	88. 33
Colorado	660. 08	Rhode Island	49. 47
Missouri	355. 13	Virginia	0. 19

The following table, arranged alphabetically by states, gives all totals relative to the granite output for the calendar year 1889. Considering the totals for the United States, it appears that something over 62,000,000 cubic feet of granite, having a total value in round numbers of \$14,500,000, were produced by 22,313 workmen from 874 quarries. To this number of men over \$9,600,000 in wages was paid. The total expense of producing the entire granite output amounts to over \$11,500,000, thus indicating a profit to the producers of about \$3,000,000. The total capital invested is over \$19,000,000, of which something more than one-half is the value of land.

PRODUCTION OF GRANITE IN THE UNITED STATES FOR THE CALENDAR YEAR 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of firms producing in 1889.	Number of quarries.	PRODUCT.		LABOR.							POWER.			
			Cubic feet.	Total value.	Average number of employes.							Number of boilers.	Total horse power of boilers.	Total horse power of water wheels.	Number of animals employed.
					Total number employed.	Foremen.	Quarrymen.	Mechanics and stonecutters.	Laborers.	Boys under 16 years.	Office force.				
Total	814	874	62,287,156	\$14,464,095	22,313	815	10,006	6,585	4,342	343	232	556	15,119	80	2,989
California	76	76	4,761,411	1,329,018	1,803	64	1,165	316	225	21	12	41	1,026		139
Colorado	10	10	2,677,465	314,673	213	12	151	13	32		5	3	20		39
Connecticut	49	53	3,835,704	1,061,292	1,639	43	694	699	251	10	32	47	1,101		262
Delaware	5	5	1,386,431	211,194	253	9	166	67	6	2	3	15	352		13
Georgia	24	28	2,425,622	752,481	1,367	35	442	352	482	51	5	15	777		98
Maine	133	153	6,701,346	2,225,839	3,737	110	1,453	1,611	453	53	27	65	1,723	20	591
Maryland	22	23	3,371,032	447,489	846	26	513	97	171	30	9	24	470		202
Massachusetts	148	151	9,587,996	2,593,533	3,333	136	1,613	993	613	39	38	123	2,947		484
Minnesota	19	23	558,200	356,782	558	18	223	239	64	10	4	10	253		32
Missouri	9	10	1,264,317	500,642	617	16	228	263	79	19	12	19	662		79
New Hampshire	77	78	2,822,026	727,591	1,253	83	519	457	148	8	8	37	771		286
New Jersey	20	23	6,374,375	425,673	627	20	214	57	319	12	5	21	1,069		49
New York	13	13	1,515,511	222,773	491	19	134	108	130	7	3		215		69
North Carolina	19	22	708,267	146,627	391	13	110	91	149	22	6	9	182		46
Oregon	4	4	287,400	44,150	54	2	32	9	10	1					2
Pennsylvania	62	64	5,782,887	623,252	1,207	47	562	200	377	11	10	37	1,243		164
Rhode Island	35	37	2,878,237	931,216	1,195	38	313	614	204	12	14	39	879		256
South Carolina	7	9	214,479	47,614	99	3	40	28	25	2	1	5	74		2
South Dakota	3	3	786,120	304,673	498	13	99	143	153	3	3	3	82		26
Texas	8	8	20,400	22,559	64	3	29	19	13	1	1	3	72		10
Utah	3	3	123,500	8,700	18	2	8	2	4	1	1				1
Vermont	46	53	1,073,936	581,870	961	69	593	155	128	13	9	17	497		131
Virginia	13	13	1,703,206	332,548	716	21	333	91	239	24	8	17	370		46
Wisconsin	5	8	1,383,609	266,095	478	17	345	84	28		4	15	349		14
Other states (a)	4	4	41,488	76,000	84	5	32	36	9		2				8

STATES AND TERRITORIES.	EXPENSES.				CAPITAL INVESTED.				
	Total expenses incurred in producing entire amount of granite.	Total wages, including salaries paid to office force.	Value of supplies and materials consumed.	All other expenditures for the quarry, such as rent, taxes, interest, insurance, etc.	Total capital.	In land.	In buildings and fixtures.	In tools, live stock, machinery, and supplies on hand.	In cash.
Total	\$11,504,021	\$9,629,485	\$1,446,485	\$437,051	\$19,115,449	\$10,897,417	\$1,589,784	\$3,731,078	\$2,996,170
California	973,276	809,205	131,837	32,234	2,829,794	1,926,095	124,075	492,348	377,276
Colorado	214,180	192,700	15,815	5,665	315,485	255,350	20,559	29,385	19,290
Connecticut	813,200	697,080	76,047	40,673	891,889	348,600	89,225	262,945	191,119
Delaware	191,662	116,216	64,705	10,741	104,545	13,200	4,255	52,869	34,221
Georgia	472,107	396,461	56,807	18,839	1,481,622	1,267,474	28,235	103,415	82,498
Maine	1,823,976	1,317,026	252,071	54,879	3,192,317	1,377,735	292,613	698,891	823,168
Maryland	351,909	275,566	61,352	14,991	640,448	386,850	26,665	77,379	149,534
Massachusetts	1,973,729	1,630,128	278,056	65,545	2,235,759	1,099,563	212,645	567,703	355,843
Minnesota	295,007	276,859	14,509	3,639	294,218	142,627	17,305	52,936	81,350
Missouri	425,667	349,203	55,173	21,286	593,109	460,500	35,100	64,000	33,500
New Hampshire	597,491	529,945	52,573	14,973	761,362	366,100	86,380	164,850	144,032
New Jersey	330,644	294,284	32,513	3,847	418,859	115,709	15,159	178,490	109,609
New York	217,160	182,831	26,515	7,814	422,709	288,309	50,090	44,759	39,650*
North Carolina	123,937	101,134	20,915	1,888	255,130	129,777	24,758	102,265	7,330
Oregon	37,033	29,860	5,150	2,023	60,609	43,000	500	12,190	
Pennsylvania	516,923	441,231	56,135	19,557	930,499	525,178	155,937	149,894	99,400
Rhode Island	789,219	618,013	113,572	57,634	646,392	279,770	54,035	226,646	85,941
South Carolina	35,028	22,843	2,488	9,697	143,275	90,634	7,775	34,866	10,000
South Dakota	222,229	216,773	1,461	3,995	444,566	288,200	79,528	66,838	19,000
Texas	33,738	20,464	7,100	6,174	212,125	184,000	11,075	15,359	1,700
Utah	7,846	7,696	100	50	18,750	8,600	5,109	2,650	3,099
Vermont	477,114	408,916	48,702	19,496	967,756	683,164	63,741	95,639	125,215
Virginia	256,125	218,828	32,297	5,000	446,656	234,900	20,946	89,236	101,568
Wisconsin	261,791	221,493	39,292	10,006	546,413	144,700	151,691	236,022	14,600
Other states (a)	63,039	43,725	10,390	7,065	261,399	242,000	3,500	8,890	7,000

* The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

The table on the following page is presented for the purpose of showing by states, as well as for the entire country, the distribution of granite for the various important purposes to which it is applied. It will be seen that the purposes considered are as follows: building; street work; cemetery, monumental, and decorative purposes; bridge, dam, and railroad work, and miscellaneous uses. This table will be found of particular interest to quarrymen and others who have reason to be interested in statistics relative to the amount and value of stone used for different purposes. In order that the general uses named above may be understood in detail, the following list is presented:

BUILDING PURPOSES.

Solid fronts.	Lintels.	Pilasters.
Foundations.	Broken range.	Belting or belt courses.
Cellar walls.	Sills.	Rubble.
Underpinning.	Kiln stone.	Range.
Steps.	Capping.	Ashlar.
Buttresses.	Columns.	Forts.
Window sills.	Plinths.	Dimension.

STREET WORK.

Paving blocks.	Road making—	Basin heads or catch-basin corners.
Belgian blocks.	(a) Macadam.	Sledged stone.
Curbing.	(b) Telford.	Crushed stone.
Flagging.	(c) Concrete.	Breaker dust.

CEMETERY, MONUMENTAL, AND DECORATIVE PURPOSES.

Statues.	Gravestone sockets.	Mausoleums.
Monuments (entire).	Grave markers.	Urns.
Monument bases.	Cemetery posts.	Wainscoting.
Monument dies.	Cemetery rails.	Dados.
Monument shafts.	Cemetery coping.	Fountains.

BRIDGE, DAM, AND RAILROAD WORK.

Culverts.	Buttresses.	Riprap.
Aqueducts.	Bridge covering.	Approaches.
Dams.	Capstone.	Towers.
Wharf stone.	Rails.	Bank stone.
Breakwater.	Ashlar.	Parapets.
Jetties.	Ballast.	Docks.
Piers.		

MISCELLANEOUS.

Millstones.	Posts.	Refuse stone.
Levelers—rollers.	Engine and machine beds.	Block granite.
Grout.	Random.	Boundary stone.
Walls (fences).	Yard stock.	Horse blocks.
Watering troughs.		

AMOUNTS AND VALUES OF GRANITE ACCORDING TO THE PURPOSES FOR WHICH IT WAS USED, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of quarries.	BUILDING PURPOSES.			STREET WORK.					
		Cubic feet.	Value.	Value per cubic foot.	Cubic feet, including paving blocks.	Value, including paving blocks.	Value per cubic foot.	Number of paving blocks.	Value of paving blocks.	Value per thousand.
Total	874	26,147,338	\$6,166,034	\$0.24	20,623,224	\$4,456,891	\$0.22	61,822,871	\$2,978,172	\$48.17
California.....	76	496,352	419,816	0.85	3,284,232	551,613	0.17	7,363,321	297,236	40.70
Colorado.....	10	2,620,419	294,356	0.11	1,100	230	0.21			
Connecticut.....	53	2,358,286	758,915	0.32	567,869	169,261	0.19	761,100	40,683	53.45
Delaware.....	5	229,066	32,443	0.14	155,500	67,202	0.43	104,333	8,208	78.67
Georgia.....	28	700,939	347,100	0.50	658,603	259,634	0.38	1,599,952	84,951	53.10
Maine.....	153	1,819,741	839,125	0.46	3,736,541	927,949	0.25	17,704,915	824,113	46.55
Maryland.....	23	1,578,872	263,491	0.17	1,051,010	125,958	0.12	286,959	10,310	35.93
Massachusetts.....	151	6,643,703	1,362,451	0.21	1,475,093	466,147	0.32	6,106,016	378,627	62.01
Minnesota.....	23	211,548	209,396	0.99	338,640	141,554	0.42	1,239,009	68,945	54.92
Missouri.....	10	110,468	219,518	1.99	871,209	216,986	0.25	4,323,139	216,986	59.19
New Hampshire.....	78	1,366,331	324,567	0.23	1,157,992	252,256	0.22	2,043,739	87,569	42.85
New Jersey.....	23	324,150	42,175	0.13	2,089,796	236,310	0.11	3,999,912	168,555	42.14
New York.....	13	1,078,203	149,700	0.14	247,902	51,062	0.21	587,120	26,962	45.92
North Carolina.....	22	63,697	33,327	0.52	221,820	42,605	0.19	775,000	34,200	44.13
Oregon.....	4	63,000	6,300	0.10	117,490	39,260	0.26	587,000	30,200	51.45
Pennsylvania.....	64	2,379,875	143,231	0.06	1,996,486	363,323	0.18	3,836,127	241,793	63.03
Rhode Island.....	37	2,349,711	266,400	0.11	213,477	65,817	0.31	781,765	45,817	58.61
South Carolina.....	9	25,777	8,130	0.32	94,489	34,016	0.36			
South Dakota.....	3	185,120	133,978	0.72	601,000	170,695	0.28	3,017,509	170,694	56.57
Texas.....	8	19,700	21,000	1.07						
Utah.....	3	122,900	8,310	0.07						
Vermont.....	53	236,759	45,198	0.19	231,128	48,323	0.21	883,096	45,643	51.69
Virginia.....	13	1,089,873	120,467	0.11	286,946	75,925	0.26	342,895	18,595	53.97
Wisconsin.....	8	109,369	40,640	0.40	1,285,000	223,825	0.17	5,540,000	179,075	32.32
Other states (a).....	4	41,488	76,000	1.83						

STATES AND TERRITORIES.	Total number of cubic feet.	Total value.	CEMETERY, MONUMENTAL, AND DECORATIVE PURPOSES.			BRIDGE, DAM, AND RAILROAD WORK.			MISCELLANEOUS USES.		
			Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.
Total	62,287,156	\$14,464,095	2,106,953	\$2,371,911	\$1.13	12,267,244	\$1,238,401	\$0.10	1,142,397	\$230,858	\$0.20
California.....	4,761,411	1,329,018	85,927	115,114	1.34	879,900	237,475	0.27	15,000	5,000	0.33
Colorado.....	2,677,465	314,673	55,946	20,087	0.36						
Connecticut.....	3,835,704	1,061,202	148,108	111,155	0.75	571,031	65,659	0.11	190,419	16,212	0.09
Delaware.....	1,386,431	211,194				995,982	110,849	0.11	5,883	700	0.12
Georgia.....	2,425,622	752,481	189,655	47,997	0.25	876,425	106,750	0.12			
Maine.....	6,701,346	2,225,839	231,972	299,153	1.29	856,786	145,117	0.17	56,306	14,499	0.26
Maryland.....	3,371,032	447,489	31,100	19,416	0.62	710,050	38,630	0.05			
Massachusetts.....	9,587,996	2,503,503	509,087	497,438	0.98	252,288	33,040	0.13	707,825	144,427	0.20
Minnesota.....	558,200	356,782	5,312	4,277	0.81	2,700	1,555	0.58			
Missouri.....	1,264,317	500,642	120	500	4.17	282,520	63,638	0.23			
New Hampshire.....	2,822,026	727,531	151,711	135,029	0.89	110,467	8,409	0.08	95,525	7,270	0.08
New Jersey.....	6,374,575	425,673	250	125	0.50	3,960,379	147,063	0.04			
New York.....	1,515,511	222,773	121,906	17,261	0.14	67,500	4,750	0.07			
North Carolina.....	708,267	146,627	25,106	23,345	0.93	378,500	44,240	0.12	19,144	3,110	0.16
Oregon.....	287,400	44,150	2,000	2,350	1.18	105,000	5,300	0.05			
Pennsylvania.....	5,782,887	623,252	15,050	5,725	0.38	1,383,976	101,473	0.07	7,500	4,500	0.60
Rhode Island.....	2,878,237	931,216	110,310	583,199	5.33	204,739	10,800	0.05			
South Carolina.....	214,479	47,614	4,213	2,528	0.60	90,000	2,940	0.03			
South Dakota.....	786,120	304,673									
Texas.....	20,400	22,550	700	1,550	2.21						
Utah.....	123,500	8,700	600	390	0.65						
Vermont.....	1,073,936	581,870	373,020	412,287	1.11	197,834	41,713	0.21	35,195	24,349	0.68
Virginia.....	1,703,206	332,548	44,620	66,356	1.49	281,167	69,000	0.25	9,600	800	0.08
Wisconsin.....	1,385,600	266,095	240	1,630	6.79						
Other states (a).....	41,488	76,000									

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

Owing to the fact that operations have been under way for only a short period of time, a number of the states named in the table have produced but limited amounts of stone. These states are as follows: Arkansas, Montana, Nevada, South Carolina, Oregon, Texas, Utah, and Washington. Figures representing the value per unit of the product from such states as these can not be regarded as strictly normal; that is to say, the values are in general decidedly higher than those for states in which production has been going on actively for a number of years. The industry being new in these states, and transportation charges high on stone from a distance, it is of course to be expected that a higher price can be obtained than in other states in which competition on stone locally produced is active. The most valuable of the figures representing values per unit are those for states in which the quarrying industry has long been established, such as Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia, and Wisconsin. Considerable variation in the values per unit for these states is evident, and this is due to differences in the quality of the stone and its degree of finish and the transportation charges to which a competing material from a distance would be subjected.

Considering the subject of paving blocks, the value per thousand is found to vary from \$32.32 in Wisconsin to \$78.67 in Delaware. In the most important states which produce paving blocks, namely, California, Maine, Massachusetts, Missouri, New Jersey, and Pennsylvania, the value varies from \$40 to something over \$60 per thousand. The variation in the price for these states, in all of which the production of paving blocks has been going on for some time, is due to the quality of the stone used for these purposes, and also to the special care observed in trimming blocks to certain definite sizes. In some localities surface rock of inferior quality is broken up into paving blocks, which are sold at low prices. In a number of cities considerable care is taken by municipal authorities in the selection of paving material. This care is exercised both with reference to the quality of stone and to invariability of size, and consequently the price paid is in some cases markedly higher than that paid in other cities more indifferent in regard to the material employed.

Considering cemetery purposes, a very wide variation in price exists, ranging all the way from 14 cents a cubic foot in New York, where comparatively little of such work is done, to \$6.79 in Wisconsin, where also very little, indeed, was done, amounting perhaps to only 2 or 3 contracts; so that the reasons for these extremes in prices are at once apparent. In Rhode Island the average price reaches the high figure of \$5.33 per cubic foot, which results from the fact that most of the stone used for these purposes in Rhode Island, coming from Westerly, is unusually well adapted for such work; further, the ornamentation and finish put upon the Westerly granite is of a very high order.

The value per unit of the product used for bridge, dam, and railroad work is naturally low, although it shows considerable variation.

Comparing the grand totals for the various purposes, it appears that of the entire output of the country \$6,000,000 worth, or something less than half, is devoted to building purposes, and a little less than one-third to street work, of which more than half is the value of paving blocks. The value of the stone devoted to cemetery, monumental, and decorative purposes is about one-sixth of the entire amount, but its value per cubic foot, namely, \$1.13, is naturally vastly in excess of the value per unit of the stone used for any other purpose. Something less than one-tenth of the value of the output is devoted to bridge, dam, and railroad work, while the value for miscellaneous uses is quite small.

Comparing the various states, it appears that for building purposes the value of the product in Massachusetts is decidedly in advance of that for any other state, Maine standing second, Connecticut third, and California fourth. In street work Maine is largely in the lead, California taking second place, while Massachusetts, which for total production heads the whole list, stands third. In connection with cemetery and monumental work, it is interesting to notice that Rhode Island stands at the head of the list, the value of its output amounting to nearly \$600,000, Massachusetts coming second, and Vermont third. In Massachusetts and Vermont, respectively, the leading localities producing fine ornamental work are Quincy, in Massachusetts, and Barre, in Vermont. In the latter locality production, although carried on to a limited extent in 1880, has largely developed within the past 10 years. In value of granite devoted to bridge, dam, and railroad work California stands first, New Jersey second, Maine third, Delaware fourth, and Georgia fifth.

LABOR.

The table on page 608 includes figures relative to the average wages received and the average number of days employed by the various classes of workmen connected with granite quarrying. Considering the daily wages paid to foremen, it is noticeable that among those states in which the granite industry has long been prosecuted the average is fairly constant, varying from \$3 in Virginia to \$3.41 in New Hampshire. In the western states the average is markedly higher, being \$4.34 in California, \$3.67 in Minnesota, and \$4.34 in Wisconsin. The foremen employed in western states naturally come, in great part, from the old-established quarry regions of the east, and their services therefore command a higher figure in these comparatively undeveloped regions. This statement, together with the fact of increased cost of living, accounts for the higher wages paid in these states. Very much

the same condition is found to exist with the other classes of labor, quarrymen, for example, in California receiving \$2.38, in Colorado \$2.50, and in Utah \$3. In the older granite-producing states wages for quarrymen amount to about \$1.75 per day, but in the southern states the amount is invariably less. In connection with mechanics, it will be noticed that the number in Maine is almost twice as great as that in Massachusetts. This great difference has been found to be due to the respective methods of classification of mechanics in these 2 states. In Maine it is a common practice to include stonecutters among mechanics, whereas in Massachusetts engineers, blacksmiths, and the like make up the number of mechanics. It is interesting to note in this connection that the average value per cubic foot of the total output in Maine is 33 cents, while for Massachusetts it is 26 cents; in other words, a greater output of finished product in Maine than in Massachusetts is indicated, and therefore this serves to explain the greater number of mechanics in the former than in the latter state. Wages for laborers in most of the states is not far from \$1.50 per day, although low figures are noticeable for the southern states. The highest figures paid are in the western states, as, for example, \$2.11 in California and \$1.96 in Colorado. In regard to the number of boys under 16 years of age employed in connection with the granite industry, it is noted that Maine employs nearly twice as many as Massachusetts. The total number, however, for the whole United States is only 343. As an explanation of this, it may be stated that in Maine there are a great many small quarries operated by farmers. After the farm work is practically done for the year attention is devoted to the development of such quarry property as may be included in these farms. Maine and Georgia together employ 104 boys, or nearly one-third of the total number employed in the United States. The wages paid to boys vary considerably, being less than \$1 per day, although in a few cases this amount is exceeded.

It will be noticed that the total wages reported in the table on page 608 as actually paid do not exactly agree with the figures which would result from computing the total wages from the data given in the table on page 611. This is very naturally the case, since the figures of the latter table are the averages given by the producers in response to an inquiry calling for average statements. The figures for total wages actually paid are exact.

The table on page 609 gives the relative standing of the various states according to the value of output and the purposes for which the product was used.

The table on page 610 shows the relative standing according to the number of cubic feet and purposes. It will be observed that the relative standing is quite variable, according to the various uses.

The table on page 611 gives the states in the order of their relative importance with respect to a number of different statistical items. It will be noticed that this order varies considerably. Thus, while Massachusetts and Maine hold first and second places, respectively, both with reference to the value of output as well as the number of cubic feet, New Jersey is third when the number of cubic feet is considered, whereas its position with respect to value of output is twelfth. Inspection of this table will reveal at a glance a number of interesting features which would require some time and labor to extract from the principal table relative to production, in which all these items are contained. The most important of these items in determining the true relative standing of the states is, of course, the value of the output, but for persons specially interested in granite the other items will undoubtedly be found of interest and value. Considering the capital invested in land, Massachusetts and Maine, instead of holding first and second places, respectively, drop to fourth and second places, while California heads the list. Exceedingly high values have been placed on some quarry property, for the reason that the area included was very large, while the value per acre may not have been excessive. It is true that in many places in the west large areas of land have been bought up for the sake of controlling the production of the granite contained in it, and while but a small portion of this area may have been actually worked for granite, still, as land was purchased as quarry property, the purchasers are justified in representing as invested in quarry land all that was paid for the tract, even though it was very large. The reason for such large purchases of land in undeveloped portions of the country is evidently to cut off possible competition by monopolizing the best territory. Thus, Texas, which stood in twenty-third place with regard to value of output in 1889, holds sixteenth place according to the capital invested in land.

LABOR AND WAGES CLASSIFIED, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	FOREMEN.				QUARRYMEN.				MECHANICS.			
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.
California.....	64	\$4.34	214	\$928.76	1,165	\$2.38	217	\$516.46	316	\$3.52	215	\$756.80
Colorado.....	12	3.42	202	690.84	151	2.50	214	535.00	13	2.98	239	712.22
Connecticut.....	43	3.15	243	765.45	694	1.70	230	391.00	600	2.67	247	659.49
Delaware.....	9	3.27	242	791.34	166	1.66	229	380.14	67	2.82	232	654.24
Georgia.....	35	3.72	268	996.96	442	1.36	222	301.92	352	3.59	218	782.62
Maine.....	110	3.15	215	677.25	1,453	1.78	177	315.06	1,611	2.49	226	547.80
Maryland.....	26	3.00	232	696.00	513	1.51	244	368.44	97	3.02	247	745.94
Massachusetts.....	136	3.09	248	766.32	1,613	1.76	221	388.96	903	2.59	247	639.73
Minnesota.....	18	3.67	204	748.68	223	1.84	196	360.64	239	3.54	206	729.24
Missouri.....	16	3.19	220	701.80	228	1.74	219	381.06	263	3.15	199	626.85
New Hampshire.....	83	3.41	170	579.70	519	1.75	178	311.50	487	2.60	223	579.80
New Jersey.....	20	2.47	250	617.50	214	1.65	231	381.15	57	2.19	238	521.22
New York.....	19	2.91	245	712.95	134	1.87	200	374.00	108	2.92	178	519.76
North Carolina.....	13	2.52	241	607.32	110	1.12	208	232.96	91	1.82	197	338.54
Oregon.....	2	5.00	200	1,000.00	32	2.50	213	532.50	9	3.00	211	633.00
Pennsylvania.....	47	2.36	189	446.04	562	1.75	187	327.25	200	2.64	200	528.00
Rhode Island.....	38	3.35	255	854.25	313	1.84	212	390.08	614	2.46	257	632.22
South Carolina.....	3	5.75	222	1,276.50	40	0.95	181	171.95	28	2.98	213	634.74
South Dakota.....	13	3.50	313	1,095.50	93	2.00	200	400.00	143	4.00	200	800.00
Texas.....	3	2.50	200	500.00	27	1.57	110	172.70	19	3.82	127	485.14
Utah.....	2	3.50	178	623.00	8	3.00	175	525.00	2	3.50	178	623.00
Vermont.....	60	3.68	202	743.36	596	1.75	186	325.50	155	2.64	216	576.24
Virginia.....	21	3.00	240	720.00	333	1.22	189	230.58	91	2.61	222	579.42
Wisconsin.....	17	4.34	301	1,306.34	345	1.70	274	465.80	84	3.09	216	667.44
Other states (a).....	5	5.77	188	1,084.76	32	2.66	162	430.92	36	4.75	151	717.25

STATES AND TERRITORIES.	LABORERS.				BOYS UNDER 16 YEARS.				OFFICE FORCE.	
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average annual salary.
California.....	225	\$2.11	194	\$409.34	21	\$1.05	230	\$241.50	12	\$1,111.11
Colorado.....	32	1.96	228	446.88	.....	.....	.....	.....	5	966.67
Connecticut.....	251	1.48	232	343.36	10	0.86	147	126.42	32	761.22
Delaware.....	6	1.50	240	360.00	2	0.50	230	115.00	3	1,266.67
Georgia.....	482	1.05	231	242.55	51	0.62	224	138.88	5	933.33
Maine.....	483	1.62	187	302.94	53	0.92	149	137.08	27	938.75
Maryland.....	171	1.34	196	262.64	30	0.65	221	143.65	9	677.78
Massachusetts.....	613	1.50	240	360.00	30	0.71	224	159.04	38	911.21
Minnesota.....	64	1.57	200	314.00	10	1.07	198	211.86	4	900.00
Missouri.....	79	1.48	185	273.80	19	0.65	229	148.85	12	808.98
New Hampshire.....	148	1.68	163	273.84	8	1.20	166	199.20	8	755.00
New Jersey.....	319	1.43	224	320.32	12	0.75	300	225.00	5	500.00
New York.....	130	1.71	258	441.18	7	0.79	185	146.15	3	970.00
North Carolina.....	149	0.84	202	169.68	22	0.35	192	67.20	6	680.00
Oregon.....	10	2.00	220	440.00	1	1.00	150	150.00	.....	.....
Pennsylvania.....	377	1.37	182	249.34	11	0.73	210	153.30	10	603.75
Rhode Island.....	204	1.54	227	349.58	12	0.69	218	150.42	14	1,047.38
South Carolina.....	25	0.78	28	21.84	2	0.25	265	66.25	1	345.00
South Dakota.....	153	1.50	200	300.00	3	1.00	235	235.00	3	1,266.67
Texas.....	13	1.17	224	262.08	1	1.00	150	150.00	1	.....
Utah.....	4	2.00	125	250.00	1	1.00	200	200.00	1	200.00
Vermont.....	128	1.45	170	246.50	13	1.00	169	169.00	9	854.33
Virginia.....	239	1.08	216	239.28	24	0.47	184	86.48	8	881.43
Wisconsin.....	28	1.37	156	213.72	.....	.....	.....	.....	4	630.00
Other states (a).....	9	1.81	89	161.09	.....	.....	.....	.....	2	500.00

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

RELATIVE STANDING OF STATES ACCORDING TO VALUE AND PURPOSES.

BUILDING PURPOSES.		STREET WORK (INCLUDING PAVING BLOCKS).		PAVING BLOCKS.	
States and territories.	Value.	States and territories.	Value.	States and territories.	Value.
Total	\$6,166,634	Total	\$4,456,891	Total	\$2,978,172
1 Massachusetts.....	1,362,451	Maine	927,949	Maine	824,113
2 Maine	839,125	California.....	551,613	Massachusetts.....	378,627
3 Connecticut	758,915	Massachusetts.....	466,147	California.....	297,236
4 California	419,816	Pennsylvania.....	368,323	Pennsylvania.....	241,793
5 Georgia.....	347,100	New Hampshire.....	252,256	Missouri.....	216,986
6 New Hampshire.....	324,567	Georgia.....	259,634	Wisconsin.....	179,675
7 Colorado.....	294,356	New Jersey.....	236,310	South Dakota.....	170,694
8 Rhode Island.....	266,400	Wisconsin.....	223,825	New Jersey.....	168,555
9 Maryland.....	263,491	Missouri.....	216,986	New Hampshire.....	87,569
10 Missouri.....	219,518	South Dakota.....	170,695	Georgia.....	84,951
11 Minnesota.....	209,396	Minnesota.....	141,554	Minnesota.....	68,045
12 New York.....	149,700	Maryland.....	125,958	Rhode Island.....	45,817
13 Pennsylvania.....	143,231	Connecticut.....	109,261	Vermont.....	45,643
14 South Dakota.....	133,978	Virginia.....	75,925	Connecticut.....	40,683
15 Virginia.....	126,467	Delaware.....	67,202	North Carolina.....	34,290
16 Vermont.....	45,198	Rhode Island.....	65,817	Oregon.....	30,200
17 New Jersey.....	42,175	New York.....	51,062	New York.....	26,962
18 Wisconsin.....	40,640	Vermont.....	48,323	Virginia.....	18,565
19 North Carolina.....	33,327	North Carolina.....	42,605	Maryland.....	10,310
20 Delaware.....	32,443	South Carolina.....	34,016	Delaware.....	8,208
21 Texas.....	21,000	Oregon.....	30,200		
22 Utah.....	8,310	Colorado.....	230		
23 South Carolina.....	8,130				
24 Oregon.....	6,300				
Other states (a).....	76,000				
CEMETERY, MONUMENTAL, AND DECORATIVE PURPOSES.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS USES.	
States and territories.	Value.	States and territories.	Value.	States and territories.	Value.
Total	\$2,371,911	Total	\$1,238,401	Total	\$230,858
1 Rhode Island.....	588,199	California.....	237,475	Massachusetts.....	144,427
2 Massachusetts.....	497,438	New Jersey.....	147,063	Vermont.....	34,349
3 Vermont.....	412,287	Maine.....	145,117	Connecticut.....	16,212
4 Maine.....	299,158	Delaware.....	110,849	Maine.....	14,490
5 New Hampshire.....	135,029	Georgia.....	106,750	New Hampshire.....	7,270
6 California.....	115,114	Pennsylvania.....	101,473	California.....	5,000
7 Connecticut.....	111,153	Virginia.....	69,000	Pennsylvania.....	4,500
8 Virginia.....	66,356	Connecticut.....	65,659	North Carolina.....	3,110
9 Georgia.....	47,997	Missouri.....	63,638	Virginia.....	800
10 North Carolina.....	29,345	North Carolina.....	44,240	Delaware.....	700
11 Colorado.....	26,087	Vermont.....	41,713		
12 Maryland.....	19,410	Maryland.....	38,630		
13 New York.....	17,261	Massachusetts.....	33,040		
14 Pennsylvania.....	5,725	Rhode Island.....	10,800		
15 Minnesota.....	4,277	New Hampshire.....	8,409		
16 South Carolina.....	2,528	Oregon.....	5,300		
17 Oregon.....	2,359	New York.....	4,750		
18 Wisconsin.....	1,630	South Carolina.....	2,940		
19 Texas.....	1,550	Minnesota.....	1,553		
20 Missouri.....	500				
21 Utah.....	390				
22 New Jersey.....	125				

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

MINERAL INDUSTRIES IN THE UNITED STATES.

RELATIVE STANDING OF STATES ACCORDING TO NUMBER OF CUBIC FEET AND PURPOSES.

BUILDING PURPOSES.		ALL CLASSES OF STREET WORK.		PAVING BLOCKS.	
States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Number.
Total	26,147,338	Total	20,683,224	Total	61,822,871
1 Massachusetts.....	6,643,703	Maine	3,736,541	Maine	17,704,915
2 Colorado.....	2,620,419	California	3,284,232	California	7,303,321
3 Pennsylvania.....	2,379,875	New Jersey.....	2,089,796	Massachusetts.....	6,106,016
4 Connecticut.....	2,358,286	Pennsylvania.....	1,996,486	Wisconsin.....	5,540,600
5 Rhode Island.....	2,349,711	Massachusetts.....	1,475,093	Missouri.....	4,323,130
6 Maine.....	1,819,741	Wisconsin.....	1,285,000	New Jersey.....	3,999,912
7 Maryland.....	1,578,872	New Hampshire.....	1,157,992	Pennsylvania.....	3,836,127
8 New Hampshire.....	1,306,331	Maryland.....	1,051,010	South Dakota.....	3,017,500
9 Virginia.....	1,080,873	Missouri.....	871,269	New Hampshire.....	2,043,739
10 New York.....	1,078,203	Georgia.....	658,603	Georgia.....	1,599,952
11 Georgia.....	700,930	South Dakota.....	601,000	Minnesota.....	1,239,000
12 California.....	496,352	Connecticut.....	567,860	Vermont.....	883,096
13 New Jersey.....	324,150	Minnesota.....	338,649	Rhode Island.....	781,765
14 Vermont.....	236,759	Virginia.....	286,946	North Carolina.....	775,000
15 Delaware.....	229,066	New York.....	247,902	Connecticut.....	761,100
16 Minnesota.....	211,548	Vermont.....	231,128	New York.....	587,120
17 South Dakota.....	185,120	North Carolina.....	221,820	Oregon.....	587,000
18 Utah.....	122,900	Rhode Island.....	213,477	Virginia.....	342,895
19 Missouri.....	110,468	Delaware.....	155,500	Maryland.....	286,950
20 Wisconsin.....	100,360	Oregon.....	117,400	Delaware.....	104,333
21 North Carolina.....	63,697	South Carolina.....	94,489		
22 Oregon.....	63,000	Colorado.....	1,190		
23 South Carolina.....	25,777				
24 Texas.....	19,700				
Other states (a).....	41,488				
CEMETERY, MONUMENTAL, AND DECORATIVE PURPOSES.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS USES.	
States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Cubic feet.
Total	2,106,953	Total	12,207,244	Total	1,142,397
1 Massachusetts.....	509,087	New Jersey.....	3,960,379	Massachusetts.....	707,825
2 Vermont.....	373,020	Pennsylvania.....	1,383,976	Connecticut.....	190,419
3 Maine.....	231,972	Delaware.....	995,982	New Hampshire.....	95,525
4 Georgia.....	189,655	California.....	879,900	Maine.....	56,306
5 New Hampshire.....	151,711	Georgia.....	876,425	Vermont.....	35,195
6 Connecticut.....	148,108	Maine.....	856,786	North Carolina.....	10,144
7 New York.....	121,906	Maryland.....	710,050	California.....	15,000
8 Rhode Island.....	110,310	Connecticut.....	571,031	Virginia.....	9,600
9 California.....	85,027	North Carolina.....	378,500	Pennsylvania.....	7,500
10 Colorado.....	55,946	Missouri.....	282,520	Delaware.....	5,883
11 Virginia.....	44,620	Virginia.....	281,167		
12 Maryland.....	31,100	Massachusetts.....	252,288		
13 North Carolina.....	25,106	Rhode Island.....	204,739		
14 Pennsylvania.....	15,050	Vermont.....	197,834		
15 Minnesota.....	5,312	New Hampshire.....	110,467		
16 South Carolina.....	4,213	Oregon.....	105,000		
17 Oregon.....	2,000	South Carolina.....	90,000		
18 Texas.....	700	New York.....	67,500		
19 Utah.....	600	Minnesota.....	2,700		
20 New Jersey.....	250				
21 Wisconsin.....	240				
22 Missouri.....	120				

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

RELATIVE STANDING OF STATES ACCORDING TO VARIOUS STATISTICAL ITEMS.

TOTAL NUMBER OF CUBIC FEET PRODUCED.		TOTAL VALUE OF PRODUCTION.		TOTAL CAPITAL INVESTED IN LAND.		TOTAL CAPITAL.	
States and territories.	Cubic feet.	States and territories.	Value.	States and territories.	Amount.	States and territories.	Amount.
Total	62,287,156	Total	\$14,464,095	Total	\$19,897,417	Total	\$19,115,449
1 Massachusetts.....	9,587,996	Massachusetts.....	2,503,593	California.....	1,926,095	Maine.....	3,192,317
2 Maine.....	6,701,346	Maine.....	2,225,839	Maine.....	1,377,735	California.....	2,829,704
3 New Jersey.....	6,374,575	California.....	1,329,018	Georgia.....	1,267,474	Massachusetts.....	2,235,759
4 Pennsylvania.....	5,782,887	Connecticut.....	1,061,202	Massachusetts.....	1,099,563	Georgia.....	1,481,622
5 California.....	4,761,411	Rhode Island.....	931,216	Vermont.....	682,164	Vermont.....	967,750
6 Connecticut.....	3,835,704	Georgia.....	752,481	Pennsylvania.....	525,178	Pennsylvania.....	950,409
7 Maryland.....	3,371,032	New Hampshire.....	727,531	Missouri.....	460,500	Connecticut.....	891,849
8 Rhode Island.....	2,878,237	Pennsylvania.....	623,252	Maryland.....	366,850	New Hampshire.....	761,363
9 New Hampshire.....	2,822,026	Vermont.....	581,879	New Hampshire.....	366,100	Rhode Island.....	646,332
10 Colorado.....	2,677,465	Missouri.....	500,642	Connecticut.....	348,600	Maryland.....	640,448
11 Georgia.....	2,425,622	Maryland.....	447,489	New York.....	288,300	Missouri.....	593,100
12 Virginia.....	1,793,206	New Jersey.....	425,673	South Dakota.....	288,200	Wisconsin.....	546,413
13 New York.....	1,515,511	Minnesota.....	356,782	Rhode Island.....	279,779	Virginia.....	446,650
14 Delaware.....	1,386,431	Virginia.....	332,548	Colorado.....	255,350	South Dakota.....	444,566
15 Wisconsin.....	1,385,690	Colorado.....	314,673	Virginia.....	234,900	New York.....	422,700
16 Missouri.....	1,264,317	South Dakota.....	304,673	Texas.....	184,000	New Jersey.....	418,859
17 Vermont.....	1,073,936	Wisconsin.....	266,095	Wisconsin.....	144,700	Colorado.....	315,445
18 South Dakota.....	736,120	New York.....	222,773	Minnesota.....	142,627	Minnesota.....	294,218
19 North Carolina.....	708,297	Delaware.....	211,194	North Carolina.....	129,777	North Carolina.....	255,130
20 Minnesota.....	558,200	North Carolina.....	146,627	New Jersey.....	115,700	Texas.....	212,125
21 Oregon.....	287,400	South Carolina.....	47,614	South Carolina.....	90,634	South Carolina.....	143,275
22 South Carolina.....	214,479	Oregon.....	44,150	Oregon.....	48,000	Delaware.....	164,545
23 Utah.....	123,609	Texas.....	22,550	Delaware.....	13,200	Oregon.....	60,690
24 Texas.....	20,400	Utah.....	8,700	Utah.....	8,060	Utah.....	18,750
Other states (a).....	41,488	Other states.....	76,000	Other states.....	242,000	Other states.....	261,300

TOTAL NUMBER OF EMPLOYÉS.		TOTAL AMOUNT OF WAGES PAID EMPLOYÉS.		TOTAL COST OF SUPPLIES.		TOTAL EXPENSE.	
States and territories.	Number.	States and territories.	Amount.	States and territories.	Amount.	States and territories.	Amount.
Total	22,313	Total.....	\$9,620,485	Total.....	\$1,446,485	Total.....	\$11,504,021
1 Maine.....	3,737	Massachusetts.....	1,630,128	Massachusetts.....	278,056	Massachusetts.....	1,973,729
2 Massachusetts.....	3,333	Maine.....	1,517,026	Maine.....	252,071	Maine.....	1,823,976
3 California.....	1,803	California.....	809,205	California.....	131,837	California.....	973,276
4 Connecticut.....	1,630	Connecticut.....	697,080	Rhode Island.....	113,572	Connecticut.....	813,200
5 Georgia.....	1,367	Rhode Island.....	618,613	Connecticut.....	76,047	Rhode Island.....	789,219
6 New Hampshire.....	1,253	New Hampshire.....	529,945	Delaware.....	64,705	New Hampshire.....	597,491
7 Pennsylvania.....	1,207	Pennsylvania.....	441,231	Maryland.....	61,352	Pennsylvania.....	516,923
8 Rhode Island.....	1,195	Vermont.....	408,916	Georgia.....	56,807	Vermont.....	477,114
9 Vermont.....	961	Georgia.....	396,401	Pennsylvania.....	56,135	Georgia.....	472,107
10 Maryland.....	846	Missouri.....	349,208	Missouri.....	55,173	Missouri.....	425,667
11 Virginia.....	716	New Jersey.....	294,284	New Hampshire.....	52,573	Maryland.....	351,909
12 New Jersey.....	627	Minnesota.....	276,850	Vermont.....	48,702	New Jersey.....	330,644
13 Missouri.....	617	Maryland.....	275,566	New Jersey.....	32,513	Minnesota.....	295,097
14 Minnesota.....	558	Wisconsin.....	221,493	Virginia.....	32,297	Wisconsin.....	261,791
15 Wisconsin.....	478	Virginia.....	218,828	Wisconsin.....	30,292	Virginia.....	256,125
16 South Dakota.....	408	South Dakota.....	216,773	New York.....	26,515	South Dakota.....	222,229
17 New York.....	401	Colorado.....	192,700	North Carolina.....	20,915	New York.....	217,160
18 North Carolina.....	391	New York.....	182,831	Colorado.....	15,815	Colorado.....	214,180
19 Delaware.....	253	Delaware.....	116,216	Minnesota.....	14,539	Delaware.....	191,662
20 Colorado.....	213	North Carolina.....	101,134	Texas.....	7,100	North Carolina.....	123,937
21 South Carolina.....	99	Oregon.....	29,850	Oregon.....	5,150	Oregon.....	37,033
22 Texas.....	64	South Carolina.....	22,843	South Carolina.....	2,488	South Carolina.....	35,028
23 Oregon.....	54	Texas.....	20,464	South Dakota.....	1,461	Texas.....	33,733
24 Utah.....	18	Utah.....	7,696	Utah.....	100	Utah.....	7,846
Other states (a).....	84	Other states.....	45,725	Other states.....	19,300	Other states.....	63,030

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

The following table gives a number of deductions from the figures of the table on production, such as the percentages of profit on capital, and also on sales in the different states. It will be noticed that in a few instances loss is reported, but in all these cases the operations have been quite limited and only recently begun. Initial operations in the quarrying industry are invariably attended by loss for some time after making the first opening, due to the considerable amount of stripping which is inevitable in almost every case. To this statement there are

occasional exceptions, among which may be specially noted the granite obtained from Stone mountain, in Georgia, where no stripping is necessary, and even the surface stone is suitable for the manufacture of paving blocks, to which purpose alone it is applied. This is also true of a number of New England quarries. It will be noticed that in the older productive states the percentages of profit on capital and sales are fairly constant. The cost per cubic foot of the total product shows a decided variation, as would of course be expected from the complexity of the causes involved, such as ease or difficulty of quarrying, quality of stone, transportation facilities, cost of labor, and the great variation in the amount of manufacturing done upon the rough product. In the matter of the proportion which wages bear to the total expense of production it will be seen that in nearly all cases this is above 80 per cent, and in a few cases it constitutes almost the entire item of expense. In regard to the amount of wages paid per cubic foot, it should be borne in mind that these wages include all paid on the product up to the time it was sold by the producer, and inasmuch as it has been sold in all stages of finish, there is a correspondingly great variation in the wages paid per unit. Excessively high figures were paid in several western states in which production is just beginning, and in each of which there are only a very few operators. In the matter of ratio of wages to total value, the figures for the various states, except in those states where actual loss occurred, do not show a very great variation.

GENERAL DEDUCTIONS.

STATES AND TERRITORIES.	Total number of cubic feet.	Total value of product.	Total wages.	Total expenses.	Total capital.	PERCENTAGE OF PROFIT OR LOSS.		Cost of product per cubic foot.	Percentage of wages to total expense.	Wages paid per cubic foot.	Percentage of wages to total value.	Value per cubic foot.
						On capital.	On value of products.					
Total	62,287,156	\$14,464,005	\$9,620,485	\$11,504,021	\$19,115,449	15.49	20.46	\$0.18	83.63	\$0.15	66.51	\$0.23
California.....	4,761,411	1,329,018	809,205	973,276	2,829,794	12.57	26.77	0.20	83.14	0.17	60.89	0.18
Colorado.....	2,677,465	314,673	192,700	214,180	315,485	31.85	31.94	0.08	89.97	0.07	61.24	0.12
Connecticut.....	3,835,704	1,061,202	697,080	813,200	891,839	27.81	23.37	0.21	85.72	0.18	65.69	0.28
Delaware.....	1,386,431	211,194	116,216	191,662	104,545	18.08	9.25	0.14	60.64	0.08	55.43	0.15
Georgia.....	2,425,622	752,481	396,461	472,107	1,481,622	18.92	37.26	0.19	83.98	0.16	52.69	0.31
Maine.....	6,701,346	2,225,839	1,517,026	1,823,976	3,192,317	12.50	18.05	0.27	83.17	0.23	68.16	0.33
Maryland.....	3,371,032	447,489	275,566	351,909	640,448	14.92	21.36	0.10	78.31	0.08	61.58	0.13
Massachusetts.....	9,587,996	2,503,503	1,630,128	1,973,729	2,235,759	23.70	21.16	0.21	82.59	0.17	65.11	0.26
Minnesota.....	558,200	356,782	276,859	295,007	294,218	21.00	17.31	0.53	93.85	0.50	77.60	0.64
Missouri.....	1,264,317	500,642	340,208	425,667	593,100	12.64	14.98	0.34	82.04	0.28	69.75	0.40
New Hampshire.....	2,822,026	727,531	520,945	597,491	761,362	17.08	17.87	0.21	88.70	0.19	72.84	0.26
New Jersey.....	6,374,575	425,673	294,284	330,644	418,850	22.69	22.32	0.05	89.00	0.05	69.13	0.67
New York.....	1,515,511	222,773	182,831	217,160	422,700	1.33	2.52	0.14	84.19	0.12	82.07	0.15
North Carolina.....	708,267	146,627	101,134	123,937	255,130	8.89	15.47	0.17	81.60	0.14	68.97	0.21
Oregon.....	287,400	44,150	29,860	37,033	60,600	11.74	16.12	0.13	80.63	0.10	67.63	0.15
Pennsylvania.....	5,782,887	623,252	441,231	516,923	930,409	11.43	17.06	0.09	85.36	0.08	70.79	0.11
Rhode Island.....	2,378,237	931,216	618,013	789,219	646,392	21.97	15.25	0.27	78.31	0.21	66.37	0.32
South Carolina.....	214,470	47,614	22,849	35,028	143,275	8.78	26.43	0.16	65.21	0.11	47.98	0.22
South Dakota.....	786,120	304,673	210,773	222,220	444,566	18.54	27.06	0.28	97.54	0.28	71.15	0.39
Texas.....	20,400	22,550	20,464	33,738	212,125	65.27	649.61	1.65	60.66	1.00	90.75	1.11
Utah.....	123,500	8,700	7,696	7,846	18,750	4.55	9.82	0.06	98.09	0.06	88.46	0.07
Vermont.....	1,073,936	581,870	408,916	477,114	967,750	10.82	18.00	0.44	85.71	0.38	70.28	0.54
Virginia.....	1,703,206	332,548	218,828	256,125	446,659	17.11	22.98	0.15	85.44	0.13	65.80	0.20
Wisconsin.....	1,385,600	266,095	221,493	261,791	546,413	0.79	1.62	0.19	84.61	0.16	83.24	0.19
Other states (a).....	41,488	76,000	45,725	63,030	261,300							

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arkansas, Montana, Nevada, and Washington.

b Loss.

METHODS OF QUARRYING GRANITE.

STRUCTURE OF GRANITE IN PLACE.

The successful and economical working of granite quarries depends upon an intelligent application of a knowledge of the structure of the rock and its natural divisions in the mass, as well as upon improved methods, tools, and machinery for quarrying. The topographical location of the quarry and its relation to facilities for transportation are important factors that affect the productiveness and greatly modify the actual cost of operations in a given place.

In regions of great dynamic movement, such as most granite localities possess, very large rock masses without seams or fissures do not occur; but these fractures, extending, as they do, in certain definite directions to each other in the mass, form systems of inchoate joints, which divide it into roughly rectangular and rhombic forms, thus rendering valuable assistance to the quarryman. It is probable that the fissures were caused by pressure operating in certain directions during the origin or uplifting of the rock, and it is even possible for it to have been sufficient

to change the molecular arrangement of the component minerals. Even those granites which are apparently normal, and which reveal no traces of stratification or parallel arrangement of mica or hornblende, are found by quarrymen and stonecutters to split more easily and with a smoother surface in one or more directions than in others. An unequal pressure operating on the mass would have caused certain directions or lines of weakness and account for this, or it may have produced the apparent rearrangement of the feldspar crystals, as found in a few of the granites. In northern New England particularly most of the fissures, as revealed by quarry openings, are slightly curved, parallel partings conforming in general to the direction of the slope upon which the quarry may be located. They produce a sheeted arrangement of the rock, which bends in ridges or curves in hilltops like anticlinal or quaquaversal folds of sedimentary strata. In addition to these divisional planes there occur one or more systems of vertical joints, the joints of each system running approximately parallel to each other, though the systems cross at varying angles.

It is interesting to note that the direction of easiest cleavage, called by quarrymen the "rift", is parallel to the most numerous natural fractures, and that at right angles to this another direction of cleavage, called the "grain", is parallel to the system having the next greatest number of joints. When the rift of the rock in place is horizontal or more nearly horizontal than perpendicular, it is customarily called the "lift". The grain, although important, is not generally an eminent feature, and its direction may remain unknown even for a long time after the quarry is opened. These systems of fracture, and the unequal ease of splitting in different directions, are points generally well understood and advantageously used by experienced granite workers.

OPENING THE QUARRY.

Granite quarries are nearly always started in natural outcroppings of the ledge, but as they are entirely open workings, and necessarily cover large areas, considerable development work is needed at first and from time to time, as the quarry is enlarged, in stripping or clearing away the timber and soil and in removing the weathered portions or cap rock. It sometimes happens, especially in the northeastern region, that a ledge is found showing sound granite at the top, ready for quarrying, having been ground smooth by glacier movement and left bare of soil; but usually long exposed outcroppings have a softer outer portion, called "sap", resulting chiefly from the partial decomposition of the feldspar. This also occurs to a less extent along the seams and fissures, and where the rock contains iron the sap is stained by its oxidation to a brownish or reddish color. The sap may be merely a thin coating, scarcely discernible, or it may be that the rock is rendered unsound for 30 feet or more in depth, as is the case with a certain coarse-grained granite occurring in the Rocky mountains. The observation of such points in the field will serve as indications of the probable durability of the stone and the stability of its color.

BLASTING.

Owing to great diversity in the structure of the rocks classed here as granite, the operations of quarrying necessarily vary considerably, even in different openings of the same region. The object desired is, however, the same in all, namely, the removal of large rectangular blocks with the least outlay of time and labor compatible with keeping the quarry in good working shape and avoiding waste. Ordinarily, to break the rock into sizes which can be handled, blasting is necessary. In doing this the object is to direct the force of the powder so that it may break the rock in the desired direction without shattering either the piece removed or the standing rock, but it can be successful only when it is detached at the ends and bottom and has a chance to move out in front. As the rift in the rock in the majority of quarries approaches the horizontal, the first breaks are obviously made either with or across the grain. The method most generally used for doing this is called "lewisling", from the shape of the blast hole. A lewis hole is made by drilling close together holes about an inch and a half in diameter and in breaking down the partition between them by means of a flat steel bar, called a "set". This wide hole determines the direction of the required fracture. A "complex" lewis hole is the combination of 3 ordinary drill holes; a "compound" one, of 4; but the latter is seldom used, for if a very long break is to be made a series of lewis holes are drilled at considerable distances apart, and after being charged are fired simultaneously by means of an electric battery.

Another process occasionally used in a few quarries is as follows: a single round hole having been drilled, the explosive is put in, and on top of it an inverted iron wedge, placed between 2 half-rounds, is carefully lowered; then the tamping is proceeded with in the usual way. When the powder is exploded, the wedge, which is driven forcibly up between the half-rounds, breaks the rock in a direction corresponding to its thin end. One of the worst results of this procedure is that considerable rock near the top of the hole is apt to be huffed or flaked up.

Within a few years past the Knox system of blasting rock has been introduced and successfully used with general satisfaction in many of the larger quarries. The results obtained are those which were sought for by lewisling, but the process is safer, quicker, takes less powder, and, as it never shatters the rock, not only gives good sound blocks as the product of the blast, but also leaves the standing rock with a perfectly sound, clean face for future operations. A round hole is first drilled to the required depth, and into this is driven a reamer, which produces V-shaped grooves at opposite sides to the entire depth of the hole. The charge is then inserted, and the tamping is done in the usual manner, except that instead of driving the tamping down upon the top of the charge an air space or cushion is reserved between the charge of powder and the tamping and as far above the charge as

possible. The explosive has therefore the greatest possible chance for expansion before actually breaking the rock, the tamping being put down only to a sufficient depth to insure firmness of position. The result of this method is that the force of the explosive is directed in the line of the grooves, and no shattering of the rock occurs if it be solid, such as is common in ordinary blasting operations, and, as a consequence, quarrymen are enabled to get out stone of rectangular shape without waste or loss of valuable rock.

Very large blasts or mines are sometimes fired in quarrying granite. A shaft is sunk to the required depth, and from it drifts are run in various directions. These chambers, or drifts, are then charged with explosives and fired. In 1887, at Granite Bend, Missouri, stone enough was broken with 1 blast to supply the demands of a firm for 50 years. The shaft, which was 85 feet deep, had chambers running in several directions from the bottom, and was charged with 32,700 pounds of black powder.

The explosive used for breaking out dimension stone is black blasting powder, as its action is somewhat slower than that of the various forms of nitroglycerin, and there is consequently less danger of shattering the rock or of weakening it by starting incipient fractures that may not be detected until it is in place in a building; but for breaking up poor stone or for getting out rock regardless of size or form giant powder is frequently employed.

In a quarry having rather thin sheets and numerous vertical joints very good splits may be made with wedges driven between half-rounds (plug and feather) into small holes drilled a few inches apart along a prescribed line, every few feet a deeper hole of a somewhat larger dimension being drilled to guide the fracture; but this process is chiefly used for subdividing the blocks after they have been loosened by powder and for initial splits in quarries where the drift is vertical.

Drills driven either by steam or compressed air are in use for making blast holes in all the principal quarries. The drill is connected with the piston, which is supported by a portable iron tripod, carrying the necessary appliances for regulating its movements. A flexible pipe conveys the motive power in the form of compressed air or steam.

In smaller quarries these holes are drilled by the "jumper" drill, a long, flat-edged steel bar, which a man holds and turns as it rebounds slightly after each of the swinging blows dealt it by heavy sledges.

Steam channeling machines, common in large marble and sandstone quarries, are used on granite by a few quarriers chiefly for making end cuts in stone of exceptional structure, but only to a limited extent, since the great hardness of granite renders the process very slow and expensive.

The large blocks loosened by blasting are broken and split into sizes of the required approximate dimensions by the plug-and-feather method. The holes, which are of small diameter, generally not more than three-fourths of an inch, and a few inches only in depth, are made by a drill and hand hammer. Into each hole is inserted 2 half-rounds or "feathers", tapering pieces of iron, flat on one side and rounded on the other, between which is placed a steel plug or wedge. The wedges are then driven in with a sledge till the strain is sufficient to split the rock.

METHODS OF CUTTING, POLISHING, AND ORNAMENTS GRANITE.

Only a small percentage of granite in rough blocks as it leaves the quarry proper is available for use in this form. Most of it has to be cut to the desired dimensions and brought to the degree of finish required for the special purposes for which it is to be used. Very large blocks and stone designed for uses not requiring fine finish are often worked in the open air, but most quarries have cutting sheds erected near the openings, in which the blocks are worked into their intended form. These sheds vary from merely a rough covering of boards to extensive buildings.

To produce good results great skill is needed by the stonecutter in the manipulation of his tools, and considerable artistic ability is required for the finer kinds of work. From the rough work of simply splitting a block or rudely spalling an ashlar face to the artistic working of highly embellished and complicated statuary carving a knowledge of the rift and grain is important, as it indicates where heavy blows may be struck and where lighter ones are required.

Owing to the great obduracy of this stone and the fact that the different minerals composing it vary greatly in hardness, the chief work of shaping it is still performed by hand, probably by much the same process that was used by Egyptian stonecutters more than 3,000 years ago. Improvements and inventions have, however, been made from time to time in hand tools, and extensive machinery is now in use for producing certain forms and kinds of finish.

RECENT IMPROVEMENTS.

The most important improvements of the last decade include the more extended adoption of lathes for turning and polishing columns, urns, etc., and new devices in power machinery for plain polishing. Greater economy and speed are now obtained by the general use of chilled iron globules and crushed steel as abrasive materials and of the pneumatic tool for the ornamentation of surfaces.

GRANITE FOR BUILDING PURPOSES.

By reference to the table giving the output of granite according to purposes it will be seen that more stone was used for building than for any other purpose. A great amount of labor by the stonecutter is necessary to fit it for its destined place, but much of this work consists in merely squaring up or subdividing the large blocks as hauled

from the quarry opening. Much more work is needed on the stone to be used for fronts, trimmings, and certain portions of superstructures, while for special parts, such as polished columns and ornate keystones and capitals, the greatest skill and longest time are required. The general processes of finer finish will, however, be mentioned further on in connection with cemetery, monumental, and decorative purposes, although all stone designed for superstructures, whether rough or finely wrought, has been tabulated under the heading "Building purposes".

IMPLEMENTS FOR CUTTING.

The implements used by stonecutters to produce common forms and ordinary finish are as follows:

Chisel.—Various forms and sizes are employed in cutting border drafts, moldings, letters, and ornamental work.

Point.—A piece of steel bar drawn out to a pyramidal end; used for "roughing out" surfaces and removing "bunches".

Hand drills, wedges, and half-rounds.—Used for splitting out blocks.

Hand hammer.—Used in one hand for driving chisels, points, and drills, which are held and guided by the other.

Spalling hammer.—A heavy square-cornered sledge, used for roughly reducing a block by breaking off large chips or spalls from the edges, thus bringing it closer to its intended form.

Peen hammer.—Shaped like a double-edged wedge, with a handle running parallel with the edges; used to remove irregularities by striking squarely upon a surface and wedging or bruising off small chips.

Bush hammer.—Made of rectangular steel plates brought to an edge, bolted together, and attached to a long handle; used in the same manner as the peen hammer, but produces a smoother surface, the degree of smoothness depending upon the number of steel plates in the particular hammer used. These hammers, which are all of the same thickness, are called 4-cut, 5-cut, 6-cut, 8-cut, 10-cut, and 12-cut, according to the number of plates used in their construction.

The size, shape, and finish of a stone depend upon the particular place it is to occupy in a building and the style of architecture. Fronts or walls are laid up in various kinds of ranges, usually designated as coursed range, broken range, broken ashlar, random range, and rubble work. The kind of finish given the face of the stone is called either bush hammered, peen hammered, pointed work, or rock face. These may or may not have a border draft chiseled around their margins. Other kinds of finish are chiseled moldings and carved or polished faces.

The usual process followed by stonecutters in shaping blocks may be generalized as follows: The block, having been split out to about the right size by the plug-and-feather method, is brought to a plane surface on 1 side, which is accomplished by knocking off overhanging edges and projections with the spalling hammer or spalling tool. Drafts or ledges are then chiseled along 2 opposite edges. 1 draft being completed, the workman lays upon it a wooden strip or rule having parallel edges. A second rule is then sunk in the draft made on the opposite side until the 2 drafts are in the same plane, which is determined by sighting across the upper edges of the rules. The whole face is then worked down to this plane with the tools necessary for the required fineness of finish, a straightedge being applied from time to time as the work progresses. The point is used for removing rougher projections. This is followed by the peen hammer, and, if a smoother surface is required, it is made by bush hammering, the hammer having the fewest number of plates being used first. The required size of the face being marked out upon this surface, the position of a second face may be determined by chiseling drafts across the ends of an adjacent surface, using for the purpose either a square or a bevel, depending upon the angle it is desired to make with the first face. The projecting rock between the drafts having been removed in the manner used in forming the first surface, a third face may be projected. A winding surface is formed by using in 1 draft a rule or strip having its opposite edges not parallel, the amount of divergence depending upon the amount of warp required. This rule is sunk till its upper edge is even with the upper edge of the strip, having parallel edges placed upon the opposite edge of the stone.

A cylindrical surface is worked by using curved rules in one direction, and is not as hard a matter as might at first seem. Much difficulty is, however, encountered in laying out and working spiral, conical, and spherical surfaces, as it is first necessary to form plane and cylindrical faces on which to apply the necessary bevels and templates.

GRANITE FOR STREET WORK.

PAVING BLOCKS.

Experience has demonstrated that the best and most enduring streets for heavy traffic in large cities are those paved with stone blocks of proper material and size, laid upon a specially prepared bed. The very hard and tough rocks frequently used, though capable of withstanding a maximum amount of wear, soon become smooth and glazed under traffic, and are therefore inferior to a stone which, wearing roughly, affords a better foothold for horses. Many of the granite rocks possess the right degree of hardness and brittleness, and are largely used for this purpose. This industry has increased largely since 1880, the number of granite blocks made in 1889 in the various states aggregating nearly 62,000,000.

Streets paved with the large-sized block used at first were found to be more difficult to keep in repair, worse for horses, and rougher on vehicles than pavements made of the smaller blocks now in general use. There is no uniform standard of size, as specifications of the various cities call for different sizes, but the variations are not great, and blocks $3\frac{1}{2}$ to $4\frac{1}{2}$ inches wide, 6 to 7 inches deep, and 8 to 12 inches long are generally preferred. In New York city, Brooklyn, and Philadelphia blocks a trifle longer are more commonly used, while in many of the western

and southern cities the length does not exceed 10 inches. New Orleans, owing to the peculiar nature of its streets, takes blocks much larger.

The manufacture of paving blocks, though an important adjunct of the granite business, varies nevertheless, for obvious reasons, in many of its details from the ordinary methods of granite cutting. The high skill and fine workmanship of the stonemason are not needed, but a quickness in seeing and taking advantage of the directions of cleavage, as well as a deftness in handling the necessary tools, is requisite.

Specifications call for blocks so quarried or dressed as to present substantially rectangular faces with practically straight edges. The corresponding dimensions of opposite faces must not vary more than one-half inch, and the surface must be free from bunches, depressions, and inequalities exceeding one-half inch.

The tools used for making blocks are knapping hammers, opening hammers, hand hammers, reels, chisels, and, for initial splits, drills, wedges, and half-rounds. When the block maker quarries his own stock it is called "motion work", and the same process is used as in quarrying stone for other purposes, except that, as large blocks are not required, most of it can be done with plug and feather.

Slabs, having been split out in the usual manner to sizes that may be easily turned over and handled by 1 man, are subdivided into pieces corresponding approximately to the dimensions of the required blocks. This is done by striking repeated blows upon the rock along the line of the desired break with heavy knapping and opening hammers. When a break is to be made crosswise the grain, it is frequently necessary to chisel a light groove across 1 face, and commonly across the adjacent sides, to guide the fracture produced by striking on the opposite surface with the opening hammer. Good splits can, however, be made along either the rift or grain by the skillful use of the opening hammer alone. Blocks broken out in the manner described are trimmed and finished with the reel, which is a hand hammer having a long, flat steel head attached to a short handle. Block breakers become very expert in the use of this instrument, and without making any measurements turn out in a surprisingly short time a large number of blocks. In Maine, which is far ahead of any other state in the number of blocks made, the entire product of many quarries is used for this exclusive purpose. This is also the case in California, which comes second, though the blocks are manufactured chiefly from the surface "boulders" or detached masses of basalt so common in Sonoma county. Other quarries, however, in various parts of the country utilize only the "grout", small or irregular shaped pieces, for making paving block, and haul the stock to the breakers, who work in sheds; but the greatest number of blocks is made on the spot where the rock is quarried, the workmen being protected during the hottest months by a temporarily spread canvas fly.

Blocks are counted as they are thrown into the cart which is usually needed to haul them to the shipping point. Several paving-block quarries in Maine are situated on steep mountain slopes so near water communication that blocks may be slid in long board chutes from the quarry directly into the hold of the vessel used for their transportation.

Paving breakers seldom work by the day, but are paid a certain sum per thousand for making the blocks, the price paid in 1889 ranging from \$22 to \$30, according to the size of block made, kind of stone used, locality, and whether the tools were furnished and the blocks quarried by their employers. Workmen using their own tools are commonly paid \$1 more per thousand for the blocks made, and when they quarry the stock they use from \$2 to \$5 per thousand is allowed in addition.

CURBING AND BASIN HEADS.

Next in importance to the manufacture of paving blocks, in the division of granite for street work, is the production of long granite slabs for curbstone. Granite, having a free rift, is preferred for this purpose on account of its better working qualities. The dimensions of ordinary curbstones are from 6 to 12 feet long, 6 to 8 inches thick, and about 2 feet deep. The top edge is made full and square and neatly bushhammered. The face is also bushhammered down about a foot from the top. The ends are dressed smooth, so as to make close joints, and the back of the stone, which is placed next to the sidewalk, is also dressed a few inches from the top.

OTHER USES.

Other applications of granite to street work are for flagstone, for crosswalks laid at the intersection of streets, and for gutter stone, but these are dressed, when required, in the usual manner, and need no special comment here.

Granite is largely used for making macadam and telford roads and concrete and artificial stone pavements, though it is seldom quarried expressly for this purpose, but made of spalls, grout, and waste from other quarries. The pieces are broken with sledges where coarse stones are needed, or run through power rock breakers when a finer subdivision is required.

GRANITE FOR CEMETERY, MONUMENTAL, AND DECORATIVE PURPOSES.

A considerable portion of the stone for these uses, especially for small-sized monuments, tombstones, and grave markers, is shipped from the quarries in rough blocks, which are suitably shaped and finished by masons working in town shops or stone yards. Large monuments and large polished blocks for buildings, columns, pilasters, and statuary are generally worked at quarry sheds, polishing mills, or shops not far distant.

There has been a decided increase in the use of polished granite for cemetery purposes since the introduction of machinery for its polishing, which has greatly decreased the price for this kind of finish. For these, as well as for all purposes where a polished surface is desired, as bottom courses in buildings, columns, pilasters, wainscoting, etc., the red, pink, dark gray, and black varieties are in high favor, since they have a richer look and present a much greater contrast between a hammered or chiseled surface and a polished one; but for granite statuary and ornately carved building blocks, and for all purposes where it is desirable to present fine detail, it is necessary that the granite be of a light color, fine grained, and easily worked to secure the best results.

POLISHED GRANITE.

The varieties of granite susceptible of the highest and most enduring polish are those containing the largest percentages of the hard minerals, quartz and feldspar, quartz being especially important. Hornblende, however, takes a fairly good polish, and contributes largely to the coloring of most dark granites. Pyroxene of the type occurring in the Quincy granites is rather bad, since, owing to its brittleness, it cracks out more or less and leaves small pits in the finished face. Much mica, especially in large plates, is objectionable, as it will not polish, but remains dull and lusterless except where the direction of its cleavage planes happen to coincide with the face of the stone.

After being prepared by bushhammering, the block is transported to the shop or mill to receive further smoothing and its final finish. The surface to be worked upon is brought to a horizontal position and ground smooth with an abrasive material mixed with water and moved about by a revolving iron or steel disk perforated with holes or made of concentric rings. This disk, which is 12 or 14 inches across, is revolved by an upright shaft, to the bottom of which it is fastened, and the power is communicated through a main shaft running overhead. Joints in the upright or counter shaft and its peculiar attachment to the main shaft allow its lower end to be swung over a considerable area, thus permitting the workman who guides it to move it over a surface of stone many times larger than the disk itself.

The abrasive material now almost exclusively used for grinding granite is either chilled iron globules, steel emery, or crushed steel. A coarse grade is used at first, then a finer kind, and for the last grinding fine emery is often used. Polishing is done in much the same way as grinding, except that a felt-covered disk is used in place of an iron one, and putty powder, mixed with a little water, instead of coarser grinding materials. Before the final polish, however, the surface is usually given a dull gloss or "skin coat" by the disk and water alone. A polish is sometimes produced by the use of oxalic acid instead of putty powder, but the polish thus made is less durable. Moldings are ground and polished by means of blocks fitting the grooves dragged back and forth either by power or hand.

Granite for columns, balusters, round posts, and urns is now worked chiefly in lathes, which for the heaviest work are made large enough to handle blocks 25 feet long and 5 feet in diameter. Instead of being turned to the desired size by sharp cutting instruments, as in ordinary machines for turning wood and metal, granite is turned or ground away by the wedge-like action of rather thick steel disks, rotated by the pressure of the stone as it slowly turns in the lathe. The disks, which are 6 or 8 inches in diameter, are set at quite an angle to the stone, and move with an automatic carriage along the lathe bed. Large lathes have 4 disks, 2 on each side, and a column may be reduced some 2 inches in diameter the whole length of the stone by 1 lateral movement of the carriages along the bed. The first lathes for turning granite cut only cylindrical or conical columns, but an improved form is so made that templates or patterns may be inserted to guide the carriages, and columns having any desired swell may be as readily turned. For fine grinding and polishing, the granite is transferred to another lathe, where the only machinery used is to produce a simple turning or revolution of the stone against iron blocks carrying the necessary grinding or polishing materials.

Blocks are prepared for lathe work by being roughed out with a point, and by having holes chiseled in their squared ends for the reception of the lathe dog and centers. This principle of cutting granite by means of disks revolved by contact with the stone has been also applied to the dressing of plain surfaces, the stone worked upon being mounted upon a traveling carriage and made to pass under a series of disks mounted in a stationary upright frame.

Tracery and lettering for polished granite are usually first drawn upon paper, which is firmly pasted to the surface, and the design chiseled through it to the requisite depth in the rock.

CARVED GRANITE.

Statues, capitals, keystones, and, in general, all highly ornamental designs, are worked out with chisels from detail drawings or plaster casts. It is necessarily a slow process, owing to the hardness of the rock, and the cost of such work is consequently great. A pneumatic tool, however, which has been recently patented and successfully applied to this purpose gives promise of superseding much of the tediousness of the hand process. This instrument is connected to a flexible pipe, supplying the compressed air or steam by which it is driven, and

works at a remarkably high rate of speed. It may be moved to any part of a surface, and works with a celerity unapproached by other means.

The use of granite for sculpture is steadily increasing, particularly for outdoor statuary. The white, fine-grained muscovite-biotite granite found at Hallowell, Manchester, and Augusta, in Maine, is particularly well adapted for this purpose. Statues made of the Hallowell granite are to be found in nearly every state, though possibly the stone is not superior to varieties found in other localities.

MARBLE.

CHARACTERISTICS OF THE INDUSTRY.

Considering the widespread occurrence of stone adapted to building and other purposes, it is natural to regard quarrying as practicable in almost any locality, and, consequently, to consider stone quarrying as a practically universal industry. This view is correct when limited to the ordinary coarser kinds of stone. Quarries producing stone of one sort or another are found scattered over all portions of the United States. In the marble branch of the industry, however, the case is different, inasmuch as this kind of stone is found only in comparatively few localities. It is only here and there that the metamorphosing influences of heat and pressure have transformed portions of the vast and widely distributed limestone deposits into marble. Among these sporadic deposits of marble it is the exception to find masses reasonably easy of access, sufficiently strong, of good color, and satisfactory in crystalline condition and freedom from flaws. Serious shortcomings in regard to any of these conditions may mean financial disaster to the would-be quarrymen.

Thus it happens that marble is obtained from only 12 states, and of these Vermont has yielded more in value than all the others together.

Limestone and marble, although closely related from the chemical standpoint, are very different in physical structure and purity. The uses to which they are put are so strongly contrasted that from a commercial point of view they are far from having anything in common, except in cases where refuse fragments of marble are used for rough building, road ballast, or burning into lime, purposes for which common limestone is freely employed. For these reasons, therefore, a careful distinction has been observed between common uncrystallized limestone on the one hand and crystallized and otherwise metamorphosed limestone, that is, marble, on the other. Statistics of a few quarries producing serpentine and verd antique have been included in this report, because the purposes for which they are used are identical with those to which pure marble is applied, such as interior decoration in buildings and in furniture manufacture.

The following statements have been compiled for the purpose of showing the present condition of the industry strictly from the standpoint of a census; that is, to show its part of the total mineral product of the country, the amount of capital which has been invested in the enterprise, the number of persons whose livelihoods are concerned, their condition, and the peculiar features essential to a successful prosecution of the business.

PRODUCTION.

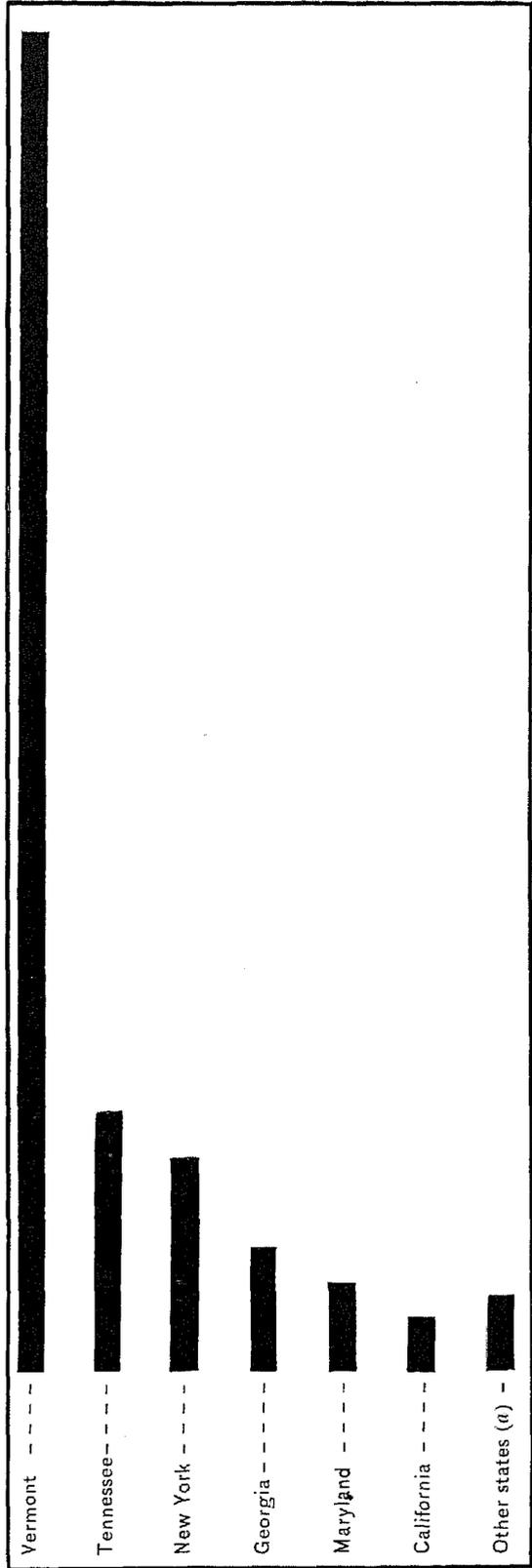
In order that the statistics herein contained may be clearly understood, a few words of explanation are necessary. The figures representing the value of the marble product are the aggregate of the prices received at the quarries or mills by the individuals or firms operating quarries. In other words, this value is what the producers receive for their output, whether rough or manufactured, eliminating all freight on the product sold. In some cases quarrymen have sold the product of their quarries in the rough to stonecutters, who have then prepared it for the consumer. In these cases the value is the price received by quarrymen for the rough stone. In other instances, however, quarrymen operating their own mills and finishing shops have sold stone ready for the consumer, and the price received by them for the product thus finished is the value of their output. The tendency at present is for quarrymen to do their own finishing and to sell the product ready for the consumer, but this practice is not yet universal.

The total value of all marble produced by quarrymen in 1889, as shown by the table on page 619, was \$3,488,170. According to Mineral Resources of the United States, 1888, page 541, the value of the marble produced during that year was \$3,000,000. The year 1888, while falling somewhat below the preceding year in actual production, was pre-eminently one of preparation for the future, inasmuch as several new enterprises were started and important additions to a number of already existing plants were made. The gain in value of nearly \$500,000 in 1889 is therefore not surprising.

The expenses of producing the marble include all wages and other outlays involved in getting it into the shape, whether rough or finished, in which it first became marketable; that is to say, they include not only wages paid to laborers in the quarry, but also wages paid to mill men and stonecutters, if such were employed by the quarry.

Robert P. Porter, Superintendent.

Eleventh Census of the United States.



RELATIVE RANK OF STATES PRODUCING MARBLE,

a Idaho, Massachusetts, New Mexico, Pennsylvania, Utah, and Virginia.

operator. The capital invested includes not only that applied to quarries and quarrying operations, but also to that invested in mills and finishing shops, provided they were operated by quarrymen. Likewise the number of men employed includes not only those engaged in quarrying operations, but also all connected with mills operated by quarrymen.

PRODUCTION OF MARBLE IN 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of individuals or firms operating quarries.	Number of quarries operated.	PRODUCT.		LABOR.							POWER.			
			Cubic feet.	Total value.	Number of employes.							Number of boilers.	Total horse power of boilers.	Horse power of water wheels.	Number of animals employed.
					Total number employed.	Foremen.	Quarrymen and millmen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.				
Total	74	100	3,320,213	\$3,488,170	4,529	158	2,185	1,021	1,013	59	96	206	8,622	3,379	633
California	4	4	33,792	87,030	62	4	27	16	10	1	4	2	129	10	16
Georgia	3	7	250,000	190,250	261	11	110	20	116	4	3	23	949	.....	25
Maryland	3	3	333,305	199,816	206	10	153	19	16	12	5	15	700	75	24
New York	13	14	1,171,550	354,197	466	17	200	91	83	4	11	31	1,241	.....	75
Tennessee	22	29	399,749	419,467	755	28	557	92	45	27	6	29	695	.....	102
Vermont	22	36	1,068,345	2,169,560	2,716	81	1,078	768	715	8	66	99	4,011	3,285	423
Other states and territories (a)	7	10	153,552	121,850	120	7	69	24	28	.....	1	16	315	.....	23

STATES AND TERRITORIES.	EXPENSES.				CAPITAL INVESTED.				
	Total expenses incurred in producing the amount of marble.	Total wages, including salaries paid to office force.	Value of supplies and materials consumed.	All other expenditures for the quarries, such as rent, taxes, insurance, interest, etc.	Total capital.	In land.	In buildings and fixtures.	In tools, live stock, machinery, and supplies on hand.	In cash.
Total	\$2,675,069	\$1,809,211	\$655,586	\$210,272	\$15,092,842	\$8,828,960	\$2,130,415	\$1,876,265	\$3,257,202
California	72,715	43,615	28,500	600	534,000	359,500	90,300	102,700	10,500
Georgia	147,086	76,661	33,175	37,250	2,373,627	2,038,790	126,750	190,350	17,737
Maryland	112,504	78,240	18,847	15,417	576,904	259,400	50,890	119,914	146,700
New York	260,804	182,641	52,756	25,407	1,033,461	621,550	121,600	195,459	34,852
Tennessee	263,741	213,214	29,159	21,377	815,500	544,695	36,600	133,192	191,013
Vermont	1,739,988	1,163,973	471,836	104,179	9,346,928	4,746,300	1,654,200	1,076,928	1,869,909
Other states and territories (a)	78,231	50,867	21,322	6,042	392,422	267,725	50,075	58,122	16,500

a The states and territories here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Idaho, Massachusetts, Pennsylvania, Virginia, New Mexico, and Utah. In New Mexico and Utah there was preparatory work only, no product having been sold in 1889.

EMPLOYÉS IN MARBLE QUARRYING, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	FOREMEN.		QUARRYMEN AND MILLMEN.		MECHANICS.		LABORERS.		BOYS UNDER 16 YEARS.	
	Average number days employed.	Average daily wages.	Average number days employed.	Average daily wages.	Average number days employed.	Average daily wages.	Average number days employed.	Average daily wages.	Average number days employed.	Average daily wages.
Total	276	\$2.87	252	\$1.26	204	\$1.98	258	\$1.28	226	\$0.66
California	273	4.31	255	2.55	286	2.86	190	2.12	200	1.25
Georgia	282	2.44	284	1.61	255	1.61	297	0.86	215	0.50
Idaho .....	.....	.....	59	2.00	100	5.00	260	1.50	.....	.....
Maryland	279	3.00	245	1.38	290	2.54	257	1.20	250	0.90
Massachusetts	275	2.00	260	1.50	260	2.25	260	1.50	.....	.....
New Mexico .....	.....	.....	50	3.00	.....	.....	.....	.....	.....	.....
New York	271	2.86	237	1.39	227	3.09	251	1.39	259	1.00
Pennsylvania	313	1.80	290	1.46	313	1.50	.....	.....	.....	.....
Tennessee	212	2.65	234	1.12	330	1.57	225	1.04	213	0.47
Utah .....	.....	.....	.....	.....	.....	.....	75	3.50	.....	.....
Vermont	272	3.00	262	1.27	270	1.87	265	1.33	226	0.75
Virginia	285	1.92	284	1.41	285	2.65	284	1.00	.....	.....

GENERAL STATEMENTS CONCERNING PRODUCTION.

It will be found impossible to obtain an accurate idea of the growth of the marble industry for the past decade by comparing the figures in the tables with those published in the census report of 1880, because in that report marble and limestone were considered together, while in the present census they are treated separately. The volume entitled Mineral Resources of the United States, 1886, page 541, contains, however, a table specially compiled by Mr. George P. Merrill, of the National Museum, which shows the value of the marble for 1880, exclusive of common limestone, to be \$2,033,595. According to this there has been a gain since 1880 of \$1,454,575, or 72 per cent. The table for 1880 is presented, as follows:

VALUE OF MARBLE QUARRIED IN 1880, BY STATES.

Vermont.....	\$1,340,000
New York.....	224,500
Massachusetts.....	230,495
Maryland.....	65,000
Tennessee.....	173,600
Total.....	2,033,595

Of the 12 productive states, Vermont, with its production of 62 per cent of the total output, has always been by far the most important. The following states, in the order of the value of the output, are the next in importance: Tennessee, New York, Georgia, Maryland, California, and Virginia. The product of each of the remaining 6 states was valued at less than \$50,000. From the states named in the table, therefore, the entire supply of marble used in the United States is obtained, with the exception of that imported into the country. The value of the marble imported in 1889 was \$701,518, so that 83 per cent of the entire consumption is supplied from this country. The figures in the first table show the number of individuals, excluding office force, employed by marble producers in the United States to be 4,433. Of this number 56 are boys under 16 years of age. Dividing the total wages paid in 1889, as shown in the first table, \$1,809,211, by the total number of individuals employed, \$400 is obtained as the average annual amount received by each individual, and dividing \$400 by the average number of days employed for all classes of labor, namely, 255, it becomes evident that the average daily wages for the total number of persons employed is \$1.57. Again, if the average wages be computed from the statements given in the second table, which are the figures furnished by the producers, the daily average is \$1.61, thus showing a very satisfactory agreement between the wages reported as actually paid in the first table and the entirely independent average statements given in the second table.

IMPORTS.

Italian marble, principally Carrara, forms over three-fourths of the total imports. A small proportion is Mexican onyx. Small annual imports of marble for special purposes come from France and French possessions. Austria-Hungary, England, Germany, Canada, Turkey in Asia, Ireland, and Scotland furnish occasional shipments.

The figures in the following table are compiled from the reports of the bureau of statistics of the Treasury department:

MARBLE IMPORTED AND ENTERED FOR CONSUMPTION IN THE UNITED STATES, 1867 TO 1883, INCLUSIVE.

YEARS ENDED—	Sawed, dressed, etc., not over 2 inches in thickness.	Sawed, dressed, etc., over 2 and not over 3 inches in thickness.	Sawed, dressed, etc., over 3 and not over 4 inches in thickness.	Sawed, dressed, etc., over 4 and not over 5 inches in thickness.	Sawed, dressed, etc., over 5 and not over 6 inches in thickness.	Veined and all other, in blocks, etc.	White, statuary, brocatel, etc.	Not otherwise specified.	Total.
June 30, 1867.....						\$192,514	\$2,540	\$51,978	\$247,032
1868.....						309,750	4,408	85,783	399,936
1869.....						359,881	3,898	101,309	465,088
1870.....						332,830	3,713	142,785	479,327
1871.....	\$5,973	\$168	\$77	\$44	\$28	400,158	1,134	118,016	525,598
1872.....	3,490	1,081	452		318	475,718	4,017	54,539	539,624
1873.....	3,124	21				396,671	4,148	69,991	473,955
1874.....	1,837					474,680	2,863	51,699	531,079
1875.....	1,456	427	96			527,628	1,623	72,389	603,619
1876.....	595	126	203	87		529,126	1,151	60,596	591,884
1877.....	2,124					349,590	1,404	77,293	430,411
1878.....	198	11	8			376,936	592	43,915	421,669
1879.....	184					329,155	427	54,857	384,623
1880.....						531,908	7,239	62,715	601,862
1881.....	339					479,047	1,468	82,046	553,900
1882.....	653					486,331	3,582	84,577	575,145
1883.....	619					533,096	2,011	71,905	607,631

During the calendar years ended December 31, from 1886 to 1889, and fiscal years ended June 30, for 1884 and 1885, the classification of marble has been as follows:

CLASSIFICATION.	1884.	1885.	1886.	1887.	1888.	1889.
Total	\$592,057	\$527,881	\$549,573	\$529,933	\$534,263	\$701,518
Marble in blocks, rough or squared, of all kinds	511,287	429,186	468,895	355,648	357,229	498,274
Veined marble, sawed, dressed, or otherwise, including marble slabs and marble paving tiles.	12,941	43,923	96,625	142,495	167,957	115,969
All manufactures of marble not specially enumerated.....	67,829	54,772	44,053	31,830	69,076	87,275

THE MARBLE INDUSTRY IN INDIVIDUAL STATES.

The following considerations apply to individual states, and are presented for the purpose of placing on record items of information which may be found interesting to marble quarrymen as well as to statisticians. The states are arranged in the order of the value of their output.

VERMONT. (a)

The producing counties are, in the order of their importance, Rutland, Bennington, Franklin, and Addison, the total value of the product being \$2,169,560. These counties are all in the western part of the state, and, interrupted only by Chittenden county, extend from the Dorset quarries in the southwest corner to the Champlain marbles at Swanton, in the extreme northern part. The quarries now operated are found in or near the towns of Manchester, Dorset, East Dorset, Wallingford, Rutland, West Rutland, Proctor, Pittsford, Brandon, Fair Haven, Middlebury, North Ferrisburg, and Swanton. Abandoned quarries are found all along the railroad line from Dorset to Middlebury. Most of the quarries are near railroad lines, but in some cases it is necessary to haul by wagon to the nearest railroad station. The longest distance of such transportation is 7 miles.

The marble lies in irregular beds, extending north and south, and having a slight dip toward the west, but at West Rutland the angle is very much increased, amounting to 80°, and the marble is worked to a depth of 300 feet. In most cases the upper layers are of little value, and the marble can only be used for purposes requiring rough stone, regardless of composition. 10 or 12 feet of surface rock must be thrown away before sound material is reached.

There is considerable variety in the color as well as in the texture of the stone. The pure white marble is rare, occurring in layers of very limited extent. Most of the stone is of a bluish-gray tone, and presents a mottled or clouded appearance, resulting from a more or less intimate mixture of blue and white. In some cases the blue is so predominant that the marble is known as "blue marble", and in cases where the blue is particularly pronounced it is called "extra dark blue". The pure white statuary marble is generally found at considerable depth. There is, however, no decided regularity in the relative arrangement of the different colors. The following analyses made at Yale University for the Columbian Marble Company may be regarded as representative of the marbles of the colors named:

ANALYSES OF MARBLE FROM PROCTOR, VERMONT.

DARK-COLORED MARBLE.

	PER CENT.
Calcium carbonate.....	98.370
Magnesium carbonate.....	0.790
Iron carbonate.....	0.034
Oxides of manganese and aluminum.....	0.005
Matter insoluble in acids.....	0.630
Organic matter.....	0.080
Total.....	99.909

LIGHT-COLORED MARBLE.

Calcium carbonate.....	96.300
Magnesium carbonate.....	3.060
Iron carbonate.....	0.053
Matter insoluble in acids.....	0.630
Organic matter.....	0.004
Total.....	100.047

The stone weighs on an average 170 pounds to the cubic foot, although it sometimes reaches 180 pounds.

a Special acknowledgments are due to Mr. M. H. Bancroft, of Swarthmore College, Pennsylvania, for valuable assistance in connection with Vermont statistics.

DESCRIPTION OF VERMONT QUARRIES.—Vermont marble is so well known the world over that it is scarcely necessary to say that the product of this state is well adapted to all the uses to which fine marble has been put. At the southern end of the marble belt in Vermont are the quarries of Messrs. D. L. Kent & Co., Freedley & Sons, the National Marble Company, and S. F. Prince & Co. These quarries are in the vicinity of Dorset mountain, and the stone produced is somewhat coarse in its crystallization, but quite sound. It has been used in the past to a considerable extent for building purposes, but the tendency now is to manufacture it into monumental products. Some of these quarries are between 6 and 7 miles from the railroad station, and the stone is hauled for that distance over a hilly road. 2 of these quarries, one belonging to Messrs. S. F. Prince & Co. and the other to Messrs. Freedley & Sons, are at a considerable altitude on the steep side of Dorset mountain. The one belonging to Messrs. Freedley & Sons, and the older of the two, is connected with the road by a double-track gravity system, so arranged that loaded cars going down draw the unloaded cars up. Mills for sawing are operated by all of the above-mentioned firms in this locality, but considerable stone is also sold in the rough without sawing, especially that used for heavy building work. Steam power is used in all cases except in the mill of Messrs. S. F. Prince & Co., which has a 28-inch turbine.

Passing northward from these quarries, the next locality of importance is West Rutland. Here the largest operators in the state are to be found. Some of the mills connected with the quarries at West Rutland are located at Rutland. This is the case with the Columbian Marble Company and the Vermont Marble Company. At West Rutland are the Sheldon, the Albertson, the True Blue, and the Orvillo quarries, in addition to those of the Vermont Marble Company. The Sheldon quarries comprise 4 openings: first, the Covered quarry; then 2 others, known by their numbers, "One" and "Two", and finally the North quarry. The most extensive of these is the Covered quarry. It is about 300 feet deep, the opening being about 200 by 250 feet, and extends at the bottom on the north and east sides in galleries 200 feet long. The marble taken from this opening is a mottled blue and white for most of the depth, but at the bottom a deposit of dark blue is found. Compressed air, instead of steam, is used in running the quarry machinery. The compressors are located in the engine room of the mills, and the air is carried in pipes from that point to machines in the quarry. 2 dynamos, of 45 and 15 horse power, respectively, are used in lighting the quarry, the office, and the mills. The marble taken from this quarry is exceptionally sound, and the blocks may be of any desired size, limited only by the capacity of the derricks. Quarries One and Two, just east of the Covered quarry, are not so deep as the latter, and have been opened at a more recent date. Steam is used in these quarries. The mills of this company, immediately adjacent to the quarries, are substantially built of blocks taken from the waste, and their equipment is very complete. 74 gangs of saws are operated. In addition to the mills there is a blacksmith shop, machine shop, finishing shop, and a carpenter shop. For finishing and polishing the work 2 buffers are employed, but most of the polishing is done by hand. A railroad siding, branching from the main road at West Rutland, runs through the yards and extends toward the northwest along the limestone belt, thus accommodating other quarries in addition to the Sheldon.

Immediately north of the Sheldon quarries are the openings of the Vermont Marble Company. The largest of these is nearest the Sheldon Covered quarry. It is known as the Gilson quarry, and is 250 or 300 feet deep. Adjoining this is the one known as the Old quarry. Next in order is the New quarry, then the Clement, and finally the Sherman. Several mills operated by this company are placed directly back of the above-named quarry openings, and they employ 37 gangs of saws and 3 rubbing beds. A large quantity of the stone quarried at this point is sawed at the mills of this company situated in Centre Rutland, where 64 gangs of saws and 3 rubbing beds are operated. The stone is of practically the same character as that in the Sheldon quarry.

The Albertson quarry is next in order, and is a comparatively new one. At the extreme end of the railroad siding above referred to is the True Blue marble quarry, which was opened during the past year. The surface rock has been removed, but operations have not proceeded far enough to secure any large quantity of marketable stone. A limekiln has been erected close to the mouth of the quarry, and a considerable portion of the product thus far yielded has been burned into lime. The lime produced can not be regarded as of the highest grade, as it is not perfectly white. It is, however, quite strong, and gives satisfaction in buildings. A mill containing 8 gangs of saws is operated in connection with this quarry. The Orvillo quarries, 3 miles south of West Rutland, have recently been opened, but the stone has not yet been placed on the market. Its quality, however, appears to be satisfactory. The next quarries in order are those of the Vermont Marble Company at Proctor.

Following the belt still farther toward the north, 2 quarries at Florence are met with. One of these is operated by the Wheaton Marble Company, the other by Messrs. Smith & Brainard. The stone of the Wheaton quarry is sold in the rough. The mills operated by Messrs. Smith & Brainard are located at Middlebury, and the quarry product is hauled to the railroad, about a mile and a half away. Some distance back of these quarries a new quarry has been started during the past year by the Venetian Marble Company, but the product has not been placed on the market. No mills have yet been built.

Farther north are the quarries at Brandon. This point may be regarded as the northern limit of the finest grade of marble. Within a radius of about 3 miles from the railroad station there are several quarries, those of the Brandon Italian Marble Company being the oldest at present operated. The stone is light, almost white in color, and is very finely crystallized. The Corona Marble Company has recently opened several shafts to the north of the Brandon Italian Marble Company, and 1 of these has proved very satisfactory. Operations are being rapidly pushed,

and mills have been recently built. Some of the stone quarried here is of the very highest grade, suitable for statuary purposes. There is considerable lateral pressure on the stone in these quarries, which renders quarrying in some cases quite difficult. The finest stone does not run throughout the quarry, but lies below the more ordinary stock. Messrs. Davidson & Sons, with headquarters at New York city, have recently opened a quarry near that of the Corona Marble Company. No mills are operated at the quarry, but the product is shipped in rough blocks to the mills operated by the company at New York city and at Watertown, New York. A comparatively small quarry in this vicinity is operated by Mr. L. B. Peck, who sells the stone in the rough to other firms, who do the sawing and finishing. Quarries and mills are operated by the Bardillo Marble Company, 3 miles southwest of the station, to which it is necessary to haul the product by wagon. In crystalline condition and color most of the stone produced at Brandon is very fine.

Passing still further north, there is little to be noticed until Swanton is reached. The product of this place goes under the name of Champlain marble. Its color varies from red to brown and drab, and its crystallization is somewhat coarse. Some of the product, especially that of Saint Albans bay, is dark green, and is known as verd antique. The Barney Marble Company, operating mills at Swanton, has several quarries in or near this place. The depth of these quarries is not great, and the stone is taken mainly from the surface. Owing to the hardness of the stone, the Knox system of blasting is employed, thus rendering channelers unnecessary, although steam drills are used in boring the holes required by this system of blasting.

By far the largest producing concern in the country is the Vermont Marble Company, with headquarters at Proctor. All the quarries operated by this firm are not, however, in this immediate vicinity. The 3 most important operated are the Sutherland Falls and Mountain Dark quarries, at Proctor, and the West Rutland quarries, located as their name indicates. The stone varies in color from white, rivaling the Carrara, in the West Rutland quarry, to a very dark-clouded blue in the Mountain Dark quarry. The color of the Sutherland Falls marble is intermediate between the shades of the other two, and presents a clouded or mottled appearance. The hardness of the stone is quite variable. Around the quarries and mills the company has built villages for the accommodation of its employes. A railroad 12 miles in length, equipped with the necessary rolling-stock and other appurtenances, is under the complete control of this company, and most of the quarry engines and machinery are built in shops owned and operated by it. Additions to the plant in the shape of buildings and mills, additional machinery, etc., are constantly being made. The power employed is largely hydraulic, amounting to 2,500 horse power, which is transmitted by the use of 75-horsepower air compressors, in which air is submitted to a pressure of 60 pounds to the square inch and carried in long lines of pipe to the various points of application. By the use of arc and incandescent lights, operated by 2 dynamos, work is carried on at night just as effectively as in daytime. Operations are practically continuous throughout the year, being interrupted only by excessive cold or snow in winter. Two-thirds of the output is converted into cemetery products and one-fourth into exterior building stock, while the remaining one-twelfth is devoted to interior decorative work in buildings. Blocks of any size that can be handled by derricks can be quarried. In the various Vermont mills operated by the firm 187 gangs of saws are in constant operation. In addition to the Vermont mills, there are others in different parts of the United States to which rough stock is shipped for finishing.

The Sutherland Falls quarry is also important. The stone is of fine quality, and is quarried with ease. Operations are conducted on an extended scale, and serve to illustrate the perfection which marble quarrying in the United States has attained. The mouth of this quarry is about 300 by 350 feet in area, and the opening has reached a depth of about 100 feet. 13 double Wardwell channelers, 2 single side-hill channelers, used for working at an angle, a diamond borer, 4 gadders, and 4 diamond drills are employed.

The Mountain Dark quarry, situated about a mile and a half north of the Sutherland Falls quarry, has been operated for a comparatively short time.

The mills at Proctor are the central works of the Vermont Marble Company and are furnished with every modern appliance for sawing and finishing the product. After the stone has been sawed it is sent to one of 3 finishing shops, according to the use to which it is finally to be put. In the shop devoted to monumental work there are 4 rubbing beds and 16 lathes, 6 of which are devoted to the polishing of smaller articles, such as monumental urns, etc., while in that for handling building stock is a heavy lathe capable of taking between its centers a block weighing 10 tons and turning a column 3 feet in diameter and 20 feet long. In the tile room, which is an adjunct to the building shop, are rubbing beds provided with special appliances for the rapid and accurate finishing of tiles. A vast amount of hard work is done in carving and decorating monuments and gravestones. A pneumatic tool for light carving is used in this mill.

Some of the uses to which Vermont marble is put are as follows: under the general head of monumental purposes are included statuary and decorated monuments, head and foot stones, markers, fence posts, ornamental railings and platforms, tombs, etc. The stone sold as building marble is used for decorative carving for exterior cornices, beltings, quoins, keystones, voussiors, window and door caps, lintels, doorsteps, and facings, ashlar facings, and solid masonry in the walls. Interior work in buildings includes such items as tiling, wainscoting, mantels, chimney pieces, counters, paneling, etc., and furniture tops. Some quarries in the state are best adapted to one particular line of work, and in these cases stone is sold for only a limited number of purposes.

TENNESSEE.

The total value of the marble produced in Tennessee for the year 1889 was \$419,467. It comes mainly from Knox, Loudon, and Hawkins counties, although a small amount is produced in Hamblen, Blount, and Jefferson counties. The marble region is thus seen to be in the eastern part of the state, running in a northeasterly direction from Loudon county, at the south, to Hawkins county, at the northeast. The total value of the marble produced in 1880 was \$173,600. The marble industry in this state is in a reasonably flourishing condition. The marble of Tennessee is in general easily quarried, and this fact has caused a number of property owners in the past to undertake quarrying operations on a small scale.

The methods of quarrying in this state are generally somewhat crude, and only a few channelers and other improvements in quarry machinery are in use.

Six marble-producing concerns have within a few years united, forming a combination known as the Tennessee Producers' Marble Company, the object of which is to maintain prices and carry on business more economically.

Tennessee marble presents much variety of color, and its great beauty is well known. It is especially well adapted for purposes of interior decoration in buildings and for furniture tops, but the amount devoted to the latter purpose is much less than it was a few years ago.

The processes of metamorphosis have in most of this marble stopped far short of the obliteration of fossil remains, the outlines of which are very plainly marked, and present a pleasing variety in the surface of the polished slab. The colors run from a very light pink through various shades to a chocolate brown and a mixed brown, white, and pink.

The product of Hawkins county is highly esteemed, and its price is almost twice that of the product of Knox or Loudon county. As shown by the numerous outcrops of marble in this state, it disintegrates rapidly under the influence of atmospheric agencies, but this does not detract from its adaptability for interior decoration, to which it is largely applied.

Some of the finishing mills in the state are well equipped and operated in a thoroughly modern way. The average cost per cubic foot of producing the marble output of Tennessee in 1889 was 85.1 cents. Of this amount 80.8 per cent was paid for labor involved in taking marble from the quarry and putting it into the shape in which it was sold. Cost of transportation by wagon and railroad from the quarry to the mill is in many cases quite a serious item of expense. The total number of individuals employed in this state is 749, including 27 boys under 16 years of age, but not including office force. The average amount per day received by each of these employes is \$1.22. This is decidedly lower than the average for Vermont. The difference is accounted for by the lower price paid for labor in the south, and by the further fact that less intricate finishing work is done, since the product there is used largely for interior decoration, which requires much less detail than highly ornamented cemetery work in Vermont. So great is the difference in the purposes to which the marbles of Vermont and Tennessee are put that the industries in these 2 states can not be regarded as strictly in competition, an increase in demand for the product in one state producing comparatively little effect in a contrary direction upon the other.

Although the beginning of the marble industry in Tennessee dates back to the introduction of this stone for interior ornamental work in the national capitol at Washington, it must still be regarded as in its infancy. The chief obstacle to its rapid development has been the lack of transportation facilities. This obstacle is being overcome, and the introduction of more capital will undoubtedly produce results which have heretofore been only imagined.

NEW YORK.

The total value of the marble produced in this state in 1889 was \$354,197. The value of the marble reported at the Tenth Census was \$224,500. The product is distributed among the following counties, arranged according to their output: Saint Lawrence, Westchester, Columbia, and Warren.

There are at present (1890) 5 quarries in operation in Saint Lawrence county, but only 3 were actually productive in 1889. The color of the Saint Lawrence county marble varies from white to dark blue and green and mixtures of these shades, producing in these cases a mottled appearance. The marble is adapted to monumental and building purposes, and the greater part of the product of 1889 was used for the latter purpose. This stone, while too coarsely crystalline for fine carving, scroll work, or tracing, forms a fine contrast with the polished surface. It weighs 174 pounds to the cubic foot, and has a crushing strength of 12,000 pounds to the inch. Preparations for increased production were quite active during 1889.

The quarries in Westchester county which were operated in 1889 are at Tuckahoe and Pleasantville. The product from Pleasantville is called, from its appearance, "snowflake marble", and is a dolomite, as is evident from the following analysis made at Columbia College:

ANALYSIS OF SNOWFLAKE MARBLE (DOLOMITE) FROM PLEASANTVILLE, NEW YORK.

	PER CENT.
Calcium carbonate	54.62
Magnesium carbonate	45.04
Iron carbonate	0.16
Alumina	0.07
Silica	0.10
Total	99.99

This marble is especially adapted for use in the preparation of carbonic acid. Its weight per cubic foot is 180 pounds. The product of 1889 was mostly used for burning into lime and for the preparation of soda water. A small quantity was used for monumental cemetery work, but none for building purposes. The Tuckahoe marble was used for building, macadamizing roads, and for the preparation of soda water. Like the Pleasantville marble, it is a dolomite.

The product of Warren county, which comes from Glens Falls and its vicinity, consists of black marble, which is generally used for tiling and to some extent for other kinds of interior decoration, soda-water fountains, clock frames, etc. The stone is quite hard, and is quarried by light blasting, and some of it, owing to the looseness of the beds, can be removed by ordinary tools. The rougher stone is largely burned into lime.

At Hudson, in Columbia county, and at Catskill, across the river in Greene county, are quarries of what is known as "shell marble", largely made up of fossil remains. The stone is so irregular that quarrying is largely done by blasting. It is of a dull brownish color, and presents a beautiful appearance in finished surfaces, but owing to its character it can not receive the fine finish given to other more perfectly metamorphosed marbles.

The marble industry in this state gives employment to 395 men, not including office force. The average amount per day received by each of these employés is \$1.82.

GEORGIA.

No mention whatever of marble or limestone production in this state was made in the reports of the Tenth Census, and in fact the promising developments to be considered in the present report have in the main been made within the past 6 years, so that it now stands, according to value of output, in fourth place among the marble-producing states. As is evident from the table of production, the value of Georgia marble in 1889 was \$196,250. This product comes from quarries in Pickens and Cherokee counties, in the northern part of the state, but by far the largest quantity comes from the first-named county.

Nearly all the output in Georgia is produced by the Georgia Marble Company, whose headquarters and quarries are at Tate, Pickens county. 5 quarries or openings, named, respectively, Creole No. 1, Creole No. 2, Cherokee, Etowah, and Kennesaw, are worked at present. The product of these quarries differs somewhat in color. The Kennesaw quarry yields a limited quantity of white marble, the crystals of which are large and glistening, but very compactly united, and in addition there is a white, clouded with light spots and lines of blue. The Cherokee quarry produces white and bluish-gray stock, both clouded with dark-blue spots. From the Creole quarries a marble having a white ground and exceedingly dark-blue mottlings is taken. This is used for monumental work and interior decoration. A great variety of different shades of marble is to be found in the Etowah quarry, the principal being pink, salmon, rose, and dark green. These with their combinations produce very rich effects, and are suitable for work in which high color and richness are desired. It finds its chief application in wainscoting, mantels, table tops, counters, panels, etc.

The following analysis was made by Mr. John C. Jackson, of Chicago:

ANALYSIS OF GEORGIA MARBLE.

	PER CENT.
Calcium carbonate.....	97.32
Magnesium carbonate.....	1.60
Silica.....	0.62
Iron protoxide.....	0.26
Alumina.....	0.25
Total.....	100.05

The following tests by compression of the strength of 3 cubes of Georgia marble, made in 1886 by Captain Marcus W. Lyon, United States army, with the testing machine at Watertown arsenal, Massachusetts, serve to indicate the great crushing strength of this marble:

MECHANICAL TESTS OF GEORGIA MARBLE.

Test number.	MARKS.	DIMENSIONS.		Sectional area. (Square inches.)	ULTIMATE STRENGTH.	
		Height.	Compressed surface.		Total pounds.	Pounds per square inch.
4337	Cherokee.....	6".04	6".01 by 6".00	36.06	395,800	10,976
4338	Creole.....	6".03	6".00 by 5".99	36.94	434,100	12,078
4339	Etowah.....	6".03	6".03 by 6".01	36.12	384,400	10,642

The structure of the marbles from the various quarries is essentially the same, the difference being in color only. The nonabsorbent properties are indicated by the following experiments, made by Professor J. B. Johnson, of Saint Louis, Missouri:

A 3-inch cube was soaked in water 24 hours and weighed. It was then dried over a steam coil at a temperature of about 215° Fahrenheit for 24 hours and again weighed. The difference in the weight divided by the weight when dry showed that it had absorbed water to an amount expressed by six-hundredths of 1 per cent. The nonabsorbent qualities thus revealed enable the stone to withstand disintegration.

The Georgia Marble Company has a very fine plant. The stone is not finished in final condition for anything but building purposes, but the mill at the quarries is well equipped with saws, rubbing beds, etc., and the electric-light plant enables work to be prosecuted at night. A railroad about 2 miles long, owned by the company, connects the quarries with the Marietta and North Georgia railroad, which forms an outlet for the product. The operations of this company have extended over a period of 6 years, but most of the work of developing has been done within the last 3 years. The company either owns in fee simple or controls in long leases over 7,000 acres of marble land.

3 miles from the quarries of the Georgia Marble Company are those of the Southern Marble Company, which has lately been organized. Operations of production are now fairly under way.

The American Marble Company, with quarries 2 miles west of Holly Springs, Cherokee county, and business headquarters at Marietta, is quarrying verd antique. This stone, although not marble, is used for interior decoration, etc., which brings it into immediate competition with marble, and statistics relating to it are therefore included.

MARYLAND.

The value of the marble product in this state in 1889 was \$139,816. According to the report of the Tenth Census it was \$65,000 in 1880.

Included in the product of 1889 is the marble from quarries at Cockeysville, Baltimore county, and also "green serpentine" from quarries in Harford county. The latter stone is included with marble for the same reasons already given in connection with the production of verd antique in Georgia.

The following is an analysis of the stone made by Dr. F. A. Genth, of Philadelphia:

ANALYSIS OF SERPENTINE FROM HARFORD COUNTY, MARYLAND.

	PER CENT.
Silica.....	40.06
Alumina.....	1.37
Chromic oxide.....	0.20
Nickel oxide.....	0.71
Ferrous oxide.....	3.43
Manganous oxide.....	0.09
Magnesia.....	39.02
Water.....	12.10
Magnetic iron.....	3.02
Total.....	100.00

Serpentine is decidedly harder than marble, and has a specific gravity of 2.668. The color varies from a pale green to a blackish green, and is very beautiful. Operations of quarrying began in 1880.

The marble quarries at Cockeysville have been operated regularly for years. The product is used to some extent for cemetery work, and also largely for building purposes, particularly in Baltimore, where it enters into the construction of a number of the finest structures. It has also been used in Philadelphia and in the extension of the national capitol. The Beaver Dam Marble Company is the most important firm, and has a well-equipped plant, including the modern improvements for quarrying and sawing. The most practical test which has been made of the strength of this marble was its use as material for the Washington monument in the District of Columbia, the highest stone structure in the world.

CALIFORNIA.

The value of the marble product in this state in 1889 was \$87,030, which was taken from quarries in San Bernardino, Amador, Inyo, and San Luis Obispo counties, five-sixths of it coming from the first-named county. No figures of limestone or marble production are given in the report of the Tenth Census, as all the quarries in this state are new, and none of them can be regarded as more than fairly under way, although the outlook is unquestionably good. The product of San Bernardino county is used for monumental purposes and for building (both interior and exterior), tiling, and dimension stone. Preparations for increased future output in the way of additions to existing plants are actively going on. The product of Amador county is used principally for copings, and but little for monumental work.

The operations near Keeler, in Inyo county, date back only a few years, and are still in the initial stages of preparation. The stone is a dolomite, as is evident from the following analysis, made in the laboratory of the University of California:

ANALYSIS OF INYO COUNTY, CALIFORNIA, MARBLE.

	PER CENT.
Carbonic acid.....	47.353
Iron.....	0.017
Calcium oxide.....	31.042
Magnesium oxide.....	21.791
Total.....	100.203

This stone weighs 178.5 pounds to the cubic foot, and is extremely nonabsorptive. A mill for finishing and polishing is now in course of erection. Water power of 500 horse power is at hand. The product of San Luis Obispo county is the so-called "onyx", similar to Mexican onyx, and shows a great variety of colors—green, blue, golden, and mixtures of these colors. Heretofore the stone has been transported on horseback to the nearest shipping point, but recently a wagon road has been built, and this improvement is expected to have the effect of considerably increasing the output.

VIRGINIA.

Within the past few years a marble quarry has been opened and worked at Mountsville, Loudoun county, by the Virginia Marble Company. Although considerable merchantable stone has been quarried, practically none has been sold, as it has been found impracticable to transport the product by wagons over the roads which connect the quarries with Leesburg, the nearest point on the railroad. There are prospects that a branch railroad connecting with the Chesapeake and Ohio may be built to the quarries, but until this is done the product can not be considered as on the market. The extent of operations so far consists of a surface opening measuring 100 by 80 feet and about 20 feet in depth, at which depth sound stock has been found. 2 floors, extending entirely over the above area, have been removed, but the third layer has been contracted in area to one-half of the original opening. 3 floors have been taken out over this contracted area, so that the greatest depth is 48 feet below the surface of the earth. The plant at the quarry consists of a number of channelers, a steam derrick for hoisting, and a gang of slab saws. The product shows a variety of colors, namely, white, creamy white, green, and green and white mixed in streaks and spots, the green shading into very dark green and chocolate. For interior decoration and for furniture tops it would undoubtedly be very handsome. The company owns 99 acres of land, all of which is believed to be quarry property.

PENNSYLVANIA.

The entire product comes from Montgomery county, is taken from quarries near Conshohocken and King of Prussia, and is used largely for building purposes, chiefly for steps, window sills, exterior trimmings for houses, etc. The waste is used as flux in iron furnaces, and also in the manufacture of glass. These quarries have been operated for a number of years.

MASSACHUSETTS.

The product of 1889 came from Lee, Berkshire county, in the western part of the state, nine-tenths of which was used for building purposes and the remainder for monumental work. This marble has long been known, and has entered into the construction of many fine buildings in various cities of the country. It is a dolomite, white in color and coarsely crystalline in texture.

ALABAMA.

Marble has been found near Florence, Lauderdale county, only 1 mile distant from the Louisville and Nashville railroad. No product has been quarried, but some preliminary steps have been taken which may lead to productive operations in the near future.

IDAHO.

At Spring Basin, Cassia county, marble is produced in sufficient quantities to supply local demand. It is suitable for cemetery work, but has never entered the market in competition with the well-known marbles of other regions.

COLORADO.

A marble quarry has been opened at a point 14 miles north of Salida, Chaffee county. The stone is properly a dolomite, and is adapted to monumental work, statuary, furniture, and building purposes. The variety of color in

this stone is very great, and the product appears to be of good quality. Developments, however, have hardly progressed far enough to justify definite statements. Marble quarries have been opened near Silver Cliff, in Custer county; at Livermore, in Larimer county; in the Elk mountains at the head of Rock creek, in Pitkin county, and at the head of Yule creek, in Gunnison county. There has been no production of marble except specimens, but the beds opened in the Elk mountains produce stone of such fine quality that it is probable the marble will enter the market on the completion of the railway now being built up Rock creek to these quarries. It is here found chiefly of a white color and fine texture, and seems well adapted to all the uses to which marble is ordinarily put. Deposits of different colors, similar in character to the white marble, have also been opened.

METHODS OF QUARRYING.

The method of quarrying is essentially the same in most marble quarries. With fine marble, blasting seems to be entirely out of the question, because of injury to the stone, which has been amply proved by past experiments in Italy. This injury has not always been apparent in freshly quarried stone, but has been revealed years after by disintegration. It has already been stated that the marble at Swanton, Vermont, and at a few quarries in other states, is quarried by the Knox system of blasting; but the product is not used for purposes which would be injuriously affected by blasting, and, furthermore, the character of the stone in such cases admits of the application of this method. Experiments in blasting marble have also been recently tried in California, but the results have not yet been made public. A spot for opening a quarry is selected with the greatest care. If the surface indications are not sufficient to determine the quality of the underlying marble, it becomes necessary to drill a hole to a greater or less depth into the body of the stone. This is accomplished by means of an ordinary diamond drill for prospecting; that is, a hollow tool cutting a circle and leaving a core, which is taken out when a proper depth is reached. Lengths of 10 or 12 feet are thus frequently taken out without flaws. If the core presents satisfactory indications, the surface material is stripped by blasting, so as to make an opening for the quarry. Derricks are then placed in position, and channelers, drills, and gadders commence operating upon the comparatively level floor secured by the operations of stripping. A channeler then cuts 2 grooves or channels across the grain of the stone the width of the channeler apart (about 5 feet). The stone thus separated from the rest is called the key course. This is cut across at intervals to the same depth as the long channels, namely, the thickness of the bed operated upon. The key course is thus cut into blocks, which are held to the fixed marble only on the under side. To separate the blocks from the quarry two processes are in use. According to one of these, a block, called the "key block", is blasted out, destroying it, but also separating it at the bottom, thus giving space for operating upon the adjacent block to be taken out entire and in sound condition. Instead of blasting, the key block may be loosened at the bottom by means of wedges driven into the channels at one side and one end. A ring fastened into the center of the block forms a means of attachment to the derrick, which then lifts it from the floor. In the latter method more time is consumed, but the key block is saved. After the key block is removed, space sufficient for the introduction of the gadder is secured. The gadder, similar to the drill, bores horizontal holes 6 inches apart into the adjacent block at the bottom. Iron wedges, known as "gadding pins", are then driven into the holes, thus separating the block at the bottom. In order to avoid breaking a block at the edges the pins are a foot or more in length. When the key course has been removed several courses parallel to it are channeled out and removed in a similar manner. The channelers require 2 men, a runner and his helper, and will cut 75 channel feet per day to a depth of about 5 feet.

The drills operate by striking rapid blows, and the diamond borer cuts by revolving, the cutting edge consisting of diamonds set into the end. The underlying marble is cut into successive floors, as in the case described, thus gradually sinking below the surface, until, as in the Rutland and Proctor quarries, depths of 200 to 300 feet have been reached. Steam is commonly employed in running the quarry machinery, but in some cases compressed air is used and hoisting is done by derricks. The usual size of blocks taken out is 4 feet by 4 feet 6 inches by 6 feet 6 inches, but for special purposes considerably larger blocks are frequently removed.

METHODS OF MANUFACTURING.

If the marble quarried as above is to be sold in sawed or in finished condition the blocks are transported to the mills, where they are sawed into slabs of various thicknesses. The saws consist of strips of steel fastened to an oscillating frame. The cutting material is sand, which, mixed with water, continually flows over the block and into the cuts made by the saws, and is fed upon the block either by hand or automatically. In the automatic process of feeding the sand is first delivered from a hopper into a well conveniently located in the mill, from which the mixture of water and sand is pumped through a main pipe connected with various branches which deliver the contents upon the blocks of stone.

After sawing, the blocks or slabs are placed upon a rubbing bed, consisting of a circular iron disk revolving horizontally and continually supplied with the same mixture of sand and water used in sawing. A rather smooth but dull surface is thus secured, and the stone is then ready for decorative work or for carving and polishing.

The polishing of large surfaces is accomplished by means of a buffer, which consists of a rapidly revolving wheel

covered with flannel and charged with a so-called putty powder, and frequently with a mixture of putty and oxalic acid. This wheel is capable of a universal horizontal movement while revolving, so that it may reach all parts of the slab. Much of the polishing in Vermont mills is necessarily done by hand on account of the delicate nature of the work, owing to the intricacies of surface resulting from carving. In Tennessee mills, where large plain slabs for wainscoting and partitions are polished, the practice of machine polishing is much more general.

The light carving, or "skin work", as it is called, is largely done in the old-fashioned way, with mallet and hand cutting tool; but a recently patented pneumatic tool, delivering a large number of light blows per second, is now being introduced. This is held in the hand and moved along the outline to be cut into the stone. Its work is very rapid and it appears to be gaining in favor. It is used not only for the softer kinds of stone but also for granite.

In the preparation of stone for architectural designs, such as moldings, cornices, etc., planers similar to iron ones are used. Monumental urns and turned architectural work are produced by means of lathes, which are used both for cutting and polishing the various forms.

WASTE AND ITS UTILIZATION.

The operations of quarrying and manufacturing marble are attended by a large amount of waste. This has been estimated by one authority to run as high as 25 per cent of the quarry output before the stone is ready for market, although it does not always run as high. This waste is due partly to natural defects in the rock as it lies in the quarry, but more particularly to the process of working the blocks into final shape. Sometimes the defects in a block of stone do not appear until sawed into slabs, and it may be that most of the block is on that account cast aside as waste. This difficulty is naturally met with only infrequently in the best quarries, and the original selection of these openings has been usually the outcome of sound judgment, coupled with geological knowledge and years of experience in marble quarrying. Financial disaster has very frequently followed unfortunate selections of points at which to open new quarries. The waste of quarries is utilized to some extent by the operator in the erection of mill buildings or to fill up excavations and natural hollows in the quarry or mill property, and some of it is used as railroad ballast and for the improvement of wagon roads. In one case limekilns have been built and the waste burned into lime, which, however, is not of the best grade. A small amount is sold for flux, and a small local demand for foundation stone is supplied at a low cost to purchasers. In the last 5 years a significant portion of the waste in Maryland quarries has been used with asphaltum in making paving block.

GENERAL STATISTICS OF MARBLE PRODUCTION IN 1889.

STATES.	Total number of cubic feet produced.	Total value of product.	Total wages.	Total expenses.	Total capital.	PERCENTAGE OF PROFIT ON—		Per cent- age of wages to total expense.	Amount of wages paid per cubic foot.	Per cent- age of wages to total value.	Cost per cubic foot of prod- uct.	Value per cubic foot.
						Capital.	Value of product.					
Total	3,320,213	\$3,488,170	\$1,809,211	\$2,675,069	\$15,092,842	5.39	23.31	67.63	\$9.545	51.67	\$0.806	\$1.05
California	33,792	87,030	43,615	72,715	554,000	2.58	16.45	59.98	1.291	50.11	2.152	2.58
Georgia	250,000	196,250	76,661	147,086	2,373,627	2.07	25.05	52.12	0.307	39.06	0.588	0.79
Maryland	333,305	139,816	78,240	112,504	576,904	4.73	19.53	69.54	0.235	55.96	0.338	0.42
New York	1,171,550	354,197	182,641	260,804	1,033,461	9.04	26.37	70.03	0.156	51.56	0.223	0.30
Tennessee	309,709	419,467	213,214	263,741	815,500	19.10	37.12	80.84	0.688	50.83	0.852	1.35
Vermont	1,068,305	2,169,560	1,163,973	1,739,988	9,346,928	4.60	19.80	66.90	1.090	53.65	1.619	2.03
Other states (a)	153,552	121,850	50,887	78,231	392,422	11.12	35.80	65.02	0.331	41.75	0.509	0.79

a The states and territories here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Idaho, Massachusetts, Pennsylvania, Virginia, New Mexico, and Utah. In New Mexico and Utah there was preparatory work only, no product having been sold in 1889.

L I M E S T O N E .

The production of limestone in the United States for the census year 1889 was as follows: for building purposes, 92,289,896 cubic feet, valued at \$5,405,671; converted into lime, 18,474,668 barrels, valued at \$8,217,015; stone for burning into lime, 478,082 tons, valued at \$184,024; flux for furnaces, 3,894,337 tons, valued at \$1,569,312; for street work, 46,491,622 cubic feet, valued at \$2,383,456; for bridge, dam, and railroad work, 26,679,012 cubic feet, valued at \$1,289,622; miscellaneous uses, 549,875 cubic feet, valued at \$46,079; making a total value of \$19,095,179. The expenditures were as follows: for wages, \$10,121,985; for supplies and materials consumed, \$4,227,246; other expenses of quarries, \$743,483; making a total of \$15,092,714. The capital invested in the industry amounted to \$27,022,325; of this sum \$14,771,200 was in land, \$4,988,207 in buildings and fixtures, \$4,541,623 in tools, implements, etc., and \$2,721,295 in cash.

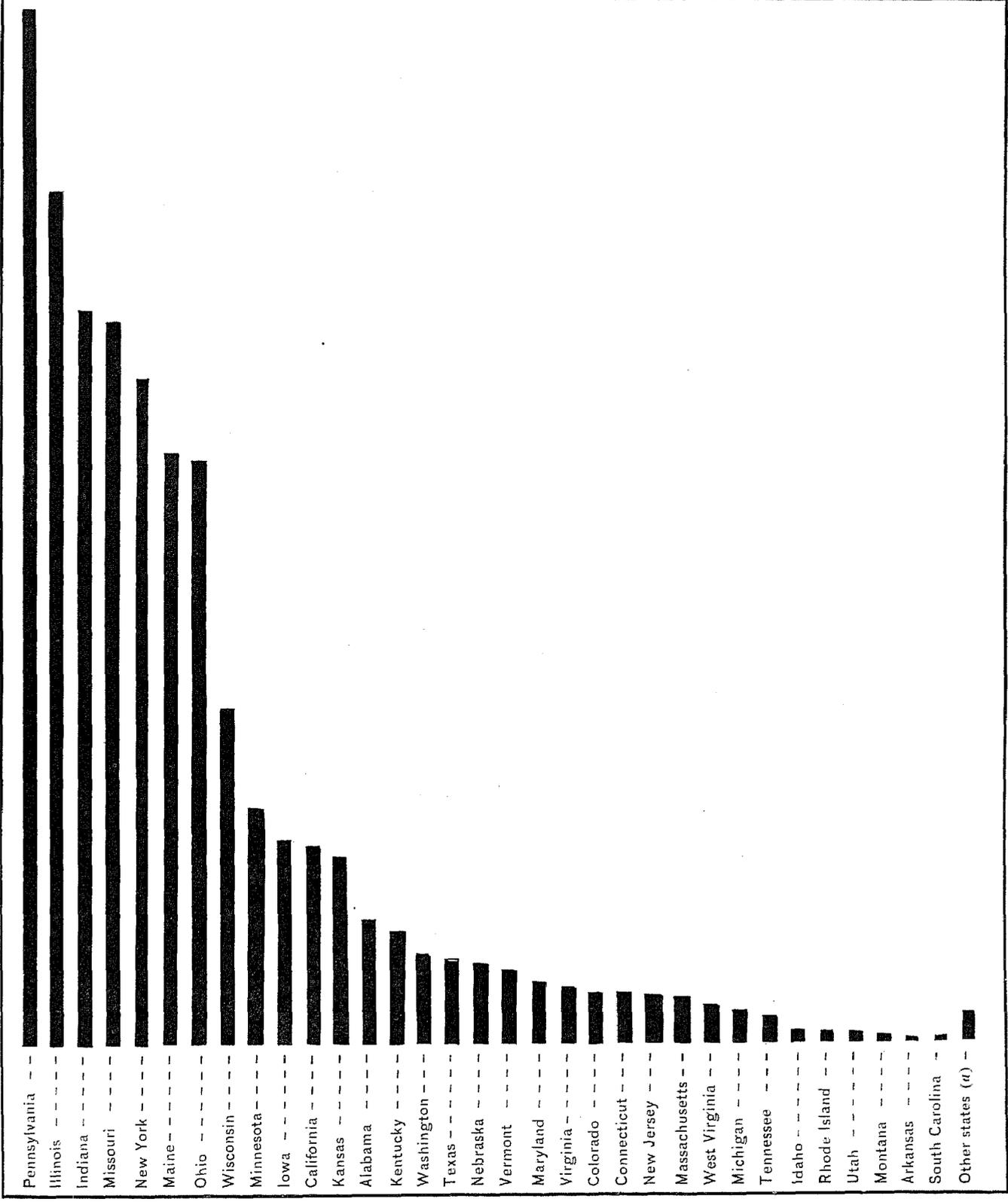
The name "limestone" carries with it the meaning "stone from which lime is made". Strictly speaking, therefore, it should apply only to the carbonate of calcium, which, by ignition, is converted into lime. The name, however, in practice covers quite a variety of materials which contain carbonate of calcium, but in very different degrees of purity. When limestone presents itself in crystalline condition, so as to be susceptible of fine polish and delicate ornamentation, it is known as marble. Marble is specially treated of in another report, inasmuch as its beauty of texture and fine crystalline condition make it applicable to uses for which the noncrystalline variety of limestone is entirely inadequate.

Calcium carbonate is frequently associated with magnesium carbonate in varying proportions. When the proportion of the latter is small the stone is called magnesian limestone, but when the proportion becomes 54.35 parts of calcium carbonate to 45.65 parts of magnesium carbonate it receives the name of "dolomite", which, if crystalline, may constitute a marble, but if noncrystalline is classed with the ordinary limestones. The term "ordinary limestone" is commonly used to include all the grades and degrees of limestone except marble, and "ordinary limestone" with this meaning is treated of in this report.

The limestones are mainly, though probably not entirely, of organic origin, resulting from the deposition and aggregation of shells, corals, etc.; but at the time of deposition other materials, such as clay, sand, iron oxides, iron pyrites, mica, etc., may have been included, thus producing a large number of grades, which are frequently distinguished by names which imply the presence of the most characteristic impurity. Siliceous, argillaceous, and micaceous limestones are names in common use. Usually the presence of these impurities is an objection to the stone for almost all the great variety of uses to which limestone is applied.

Among all the kinds of stone of commercial interest, limestone presents the widest range of variation in the qualities which are of special economic importance. Although it is essentially the carbonate of calcium, this compound may be so mixed with other materials as to be for practical purposes anything but limestone and, indeed, it would seem frequently unfortunate that the name limestone should have to do duty for a large number of materials which show vast differences in quality. The grouping of the various limestones under one general head is made necessary chiefly by the fact that no standard classification has been adopted among the producers, and distinctions clearly recognized in one locality are unknown in some other region, and especially is this the case among the smaller and more widely separated producers. It is the difficulty of securing any returns even of the simplest character from these small producers which limits the scope of a general investigation complete for the United States. A classification of the statistics according to the varieties of limestone is also impracticable from the fact that neither the chemical nor physical differences suffice for such a division. There is frequently as great a difference between the utility and value of two pure limestones differing but slightly in composition, such as the high-priced oolitic stone and Maryland limestone used for lime burning, as between the pure limestones on the one hand and the magnesian limestone or siliceous limestones on the other. The establishment of such classifications by means other than the producers' returns did not come within the census limitations.

It will be evident from the above that the range of prices per cubic foot of the various limestones must vary between extraordinary limits. There are many purposes for which limestone is alone suitable and for these its price meets no competition from other stones. In its application to lime burning and furnace fluxing, limestone stands alone, and, as will be seen from the table of production, large quantities are devoted to these purposes. The maximum value given in this report is \$3.33 per cubic foot for a very small product (150 cubic feet) of hard siliceous limestone used for polishing marble and for other abrasive purposes and is referred to again on page 640. In another case an unusually high value for a small quantity is due to the use of a limestone for a peculiar form of paint. In the larger uses for building the same great variation in price is also observed. The forms of limestone, as with other stones, which prove to be unusually enduring and which gives pleasing architectural effects command a price above the average. On the other hand the average value of a state's product is frequently greatly reduced by the quantity of stone used for road ballast and rubble at 4 cents per cubic foot or even less. It is of course also reduced by the local use of inferior building stone where nothing else is available.



RELATIVE RANK OF STATES PRODUCING LIMESTONE.

a Arizona, Florida, Georgia, New Mexico, Oregon, South Dakota, and Wyoming.

It should be carefully noted that, in stating the amount of lime given in this report, the figures are limited to that which is manufactured by the producers of the limestone used, and do not include lime produced by lime burners, who purchase the limestone from quarrymen and then burn it into lime. The figures given in the table of production, page 632, for the total value of the limestone product, namely \$19,095,179, represent the value of the industry to the limestone quarrymen; that is, it is the aggregate value of the product sold by them, whether of the stone itself or of the products made by them from it. The aggregate value of \$19,095,179 shows the limestone industry to be greater in point of value of output than that of any other kind of stone on which a separate report has been made. Limestone used for blast-furnace flux is to a large extent quarried by the operators of blast furnaces. Such operators as conduct regularly equipped quarries have reported the limestone so quarried and used by them, so that their figures are included in the totals herein given. (a)

GEOGRAPHICAL DISTRIBUTION.

The following statement shows the value of the output produced in each of the geographical divisions. The North Atlantic division includes the states of Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; the South Atlantic, Florida, Georgia, Maryland, South Carolina, Virginia, and West Virginia; the North Central, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin; the South Central, Alabama, Arkansas, Kentucky, Tennessee, and Texas, and the Western, Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming.

North Atlantic.....	\$6,491,834
South Atlantic.....	464,171
North Central.....	10,185,203
South Central.....	937,351
Western.....	1,016,620
Total.....	19,095,179

From this it is evident that the North Central division is the most important for the production of limestone, \$10,185,203 worth of the total \$19,095,179 being produced from this division. The most productive states of the North Central division are Illinois, Indiana, Missouri, and Ohio, in the order named, 3 of these states producing more than \$1,000,000 worth each, and Illinois more than \$2,000,000 worth. In the North Atlantic division the most important states are Pennsylvania, New York, and Maine, in the order named, 2 of these states producing more than \$1,500,000 worth each, while Pennsylvania produces more than \$2,500,000 worth.

The table on pages 632-635 gives, among other items, the states producing limestone in the order of value of output for the year 1889. From this it appears that 40 states produced limestone in 1889, while 18 were productive of both marble and limestone at the Tenth Census. All of the states which produce marble, however, also yield limestone. Pennsylvania heads the list with an output valued at \$2,655,477. There is a very striking difference in the production in Pennsylvania in the Tenth Census as compared with the value of its output for the Eleventh Census. Limestone and marble together were valued at \$240,934 at the former census, which is evidently a very small figure as compared with the value of the output at the present census. Comparisons, however, of the limestone production of the 2 censuses are almost impracticable, from the fact that ordinary limestone and marble were included in one statement at the Tenth Census, whereas in the present census they are separated. The total value of all limestone produced is \$19,095,179, exclusive, of course, of marble, which, as will be seen in the report on marble, amounts to \$3,488,170, so that the value of ordinary limestone and marble together would amount to \$22,583,349. The combined value of the 2 kinds of stone for the Tenth Census was \$6,856,681; in other words, the value in 1889 is between 3 and 4 times as large as that of 1880 for ordinary limestone and marble together.

The table of production following shows that \$19,095,179 worth of ordinary limestone was produced from 1,954 quarries by a force of 30,644 men, including office force, to whom a total of \$10,121,985 was paid in wages. The total expense of producing the limestone amounted to \$15,092,714, thus indicating a profit to the producers of \$4,002,465. The capital invested amounts to \$27,022,325, of which amount \$14,771,200 is invested in land.

Glancing at the purposes for which the stone is used, it appears that the value of the lime produced, namely, \$8,217,015, is the greatest. The value of the limestone itself from which this lime was made is estimated at \$1,477,974. It is important to remember in this connection that this lime was produced by the quarry operators who burned their own stone into lime, while that produced by lime burners purchasing the stone is not included here.

The item next in importance to lime in point of value is the stone used for building purposes, valued at \$5,405,671. Next follows the value of stone used for flux in furnaces, namely, \$1,569,312. For bridge, dam, and railroad work the amount is \$1,289,622, and small values are given for stone sold for burning into lime, also for stone used for miscellaneous purposes. In point of value the limestone industry is ahead of all other stone interests, granite standing second.

a In addition to the limestone quarried for blast-furnace flux, included in this report as coming from regularly operated quarries, there is a considerable amount produced by blast-furnace operators of which no complete account is kept, and consequently no statistics of such operations are given. The total value, however, of limestone used as flux is estimated at \$3,500,000.

PRODUCTION OF LIMESTONE IN 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of quarries.	Total value.	BUILDING PURPOSES.			LIME.			STONE FOR BURNING INTO LIME.		
			Cubic feet.	Value.	Value per cubic foot.	Barrels. (200 pounds.)	Value.	Value per barrel.	Tons. (2,000 pounds.)	Value.	Value per ton.
Total	1,954	\$19,695,179	92,289,896	\$5,405,671	\$0.06	18,474,668	\$8,217,015	\$0.44	478,082	\$184,024	\$0.38
Alabama	21	324,814	154,480	37,981	0.25	350,340	178,248	0.51	12,000	6,024	0.59
Arkansas.....	7	18,360	9,100	1,260	0.14	37,600	14,600	0.39			
California.....	22	516,780	12,500	360	0.03	533,123	513,130	0.96			
Colorado.....	15	138,091	56,250	7,300	0.13	146,737	91,101	0.62	15,000	3,750	0.25
Connecticut	9	131,697	33,750	894	0.03	191,795	129,663	0.68			
Idaho.....	3	28,545				29,871	28,545	0.96			
Illinois.....	104	2,190,607	21,433,967	1,084,556	0.05	877,274	366,245	0.42			
Indiana.....	172	1,889,336	7,492,345	994,313	0.13	1,074,517	340,315	0.32			
Iowa.....	143	530,863	6,280,787	230,792	0.04	365,394	170,643	0.47			
Kansas.....	115	478,822	4,562,049	269,316	0.06	16,686	9,013	0.54			
Kentucky.....	54	303,314	1,854,917	187,570	0.10	66,376	24,414	0.37			
Maine.....	60	1,523,499				1,903,639	1,523,499	0.80			
Maryland.....	30	164,860	41,897	1,140	0.03	545,591	148,432	0.27			
Massachusetts.....	12	119,978	283,100	21,833	0.08	82,977	93,702	1.13			
Michigan.....	8	85,952	1,296,539	46,308	0.04	44,173	15,500	0.35	13,466	3,313	0.25
Minnesota.....	72	613,247	7,277,348	383,556	0.05	344,162	124,266	0.36	400	200	0.50
Missouri.....	123	1,859,960	11,083,370	542,871	0.05	1,144,962	465,390	0.41			
Montana.....	4	24,964	100,000	7,500	0.05	2,217	1,464	0.66			
Nebraska.....	29	207,019	2,058,614	90,542	0.04	41,895	16,722	0.40			
New Jersey.....	33	129,662	28,058	636	0.02	400,249	99,496	0.25			
New Mexico.....	4	3,862	49,675	1,211	0.02	2,850	2,331	0.82			
New York.....	157	1,708,830	7,154,747	444,291	0.06	1,636,148	837,613	0.51	43,003	21,349	0.59
Ohio.....	221	1,514,934	9,754,989	407,388	0.04	1,725,336	581,325	0.34	220,095	98,059	0.45
Pennsylvania.....	373	2,655,477	5,188,013	238,431	0.05	4,043,679	1,195,955	0.30	137,285	37,120	0.27
Rhode Island.....	2	27,625				32,100	27,500	0.86			
South Carolina.....	2	14,520				13,500	6,120	0.45			
Tennessee.....	11	73,028	11,510	1,336	0.12	113,228	60,625	0.54			
Texas.....	18	217,835	666,160	135,901	0.20	12,000	6,700	0.56			
Utah.....	2	27,568	129,865	2,600	0.02	16,480	10,300	0.63			
Vermont.....	16	195,066	95,040	5,010	0.05	324,148	168,808	0.52			
Virginia.....	11	159,023	471,505	19,520	0.04	178,489	83,667	0.47	15,000	7,500	0.50
Washington.....	8	231,287	15,970	1,580	0.10	222,759	224,707	1.01			
West Virginia.....	8	93,856	194,250	3,835	0.02	296,498	82,471	0.28			
Wisconsin.....	79	813,963	4,537,351	232,780	0.05	1,561,611	514,974	0.33	21,833	6,769	0.31
Other states (a).....	6	77,935	840	60	0.07	96,423	60,221	0.62			

^a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

PRODUCTION OF LIMESTONE IN 1889, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	FLUX FOR FURNACES.			STREET WORK.			BRIDGE, DAM, AND RAILROAD WORK.			MISCELLANEOUS.		
	Tons. (2,000 pounds.)	Value.	Value per ton.	Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.
Total	3,894,337	\$1,569,312	\$0.40	46,491,622	\$2,223,456	\$0.05	26,679,012	\$1,289,622	\$0.05	549,875	\$46,079	\$0.08
Alabama	247,761	92,761	0.37	98,000	9,800	0.10						
Arkansas				2,000	500	0.25	32,500	650	0.02	13,500	1,350	0.10
California				35,000	1,390	0.04				31,250	1,900	0.06
Colorado	51,851	35,940	0.69									
Connecticut	3,468	1,140	0.33									
Idaho												
Illinois	300,182	166,507	0.55	10,221,392	505,576	0.05	969,899	65,762	0.07	13,211	1,961	0.15
Indiana	2,640	1,056	0.40	2,614,862	316,722	0.12	1,410,285	233,710	0.17	31,409	3,220	0.10
Iowa				1,767,931	53,641	0.03	1,732,630	70,387	0.04			
Kansas				771,041	97,502	0.13	2,532,801	102,991	0.04			
Kentucky	3,244	1,598	0.49	1,762,711	86,054	0.05	14,715	3,178	0.22	159	500	3.33
Maine												
Maryland	10,080	6,750	0.67	145,670	6,750	0.05	43,680	1,788	0.04			
Massachusetts	4,309	2,443	0.57							59,600	2,600	0.04
Michigan	10,957	2,675	0.24	485,377	18,156	0.04						
Minnesota				68,788	11,778	0.17	862,144	90,017	0.10	87,300	6,430	0.07
Missouri	13,488	5,691	0.42	11,542,723	670,351	0.06	5,471,386	169,720	0.03	29,688	5,937	0.20
Montana	17,000	16,000	0.94									
Nebraska	21,600	10,000	0.46	1,926,469	86,643	0.04	10,000	2,500	0.25	56,500	612	0.01
New Jersey	59,275	29,620	0.50									
New Mexico	400	320	0.80									
New York	84,222	32,750	0.39	5,241,262	197,091	0.04	1,434,115	175,736	0.12			
Ohio	289,626	165,963	0.38	7,236,981	183,225	0.03	4,984,581	124,518	0.02	173,788	14,446	0.08
Pennsylvania	2,583,926	949,683	0.37	2,042,804	72,512	0.04	3,714,444	155,653	0.04	60,688	6,723	0.11
Rhode Island	50	125	2.50									
South Carolina							56,700	8,400	0.15			
Tennessee	5,000	2,800	0.56	14,500	3,400	0.23	115,182	4,867	0.04			
Texas	16,455	12,037	0.73	67,750	32,278	0.48	638,921	30,919	0.05			
Utah	32,596	14,668	0.45									
Vermont				9,990	2,098	0.21	445,500	18,150	0.04	2,400	1,000	0.42
Virginia	78,756	48,146	0.61	7,560	190	0.03						
Washington	7,000	5,000	0.71									
West Virginia	21,600	7,200	0.33				25,000	350	0.01			
Wisconsin	21,564	8,641	0.40	488,811	27,789	0.06	2,048,954	23,070	0.01			
Other states (a)	16,287	10,398	0.64				129,375	7,256	0.06			

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

PRODUCTION OF LIMESTONE IN 1889, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	LABOR.							POWER.			
	Total number of employes.	Foremen.	Quarrymen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.	Number of boilers.	Total horse power.	Number of animals employed.	Horse power of water wheels.
Total.....	30,644	1,470	16,420	2,037	9,825	459	433	926	21,945	6,982	417
Alabama.....	837	23	209	26	534	31	14	23	772	297	.....
Arkansas.....	50	6	26	6	8	4	.....	.....	.....	19	10
California.....	302	21	89	16	170	1	5	.....	.....	166	.....
Colorado.....	114	12	50	26	24	.....	2	.....	.....	44	.....
Connecticut.....	95	5	38	23	27	.....	2	5	73	39	.....
Idaho.....	26	3	20	1	2	.....	.....	.....	.....	9	.....
Illinois.....	3,240	125	2,081	151	898	23	52	109	2,939	666	94
Indiana.....	3,383	162	1,375	238	1,440	99	69	167	3,533	349	.....
Iowa.....	1,254	70	692	78	371	25	18	29	662	261	.....
Kansas.....	1,201	54	801	87	223	18	18	13	240	369	.....
Kentucky.....	777	46	423	59	219	23	7	28	798	245	.....
Maine.....	1,063	131	607	50	260	.....	15	25	750	10	.....
Maryland.....	286	13	123	17	122	10	1	13	345	96	.....
Massachusetts.....	103	9	66	4	24	.....	.....	2	52	37	.....
Michigan.....	145	6	58	8	73	.....	.....	8	316	34	.....
Minnesota.....	1,232	68	864	94	190	5	11	33	847	128	.....
Missouri.....	3,220	133	1,387	202	1,422	36	40	77	1,963	1,212	.....
Montana.....	48	6	14	1	26	.....	.....	1	45	29	.....
Nebraska.....	506	20	272	23	177	4	10	9	375	158	.....
New Jersey.....	230	11	158	8	48	2	3	2	45	64	.....
New Mexico.....	18	1	8	2	7	.....	.....	.....	.....	7	.....
New York.....	2,600	123	1,052	323	1,023	50	29	76	1,666	542	293
Ohio.....	2,626	145	1,490	161	737	46	47	108	2,767	735	.....
Pennsylvania.....	4,832	166	3,270	191	1,694	54	57	123	2,431	1,069	.....
Rhode Island.....	31	2	14	3	10	.....	2	2	37	16	.....
South Carolina.....	46	2	18	1	24	1	.....	1	6	26	.....
Tennessee.....	163	6	75	10	71	.....	1	2	36	22	.....
Texas.....	278	12	154	26	81	3	2	6	48	74	.....
Utah.....	26	2	6	1	15	1	1	.....	.....	10	.....
Vermont.....	170	12	79	26	49	3	1	5	65	49	20
Virginia.....	253	10	63	24	141	7	8	3	80	47	.....
Washington.....	205	12	48	54	86	3	2	2	120	28	.....
West Virginia.....	126	7	58	18	41	.....	2	7	62	28	.....
Wisconsin.....	1,048	42	637	77	270	9	13	45	853	317	.....
Other states (a).....	110	4	95	2	8	1	.....	2	25	29	.....

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

PRODUCTION OF LIMESTONE IN 1889, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	EXPENSES.				CAPITAL.				
	Total expenses.	Wages.	Supplies and materials consumed.	Other expenses of quarries.	Total capital.	Land.	Buildings and fixtures.	Tools, implements, etc.	Cash.
Total	\$15,092,714	\$10,121,985	\$4,227,246	\$743,483	\$27,022,325	\$14,771,200	\$4,988,207	\$4,541,623	\$2,721,295
Alabama	259,118	199,489	47,989	11,658	353,071	124,509	112,990	92,371	23,390
Arkansas	14,449	9,859	4,023	597	32,531	27,659	1,600	2,775	596
California	354,930	164,615	175,849	14,475	857,499	525,515	193,259	103,644	35,090
Colorado	94,064	73,969	18,091	2,013	183,370	107,459	34,859	11,629	29,459
Connecticut	198,048	43,189	69,382	4,489	199,465	37,659	29,659	14,729	21,436
Idaho	17,391	11,159	5,532	610	27,299	14,799	6,009	1,399	5,299
Illinois	1,797,938	1,247,057	376,687	84,154	3,316,616	1,998,575	596,414	655,777	295,859
Indiana	1,423,594	1,025,629	333,625	64,199	3,176,365	1,478,199	463,299	672,119	556,155
Iowa	432,465	329,442	81,216	21,813	1,008,992	489,915	199,109	296,295	113,772
Kansas	364,049	317,489	35,696	19,873	734,361	528,313	54,532	93,599	54,753
Kentucky	240,744	194,092	29,763	16,889	519,189	269,687	31,405	173,689	42,614
Maine	1,474,899	679,825	754,845	49,229	1,123,599	514,299	349,299	68,199	183,099
Maryland	138,793	69,989	69,064	8,659	418,168	262,745	69,559	53,215	32,658
Massachusetts	95,831	47,431	46,732	1,668	72,451	39,359	14,759	14,681	13,279
Michigan	58,132	44,211	13,191	739	181,318	123,799	41,652	9,889	9,086
Minnesota	497,498	367,321	162,849	27,337	1,186,847	628,449	263,914	158,661	135,832
Missouri	1,523,257	1,181,115	281,565	69,577	2,066,017	1,053,192	339,622	432,531	239,762
Montana	29,359	19,375	3,899	175	39,599	21,099	7,999	19,999	.....
Nebraska	164,533	129,996	24,399	19,237	268,719	191,099	17,935	89,559	39,225
New Jersey	199,492	62,929	49,588	5,978	152,539	84,797	37,497	21,795	8,459
New Mexico	3,019	1,754	1,195	79	19,699	11,899	5,259	1,599	1,059
New York	1,268,151	846,623	337,995	83,533	2,661,847	1,612,169	389,224	379,169	293,295
Ohio	1,138,979	797,682	283,247	69,741	2,283,986	1,311,139	478,557	399,833	193,466
Pennsylvania	2,178,013	1,421,496	629,279	136,238	3,462,345	1,799,915	739,649	632,358	239,632
Rhode Island	22,449	9,992	12,149	398	37,499	25,099	9,999	3,499	.....
South Carolina	11,449	8,555	1,835	1,959	14,259	7,099	2,199	4,959	1,199
Tennessee	51,487	38,999	12,199	1,257	79,915	32,899	37,859	7,775	1,499
Texas	114,022	96,778	13,678	3,566	69,795	37,355	9,659	21,599	1,899
Utah	19,577	13,172	5,465	1,099	155,225	145,999	7,559	2,675	.....
Vermont	141,669	55,959	79,199	6,592	169,424	64,259	45,459	31,539	19,185
Virginia	116,636	89,994	32,831	2,811	99,875	47,399	29,599	17,399	5,775
Washington	211,418	139,215	67,595	19,698	584,825	333,929	179,689	58,325	13,599
West Virginia	51,323	28,651	21,092	1,679	217,188	129,058	25,261	35,869	36,099
Wisconsin	617,911	345,184	226,925	45,892	1,397,986	779,143	262,785	265,285	159,773
Other states (a)	48,269	29,359	17,886	1,024	31,175	12,099	14,159	4,425	699

(a) The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

The following table gives statistics of labor and wages for all states producing ordinary limestone. It will be noticed that the highest wages are those paid in the western states, and the lowest are those for the southern states.

It will also be noticed that the total wages reported in the table on page 635 as actually paid do not exactly agree with the figures which would result from computing the total wages from the data given in the following table. This is very naturally the case, since the figures of the latter table are the averages given by the producers in response to an inquiry calling for average statements. The figures given for total wages actually paid are exact.

LABOR AND WAGES CLASSIFIED, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	FOREMEN.				QUARRYMEN.				MECHANICS AND STONECUTTERS.			
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.
Alabama.....	23	\$2.24	257	\$575.68	259	\$1.17	202	\$236.94	26	\$2.09	161	\$372.59
Arkansas.....	6	1.62	175	283.59	26	1.34	127	170.18	6	1.26	195	245.70
California.....	21	3.47	255	884.85	89	2.18	228	497.04	16	2.31	253	564.43
Colorado.....	12	2.78	231	642.18	59	2.33	271	631.43	26	2.71	159	466.50
Connecticut.....	5	1.99	306	581.40	38	1.58	250	395.00	23	1.84	289	515.29
Idaho.....	3	3.48	192	668.16	29	2.09	201	429.09	1	2.00	99	161.66
Illinois.....	125	2.55	259	660.45	2,081	1.64	210	344.40	151	2.35	230	540.50
Indiana.....	102	2.48	208	515.84	1,375	1.59	198	314.82	238	2.33	178	414.74
Iowa.....	70	2.01	197	395.97	692	1.53	175	267.75	78	2.48	189	446.40
Kansas.....	54	2.63	190	499.70	891	1.56	175	273.01	87	2.70	173	467.19
Kentucky.....	46	2.40	225	540.00	423	1.39	167	232.13	59	2.21	172	381.12
Maine.....	131	2.30	287	669.10	697	2.00	289	569.00	50	2.00	250	500.00
Maryland.....	13	1.65	235	387.75	123	1.29	182	234.78	17	1.52	173	262.96
Massachusetts.....	9	1.98	243	481.14	66	1.59	237	385.59	4	3.19	121	385.96
Michigan.....	6	2.67	281	759.27	58	1.53	291	307.53	8	1.74	293	509.62
Minnesota.....	68	3.19	210	669.99	864	1.60	173	276.89	94	2.65	169	447.85
Missouri.....	133	2.73	226	616.98	1,387	1.49	254	378.46	292	2.15	269	449.35
Montana.....	6	3.09	83	249.00	14	2.51	123	308.73	1	3.00	206	606.00
Nebraska.....	20	2.30	176	404.80	272	1.59	152	241.68	23	2.74	124	339.76
New Jersey.....	11	1.79	258	461.82	158	1.28	215	275.29	8	1.60	291	465.60
New Mexico.....	1	3.00	129	380.00	8	2.82	54	152.28	2	2.00	65	130.00
New York.....	123	2.41	296	496.46	1,052	2.03	203	412.09	323	2.23	171	381.33
Ohio.....	145	1.96	218	427.28	1,499	1.44	215	309.60	161	1.80	296	533.16
Pennsylvania.....	106	2.31	225	519.75	3,270	1.20	222	266.40	191	1.76	215	378.40
Rhode Island.....	2	1.90	195	370.50	14	1.41	183	258.03	3	2.00	233	466.00
South Carolina.....	2	1.77	179	316.83	18	1.13	184	207.92	1	2.50	138	345.00
Tennessee.....	6	2.09	209	436.81	75	1.10	176	193.60	10	1.85	122	225.70
Texas.....	12	2.70	181	488.70	154	1.82	191	347.62	26	2.67	224	598.68
Utah.....	2	2.50	295	737.50	6	2.41	293	561.53	1	3.50	159	555.00
Vermont.....	12	1.78	258	459.24	79	1.33	221	293.93	26	1.52	271	411.92
Virginia.....	10	1.99	238	473.62	63	1.38	258	356.04	24	1.58	266	420.25
Washington.....	12	3.11	210	653.10	48	2.25	195	438.75	54	2.90	228	674.88
West Virginia.....	7	2.31	252	582.12	58	1.06	181	191.86	18	1.39	274	384.86
Wisconsin.....	42	2.05	234	479.70	637	1.44	212	305.28	77	1.85	238	440.50
Other states (a).....	4	2.50	237	592.50	95	2.11	98	206.78	2	2.50	300	750.00

aThe states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

LABOR AND WAGES CLASSIFIED, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	LABORERS.				BOYS UNDER 16 YEARS.				OFFICE FORCE.	
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average annual salary.
Alabama.....	534	\$1.00	205	\$205.00	31	\$0.51	234	\$119.34	14	\$655.62
Arkansas.....	8	1.38	156	215.28	4	0.51	112	57.12		
California.....	170	2.02	242	488.84	1	1.50	85	127.50	5	887.50
Colorado.....	24	2.03	257	521.71					2	1,087.75
Connecticut.....	27	1.49	265	394.85					2	1,109.00
Idaho.....	2	1.77	80	141.60						
Illinois.....	808	1.54	234	344.96	23	0.91	201	182.91	52	1,087.52
Indiana.....	1,440	1.37	298	408.26	99	0.69	180	124.20	69	842.60
Iowa.....	371	1.19	182	216.58	25	0.87	183	159.21	18	663.13
Kansas.....	223	1.43	182	260.26	18	0.74	138	102.12	18	597.14
Kentucky.....	219	1.01	137	138.37	23	0.59	149	87.91	7	996.14
Maine.....	260	1.75	269	470.75					15	889.00
Maryland.....	122	1.21	221	267.41	10	0.56	164	91.84	1	1,209.00
Massachusetts.....	24	1.32	152	200.64						
Michigan.....	73	1.57	227	356.39						
Minnesota.....	100	1.48	168	248.64	5	0.61	135	82.35	11	350.25
Missouri.....	1,422	1.70	213	362.10	36	0.85	188	159.80	40	947.31
Montana.....	26	2.25	162	361.50					1	500.00
Nebraska.....	177	1.54	118	181.72	4	1.00	160	160.00	19	521.88
New Jersey.....	48	1.22	185	225.70	2	0.62	295	127.10	3	1,169.00
New Mexico.....	7	1.45	43	62.35						
New York.....	1,023	1.31	201	263.31	50	0.89	198	176.22	29	615.67
Ohio.....	737	1.35	220	297.00	46	0.68	151	102.68	47	691.55
Pennsylvania.....	1,094	1.29	192	247.68	54	0.71	203	144.13	57	729.58
Rhode Island.....	10	1.36	244	331.84					2	466.00
South Carolina.....	24	1.20	186	223.20	1	0.75	138	103.50		
Tennessee.....	71	1.01	251	253.51					1	800.00
Texas.....	81	1.39	185	257.15	3	0.93	235	218.55	2	1,500.00
Utah.....	15	2.06	237	488.22	1	0.75	200	150.00	1	390.00
Vermont.....	49	1.03	235	242.05	3	0.75	136	102.00	1	900.00
Virginia.....	141	1.02	279	284.58	7	0.77	249	191.73	8	546.00
Washington.....	86	2.06	110	226.60	3	1.00	100	100.00	2	1,500.00
West Virginia.....	41	0.93	207	192.51					2	600.00
Wisconsin.....	270	1.39	208	289.12	9	0.89	186	148.80	13	876.67
Other states (a).....	8	1.05	290	304.50	1	0.60	145	87.00		

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

The following table shows the relative standing of various states according to various statistical items. It will be noticed that Pennsylvania stands at the head of all the lists except two, and as a limestone-producing state it is of the first importance. The items which contribute largely to the importance of Pennsylvania as a limestone state are the conversion of the stone into lime and that used for blast-furnace flux.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO VARIOUS STATISTICAL ITEMS.

TOTAL VALUE OF PRODUCTION.		TOTAL CAPITAL IN LAND.		TOTAL CAPITAL.	
States and territories.	Value.	States and territories.	Amount.	States and territories.	Amount.
Total	\$19,095,179	Total	\$14,771,200	Total	\$27,022,325
1 Pennsylvania.....	2,635,477	Illinois	1,998,375	Pennsylvania.....	3,402,345
2 Illinois	2,190,607	Pennsylvania	1,799,915	Illinois	3,316,616
3 Indiana	1,889,336	New York	1,612,160	Indiana.....	3,170,385
4 Missouri.....	1,859,060	Indiana.....	1,478,190	New York.....	2,664,847
5 New York	1,708,830	Ohio	1,311,130	Ohio	2,283,986
6 Maine	1,523,499	Missouri.....	1,053,102	Missouri.....	2,066,017
7 Ohio	1,514,934	Wisconsin.....	770,143	Wisconsin.....	1,397,988
8 Wisconsin.....	813,963	Minnesota.....	628,440	Minnesota.....	1,186,847
9 Minnesota.....	613,247	Kansas	528,313	Maine	1,120,590
10 Iowa.....	530,863	California	525,515	Iowa	1,068,992
11 California	516,780	Maine	514,200	California	857,499
12 Kansas	478,822	Iowa	489,915	Kansas	734,301
13 Alabama.....	324,814	Washington	333,320	Washington	584,825
14 Kentucky	303,314	Maryland	262,745	Kentucky	510,189
15 Washington	231,287	Kentucky	260,087	Maryland.....	418,163
16 Texas.....	217,835	Utah	145,000	Alabama.....	353,071
17 Nebraska.....	207,019	Nebraska.....	131,000	Nebraska.....	268,719
18 Vermont.....	195,060	Alabama.....	124,500	West Virginia.....	217,188
19 Maryland.....	164,860	Michigan.....	123,700	Michigan.....	184,318
20 Virginia.....	159,023	West Virginia.....	120,058	Colorado.....	183,379
21 Colorado.....	138,091	Colorado.....	107,450	Vermont.....	160,424
22 Connecticut.....	131,697	New Jersey.....	84,797	Utah	155,225
23 New Jersey.....	129,662	Vermont.....	64,250	New Jersey.....	152,539
24 Massachusetts.....	119,978	Virginia.....	47,300	Connecticut.....	100,465
25 West Virginia.....	93,850	Connecticut.....	37,650	Virginia.....	99,875
26 Michigan.....	85,952	Texas	37,355	Tennessee.....	79,915
27 Tennessee.....	73,028	Tennessee.....	32,890	Massachusetts.....	72,451
28 Idaho.....	28,545	Massachusetts.....	30,350	Texas	69,705
29 Rhode Island.....	27,625	Arkansas.....	27,650	Montana.....	39,500
30 Utah	27,568	Rhode Island.....	25,000	Rhode Island.....	37,400
31 Montana.....	24,064	Montana.....	21,000	Arkansas.....	32,531
32 Arkansas.....	18,360	Idaho.....	14,700	Idaho.....	27,200
33 South Carolina.....	14,520	New Mexico.....	11,800	New Mexico.....	19,600
34 New Mexico.....	3,862	South Carolina.....	7,000	South Carolina.....	14,250
Other states (a).....	77,635	Other states.....	12,000	Other states.....	31,175

^a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO VARIOUS STATISTICAL ITEMS—Continued.

TOTAL NUMBER OF EMPLOYÉS.		TOTAL AMOUNT OF WAGES PAID EMPLOYÉS.		TOTAL COST OF SUPPLIES.		TOTAL EXPENSES.	
States and territories.	Number.	States and territories.	Amount.	States and territories.	Amount.	States and territories.	Amount.
Total	30,644	Total	\$10,121,985	Total	\$4,227,246	Total	\$15,092,714
1 Pennsylvania.....	4,832	Pennsylvania.....	1,421,496	Maine.....	754,845	Pennsylvania.....	2,178,013
2 Indiana.....	3,383	Illinois.....	1,247,097	Pennsylvania.....	620,279	Illinois.....	1,707,933
3 Illinois.....	3,240	Missouri.....	1,181,115	Illinois.....	376,687	Missouri.....	1,523,257
4 Missouri.....	3,220	Indiana.....	1,025,689	New York.....	337,995	Maine.....	1,474,890
5 Ohio.....	2,626	New York.....	846,623	Indiana.....	333,625	Indiana.....	1,423,504
6 New York.....	2,600	Ohio.....	797,082	Missouri.....	281,565	New York.....	1,268,151
7 Iowa.....	1,254	Maine.....	679,825	Ohio.....	280,247	Ohio.....	1,138,070
8 Minnesota.....	1,232	Minnesota.....	367,321	Wisconsin.....	226,925	Wisconsin.....	617,911
9 Kansas.....	1,201	Wisconsin.....	345,184	California.....	175,840	Minnesota.....	467,493
10 Maine.....	1,063	Iowa.....	329,442	Minnesota.....	102,840	Iowa.....	432,465
11 Wisconsin.....	1,048	Kansas.....	317,480	Iowa.....	81,210	Kansas.....	364,049
12 Alabama.....	837	Alabama.....	199,480	Vermont.....	79,199	California.....	354,930
13 Kentucky.....	777	Kentucky.....	194,092	Washington.....	67,595	Alabama.....	259,113
14 Nebraska.....	506	California.....	164,615	Connecticut.....	60,382	Kentucky.....	240,744
15 California.....	302	Washington.....	133,215	Maryland.....	60,064	Washington.....	211,418
16 Maryland.....	286	Nebraska.....	129,906	Alabama.....	47,960	Nebraska.....	164,533
17 Texas.....	278	Texas.....	96,778	Massachusetts.....	46,732	Vermont.....	141,669
18 Virginia.....	253	Virginia.....	89,994	New Jersey.....	40,588	Maryland.....	138,703
19 New Jersey.....	230	Colorado.....	73,960	Kansas.....	35,896	Virginia.....	116,636
20 Washington.....	205	Maryland.....	69,980	Virginia.....	32,891	Texas.....	114,622
21 Vermont.....	170	New Jersey.....	62,926	Kentucky.....	29,763	New Jersey.....	169,462
22 Tennessee.....	163	Vermont.....	55,959	Nebraska.....	24,390	Connecticut.....	193,648
23 Michigan.....	145	Massachusetts.....	47,431	West Virginia.....	21,002	Massachusetts.....	95,831
24 West Virginia.....	126	Michigan.....	44,211	Colorado.....	18,091	Colorado.....	94,064
25 Colorado.....	114	Connecticut.....	43,186	Texas.....	13,678	Michigan.....	58,132
26 Massachusetts.....	103	Tennessee.....	38,040	Michigan.....	13,191	Tennessee.....	51,467
27 Connecticut.....	95	West Virginia.....	28,651	Tennessee.....	12,190	West Virginia.....	51,323
28 Arkansas.....	50	Montana.....	16,375	Rhode Island.....	12,140	Rhode Island.....	22,440
29 Montana.....	48	Utah.....	13,172	Idaho.....	5,532	Montana.....	29,350
30 South Carolina.....	46	Idaho.....	11,159	Utah.....	5,405	Utah.....	19,577
31 Rhode Island.....	31	Rhode Island.....	9,992	Arkansas.....	4,023	Idaho.....	17,301
32 Idaho.....	26	Arkansas.....	9,859	Montana.....	3,800	Arkansas.....	14,440
33 Utah.....	26	South Carolina.....	8,555	South Carolina.....	1,835	South Carolina.....	11,440
34 New Mexico.....	18	New Mexico.....	1,754	New Mexico.....	1,195	New Mexico.....	3,019
Other states (a).....	110	Other states.....	29,350	Other states.....	17,886	Other states.....	48,260

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

The tables following give the relative standing of all states producing limestone according to the purposes for which the stone was used. The first table gives the standing according to value for these purposes, while the second refers to the number of cubic feet and the purposes. Considering the first table relative to value, it is evident that for building purposes Illinois stands first. The large amount devoted to building purposes in this state comes chiefly from the Joliet and Lemont quarry regions, and the product from these places is largely used for building. Indiana stands second in value, and the stone which contributes largely to the value given, namely, \$994,313, is the oölitic limestone, which is exceptionally popular, not only in the immediate vicinity but in many of the larger and more important cities of the country, both east and west.

In regard to the value of lime produced, it appears that Maine heads the list. The product comes almost entirely from Knox county, where large quarries of very pure limestone are operated exclusively for the purpose of burning the product into lime. In the value of the lime produced Pennsylvania stands second, but by reference to the second table it will be noticed that Pennsylvania stands first, with a product of 4,043,679 barrels, while Maine stands second, with a product about one-half as great. There is evidently a great difference in favor of Maine in the value per barrel of the lime from these 2 states. This is accounted for by the fact that a large proportion of the lime produced in Pennsylvania is used for agricultural purposes, which require only inferior grades, whereas the lime from Maine is almost entirely used for building purposes in many of the most important cities on the Atlantic coast, principally New York city.

A small amount of stone is reported under the heading "Stone for burning into lime". This represents stone which was sold by quarrymen to lime burners. In connection with the use of limestone for flux, Pennsylvania naturally stands at the head of the list. The amount consumed for this purpose is quite large, being 2,583,926 tons, valued at \$949,083. It is evident that there is a very great difference between Pennsylvania and other states in the consumption of limestone for this purpose.

MINERAL INDUSTRIES IN THE UNITED STATES.

For street work Missouri stands first, the amount being valued at \$670,351. The limestone used for street work goes largely into macadamizing.

In connection with miscellaneous uses, it will be found that Kentucky has produced 150 cubic feet, with a value of \$500. This item needs special explanation because of the exceedingly high value per cubic foot, namely, \$3.33. The stone which has this high value is a quite highly siliceous limestone, and is used for purposes of polishing surfaces of marble, and also in polishing gold and silver previous to final buffing or polishing.

It will be noticed also that in Vermont 2,400 cubic feet are reported, with a value of \$1,000. This product was used for grinding for the manufacture of paint.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO VALUE AND PURPOSES.

BUILDING PURPOSES.		LIME.		STONE FOR BURNING INTO LIME.	
States and territories.	Value.	States and territories.	Value.	States and territories.	Value.
Total	\$5,405,671	Total	\$8,217,015	Total	\$184,024
1 Illinois	1,084,550	Maine	1,523,499	Ohio	98,059
2 Indiana	994,313	Pennsylvania	1,195,955	Pennsylvania	37,120
3 Missouri	542,871	New York	837,613	New York	21,349
4 New York	444,291	Ohio	581,225	Virginia	7,500
5 Ohio	407,388	Wisconsin	514,974	Wisconsin	6,709
6 Minnesota	390,556	California	513,130	Alabama	6,024
7 Kansas	269,316	Missouri	465,390	Colorado	3,750
8 Pennsylvania	238,431	Illinois	366,245	Michigan	3,313
9 Iowa	236,792	Indiana	340,315	Minnesota	200
10 Wisconsin	232,780	Washington	224,707		
11 Kentucky	187,570	Alabama	178,248		
12 Texas	185,901	Iowa	170,043		
13 Nebraska	90,542	Vermont	168,808		
14 Michigan	46,308	Maryland	148,432		
15 Alabama	37,981	Connecticut	129,693		
16 Massachusetts	21,833	Minnesota	124,266		
17 Virginia	19,520	New Jersey	99,406		
18 Montana	7,500	Massachusetts	93,702		
19 Colorado	7,300	Colorado	91,101		
20 Vermont	5,010	Virginia	83,667		
21 West Virginia	3,835	West Virginia	82,471		
22 Utah	2,600	Tennessee	60,625		
23 Washington	1,580	Idaho	28,545		
24 Tennessee	1,336	Rhode Island	27,500		
25 Arkansas	1,260	Kentucky	24,414		
26 New Mexico	1,211	Nebraska	16,722		
27 Maryland	1,140	Michigan	15,500		
28 Connecticut	894	Arkansas	14,690		
29 New Jersey	636	Utah	10,300		
30 California	360	Kansas	9,013		
31		Texas	6,700		
32		South Carolina	6,120		
33		New Mexico	2,331		
34		Montana	1,464		
Other states (a)	60	Other states	60,221		

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO VALUE AND PURPOSES—Continued.

FLUXING FOR FURNACES.		STREET WORK.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS.	
States and territories.	Value.	States and territories.	Value.	States and territories.	Value.	States and territories.	Value.
Total	\$1,569,312	Total	\$2,383,456	Total	\$1,289,622	Total	\$46,079
1 Pennsylvania.....	949,083	Missouri.....	670,351	Indiana.....	233,710	Ohio.....	14,446
2 Illinois.....	166,507	Illinois.....	505,576	New York.....	175,736	Pennsylvania.....	6,723
3 Ohio.....	105,963	Indiana.....	316,722	Missouri.....	169,729	Minnesota.....	6,430
4 Alabama.....	92,761	New York.....	197,091	Pennsylvania.....	155,653	Missouri.....	5,937
5 Virginia.....	48,146	Ohio.....	183,235	Ohio.....	124,518	Indiana.....	3,220
6 Colorado.....	35,940	Kansas.....	97,502	Kansas.....	102,991	Massachusetts.....	2,600
7 New York.....	32,750	Nebraska.....	86,643	Minnesota.....	99,017	Illinois.....	1,961
8 New Jersey.....	29,620	Kentucky.....	86,054	Iowa.....	70,387	California.....	1,960
9 Montana.....	16,000	Pennsylvania.....	72,512	Illinois.....	65,762	Arkansas.....	1,350
10 Utah.....	14,668	Iowa.....	53,641	Texas.....	30,919	Vermont.....	1,000
11 Texas.....	12,037	Texas.....	32,278	Wisconsin.....	23,070	Nebraska.....	612
12 Nebraska.....	10,000	Wisconsin.....	27,789	Vermont.....	18,159	Kentucky.....	500
13 Wisconsin.....	8,641	Michigan.....	18,156	South Carolina.....	8,490		
14 West Virginia.....	7,200	Minnesota.....	11,778	Tennessee.....	4,867		
15 Maryland.....	6,750	Alabama.....	9,800	Kentucky.....	3,178		
16 Missouri.....	5,691	Maryland.....	6,750	Nebraska.....	2,500		
17 Washington.....	5,000	Tennessee.....	3,400	Maryland.....	1,788		
18 Tennessee.....	2,800	Vermont.....	2,098	Arkansas.....	650		
19 Michigan.....	2,075	California.....	1,390	West Virginia.....	350		
20 Massachusetts.....	2,443	Arkansas.....	500				
21 Kentucky.....	1,598	Virginia.....	180				
22 Connecticut.....	1,140			Other states.....	7,256		
23 Indiana.....	1,056						
24 New Mexico.....	320						
25 Rhode Island.....	125						
Other states (a).....	10,398						

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO AMOUNTS AND PURPOSES.

BUILDING PURPOSES.		LIME.		STONE FOR BURNING INTO LIME.	
States and territories.	Cubic feet.	States and territories.	Barrels.	States and territories.	Tons.
Total	92,289,896	Total	18,474,608	Total	478,082
1 Illinois.....	21,433,967	Pennsylvania.....	4,043,679	Ohio.....	220,095
2 Missouri.....	11,083,370	Maine.....	1,903,639	Pennsylvania.....	137,285
3 Ohio.....	9,754,989	Ohio.....	1,725,336	New York.....	43,003
4 Indiana.....	7,402,345	New York.....	1,636,148	Wisconsin.....	21,833
5 Minnesota.....	7,277,348	Wisconsin.....	1,561,611	Colorado.....	15,000
6 New York.....	7,154,747	Missouri.....	1,144,962	Virginia.....	15,000
7 Iowa.....	6,280,787	Indiana.....	1,074,517	Michigan.....	13,466
8 Pennsylvania.....	5,188,013	Illinois.....	877,274	Alabama.....	12,000
9 Kansas.....	4,562,049	Maryland.....	545,591	Minnesota.....	400
10 Wisconsin.....	4,537,351	California.....	533,123		
11 Nebraska.....	2,058,614	New Jersey.....	400,249		
12 Kentucky.....	1,854,917	Iowa.....	365,394		
13 Michigan.....	1,296,539	Alabama.....	350,340		
14 Texas.....	666,160	Minnesota.....	344,102		
15 Virginia.....	471,565	Vermont.....	324,148		
16 Massachusetts.....	283,100	West Virginia.....	296,498		
17 West Virginia.....	194,250	Washington.....	222,759		
18 Montana.....	160,000	Connecticut.....	191,795		
19 Alabama.....	154,480	Virginia.....	178,480		
20 Utah.....	120,865	Colorado.....	146,737		
21 Vermont.....	95,040	Tennessee.....	113,228		
22 Colorado.....	56,250	Massachusetts.....	82,977		
23 New Mexico.....	49,675	Kentucky.....	66,376		
24 Maryland.....	41,807	Michigan.....	44,173		
25 Connecticut.....	33,750	Nebraska.....	41,805		
26 New Jersey.....	28,058	Arkansas.....	37,600		
27 Washington.....	15,970	Rhode Island.....	32,100		
28 California.....	12,500	Idaho.....	29,871		
29 Tennessee.....	11,510	Kansas.....	16,686		
30 Arkansas.....	9,100	Utah.....	16,480		
31.....		South Carolina.....	13,500		
32.....		Texas.....	12,000		
33.....		New Mexico.....	2,850		
34.....		Montana.....	2,217		
Other states (a).....	840	Other states.....	96,423		

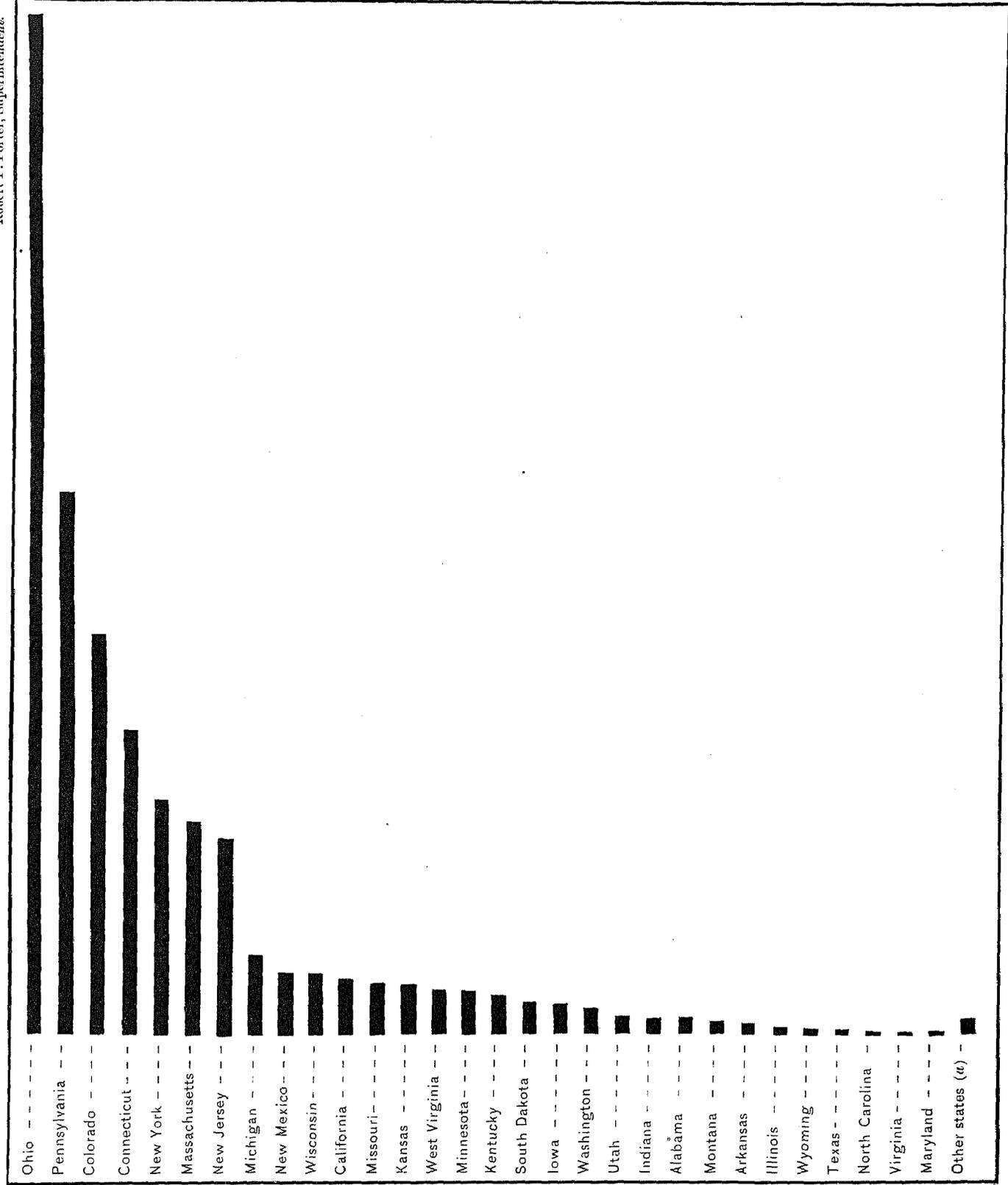
a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO AMOUNTS AND PURPOSES—Continued.

FLUXING FOR FURNACES.		STREET WORK.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS.	
States and territories.	Tons.	States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Cubic feet.
Total	3,894,337	Total	46,491,622	Total	26,673,012	Total	549,875
1 Pennsylvania.....	2,583,926	Missouri.....	11,542,723	Missouri.....	5,471,386	Ohio.....	173,788
2 Illinois.....	300,182	Illinois.....	10,221,392	Ohio.....	4,984,581	Minnesota.....	87,300
3 Ohio.....	280,026	Ohio.....	7,236,981	Pennsylvania.....	3,714,444	Pennsylvania.....	60,688
4 Alabama.....	247,761	New York.....	5,241,262	Kansas.....	2,532,801	Nebraska.....	56,500
5 New York.....	84,222	Indiana.....	2,614,862	Wisconsin.....	2,048,954	Massachusetts.....	50,000
6 Virginia.....	78,756	Pennsylvania.....	2,042,894	Iowa.....	1,732,630	Indiana.....	31,409
7 New Jersey.....	59,275	Nebraska.....	1,926,469	New York.....	1,434,115	California.....	31,250
8 Colorado.....	51,851	Kentucky.....	1,762,711	Indiana.....	1,410,285	Missouri.....	29,688
9 Utah.....	32,596	Iowa.....	1,707,931	Illinois.....	969,899	Arkansas.....	13,500
10 Nebraska.....	21,600	Kansas.....	771,941	Minnesota.....	868,144	Illinois.....	13,211
11 West Virginia.....	21,600	Wisconsin.....	488,811	Texas.....	638,921	Vermont.....	2,400
12 Wisconsin.....	21,564	Michigan.....	485,377	Vermont.....	445,500	Kentucky.....	150
13 Montana.....	17,000	Maryland.....	145,670	Tennessee.....	115,182		
14 Texas.....	16,455	Alabama.....	98,000	South Carolina.....	56,700		
15 Missouri.....	13,488	Minnesota.....	68,788	Maryland.....	43,680		
16 Michigan.....	10,957	Texas.....	67,750	Arkansas.....	32,500		
17 Maryland.....	10,080	California.....	35,000	West Virginia.....	25,000		
18 Washington.....	7,000	Tennessee.....	14,500	Kentucky.....	14,715		
19 Tennessee.....	5,000	Vermont.....	9,990	Nebraska.....	10,000		
20 Massachusetts.....	4,309	Virginia.....	7,560				
21 Connecticut.....	3,468	Arkansas.....	2,000				
22 Kentucky.....	3,244						
23 Indiana.....	2,640						
24 New Mexico.....	400						
25 Rhode Island.....	50						
Other states (a).....	16,287			Other states.....	129,575		

^a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

The table on the following page gives general deductions in regard to a number of important items. In comparing the percentage of profit on capital and on sales for the state of Maine, it will be noticed that the figures 4.34 and 3.19 are very much lower than in most of the other states. The excessively high figures which occur in a few places are generally accounted for by the newness of the industry or the small amount produced.



RELATIVE RANK OF STATES PRODUCING SANDSTONE.

α Arizona, Florida, Georgia, Idaho, Nevada, New Hampshire, Oregon, Rhode Island, Tennessee, and Vermont.

GENERAL STATISTICS OF PRODUCTION IN 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Total value of product.	Total wages.	Total expenses.	Total capital.	PERCENTAGE OF PROFIT ON—		Percentage of wages to total expenses.	Percentage of wages to total value.
					Capital.	Value of product.		
Total	\$19,095,179	\$10,121,985	\$15,092,714	\$27,022,325	14.81	29.96	67.97	53.01
Alabama	324,814	199,480	259,118	353,071	18.61	20.23	76.98	61.41
Arkansas	18,360	9,850	14,446	32,531	12.65	21.35	68.21	53.65
California	516,615	164,615	354,939	857,409	18.88	31.32	46.28	31.85
Colorado	138,091	73,960	94,664	183,370	24.01	31.88	78.63	53.56
Connecticut	131,697	43,186	108,048	190,465	23.54	17.96	39.97	32.79
Idaho	28,545	11,159	17,391	27,200	41.34	39.39	64.59	39.09
Illinois	2,190,607	1,247,097	1,707,938	3,316,616	14.55	22.63	73.02	56.93
Indiana	1,889,336	1,025,689	1,423,594	3,170,385	14.69	24.66	72.05	54.29
Iowa	530,863	329,442	432,465	1,008,992	9.75	18.54	76.18	62.06
Kansas	478,822	317,480	364,049	734,391	15.63	23.97	87.21	66.30
Kentucky	303,314	194,092	249,744	510,189	12.26	20.63	89.62	63.99
Maine	1,523,499	679,825	1,474,899	1,120,500	4.34	3.19	46.09	44.62
Maryland	164,860	69,980	138,703	418,168	6.26	15.87	50.45	42.45
Massachusetts	119,978	47,431	95,821	72,451	33.33	20.13	49.49	39.53
Michigan	85,952	44,211	58,132	184,318	15.09	32.37	76.95	51.44
Minnesota	613,247	367,321	497,498	1,186,847	9.75	18.87	73.83	59.99
Missouri	1,859,960	1,181,115	1,523,257	2,066,017	16.39	18.10	77.54	63.50
Montana	24,964	16,375	20,350	39,500	11.68	18.48	89.47	65.59
Nebraska	207,019	129,906	164,533	268,710	15.81	29.52	78.95	62.75
New Jersey	129,662	62,926	109,492	152,539	13.22	15.56	57.47	48.53
New Mexico	3,862	1,754	3,019	19,690	4.30	21.83	58.10	45.42
New York	1,708,830	846,623	1,268,151	2,664,847	16.54	25.79	66.76	49.54
Ohio	1,514,934	797,082	1,158,070	2,283,986	16.50	24.88	70.04	52.61
Pennsylvania	2,655,477	1,421,496	2,178,013	3,402,345	14.03	17.98	65.27	53.53
Rhode Island	27,625	9,992	22,440	37,400	13.86	18.77	44.53	36.17
South Carolina	14,529	8,555	11,440	14,250	21.61	21.21	74.78	58.92
Tennessee	73,028	38,040	51,487	79,915	26.95	29.50	73.88	52.09
Texas	217,835	96,778	114,022	69,765	148.93	47.66	84.88	44.43
Utah	27,568	13,172	19,577	155,225	5.15	28.99	67.28	47.78
Vermont	195,066	55,959	141,660	160,424	33.29	27.38	39.50	28.69
Virginia	159,023	80,994	116,636	99,875	42.44	26.65	69.44	50.93
Washington	231,287	133,215	211,418	584,625	3.40	8.59	63.01	57.60
West Virginia	93,856	28,651	51,323	217,188	19.58	45.32	55.82	30.53
Wisconsin	813,963	345,184	617,911	1,397,986	14.02	24.09	55.86	42.41
Other states (a)	77,935	29,350	48,260	31,175	95.19	38.08	60.82	37.66

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Arizona, Florida, Georgia, Oregon, South Dakota, and Wyoming.

SANDSTONE.

The name "sandstone" is applied to stone which has been formed by sedimentary deposit from water of granules which have resulted from the disintegration of older rocks by various kinds of dynamic action, weathering, and erosion. Naturally, therefore, grains of quartz, the hardest essential component of the older rocks, are vastly more abundant in sandstone than all other minerals; indeed, most sandstones are almost entirely made up of particles of quartz. Other minerals, however, occur. Various varieties of feldspar and mica are frequently found, while small amounts of still other minerals are occasionally observed, but there is by no means the variety which characterizes the constitution of granitic and volcanic rocks.

The size of the granules composing sandstone is quite variable, giving rise to the distinction between the fine and coarse grained varieties.

The granules constituting sandstone are usually held together by some cementing material, and the nature of the latter is an all-important consideration bearing upon the strength, durability, and beauty of the stone, and, consequently, upon its value as a structural material. Some sandstones are apparently without this cementing or binding material, and are particularly desirable as abrasive material, although they may also form good building stone.

Lithologically considered, the different kinds of sandstone are classed with reference to the cementing material rather than to the mineralogical nature of the component granules. Argillaceous sandstone is one in which the cementing material is clay, and in cases where the clay has not been subjected to metamorphic action such stone is subject to disintegration under the influences of weather.

In calcareous sandstone the cementing material is calcium carbonate, and when the latter is present in great excess the stone is called siliceous limestone. Limestone being readily acted upon by acids, disintegration may easily result from atmospheric agencies.

Ferruginous sandstone is one in which the cementing material consists of oxides of iron, which determine the color of the stone when it is pink, red, brown, or shades intermediate between those named.

Siliceous sandstone is that in which the cementing material is silica, so that the rock consists of almost pure silica. Such stone is usually hard, durable, capable of withstanding great crushing strength, and is not subject to alteration in color, and, as a consequence of its extreme hardness, it is naturally difficult to work. This kind grades into quartzite, which has been hardened by heat and pressure.

Freestone is a name of popular origin, and is applied to such sandstones as work well in any direction. The terms "arkose", "conglomerate", and "breccia" are names which have special reference to the character of the granules present. Arkose is composed of the constituents of granitic rocks which have been disintegrated and reconsolidated into sandstone, and conglomerate is a sandstone in which the granules are rounded pebbles instead of small grains. When these fragments are angular instead of rounded it is called breccia.

The terms "quartzose", "feldspathic", and "micaceous" sandstone refer to the presence of the minerals implied by these names.

The following table of analyses of sandstone from a number of localities will serve to indicate its general composition:

ANALYSES OF SANDSTONE.

[Per cent.]

KINDS OF STONE.	Locality.	Silica.	Alumina.	Iron oxides.	Manganese oxide.	Lime.	Magnesia.	Potash.	Soda.	Carbonic acid, water, and loss.
1 Manyard	East Longmeadow, Massachusetts.....	79.38	8.75	2.43	.....	2.57	.....	4.08	.....	2.79
2 Worcester	East Longmeadow, Massachusetts.....	88.89	5.95	1.79	0.41	0.27	.....	0.86	.....	1.83
3 Kibble quartz.....	East Longmeadow, Massachusetts.....	81.38	9.44	3.54	0.11	0.76	0.28	.....	.....	4.49
4 Brownstone	Portland, Connecticut.....	60.94	13.15	2.48	0.70	3.09	Trace.	3.30	5.43	1.01
5 Sandstone	Stony Point, Michigan.....	84.57	5.90	6.48	.....	.....	0.68	Undetermined.		1.92
6 Quartzite	Pipestone, Minnesota.....	84.52	12.33	2.12	.....	0.31	Trace.	0.11	0.34	2.31
7 Buff	Amherst, Ohio.....	97.00	.....	1.00	.....	1.15	.....	0.64	.....	0.21
8 Berea	Berea, Ohio.....	96.90	.....	1.68	.....	0.55	.....	0.55	.....	0.32
9 Euclid bluestone.....	Euclid, Ohio.....	95.00	2.50	1.00	.....	.....	.....	.....	.....	1.50
10 Columbia	Columbia, Ohio.....	96.50	.....	.....	.....	1.00	.....	0.50	.....	2.00
11 Red	Laurel Run, Pennsylvania.....	94.00	Trace.	1.90	.....	1.10	1.00	.....	.....	1.92
12 Elyria	Grafton, Ohio.....	87.66	1.72	3.52	0.17	0.20	2.03
13 Sandstone	Fond du Lac, Minnesota.....	78.24	10.88	3.83	0.95	1.60	1.67	0.06

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The commercial names of sandstone are usually found by reference to the places at which they are quarried, as Portland brownstone, Berea grit, etc.

In connection with this report it should be carefully noted that the stone commercially known as bluestone, in so far as it comes from certain sections of the states of New York, New Jersey, and Pennsylvania, is not included here, but is specially treated in another report under the title of "Bluestone". The Tenth Census report included bluestone with sandstone from the above-named states, which is scientifically correct, but the difference in the practical applications of bluestone from the states named and the other kinds of sandstone is so well defined commercially that it was thought best to separate bluestone and treat of it in a report by itself.

The table following shows the relative standing of productive states according to the Tenth and Eleventh Censuses. The states are arranged in the order of value of output. It is evident from this that, while 18 states only were productive in 1880, the number has now reached 40. Ohio holds first place in both columns. At the Tenth Census New York held second place, but it must be remembered that bluestone is included in the figures given for value of output. At the present time New York holds fifth place, and the apparent decline is due to the exclusion of bluestone. According to the Eleventh Census Colorado holds third place, while 10 years ago it held sixteenth place among the productive states. The vast increase in the sandstone production of this state, namely, from \$9,000 to \$1,224,098, is due largely to the operations of the Union Pacific Railway Company. This company is not only one of the most extensive producing concerns, but the facilities for shipment which they afford to other large producers account in a great measure for the striking increase in production. Enormous shipments of sandstone are now made from Colorado to remote parts of the United States, and the business is in a most flourishing condition. Another notable change is the appearance of California as a productive state, holding eleventh place. This state does not appear among the 18 states of the Tenth Census.

COMPARISON OF VALUE OF OUTPUT OF SANDSTONE AND RANK OF STATES AND TERRITORIES
AT THE TENTH AND ELEVENTH CENSUSES.

TENTH CENSUS, INCLUDING BLUESTONE.		ELEVENTH CENSUS, NOT INCLUDING BLUESTONE.			
Rank.	States and territories.	Value of output.	Rank.	States and territories.	Value of output.
	Total	\$4,780,391		Total	\$10,816,057
1	Ohio	1,871,924	1	Ohio	3,046,656
2	New York	724,556	2	Pennsylvania	1,699,159
3	Connecticut	680,200	3	Colorado	1,224,698
4	Pennsylvania	627,943	4	Connecticut	929,061
5	New Jersey	400,420	5	New York	792,419
6	Massachusetts	144,294	6	Massachusetts	649,097
7	Missouri	81,960	7	New Jersey	597,209
8	Michigan	53,080	8	Michigan	246,570
9	Minnesota	41,150	9	New Mexico	186,894
10	Indiana	40,400	10	Wisconsin	183,958
11	Wisconsin	37,745	11	California	175,598
12	Illinois	21,830	12	Missouri	155,557
13	West Virginia	16,689	13	Kansas	149,289
14	Dakota	12,000	14	West Virginia	140,687
15	Kansas	11,000	15	Minnesota	131,979
16	Colorado	9,000	16	Kentucky	117,940
17	Iowa	4,200	17	South Dakota	93,570
18	Washington	2,000	18	Iowa	80,251
			19	Washington	75,936
			20	Utah	48,306
			21	Indiana	43,983
			22	Alabama	43,965
			23	Montana	31,648
			24	Arkansas	25,074
			25	Illinois	17,896
			26	Wyoming	16,760
			27	Texas	14,651
			28	North Carolina	12,000
			29	Virginia	11,500
			30	Maryland	10,605
			31	Arizona	9,146
			32	Oregon	8,424
			33	New Hampshire	3,750
			34	Tennessee	2,722
			35	Idaho	2,490
				Other states (a)	26,199

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

It is evident that the increase in production during the last 10 years amounted to \$6,035,666, or 126.26 per cent. The 18 states which were productive in both census years produced sandstone in 1889 to the value of \$10,068,475, or 93.09 per cent of the entire product, not, however, including bluestone. The 22 other states produced to the value of \$747,582 in 1889, or 6.91 per cent of the total amount. It is thus apparent that, although the number of states producing sandstone is now more than twice as great as in 1880, nearly the entire output comes from the same states that were productive 10 years ago.

MINERAL INDUSTRIES IN THE UNITED STATES.

The following table shows the comparison in detail of the 18 states producing in 1880 and 1889, and also gives the percentage of increase or decrease for each:

COMPARISON OF STATES AND TERRITORIES PRODUCTIVE IN 1880 AND 1889.

Rank in Tenth Census.	STATES AND TERRITORIES.	Value of output at Tenth Census.	Value of output at Eleventh Census.	Per cent increase.	Rank in Eleventh Census.
	Total	\$4,780,391	\$10,068,475	110.62	
1	Ohio	1,871,924	3,046,656	62.76	1
2	New York	724,556	702,419	a3.06	5
3	Connecticut	680,200	920,661	35.26	4
4	Pennsylvania	627,943	1,609,159	156.26	2
5	New Jersey	400,420	597,309	49.17	7
6	Massachusetts	144,294	649,097	349.84	6
7	Missouri	81,960	155,557	89.80	12
8	Michigan	53,080	246,570	364.53	8
9	Minnesota	41,150	131,979	220.73	15
10	Indiana	40,400	43,983	8.87	21
11	Wisconsin	37,745	183,958	387.37	10
12	Illinois	21,830	17,896	a18.02	25
13	West Virginia	16,689	140,687	742.99	14
14	Dakota and South Dakota	12,000	93,570	679.75	17
15	Kansas	11,000	149,289	1,257.17	13
16	Colorado	9,000	1,224,098	13,501.09	3
17	Iowa	4,200	80,251	1,810.74	18
18	Washington	2,000	75,936	3,696.80	19

a Decrease.

The following table shows the amount yielded by states and territories not productive in 1880:

ELEVENTH CENSUS STATES AND TERRITORIES NOT REPRESENTED IN TENTH CENSUS.

Rank.	STATES AND TERRITORIES.	Value.	Rank.	STATES AND TERRITORIES.	Value.
	Total	\$747,582	28	North Carolina	\$12,000
9	New Mexico	186,804	29	Virginia	11,500
11	California	175,598	30	Maryland	10,605
16	Kentucky	117,940	31	Arizona	9,146
20	Utah	48,306	32	Oregon	8,424
22	Alabama	43,965	33	New Hampshire	3,750
23	Montana	31,648	34	Tennessee	2,722
24	Arkansas	25,074	35	Idaho	2,490
26	Wyoming	16,760		Other states (a)	26,199
27	Texas	14,651			

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

The following table shows for both census years the geographical distribution of sandstone: (a)

COMPARISON OF TENTH AND ELEVENTH CENSUSES BY DIVISIONS AND VALUES.

DIVISIONS.	Eleventh Census.	Tenth Census.	Increase.	Per cent increase.
Total	\$10,816,057	\$4,780,391	\$6,035,666	126.26
North Atlantic	4,504,165	2,577,413	1,926,752	74.76
South Atlantic	176,292	16,689	159,603	956.24
North Central	4,149,709	2,175,289	1,974,420	90.77
South Central	204,352		204,352	
Western	1,781,539	11,000	1,770,539	16,095.81

a The states and territories included in the various divisions are as follows:

NORTH ATLANTIC DIVISION.—New Hampshire, Massachusetts, Connecticut, New Jersey, Vermont, Rhode Island, New York, Pennsylvania.

SOUTH ATLANTIC DIVISION.—Maryland, West Virginia, Florida, Georgia, Virginia, North Carolina.

NORTH CENTRAL DIVISION.—Ohio, Illinois, Wisconsin, Iowa, South Dakota, Indiana, Michigan, Minnesota, Missouri, Kansas.

SOUTH CENTRAL DIVISION.—Kentucky, Alabama, Arkansas, Tennessee, Texas.

WESTERN DIVISION.—Montana, Colorado, Arizona, Nevada, Washington, California, Wyoming, New Mexico, Utah, Idaho, Oregon.

It is evident that in both censuses the North Atlantic division was the most productive, the North Central division following closely in value of production. The Western division stands third for the Eleventh Census, with a product amounting to \$1,781,539, while the third position for the Tenth Census is occupied by the South Atlantic division. Fourth place for the Eleventh Census is filled by the South Central division, in which at the Tenth Census no sandstone was produced. Fifth place for the Eleventh Census is occupied by the South Atlantic division, which produced only a small amount 10 years ago. The great bulk of the sandstone production comes, therefore, at present from the North Atlantic and North Central divisions, the South Atlantic and the South Central producing very little in comparison, while the Western division shows the enormous increase in 10 years from \$11,000 to \$1,781,539.

The following table, the states and territories being arranged in alphabetical order, gives all totals relative to the sandstone output for the calendar year 1889. From the grand total for the United States it appears that 71,571,054 cubic feet of sandstone, having a total value of \$10,816,057, were produced by 16,925 workmen from 803 quarries. To this number of men \$6,257,580 was paid in wages. The total expense of producing the entire amount of sandstone is \$8,130,295, thus indicating a profit to the producers of \$2,685,762. The total capital invested is \$17,776,467, of which \$11,501,100 is invested in land.

PRODUCTION OF SANDSTONE IN THE UNITED STATES IN 1889, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of quarries.	PRODUCTION.		LABOR.							POWER.			
		Cubic feet.	Value.	Total employed.	Foremen.	Quarrymen.	Mechanics and stone-cutters.	Laborers.	Boys under 16 years.	Office force.	Number of boilers.	Total horse-power of boilers.	Number of animals.	Other power.
Total	803	71,571,054	\$10,816,057	16,925	782	7,746	1,983	5,912	250	252	553	15,162	2,851	165
Alabama	5	610,020	43,965	127	5	53	9	54	5	1				9
Arizona	2	127,907	9,146	13	1	10		2						3
Arkansas	8	210,010	25,074	50	3	24	9	14			1	12	8	3
California	15	333,209	175,598	222	10	114	31	64	2	1	2	20	33	20
Colorado	71	6,570,529	1,224,098	1,485	90	854	187	313	8	33	21	535	298	
Connecticut	13	2,821,430	920,061	1,092	45	814	58	150	5	20	66	2,111	294	
Idaho	2	28,710	2,490	5		3		2						4
Illinois	10	141,605	17,896	46	4	33	1	8			2	24	14	
Indiana	11	334,441	43,983	188	12	71	25	67	11	2	7	113	35	
Iowa	11	404,350	80,251	142	8	41	21	63	3	6	4	130	18	
Kansas	17	680,289	140,289	329	11	159	57	88	4	10	4	88	84	
Kentucky	11	888,738	117,940	302	15	126	43	105	11	2	10	162	39	
Maryland	4	508,325	10,605	43	2	39			2		1	50	8	
Massachusetts	21	1,967,179	649,097	906	28	358	161	347	2	10	33	782	289	
Michigan	6	658,318	246,570	345	9	132	31	166	5	2	11	320	24	
Minnesota	7	4,150,224	131,979	205	10	151	16	22	5	1	6	139	15	
Missouri	17	734,370	155,557	192	12	80	17	77	3	3	15	282	36	
Montana	6	644,740	31,648	69	6	57	1	2	2	1	2	26	24	
New Hampshire	2	21,665	3,750	13	2	9	1	1			2	30	4	
New Jersey	26	6,010,212	597,309	866	38	299	130	378	11	10	24	569	191	
New Mexico	11	588,048	186,804	377	11	217	47	87	11	4	3	82	98	
New York	63	4,878,365	702,419	1,569	58	568	183	738	10	12	30	470	362	75
North Carolina	2	50,000	12,000	53	1	4		2						
Ohio	192	16,016,258	3,046,656	4,095	187	1,600	506	1,610	54	78	231	7,310	400	70
Oregon	2	50,000	8,424	7		5		2			1	15	6	
Pennsylvania	159	17,414,875	1,609,159	2,932	140	1,262	337	1,102	66	25	44	1,167	376	
South Dakota	12	341,875	93,570	140	9	64	18	43		6	2	54	36	
Tennessee	4	53,978	2,722	33	2	22	2	4	1	2	1	30	2	
Texas	7	180,591	14,651	42	3	16	4	19					12	
Utah	7	145,726	48,306	61	6	28	1	25		1	3	40	10	
Virginia	3	70,800	11,500	37	3	20	5	8	1				17	
Washington	5	540,039	75,936	105	6	57	10	29	1	2	3	89	2	
West Virginia	27	964,263	140,687	337	23	136	28	133	13	4	5	162	20	
Wisconsin	32	1,146,730	183,958	373	15	199	39	103	5	12	14	260	48	
Wyoming	7	197,775	16,760	69	5	32	1	28	2	1	1	10	44	
Other states (a)	5	1,079,448	26,199	55	2	29	2	19	1	2			45	

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

PRODUCTION OF SANDSTONE IN THE UNITED STATES IN 1889, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	EXPENSES.				CAPITAL.				
	Total expenses.	Total wages.	Cost of supplies.	All other expenses.	Total capital.	Land.	Buildings and fixtures.	Tools, live stock, machinery, and supplies.	Cash.
Total	\$8,130,295	\$6,257,580	\$1,277,004	\$595,711	\$17,776,467	\$11,591,100	\$1,492,859	\$3,044,557	\$1,737,969
Alabama	48,587	41,562	5,600	1,425	18,535	8,000	1,535	3,800	5,200
Arizona	3,742	2,542	1,200	.....	35,000	19,400	350	15,250	.....
Arkansas	12,860	11,287	1,122	451	17,660	9,750	2,200	2,510	3,200
California	147,264	122,847	16,729	7,688	400,950	278,000	33,600	49,150	40,200
Colorado	992,768	772,158	76,831	53,779	2,009,484	1,507,255	100,300	220,860	181,009
Connecticut	710,772	528,089	127,402	55,281	1,896,957	1,190,696	234,992	292,398	178,961
Idaho	1,040	1,350	75	515	10,250	6,200	3,500	550	.....
Illinois	10,808	8,937	977	894	49,490	33,450	1,900	5,625	8,425
Indiana	43,232	37,387	4,663	1,182	169,225	113,700	7,400	40,925	7,200
Iowa	71,014	56,714	11,387	2,913	178,455	86,870	6,115	71,710	13,760
Kansas	117,594	105,507	8,855	3,232	324,135	194,510	18,025	32,600	79,000
Kentucky	86,102	62,745	14,223	9,134	196,580	90,468	12,822	41,200	52,000
Maryland	9,271	7,749	410	1,112	41,000	27,480	1,700	7,770	4,050
Massachusetts	509,649	414,282	51,051	44,316	373,862	130,550	37,170	126,851	79,291
Michigan	127,962	102,094	11,529	14,339	609,877	215,402	104,025	177,500	112,950
Minnesota	103,107	74,110	23,301	5,696	407,090	328,000	16,590	52,900	9,600
Missouri	81,773	60,549	8,806	3,418	298,330	201,100	14,150	57,480	25,650
Montana	31,454	27,881	3,473	100	70,400	46,300	6,650	9,450	8,000
New Hampshire	3,621	3,138	403	80	22,310	15,300	2,500	4,010	500
New Jersey	452,657	380,767	48,012	23,878	793,115	488,650	45,075	127,313	132,077
New Mexico	139,300	122,730	14,750	1,829	421,500	366,400	24,022	21,605	9,473
New York	571,381	522,702	39,017	9,662	879,330	567,880	69,155	153,522	88,823
North Carolina	9,600	7,500	2,000	100	70,000	40,000	5,000	25,000	.....
Ohio	2,277,735	1,450,266	585,635	241,834	5,075,660	3,455,499	372,045	869,686	378,430
Oregon	4,400	3,600	500	300	53,000	50,000	1,000	2,000	.....
Pennsylvania	1,180,324	943,641	143,174	93,509	1,927,410	1,081,894	250,484	382,781	212,251
South Dakota	90,213	65,434	19,075	5,704	303,770	240,300	14,965	40,505	8,000
Tennessee	2,603	2,119	182	302	12,988	7,520	800	4,168	500
Texas	11,520	8,993	1,855	672	12,185	10,650	850	635	50
Utah	44,321	33,598	10,470	253	123,575	81,125	30,200	10,250	2,000
Virginia	8,629	8,000	570	59	9,180	4,700	300	1,180	3,000
Washington	54,955	45,722	8,050	583	78,700	30,000	13,600	11,100	24,000
West Virginia	80,704	72,269	6,037	2,398	181,158	114,478	8,070	36,510	22,100
Wisconsin	138,543	110,509	19,724	8,310	559,822	319,615	50,010	133,787	47,410
Wyoming	22,871	18,283	3,950	638	139,348	130,048	1,500	7,300	500
Other states (a)	17,010	11,519	5,366	125	15,126	10,000	250	4,670	200

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

The table on the following pages is presented for the purpose of showing by states and territories as well as for the entire country the purposes to which sandstone is applied. It will be seen that they are as follows: building purposes; street work; abrasive purposes; bridge, dam, and railroad work, and miscellaneous uses. In order that these general purposes may be understood, the detailed list of uses which come under one or another of the general headings in the table is presented.

DETAILED LIST OF USES OF SANDSTONE.

FOUNDATIONS, SUPERSTRUCTURES, AND TRIMMINGS.

Solid fronts.	Steps.	Kiln stone.	Ashlar.
Foundations.	Buttresses.	Capping.	Forts.
Cellar walls.	Window sills.	Belting or belt courses.	Dimension.
Underpinning.	Lintels.	Rubble.	Sills.

STREET WORK.

Paving blocks.	Basin heads or catch-basin covers.	Road making: { Macadam. Telford. Concrete.	Sledged stone.
Curbing.	Stepping stones.		Crushed stone.
Flagging.			

ABRASIVE PURPOSES.

Grindstones.	Whetstones.	Shoe rubbers.	Oilstones.
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BRIDGE, DAM, AND RAILROAD WORK.

Bridges.	Breakwater.	Rails.	Bank stone.
Culverts.	Jetties.	Ballast.	Parapets.
Aqueducts.	Piers.	Approaches.	Docks.
Dams.	Buttresses.	Towers.	Bridge covering.
Wharfstone.	Capstone.		

MISCELLANEOUS.

Grout.	Furnace hearths.	Cemetery work.	Lining for steel converters.
Hitching posts.	Lining for blast furnaces.	Watering troughs.	Glass furnaces.
Fence wall.	Rolling-mill furnaces.	Fluxing.	Core sand for foundries.
Sand for glass.	Adamantine plaster.	Ganister.	Random stock.
Sand for plaster and cement.	Millstones.	Fire brick, silica brick.	

DISTRIBUTION OF SANDSTONE ACCORDING TO ITS SEVERAL USES, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	Number of quarries.	Total number of cubic feet.	Total value.	BUILDING PURPOSES.			STREET WORK.		
				Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.
Total	803	71,571,054	\$10,816,057	44,979,241	\$7,121,942	\$0.16	8,463,506	\$1,832,822	\$0.22
Alabama	5	610,026	43,965	542,700	31,310	0.06			
Arizona	2	127,907	9,146	42,250	1,750	0.04			
Arkansas	8	210,010	25,074	139,950	12,359	0.09	27,160	8,215	0.30
California	15	333,209	175,598	330,275	172,758	0.52	100	200	2.00
Colorado	71	6,570,529	1,224,098	4,601,965	703,477	0.15	1,926,464	509,955	0.26
Connecticut	13	2,821,430	920,061	2,524,895	894,226	0.35	40,500	2,250	0.06
Idaho	2	28,710	2,490	28,710	2,490	0.09			
Illinois	10	141,605	17,896	82,799	13,178	0.16	3,200	50	0.02
Indiana	11	334,441	43,983	104,600	16,033	0.15			
Iowa	11	404,350	80,251	394,870	79,356	0.20	8,840	880	0.10
Kansas	17	680,289	149,289	225,774	17,026	0.08	452,015	132,188	0.29
Kentucky	11	888,738	117,940	485,363	77,877	0.16	13,900	1,600	0.12
Maryland	4	508,325	10,605	63,269	1,944	0.03	40,320	2,045	0.05
Massachusetts	21	1,967,179	649,097	1,344,850	602,137	0.45	501,221	40,471	0.08
Michigan	6	658,318	246,570	606,182	217,720	0.36	2,496	550	0.22
Minnesota	7	4,156,224	131,979	1,088,870	82,000	0.08	51,930	38,200	0.74
Missouri	17	734,370	155,557	469,187	113,445	0.24	6,553	2,512	0.38
Montana	6	644,740	31,648	644,740	31,648	0.05			
New Hampshire	2	21,065	3,750						
New Jersey	26	6,010,212	597,309	4,697,767	486,788	0.11			
New Mexico	11	588,048	186,804	545,648	182,184	0.33	10,000	3,000	0.30
New York	63	4,878,365	702,419	1,960,277	241,216	0.12	2,864,366	459,158	0.16
North Carolina	2	50,000	12,000	50,000	12,000	0.24			
Ohio	192	16,016,258	3,046,656	10,122,544	1,846,918	0.18	1,603,014	430,552	0.27
Oregon	2	50,000	8,424	50,000	8,424	0.17			
Pennsylvania	159	17,414,875	1,609,159	9,864,139	777,123	0.08	854,907	175,062	0.20
South Dakota	12	341,875	93,570	317,751	81,949	0.26			
Tennessee	4	53,978	2,722	45,878	2,632	0.06			
Texas	7	180,591	14,651	180,591	14,651	0.08			
Utah	7	145,726	48,306	145,726	48,306	0.33			
Virginia	3	70,800	11,500	70,800	11,500	0.16			
Washington	5	540,039	75,936	540,039	75,936	0.14			
West Virginia	27	964,263	140,687	412,053	40,149	0.10	42,075	23,274	0.55
Wisconsin	32	1,146,736	183,958	1,087,856	182,333	0.17			
Wyoming	7	197,775	16,760	197,775	16,760	0.08			
Other states (a)	5	1,079,448	26,199	1,059,148	22,339	0.02	13,865	2,660	0.19

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

DISTRIBUTION OF SANDSTONE ACCORDING TO ITS SEVERAL USES, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	ABRASIVE PURPOSES.			BRIDGE, DAM, AND RAILROAD WORK.			MISCELLANEOUS.		
	Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.	Cubic feet.	Value.	Value per cubic foot.
Total	1,378,535	\$580,229	\$0.42	13,614,390	\$1,021,920	\$0.080	3,135,382	\$259,144	\$0.08
Alabama.....				67,326	12,655	0.196			
Arizona.....				85,657	7,396	0.090			
Arkansas.....							42,900	4,500	0.10
California.....	448	440	0.98				2,386	2,200	0.92
Colorado.....				42,100	10,666	0.250			
Connecticut.....				256,035	23,585	0.090			
Idaho.....									
Illinois.....				55,606	4,668	0.080			
Indiana.....	3,813	9,870	2.59	226,028	18,080	0.080			
Iowa.....				640	15	0.020			
Kansas.....				2,500	75	0.030			
Kentucky.....				389,475	38,463	0.100			
Maryland.....				255,041	3,368	0.010	149,695	3,248	0.02
Massachusetts.....				121,108	6,489	0.050			
Michigan.....	44,640	27,800	0.62	5,000	500	0.100			
Minnesota.....				3,015,424	11,779	0.004			
Missouri.....				258,650	39,600	0.150			
Montana.....									
New Hampshire.....	21,665	3,750	0.17						
New Jersey.....				1,302,445	100,521	0.080	100,000	10,000	0.10
New Mexico.....				32,400	1,620	0.050			
New York.....				9,840	445	0.050	43,882	1,600	0.04
North Carolina.....									
Ohio.....	1,277,410	525,548	0.41	2,026,314	166,114	0.080	986,376	77,524	0.08
Oregon.....									
Pennsylvania.....				4,885,686	496,902	0.100	1,810,143	160,072	0.09
South Dakota.....	24,124	11,621	0.48						
Tennessee.....				8,100	90	0.010			
Texas.....									
Utah.....									
Virginia.....									
Washington.....									
West Virginia.....				510,135	77,264	0.150			
Wisconsin.....				58,880	1,625	0.030			
Wyoming.....									
Other states (a).....	6,435	1,200	0.19						

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

Glancing over this table, it appears that \$7,121,942 worth of stone is applied to building purposes, while \$1,832,822 worth has been applied to street work. Abrasive purposes have consumed an amount valued at \$580,229, while for bridge, dam, and railroad work \$1,021,920 worth was used. For miscellaneous purposes the amount is \$259,144. Although the value of the stone for abrasive purposes is comparatively small, it is important to note that the quality of stone applied to these purposes is necessarily very fine, and consequently has a decidedly higher average value per cubic foot than that used for any other purpose. It will be noticed that there is quite a variation in the value per cubic foot of the stone used for different purposes, and in some cases for the same purpose. This is due to a variety of causes, among which may be mentioned variations in the quality of the stone, distance from any competing sources, rates of wages, etc.

The tables following give the relative standing of the states and territories, first, according to value and purposes, and, second, according to number of cubic feet and purposes.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO VALUE AND PURPOSES.

BUILDING PURPOSES.		STREET WORK.		ABRASIVE PURPOSES.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS.	
States and territories.	Value.	States and territories.	Value.	States and territories.	Value.	States and territories.	Value.	States and territories.	Value.
Total	\$7,121,942	Total	\$1,832,822	Total	\$580,229	Total	\$1,021,920	Total	\$259,144
1 Ohio	1,846,918	Colorado	509,955	Ohio	525,548	Pennsylvania	496,902	Pennsylvania	109,672
2 Connecticut	894,226	New York	459,158	Michigan	27,809	Ohio	166,114	Ohio	77,524
3 Pennsylvania	777,123	Ohio	430,552	South Dakota	11,621	New Jersey	109,521	New Jersey	19,099
4 Colorado	703,477	Pennsylvania	175,062	Indiana	9,870	West Virginia	77,264	Arkansas	4,599
5 Massachusetts	602,137	Kansas	132,188	New Hampshire	3,750	Missouri	39,690	Maryland	3,248
6 New Jersey	486,788	Massachusetts	40,471	California	440	Kentucky	38,463	California	2,399
7 New York	241,216	Minnesota	38,200	.....	.....	Connecticut	23,585	New York	1,699
8 Michigan	217,720	West Virginia	23,274	.....	.....	Indiana	18,680	.....	.....
9 Wisconsin	182,333	Arkansas	8,215	.....	.....	Alabama	12,655	.....	.....
10 New Mexico	182,184	New Mexico	3,000	.....	.....	Minnesota	11,779	.....	.....
11 California	172,758	Missouri	2,512	.....	.....	Colorado	10,666	.....	.....
12 Missouri	113,445	Connecticut	2,250	.....	.....	Arizona	7,396	.....	.....
13 Minnesota	82,000	Maryland	2,045	.....	.....	Massachusetts	6,489	.....	.....
14 South Dakota	81,949	Kentucky	1,600	.....	.....	Illinois	4,668	.....	.....
15 Iowa	79,356	Iowa	880	.....	.....	Maryland	3,368	.....	.....
16 Kentucky	77,877	Michigan	550	.....	.....	Wisconsin	1,625	.....	.....
17 Washington	75,936	California	200	.....	.....	New Mexico	1,620	.....	.....
18 Utah	48,306	Illinois	50	.....	.....	Michigan	500	.....	.....
19 West Virginia	40,149	.....	.....	.....	.....	New York	445	.....	.....
20 Montana	31,648	.....	.....	.....	.....	Tennessee	90	.....	.....
21 Alabama	31,310	.....	.....	.....	.....	Kansas	75	.....	.....
22 Kansas	17,026	.....	.....	.....	.....	Iowa	15	.....	.....
23 Wyoming	10,760	.....	.....	.....	.....	.....	.....	.....	.....
24 Indiana	16,033	.....	.....	.....	.....	.....	.....	.....	.....
25 Texas	14,651	.....	.....	.....	.....	.....	.....	.....	.....
26 Illinois	13,178	.....	.....	.....	.....	.....	.....	.....	.....
27 Arkansas	12,859	.....	.....	.....	.....	.....	.....	.....	.....
28 North Carolina	12,000	.....	.....	.....	.....	.....	.....	.....	.....
29 Virginia	11,509	.....	.....	.....	.....	.....	.....	.....	.....
30 Oregon	8,424	.....	.....	.....	.....	.....	.....	.....	.....
31 Tennessee	2,632	.....	.....	.....	.....	.....	.....	.....	.....
32 Idaho	2,490	.....	.....	.....	.....	.....	.....	.....	.....
33 Maryland	1,944	.....	.....	.....	.....	.....	.....	.....	.....
34 Arizona	1,750	.....	.....	.....	.....	.....	.....	.....	.....
Other states (a)	22,339	Other states	2,660	Other states	1,200	.....	.....	.....	.....

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

RELATIVE STANDING OF STATES AND TERRITORIES ACCORDING TO CUBIC FEET AND PURPOSES.

BUILDING PURPOSES.		STREET WORK.		ABRASIVE PURPOSES.		BRIDGE, DAM, AND RAILROAD WORK.		MISCELLANEOUS.	
States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Cubic feet.	States and territories.	Cubic feet.
Total	44, 979, 241	Total	8, 463, 506	Total	1, 372, 535	Total	13, 614, 390	Total	3, 135, 382
1 Ohio	10, 122, 544	New York	2, 864, 366	Ohio	1, 277, 410	Pennsylvania	4, 885, 686	Pennsylvania	1, 810, 143
2 Pennsylvania	9, 864, 139	Colorado	1, 926, 464	Michigan	44, 640	Minnesota	3, 015, 424	Ohio	986, 376
3 New Jersey	4, 607, 767	Ohio	1, 603, 614	South Dakota	24, 124	Ohio	2, 026, 314	Maryland	149, 635
4 Colorado	4, 601, 965	Pennsylvania	854, 907	New Hampshire	21, 665	New Jersey	1, 302, 445	New Jersey	190, 000
5 Connecticut	2, 524, 895	Massachusetts	501, 221	Indiana	3, 813	West Virginia	510, 135	New York	43, 883
6 New York	1, 960, 277	Kansas	452, 015	California	448	Kentucky	389, 475	Arkansas	42, 900
7 Massachusetts	1, 344, 850	Minnesota	51, 930			Missouri	258, 650	California	2, 386
8 Minnesota	1, 088, 870	West Virginia	42, 075			Connecticut	256, 035		
9 Wisconsin	1, 087, 856	Connecticut	40, 500			Maryland	255, 041		
10 Montana	644, 740	Maryland	40, 320			Indiana	226, 028		
11 Michigan	606, 182	Arkansas	27, 160			Massachusetts	121, 108		
12 New Mexico	545, 648	Kentucky	13, 900			Arizona	85, 657		
13 Alabama	542, 700	New Mexico	10, 000			Alabama	67, 326		
14 Washington	540, 039	Iowa	8, 840			Wisconsin	58, 880		
15 Kentucky	485, 363	Missouri	6, 533			Illinois	55, 606		
16 Missouri	469, 187	Illinois	3, 200			Colorado	42, 100		
17 West Virginia	412, 053	Michigan	2, 496			New Mexico	32, 400		
18 Iowa	394, 870	California	100			New York	9, 840		
19 California	330, 275					Tennessee	8, 100		
20 South Dakota	317, 751					Michigan	5, 000		
21 Kansas	225, 774					Kansas	2, 500		
22 Wyoming	197, 775					Iowa	640		
23 Texas	180, 591								
24 Utah	145, 726								
25 Arkansas	139, 950								
26 Indiana	104, 600								
27 Illinois	82, 799								
28 Virginia	70, 800								
29 Maryland	63, 269								
30 Oregon	50, 000								
31 North Carolina	50, 000								
32 Tennessee	45, 878								
33 Arizona	42, 250								
34 Idaho	28, 710								
Other states (a)	1, 059, 148	Other states	13, 865	Other states	6, 435				

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

It is evident that for building and abrasive purposes Ohio holds first place, while for street work Colorado stands first. It is also interesting to note that only 7 states produce sandstone suitable for abrasive purposes. These in the order of importance are Ohio, Michigan, Indiana, New Hampshire, Vermont, California, and South Dakota. The vast difference in the value of stone for abrasive purposes produced by Ohio as compared with the other states is very striking.

The following table gives information in reference to the labor employed in the sandstone industry. It is evident that the highest wages are paid in the western states. This statement, of course, is true not only for this industry, but for others generally. In Ohio and Pennsylvania wages are not greatly different, although in Pennsylvania they are, as a rule, a little higher than in Ohio.

It will also be noticed that the total wages reported in the table on page as actually paid do not exactly agree with the figures which would result from computing the total wages from the data given in the following table. This is very naturally the case, since the figures of the latter table are the averages given by the producers in response to an inquiry calling for average statements. The figures given for total wages actually paid are exact.

LABOR AND WAGES INVOLVED IN PRODUCTION OF SANDSTONE CLASSIFIED, BY STATES AND TERRITORIES.

STATES AND TERRITORIES.	FOREMEN.				QUARRYMEN.				MECHANICS AND STONECUTTERS.			
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.
Alabama	5	\$2.48	254	\$629.92	53	\$1.06	239	\$253.34	9	\$3.50	230	\$695.00
Arizona	1	3.00	150	450.00	10	1.84	89	163.76				
Arkansas	3	2.38	218	518.84	24	1.44	185	266.40	9	1.87	94	175.78
California	10	4.05	231	935.55	114	2.42	223	539.66	31	3.92	237	929.04
Colorado	90	3.00	208	642.72	854	2.35	216	507.60	187	2.45	236	578.29
Connecticut	45	2.98	240	742.02	814	1.87	249	465.63	58	2.80	232	649.60
Idaho					3	2.00	247	494.00				
Illinois	4	2.56	175	448.00	33	1.67	116	193.72	1	2.15	36	77.40
Indiana	12	4.00	280	1,120.00	71	1.49	175	260.75	25	1.75	280	490.00
Iowa	8	3.30	191	630.30	41	2.29	160	352.00	21	2.43	210	510.30
Kansas	11	2.72	190	516.80	159	1.87	216	403.92	57	2.02	231	466.62
Kentucky	15	3.06	164	501.84	126	1.61	107	172.27	43	3.15	157	484.55
Maryland	2	1.50	170	255.00	39	1.14	158	180.12				
Massachusetts	28	3.02	267	806.34	358	2.00	209	418.00	161	3.06	221	676.26
Michigan	9	2.92	255	744.60	132	1.68	171	287.28	31	2.63	232	610.16
Minnesota	10	3.00	235	705.00	151	1.53	231	353.43	16	2.00	269	520.00
Missouri	12	2.88	214	616.32	80	2.00	182	364.00	17	2.33	218	507.94
Montana	6	4.55	138	627.90	57	2.66	149	396.34	1	3.00	30	90.00
New Hampshire	2	3.80	174	661.20	9	1.49	119	177.31	1	1.50	130	195.00
New Jersey	38	3.00	268	804.00	299	2.03	246	499.38	130	3.20	241	771.20
New Mexico	11	4.08	120	489.60	217	2.26	96	216.96	47	3.30	116	382.80
New York	58	2.79	170	474.30	568	1.99	161	320.39	183	2.96	165	488.40
North Carolina	1	4.00	200	800.00	4	1.50	200	300.00	2	1.50	200	300.00
Ohio	187	2.59	222	574.98	1,660	1.73	204	352.92	506	2.06	231	475.86
Oregon					5	2.00	300	600.00				
Pennsylvania	140	2.67	201	536.67	1,262	1.83	194	355.02	337	2.66	175	465.50
South Dakota	9	3.98	197	784.06	64	2.05	101	207.05	18	2.91	136	395.76
Tennessee	2	1.83	45	82.35	22	1.08	45	48.60	2	1.50	30	45.00
Texas	3	2.29	215	492.35	16	1.74	76	132.24	4	1.76	138	242.88
Utah	6	4.09	219	895.71	28	2.93	182	533.26	1	3.00	119	357.00
Virginia	3	2.72	145	394.40	20	1.00	146	146.00	5	2.50	120	300.00
Washington	6	3.57	262	935.34	57	2.28	157	357.96	10	3.16	153	483.48
West Virginia	23	2.51	149	373.99	136	1.44	154	221.76	28	2.73	145	395.85
Wisconsin	15	3.10	174	539.40	199	1.92	144	276.48	39	2.91	167	485.97
Wyoming	5	3.63	129	435.60	32	2.85	142	404.70	1	3.00	175	525.00
Other states (a)	2	2.00	138	276.00	29	1.37	134	183.58	2	1.50	175	262.50

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

LABOR AND WAGES INVOLVED IN PRODUCTION OF SANDSTONE CLASSIFIED, BY STATES AND TERRITORIES—Continued.

STATES AND TERRITORIES.	LABORERS.				BOYS UNDER 16 YEARS.				OFFICE FORCE.	
	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average daily wages.	Average number of days.	Average yearly earnings.	Average number.	Average annual salary.
Alabama.....	54	\$1.16	242	\$280.72	5	\$0.59	237	\$139.83	1	\$480.00
Arizona.....	2	1.50	150	225.00						
Arkansas.....	14	1.22	149	181.78						
California.....	64	2.05	229	469.45	2	1.00	250	250.00	1	1,200.00
Colorado.....	313	2.01	238	478.38	8	1.24	119	147.56	33	725.00
Connecticut.....	150	1.74	238	414.12	5	0.85	280	238.00	20	2,006.88
Idaho.....	2	2.00	208	416.00						
Illinois.....	8	1.38	60	82.80						
Indiana.....	67	1.25	263	328.75	11	0.73	186	135.78	2	180.00
Iowa.....	63	1.48	209	309.32	3	0.51	146	74.46	6	1,250.00
Kansas.....	88	1.43	218	311.74	4	0.75	300	225.00	10	744.44
Kentucky.....	105	1.28	157	200.96	11	0.63	108	68.04	2	105.88
Maryland.....					2	0.57	175	99.75		
Massachusetts.....	347	1.70	211	358.70	2	0.60	130	90.00	10	552.84
Michigan.....	166	1.46	243	354.78	5	1.00	145	145.00	2	890.00
Minnesota.....	22	1.55	300	465.00	5	1.00	260	260.00	1	890.00
Missouri.....	77	1.38	190	262.20	3	0.75	257	192.75	3	1,009.00
Montana.....	2	1.50	100	150.00	2	1.75	300	525.00	1	35.00
New Hampshire.....					1	0.50	35	17.50		
New Jersey.....	378	1.45	251	363.95	11	0.94	231	217.14	10	480.74
New Mexico.....	87	1.79	56	100.24	11	0.75	45	33.75	4	393.33
New York.....	738	1.52	173	262.96	10	0.73	136	99.28	12	762.50
North Carolina.....	40	1.00	200	200.00	5	0.50	200	100.00	1	590.00
Ohio.....	1,610	1.33	182	242.06	54	0.74	198	146.52	78	1,157.24
Oregon.....	2	1.00	300	300.00						
Pennsylvania.....	1,102	1.41	181	255.21	66	0.80	199	177.11	25	629.62
South Dakota.....	43	1.96	118	231.28					6	472.50
Tennessee.....	4	0.60	30	18.00					2	75.00
Texas.....	19	1.20	192	230.40						
Utah.....	25	2.23	232	517.36					1	390.00
Virginia.....	8	1.00	130	130.00	1	0.75	130	97.50		
Washington.....	29	2.08	200	416.00	1	0.75	50	37.50	2	1,033.33
West Virginia.....	133	1.24	144	178.56	13	0.73	153	111.69	4	445.50
Wisconsin.....	103	1.71	145	247.95	5	0.90	217	195.30	12	877.78
Wyoming.....	28	2.02	133	268.66					1	800.00
Other states (a).....	19	1.41	147	207.27	1	1.00	175	175.00	2	450.00

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

The table following gives the states and territories in the order of their relative importance with respect to a number of different statistical items. It will be noticed that for all of these items except the number of cubic feet Ohio stands first, while Pennsylvania stands first in the number of cubic feet quarried. Inspection of this table will reveal at once a number of interesting features, which would require no little time and labor to extract from the principal table relative to production, in which all these items are contained. The most important of these items in determining the relative standing of the states is, of course, the value of the output.

RELATIVE STANDING OF STATES AND TERRITORIES PRODUCING SANDSTONE ACCORDING TO VARIOUS STATISTICAL ITEMS.

States and territories.	Cubic feet.	States and territories.	Value of product.	States and territories.	Capital in land.	States and territories.	Total capital.
Total	71,571,054	Total	\$10,816,057	Total	\$11,501,100	Total	\$17,770,467
1 Pennsylvania.....	17,414,875	Ohio.....	3,046,656	Ohio.....	3,455,499	Ohio.....	5,075,660
2 Ohio.....	16,016,258	Pennsylvania.....	1,699,159	Colorado.....	1,507,255	Colorado.....	2,009,484
3 Colorado.....	6,570,529	Colorado.....	1,224,098	Connecticut.....	1,190,696	Pennsylvania.....	1,927,410
4 New Jersey.....	6,010,212	Connecticut.....	920,061	Pennsylvania.....	1,081,894	Connecticut.....	1,896,957
5 New York.....	4,878,365	New York.....	702,419	New York.....	567,889	New York.....	879,320
6 Minnesota.....	4,150,224	Massachusetts.....	649,097	New Jersey.....	488,650	New Jersey.....	793,115
7 Connecticut.....	2,821,430	New Jersey.....	597,309	New Mexico.....	366,400	Michigan.....	609,877
8 Massachusetts.....	1,967,179	Michigan.....	246,570	Minnesota.....	328,060	Wisconsin.....	559,822
9 Wisconsin.....	1,146,736	New Mexico.....	186,804	Wisconsin.....	319,615	New Mexico.....	421,500
10 West Virginia.....	964,263	Wisconsin.....	183,958	California.....	278,000	Minnesota.....	407,000
11 Kentucky.....	888,738	California.....	175,598	South Dakota.....	240,306	California.....	400,950
12 Missouri.....	734,370	Missouri.....	155,557	Michigan.....	215,492	Massachusetts.....	373,862
13 Kansas.....	680,289	Kansas.....	149,289	Missouri.....	201,100	Kansas.....	324,135
14 Michigan.....	658,318	West Virginia.....	140,687	Kansas.....	194,510	South Dakota.....	303,770
15 Montana.....	644,740	Minnesota.....	131,979	Massachusetts.....	130,550	Missouri.....	298,339
16 Alabama.....	610,026	Kentucky.....	117,940	Wyoming.....	130,048	Kentucky.....	196,530
17 New Mexico.....	588,048	South Dakota.....	93,570	West Virginia.....	114,478	West Virginia.....	181,158
18 Washington.....	540,039	Iowa.....	80,251	Indiana.....	113,700	Iowa.....	178,455
19 Maryland.....	508,325	Washington.....	75,936	Kentucky.....	90,468	Indiana.....	169,225
20 Iowa.....	404,350	Utah.....	48,306	Iowa.....	86,870	Wyoming.....	139,348
21 South Dakota.....	341,875	Indiana.....	43,983	Utah.....	81,125	Utah.....	123,575
22 Indiana.....	334,441	Alabama.....	43,965	Oregon.....	50,000	Washington.....	78,700
23 California.....	333,209	Montana.....	31,648	Montana.....	46,300	Montana.....	70,400
24 Arkansas.....	210,010	Arkansas.....	25,074	North Carolina.....	40,000	North Carolina.....	70,000
25 Wyoming.....	197,775	Illinois.....	17,896	Illinois.....	33,450	Oregon.....	53,000
26 Texas.....	180,591	Wyoming.....	16,760	Washington.....	30,000	Illinois.....	49,400
27 Utah.....	145,726	Texas.....	14,651	Maryland.....	27,480	Maryland.....	41,000
28 Illinois.....	141,605	North Carolina.....	12,000	Arizona.....	19,400	Arizona.....	35,000
29 Arizona.....	127,907	Virginia.....	11,500	New Hampshire.....	15,300	New Hampshire.....	22,310
30 Virginia.....	70,800	Maryland.....	10,605	Texas.....	10,650	Alabama.....	18,535
31 Tennessee.....	53,978	Arizona.....	9,146	Arkansas.....	9,750	Arkansas.....	17,060
32 North Carolina.....	50,000	Oregon.....	8,424	Alabama.....	8,000	Tennessee.....	12,988
33 Oregon.....	50,000	New Hampshire.....	3,750	Tennessee.....	7,529	Texas.....	12,185
34 Idaho.....	28,710	Tennessee.....	2,722	Idaho.....	6,200	Idaho.....	10,250
35 New Hampshire.....	21,605	Idaho.....	2,490	Virginia.....	4,700	Virginia.....	9,180
Other states (a).....	1,079,448	Other states.....	26,199	Other states.....	10,060	Other states.....	15,126

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

MINERAL INDUSTRIES IN THE UNITED STATES.

RELATIVE STANDING OF STATES AND TERRITORIES PRODUCING SANDSTONE, ETC.—Continued.

States and territories.	Number of employes.	States and territories.	Wages paid.	States and territories.	Cost of supplies.	States and territories.	Total expenses.
Total	16,925	Total	\$6,257,580	Total	\$1,277,004	Total	\$8,130,295
1 Ohio	4,095	Ohio	1,459,266	Ohio	585,635	Ohio	2,277,735
2 Pennsylvania	2,952	Pennsylvania	943,641	Pennsylvania	143,174	Pennsylvania	1,189,324
3 New York	1,569	Colorado	772,158	Connecticut	127,492	Colorado	902,768
4 Colorado	1,485	Connecticut	528,089	Colorado	76,831	Connecticut	710,772
5 Connecticut	1,092	New York	522,702	Massachusetts	51,051	New York	571,381
6 Massachusetts	906	Massachusetts	414,282	New Jersey	48,012	Massachusetts	509,649
7 New Jersey	866	New Jersey	380,767	New York	39,017	New Jersey	452,657
8 New Mexico	377	California	122,847	Minnesota	23,301	California	147,264
9 Wisconsin	373	New Mexico	122,730	Wisconsin	19,075	New Mexico	139,309
10 Michigan	345	Wisconsin	110,509	South Dakota	19,724	Wisconsin	138,543
11 West Virginia	337	Kansas	105,507	California	16,729	Michigan	127,962
12 Kansas	329	Michigan	102,094	New Mexico	14,750	Kansas	117,594
13 Kentucky	302	Minnesota	74,110	Kentucky	14,223	Minnesota	103,107
14 California	222	West Virginia	72,269	Michigan	11,529	South Dakota	90,213
15 Minnesota	205	Missouri	69,549	Iowa	11,387	Kentucky	86,102
16 Missouri	192	South Dakota	65,434	Utah	10,470	Missouri	81,773
17 Indiana	188	Kentucky	62,745	Kansas	8,855	West Virginia	80,704
18 Iowa	142	Iowa	56,714	Missouri	8,806	Iowa	71,014
19 South Dakota	140	Washington	45,722	Washington	8,650	Washington	54,955
20 Alabama	127	Alabama	41,562	West Virginia	6,037	Alabama	48,587
21 Washington	105	Indiana	37,387	Alabama	5,600	Utah	44,321
22 Montana	69	Utah	33,598	Indiana	4,663	Indiana	43,232
23 Wyoming	69	Montana	27,881	Wyoming	3,950	Montana	31,454
24 Utah	61	Wyoming	18,283	Montana	3,473	Wyoming	22,871
25 North Carolina	53	Arkansas	11,287	North Carolina	2,000	Arkansas	12,860
26 Arkansas	50	Texas	8,993	Texas	1,855	Texas	11,520
27 Illinois	46	Illinois	8,937	Arizona	1,200	Illinois	10,838
28 Maryland	43	Virginia	8,000	Arkansas	1,122	North Carolina	9,600
29 Texas	42	Maryland	7,749	Illinois	977	Maryland	9,271
30 Virginia	37	North Carolina	7,500	Virginia	570	Virginia	8,029
31 Tennessee	33	Oregon	3,600	Oregon	500	Oregon	4,400
32 Arizona	13	New Hampshire	3,138	Maryland	410	Arizona	3,742
33 New Hampshire	13	Arizona	2,542	New Hampshire	403	New Hampshire	3,621
34 Oregon	7	Tennessee	2,110	Tennessee	182	Tennessee	2,603
35 Idaho	5	Idaho	1,350	Idaho	75	Idaho	1,940
Other states (a)	55	Other states	11,519	Other states	5,366	Other states	17,010

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

The following table gives a number of deductions from the figures in the table on production, such as the percentages of the profit on capital, also on sales in the different states. It will be noticed that in 2 of the states loss is reported, but in these cases operations have been quite limited and only recently begun.

GENERAL STATISTICS.

STATES AND TERRITORIES.	Total number of cubic feet.	Total value of product.	Total wages.	Total expense.	Total capital.	PERCENTAGE OF PROFIT ON—		Cost per cubic foot of production.	Percentage of wages to total expense.	Amount of wages paid per cubic foot.	Percentage of wages to total value.	Value per cubic foot.
						Capital.	Value of product.					
Total	71,571,054	\$10,816,057	\$6,257,580	\$8,130,295	\$17,770,467	15.11	24.83	\$0.11	76.97	\$0.09	57.85	\$0.15
Alabama	610,026	43,965	41,562	46,587	18,535	-24.94	-10.51	0.08	85.54	0.07	94.53	0.67
Arizona	127,907	9,146	2,542	3,742	35,000	15.44	59.09	0.03	67.93	0.02	27.79	0.07
Arkansas	210,010	25,074	11,287	12,860	17,669	69.16	48.71	0.06	87.77	0.05	45.01	0.12
California	333,209	175,598	122,847	147,264	400,950	7.07	16.14	0.44	83.42	0.37	69.96	0.53
Colorado	6,570,329	1,224,098	772,158	902,768	2,009,484	15.99	26.25	0.14	85.53	0.12	63.08	0.19
Connecticut	2,821,430	920,061	528,089	710,772	1,896,957	11.03	22.75	0.25	74.30	0.19	57.49	0.33
Idaho	28,710	2,490	1,350	1,940	10,250	5.37	22.69	0.07	69.59	0.05	54.22	0.09
Illinois	141,605	17,896	8,937	10,808	49,400	14.35	39.61	0.08	82.69	0.06	49.94	0.13
Indiana	334,441	43,983	37,387	43,232	169,225	0.44	1.71	0.13	86.48	0.11	85.09	0.13
Iowa	404,350	80,251	56,714	71,014	178,455	5.18	11.51	0.18	79.86	0.14	70.67	0.20
Kansas	680,289	149,289	105,597	117,594	324,135	9.78	21.23	0.17	89.72	0.16	70.67	0.22
Kentucky	888,738	117,940	62,745	86,102	196,580	16.20	27.09	0.10	72.87	0.07	53.20	0.13
Maryland	508,325	10,605	7,749	9,271	41,000	3.25	12.58	0.02	83.53	0.02	73.07	0.02
Massachusetts	1,967,179	649,067	414,282	509,649	373,862	37.39	21.48	0.26	81.29	0.21	63.82	0.33
Michigan	658,318	246,570	192,091	127,962	609,877	19.45	48.19	0.19	79.73	0.16	41.41	0.37
Minnesota	4,156,224	131,979	74,110	103,107	407,090	7.09	21.88	0.02	71.88	0.02	56.15	0.03
Missouri	734,370	155,557	69,549	81,773	298,389	24.79	47.43	0.11	85.05	0.09	44.71	0.21
Montana	644,740	31,648	27,881	31,454	70,490	0.23	0.61	0.05	88.64	0.04	88.10	0.05
New Hampshire	21,665	3,750	3,138	3,621	22,310	0.58	3.44	0.17	86.66	0.14	83.68	0.17
New Jersey	6,010,212	597,369	380,767	452,637	793,115	18.24	24.22	0.08	84.12	0.06	63.75	0.10
New Mexico	588,048	186,804	122,730	139,309	421,500	11.27	25.43	0.24	88.10	0.21	65.70	0.32
New York	4,878,365	702,419	522,702	571,381	879,389	14.90	18.66	0.12	91.48	0.11	74.41	0.14
North Carolina	50,000	12,000	7,500	9,600	70,000	3.43	20.00	0.19	78.13	0.15	62.50	0.24
Ohio	16,016,258	3,046,656	1,450,266	2,277,735	5,075,600	15.15	25.24	0.14	63.67	0.09	47.60	0.19
Oregon	50,000	8,424	3,600	4,400	53,000	7.59	47.77	0.09	81.82	0.07	42.74	0.17
Pennsylvania	17,414,875	1,609,159	943,641	1,180,324	1,927,410	22.25	26.65	0.07	79.95	0.05	58.64	0.09
South Dakota	341,875	93,570	65,434	90,213	303,770	1.11	3.59	0.26	72.53	0.19	69.93	0.27
Tennessee	53,978	2,722	2,119	2,603	12,988	0.92	4.37	0.05	81.41	0.04	77.85	0.05
Texas	180,591	14,651	8,993	11,520	12,185	25.70	21.37	0.06	78.06	0.05	61.38	0.08
Utah	145,726	48,306	33,598	44,321	123,575	3.22	8.25	0.30	75.81	0.23	60.55	0.33
Virginia	70,890	11,500	8,000	8,629	9,180	31.27	24.97	0.12	92.71	0.11	69.57	0.16
Washington	540,039	75,936	45,722	54,955	78,700	26.66	27.63	0.10	83.20	0.08	61.21	0.14
West Virginia	964,263	140,687	72,269	80,704	181,158	33.11	42.64	0.08	89.55	0.07	51.37	0.15
Wisconsin	1,146,736	183,958	110,509	138,543	550,822	8.24	24.69	0.12	79.77	0.10	60.07	0.16
Wyoming	197,775	16,760	18,283	22,871	139,348	-4.39	-36.46	0.12	79.94	0.09	109.09	0.08
Other states (a)	1,079,448	26,199	11,519	17,010	15,126							

a The states here grouped, in order that the business of individual establishments may not be disclosed to the public, embrace Florida, Georgia, Nevada, Rhode Island, and Vermont.

METHODS OF QUARRYING.

The work of quarrying sandstone is greatly facilitated by the ease with which parallel top and bottom beds may be obtained. In most cases good natural beds or partings parallel to the stratifications may be taken advantage of by the quarryman, and the rock is said to be thick bedded or thin bedded owing to the thickness of these sheets. The beds in the majority of quarries are horizontal or nearly so, and the object desired is to cut or break the sheets into rectangular blocks through to the bedding planes below. Much of this work was formerly accomplished by gunpowder used in the ordinary way or by heavy charges contained in tin canisters and exploded in specially large drill holes. These processes have been supplanted in the larger quarries by the Knox patent system of blasting rock and by the more extended use of steam channeling machines, such as are used in quarrying marble. The Knox system is particularly efficacious in thick-bedded sandstone, and the channelers are specially serviceable where the sheets are thinner. Vertical joints in the rock are a great aid in quarrying, and where they are numerous channelers are not required, and but little powder is necessary in loosening the blocks.

In some quarries the Knox system is used also in blocking up or subdividing the rock after the initial cuts have been made. Ordinarily, however, the plug-and-feather method is used, or in a rather soft variety, like the Connecticut brownstone, grooves are cut with pickaxes and the stone is broken by driving iron wedges into the grooves thus formed.

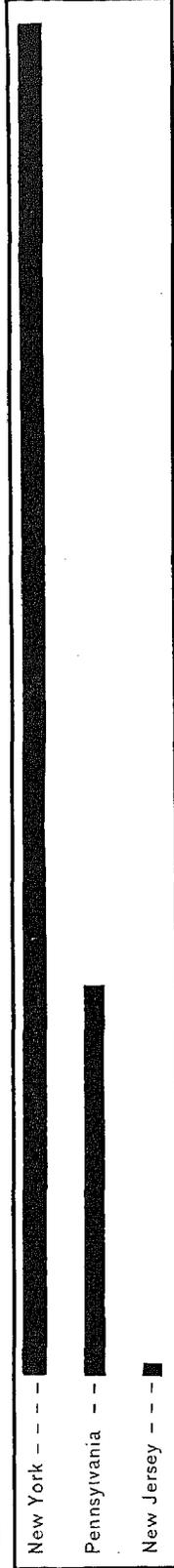
The following is a list of prominent structures built of sandstone in some of the principal cities of the United States:

PROMINENT SANDSTONE STRUCTURES IN SOME OF THE PRINCIPAL CITIES OF THE UNITED STATES.

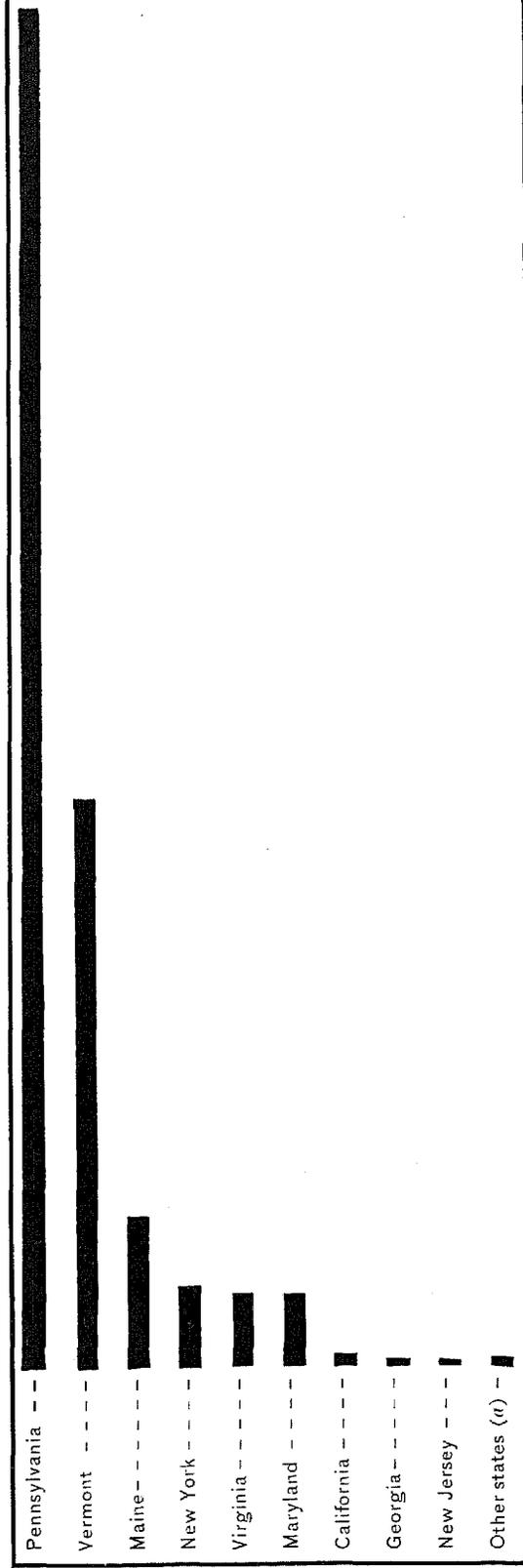
LOCALITY.	Name of structure and date of erection.	Commercial name of stone.	Locality of quarry.
Albany, New York	All Saints' cathedral	Potsdam sandstone	Potsdam, New York.
	Cathedral of the Immaculate Conception, 1852	Brownstone	Portland, Connecticut.
	First Presbyterian church, 1884		East Longmeadow, Massachusetts.
Albuquerque, New Mexico	Albany academy, 1815	Nyack sandstone	Nyack, New York.
	Territorial university (wing)		Rio Puerco, New Mexico.
Baltimore, Maryland	First Presbyterian church		New Brunswick, New Jersey.
	Mount Vernon Methodist Episcopal church	Berea sandstone	Berea, Ohio.
Boston, Massachusetts	Second Unitarian church	Red sandstone	Newark, New Jersey.
	New Old South church	Pudding stone	Roxbury, Massachusetts.
	Tremont street Methodist Episcopal church	Pudding stone	Boston, Massachusetts.
Brooklyn, New York	Hotel Brunswick	Buff Amherst sandstone	Amherst, Ohio.
	Saint Ann's Protestant Episcopal church		—, New Jersey.
Carson City, Nevada	Academy of Design	Brownstone	Portland, Connecticut.
	United States mint	Sandstone	Cañon City, Nevada.
Chicago, Illinois	Union League clubhouse	Brown sandstone	Springfield, Massachusetts.
	Palmer house	Buff Amherst sandstone	Amherst, Ohio.
Cincinnati, Ohio	Public library	Berea sandstone	Berea, Ohio.
	City hall	Brownstone	Houghton, Wisconsin.
Cleveland, Ohio	Garfield monument, Lake View cemetery	Berea sandstone	Berea, Ohio.
Colorado Springs, Colorado	First National Bank building	Peachblow sandstone	Peachblow, Colorado.
Columbus, Ohio	United States post office and courthouse	Berea sandstone	Berea, Ohio.
Denver, Colorado	Arapahoe county courthouse		Cañon City, Colorado.
	Tabor grand opera house	Buff Amherst sandstone Manitou sandstone	Amherst, Ohio. Manitou, Colorado.
Dover, Delaware	Barclay block	Coal Creek sandstone	Coal Creek, Colorado.
	United States post office and courthouse	Berea sandstone	Berea, Ohio.
Grand Rapids, Michigan	City hall	Blue Amherst sandstone	Amherst, Ohio.
Lansing, Michigan	State capitol	Buff Amherst sandstone	Amherst, Ohio.
Leavenworth, Kansas	United States post office and courthouse	Blue Amherst sandstone	Amherst, Ohio.
Milwaukee, Wisconsin	Chamber of Commerce building	Blue Amherst sandstone	Amherst, Ohio.
Minneapolis, Minnesota	Westminster Presbyterian church, 1881-1883	Brown sandstone	Fond du Lac, Minnesota.
	United States post office and courthouse	Blue Amherst sandstone	Amherst, Ohio.
Newark, New Jersey	Old customhouse and post office, 1859		Little Falls, New Jersey.
New York city	Columbia college	Red sandstone	Potsdam, New York.
	Trinity church, 1846		Little Falls, New Jersey.
	United Bank building		East Longmeadow, Massachusetts.
	Broadway Bank building		Portland, Connecticut.
	Collegiate Reformed church, 1872		Newark, New Jersey.
	Fulton National Bank building		Hummelstown, Pennsylvania.
	Dutch Reformed church	Berea sandstone	Berea, Ohio.
	College of Surgeons	Buff Amherst sandstone	Amherst, Ohio.
Philadelphia, Pennsylvania	Saint Mark's Protestant Episcopal church, 1849	Brownstone	Portland, Connecticut.
	Bank of North America, 1850	Brownstone	Portland, Connecticut.
	Young Men's Christian Association building, 1868	Buff Amherst sandstone	Amherst, Ohio.
Providence, Rhode Island	New Catholic cathedral	Brownstone	Portland, Connecticut.
	Grace church		Little Falls, New Jersey.
Salt Lake City, Utah	Mormon tabernacle (piers)	Red sandstone	Red Butte, Utah.
San Francisco, California	Bank of California, 1865	Blue sandstone	Angel Island, California.
Santa Fe, New Mexico	Federal building	Cerrillos sandstone	Los Cerrillos, New Mexico.
Trenton, New Jersey	State capitol		Trenton, New Jersey.
Washington, District of Columbia	Smithsonian Institution, 1847-1856	Seneca sandstone	Seneca creek, Maryland.
	United States capitol, old portion, 1793		Aquia creek, Virginia.
	Executive mansion (painted)		Aquia creek, Virginia.
	Treasury, old portion, 1836-1841		Aquia creek, Virginia.

Robert P. Porter, Superintendent.

Eleventh Census of the United States.



RELATIVE RANK OF STATES PRODUCING BLUESTONE.



RELATIVE RANK OF STATES PRODUCING SLATE.

a Arkansas, Michigan, and Utah.

BLUESTONE.

Bluestone is the name given to one of the varieties of sandstone. It consists of exceedingly small particles of silica cemented together by silica. Practically, the entire cementing material is silica, with the exception of a slight amount of argillaceous material, which is present to a very limited extent. Owing to the minuteness of the silica and the firmness of the siliceous cement the stone is extremely hard and durable, and naturally difficult to work. In the beginning of the investigation for the purpose of collecting stone statistics it was decided to include bluestone with sandstone simply as one of the varieties of the latter. This decision was, however, afterward changed, partly because the producers of bluestone are in a large number of cases apparently ignorant of the fact that bluestone is properly a sandstone, and it was found that a number of them object strenuously to the name sandstone. It was also found that, owing to the peculiarities of the methods of conducting bluestone quarrying and the subsequent disposal of the product, a separation of bluestone from sandstone was advisable, and even necessary, for reasons that will be given in detail.

Owing to the hardness and durability of this stone, as well as to the manner in which it occurs in the earth, it is well adapted for purposes of street paving, such as flagging and curbing, and most of it is devoted to these uses. The business methods involved in the operations of quarrying and putting the stone into the hands of the consumers are peculiar. A certain amount of the stone is quarried from regularly organized quarries, with a definitely invested capital and plant or facilities for quarrying. From all such quarries statistics were obtained by means of schedules, according to the method adopted for all other kinds of stone; but in addition to the stone taken from these regularly operated quarries a large amount is produced irregularly and spasmodically by men who invest no capital and have no definite organization as producers of stone. Their operations are conducted as follows: provided with a very simple equipment of the most ordinary quarry tools, they dislodge the stone found on land belonging to other persons and transport it to a number of shipping points, selling it there to dealers, who make a business of collecting stone in this manner and then shipping it to the place where used. The dealers pay the individuals who quarry the stone an amount which simply compensates the seller for his time and labor, while the owner of the property receives a certain definite percentage from the dealer for the amount of stone thus taken from his land. During the year 1889 and a number of years previous some of the dealers at various points in New York state constituted the members of the Union Bluestone Company, with headquarters in New York city. Each member of this company was entitled to furnish a certain percentage of the total amount sold by this company in a given year. The dealers may therefore be regarded in a certain sense as producers. From these considerations it becomes evident that it was impossible to obtain a knowledge of the value of the land from which stone was taken in this irregular manner, and also to obtain replies, which have been so readily secured from definitely organized companies operating quarries.

The table on page 660, giving statistics relative to the bluestone industry, exhibits returns from all regularly operated quarries, including replies to all inquiries which have been addressed to operators of regular quarries in all kinds of stone. A table on the same page includes the total purchases of these dealers from the laborers who obtain their output in the manner above described, and also from farmers. The irregular methods of conducting the bluestone industry are probably due in great part to the manner in which the stone occurs. Many of the ledges run out in a short time, and are then, of course, abandoned, so that long-continued operations at one point are not possible in many cases.

The tables show in as complete a manner as it was possible to make them the various statistics relative to the bluestone industry in the 3 states considered. The area from which bluestone is taken, and which is considered in this report, comprises the following counties in the states named:

NEW JERSEY.—Hunterdon, Mercer, and Sussex.

NEW YORK.—Albany, Broome, Cayuga, Chemung, Chenango, Delaware, Greene, Jefferson, Oneida, Orange, Otsego, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, Steuben, Sullivan, Tompkins, Ulster, Washington, Wyoming, and Yates.

PENNSYLVANIA.—Bradford, Lackawanna, Luzerne, Lycoming, Monroe, Pike, Schuylkill, Susquehanna, Wayne, and Wyoming.

The number of square miles embraced in this area is 26,897.

MINERAL INDUSTRIES IN THE UNITED STATES.

TOTAL BLUESTONE PRODUCTION, INCLUDING PURCHASES BY WHOLESALE DEALERS.

STATES.	Total.		RETURNS FROM REGULARLY OPERATED QUARRIES.				Purchases by wholesale dealers.	
			Rubble and bridge stone, sold by perch and cubic yard.		Dimension stone.			
	Cubic feet.	Amount.	Cubic feet.	Amount.	Cubic feet.	Amount.	Cubic feet.	Amount.
Total	5, 126, 340	\$1, 689, 606	1, 641, 626	\$53, 768	1, 518, 260	\$696, 144	1, 966, 454	\$939, 694
New Jersey.....	15, 849	8, 550			15, 649	8, 550		
New York.....	4, 009, 942	1, 303, 321	1, 514, 767	51, 495	842, 957	423, 908	1, 652, 218	827, 918
Pennsylvania.....	1, 100, 749	377, 735	126, 859	2, 273	659, 654	263, 686	314, 236	111, 776

STATISTICS OF BLUESTONE PRODUCED FROM SYSTEMATICALLY OPERATED QUARRIES ONLY.

STATES.	Number of individuals or firms operating quarries.	Number of quarries operated.	PRODUCT.					LABOR.						
			Superficial feet.	Linear feet.	Cubic feet.	Total expressed in cubic feet.	Total value.	Total number employed.	Foremen.	Quarrymen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.
Total	211	217	4, 012, 817	882, 005	1, 861, 446	3, 159, 886	\$749, 912	1, 793	144	778	109	736	18	8
New Jersey.....	3	3	67, 000	4, 200		15, 649	8, 550	34	3	13		17	1	
New York.....	142	142	2, 241, 335	543, 985	1, 612, 041	2, 357, 724	475, 403	1, 113	94	484	78	436	14	7
Pennsylvania.....	66	72	1, 704, 482	333, 820	249, 405	786, 513	265, 959	646	47	281	31	283	3	1

STATES.	POWER.				EXPENSES.				CAPITAL INVESTED.				
	Number of boilers.	Total horse power of boilers.	Other power.	Number of animals employed.	Total expenses incurred in producing entire amount of bluestone.	Total wages, including salaries to office force.	Value of supplies and materials consumed.	All other expenditures for the quarries, such as rent, taxes, insurance, interest, etc.	Total capital.	In land.	In buildings and fixtures.	In tools, live stock, machinery, and supplies on hand.	In cash.
Total	12	169		183	\$608, 582	\$527, 634	\$34, 785	\$46, 163	\$635, 757	\$428, 380	\$17, 015	\$106, 292	\$84, 070
New Jersey.....					7, 122	6, 795	275	52	21, 850	9, 300	1, 550	1, 000	10, 000
New York.....	9	135		145	395, 804	333, 574	26, 768	35, 552	409, 261	264, 980	10, 205	77, 506	56, 570
Pennsylvania.....	3	34		38	205, 566	187, 265	7, 742	10, 559	204, 646	154, 100	5, 260	27, 786	17, 500

STATES.	EMPLOYÉS.									
	Foremen.		Quarrymen.		Mechanics.		Laborers.		Boys under 16 years.	
	Average number of days employed.	Average daily wages.	Average number of days employed.	Average daily wages.	Average number of days employed.	Average daily wages.	Average number of days employed.	Average daily wages.	Average number of days employed.	Average daily wages.
Total	162	\$2.53	159	\$2.02	135	\$2.37	159	\$1.44	146	\$0.89
New Jersey.....	137	2.20	90	2.25			139	1.35	90	0.75
New York.....	159	2.55	163	1.95	129	2.43	159	1.48	156	0.81
Pennsylvania.....	169	2.51	154	2.13	150	2.23	161	1.38	120	0.75

Owing to the unique character of the bluestone industry, as indicated in the foregoing statements, it has been thought advisable to give a somewhat more detailed description of it than has been necessary in connection with the other kinds of stone, which are more or less distributed over the entire country. Much of this region is composed of rough mountain land, of little value except for the stone to be obtained from it. Over this region quarrymen, operating on the limited scale already indicated, are continually prospecting for such ledges of stone as will justify their labor, which is carried on with extremely simple implements, producing the stone principally in the form of flagging. Originally the stone was quarried for flagging only, but recently it has been applied to quite a long list of purposes, such as rubble masonry, retaining walls and bridge stone, sidewalks, crosswalks, curbing, gutters, flagging, stepstones, flooring, vault covers, bases of tombstones, porch and hitching posts, and house trimmings, such as platforms, steps, door and window sills, lintels, and caps.

Although the name of the stone implies that it is of a blue color, this is not invariably the case. The colors vary from dark-blue or slate color to bluish gray, and sometimes the stone presents a greenish tinge, and in other

cases a brown. The stone is known commercially by several names, which designate, approximately, the region from which it is taken. Among the names in common use may be mentioned the following: Hudson River bluestone, Hudson River flagging, North River bluestone, North River flagging, Pennsylvania bluestone, Wyoming Valley bluestone, Delaware River bluestone, Delaware flags, bluestone flagging, and bluestone. The methods of transportation employed by bluestone quarrymen in getting their product from the quarries to the dealers necessitate the employment of a large number of teams, principally horses, although oxen are also employed in Pennsylvania. The principal shipping points for general distribution to which stone is transported directly from the quarries in New York state are Kingston (including Wilbur and Rondout), Malden, Saugerties, Catskill, and Coeymans, all along the Hudson river. Leading into Kingston are stone tramways, constructed over a distance of 9 miles, coming from quarries at West Hurley, and between other quarries and shipping points similar tramways are in use. These enable exceedingly heavy loads to be hauled. Ruts have been worn in the stone by the heavily-laden wagons, and these ruts answer the purpose of a track, from which it is impossible for the wheels to escape in the course of a trip.

METHODS OF QUARRYING.

Bluestone occurs in beds, the surface layers of which are often quite thin. The thickness, however, increases with the depth, so that layers well below the surface are frequently of considerable thickness. In many quarries the stone is taken out with considerable ease by the very simplest tools and methods, so that in many cases powder is not used. When the stone exceeds 6 inches in thickness it is necessary to drill a row of plug holes and remove it by a series of wedges. In the quarries operated principally for flagging the blocks are simply pried out by iron or steel bars. The Knox system of blasting is in use at some of the principal quarries in New York state. Some quarries also operate mills, where the usual machinery, such as planers, saws, and rubbing beds, is operated. At some of these mills the facilities are very complete, but do not differ essentially from those in use in mills operating upon other kinds of stone.

BUSINESS METHODS.

Owing to the fact that no carefully itemized accounts on the part of the dealers are kept and to the total absence of any records whatever on the part of the roving quarrymen, who operate here and there, the task of collecting the statistics of bluestone has been rendered one of exceeding difficulty, and, having never before been attempted with the completeness which has attended the present investigation, it was entirely pioneer work. The methods adopted necessarily vary according to the peculiarities of business methods in an individual locality.

The royalty paid by the shipping agent or dealer to the owner of the property varies from 0.5 to 1.5 cents per superficial foot. In some cases a percentage ranging from 5 to 10 per cent of the price received from the sale is charged by the owner of the land. The dealers keep no account of the number of feet or the total value of the stone obtained from any particular quarryman, nor do they keep a permanent record of the property from which a particular quarryman has secured the stone sold by him. Furthermore, the dealers keep a record of the stock purchased in various ways, generally measuring it in superficial feet without taking any account of the particular thickness, or in linear feet without noting either of the other dimensions beyond certain general limits which these dimensions do not exceed. In regard to the value of property from which bluestone is taken, it may be said that this is extremely variable, depending, as it does, entirely upon the quality and the amount of stone contained in it, as the land is worth very little for agricultural purposes. As soon as the supply of stone is exhausted the value of the property drops to the low figure at which it is valued as agricultural land.

SLATE.

The total value of all slate produced in the United States in 1889, as shown by the following table, is \$3,482,513. Of this amount \$2,797,904 is the value of 835,625 squares of roofing slate, and \$684,609 is the value of slate for all other purposes besides roofing.

As compared with the statements of the Tenth Census report of 1880 on stone, the roofing-slate product of 1889 is nearly twice as great in number of squares and in value. A consideration of the slate used for purposes other than roofing appears to have been omitted from the Tenth Census report. The total value of all slate produced in 1889 is more than twice as great as that considered in the Tenth Census.

According to Mineral Resources of the United States, 1888, the total number of squares of roofing slate produced in that year is 662,400, valued at \$2,053,440.

DISTRIBUTION OF THE QUARRIES.

At present 12 states produce slate. A line drawn on the map from Piscataquis county, Maine, to Polk county, Georgia, and approximately following the coast outline, passes through all the important slate-producing localities. According to amount and value of product the most important states are, in the order named, Pennsylvania, Vermont, Maine, New York, Maryland, and Virginia. In the remaining 6 states productive operations are of limited extent, and in the case of Arkansas, California, and Utah of very recent date.

Inasmuch as in slate quarrying the initial operations are those of stripping and excavating, preliminary to actual output, some time must necessarily elapse before any returns for labor can be realized.

The 12 states referred to do not include all those in which merchantable slate is known to exist, since discoveries promising good results for the future have been made in a number of other states, among which may be specially mentioned Tennessee, where operations for production have begun.

PRODUCTION OF SLATE IN THE UNITED STATES IN 1889, BY STATES.

STATES.	PRODUCT.					LABOR.						
	Number of quarries operated in 1889.	Number of squares of roofing slate. (a)	Total value of roofing slate.	Total value of slate for other purposes.	Total value of all slate produced.	Average number of employes.						
						Total number employed.	Foremen.	Quarrymen and millmen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.
Total	212	835,625	\$2,797,904	\$684,609	\$3,482,513	6,170	221	3,251	282	1,986	355	75
California	3	3,104	18,089	.....	18,089	45	3	18	5	15	.....	4
Georgia	4	3,050	14,850	480	15,330	31	2	15	.....	12	2	.....
Maine	8	41,000	201,500	18,000	219,500	327	11	186	16	113	.....	1
Maryland	5	23,099	105,745	4,263	110,008	185	7	109	10	44	12	3
New Jersey	5	2,700	9,675	1,250	10,925	41	1	27	.....	12	.....	1
New York	15	16,767	81,726	44,877	126,603	206	13	148	2	37	2	4
Pennsylvania	105	476,038	1,641,003	370,723	2,011,726	3,667	137	1,764	204	1,254	275	33
Vermont	61	236,350	506,997	245,016	842,013	1,338	38	862	40	348	29	21
Virginia	3	30,457	113,079	.....	113,079	29#	7	119	2	124	35	7
Other states (b)	3	3,060	15,240	.....	15,240	36	2	3	3	27	.....	1

STATES.	EXPENSES.				POWER.				CAPITAL INVESTED.				
	Total expenses of producing entire amount of slate.	Total wages, including salaries paid to office force.	Value of supplies and materials consumed.	All other expenditures for the quarries, such as rent, taxes, insurance, interest, etc.	Number of boilers.	Total horse power of boilers.	Horse power of water wheels.	Number of animals employed.	Total capital.	In land.	In buildings and fixtures.	In tools, live stock, machinery, and supplies on hand.	In cash.
Total	\$2,762,122	\$2,218,982	\$282,114	\$261,026	291	11,772	265	400	\$10,569,593	\$7,408,491	\$600,038	\$1,223,738	\$1,323,326
California	44,245	31,085	5,053	8,167	1	8	20	3	85,800	61,200	4,000	2,800	17,800
Georgia	13,551	11,371	830	1,350	2	20	.....	6	155,000	141,150	1,350	1,500	11,000
Maine	151,090	125,640	24,500	950	15	810	.....	12	1,141,000	845,000	144,000	101,000	51,000
Maryland	85,444	65,255	10,909	9,220	12	557	.....	12	334,000	219,200	15,350	46,450	53,000
New Jersey	9,127	7,367	1,185	575	5	193	.....	9	103,550	74,150	11,800	12,300	5,300
New York	98,289	81,797	9,900	6,592	15	349	140	30	287,630	179,200	29,789	48,900	38,800
Pennsylvania	1,631,022	1,283,535	169,788	177,699	171	7,941	65	218	6,893,002	5,087,507	263,432	718,373	783,690
Vermont	616,113	517,257	48,025	50,831	65	1,649	40	87	1,290,451	736,900	89,071	230,265	252,215
Virginia	95,246	80,920	11,624	2,702	4	170	.....	16	181,500	37,634	13,095	26,925	103,796
Other states (b)	17,995	14,755	240	3,000	1	75	.....	7	118,610	26,500	59,160	40,235	1,725

a A square is the number of slates it takes to cover 100 square feet of roof when properly laid.

b There are here grouped, in order that the business of individual establishments may not be disclosed to the public, Arkansas, Michigan, and Utah.

PRODUCTION OF SLATE, BY REGIONS.

The table on the preceding page shows the geographical distribution of the quarries by states, but in order to conform to the custom observed by slate producers, the following table, in which the figures are arranged by regions, is also presented:

PRODUCTION OF SLATE IN THE UNITED STATES IN 1889, BY REGIONS.

REGIONS.	Number of quarries.	PRODUCT.				LABOR.						
		Number of squares of roofing slate.	Total value of roofing slate.	Total value of slate for other purposes.	Total value of all slate produced.	Average number of employes.						
						Total number employed.	Foremen.	Quarrymen and millmen.	Mechanics.	Laborers.	Boys under 16 years.	Office force.
Total	212	835,025	\$2,797,904	\$684,609	\$3,482,513	6,170	221	3,251	282	1,986	355	75
California	3	3,104	18,089	.....	18,089	45	3	18	5	15	.....	4
Maine	8	41,000	201,500	18,000	219,500	327	11	186	16	113	.....	1
Peach Bottom region, comprising Harford county, Maryland, and York county, Pennsylvania.	9	31,067	142,255	4,310	146,565	233	10	138	13	53	16	3
New Jersey	5	2,700	9,675	1,250	10,925	41	1	27	.....	12	.....	1
Bangor region, Pennsylvania.	20	165,832	588,258	118,904	707,162	1,257	32	617	57	433	107	11
Lehigh region, Pennsylvania.	45	142,500	478,559	211,823	690,382	1,219	63	553	79	427	85	12
Northampton Hard Vein region, Pennsylvania.	18	47,074	163,440	21,146	184,595	455	22	220	27	154	27	5
Pen Argyl region, Pennsylvania.	18	112,614	374,227	18,893	393,030	688	17	345	38	231	52	5
Vermont and New York region, comprising Rutland county, Vermont, and Washington county, New York. (a)	76	253,117	678,723	289,893	968,616	1,544	51	1,010	42	385	31	25
Virginia	3	30,457	113,079	.....	113,079	294	7	119	2	124	35	7
Georgia	4	3,050	14,850	480	15,330	31	2	15	.....	12	2	.....
Other states (b)	3	3,060	15,240	.....	15,240	36	2	3	3	27	.....	1

REGIONS.	EXPENSES.				POWER.				CAPITAL INVESTED.				
	Total expenses of producing entire amount of slate.	Total wages, including salaries paid to office force.	Value of supplies and materials consumed.	All other expenditures for the quarries, such as rent, taxes, insurance, interest, etc.	Number of boilers.	Total horse power of boilers.	Horse power of water wheels.	Number of animals employed.	Total capital.	In land.	In buildings and fixtures.	In tools, live stock, machinery, and supplies on hand.	In cash.
Total	\$2,762,122	\$2,218,982	\$282,114	\$261,026	291	11,772	265	400	\$10,569,593	\$7,408,491	\$609,038	\$1,228,738	\$1,323,326
California	44,245	31,085	5,053	8,107	1	8	20	3	85,800	61,290	4,000	2,800	17,800
Maine	151,090	125,640	24,500	950	15	810	.....	12	1,141,000	845,090	144,000	101,000	51,000
Peach Bottom region, comprising Harford county, Maryland, and York county, Pennsylvania.	105,037	81,066	12,423	11,548	16	712	.....	16	458,000	314,145	17,800	57,340	68,715
New Jersey	9,127	7,367	1,185	575	5	193	.....	9	103,550	74,150	11,800	12,300	5,300
Bangor region, Pennsylvania.	555,239	446,272	54,548	54,419	44	2,261	.....	72	1,888,575	1,431,350	53,200	268,525	195,500
Lehigh region, Pennsylvania.	598,219	390,578	61,492	56,149	64	2,706	65	64	2,352,993	1,628,140	132,507	314,377	277,969
Northampton Hard Vein region, Pennsylvania.	177,695	143,969	21,349	12,377	30	1,229	.....	38	972,608	756,679	52,675	70,441	112,814
Pen Argyl region, Pennsylvania.	370,276	286,905	30,945	52,426	29	1,599	.....	40	1,524,825	1,106,393	27,600	114,140	186,692
Vermont and New York region, comprising Rutland county, Vermont, and Washington county, New York. (a)	714,402	599,054	57,925	57,423	80	1,998	180	117	1,587,131	916,100	100,851	279,165	291,015
Virginia	95,246	80,920	11,624	2,702	4	170	.....	16	181,500	97,684	13,065	26,925	103,796
Georgia	13,551	11,371	830	1,350	2	20	.....	6	155,000	141,159	1,350	1,500	11,000
Other states (b)	17,995	14,755	240	3,000	1	75	.....	7	118,610	26,500	50,160	40,225	1,725

a Included in the production of this region are 7,247 squares of red slate, valued at \$61,101, taken entirely from quarries in Washington county, New York, the only locality in the country producing red slate.

b There are here grouped, in order that the business of individual establishments may not be disclosed to the public, Arkansas, Michigan, and Utah

It will be observed that these regions do not coincide exactly with states, nor, in the case of the Lehigh region, with counties, but in a number of instances they overlap the geographical boundaries of state and county; thus the Peach Bottom region lies both in Maryland and Pennsylvania, and the Lehigh region in Lehigh, Carbon, and Berks counties and a small portion of Northampton county.

As shown in the table, the Bangor region, which is entirely within Northampton county, Pennsylvania, is the most important. This region includes quarries at Bangor, East Bangor, and Mount Bethel, Pennsylvania. (The character of the slate produced at Mount Bethel is similar to that of the Northampton Hard Vein region.) Included in the Lehigh region, besides Lehigh county, Pennsylvania, are a few quarries in Berks and Carbon counties and a small number in Northampton county, on the opposite side of the Lehigh river.

The Pen Argyl region embraces quarries at Pen Argyl and Wind Gap.

The Northampton Hard Vein region is specially distinguished on account of the extreme hardness of the slate as compared with that produced in other regions of the state. This region includes the following localities: Chapman's quarries, Belfast, Edelman, Seemsville, and Treichlers, all in Northampton county.

Of the 9 quarries included in the Peach Bottom region, 5 are in Harford county, Maryland, the remaining 4 being in York county, Pennsylvania.

The Vermont and New York region includes an extensive slate formation occupying a part of the old Champlain valley, lying between the western base of the Green mountains of Vermont and the southern trend of the Adirondacks, in New York. The area in which slate is actually produced at present is confined to a narrow strip in Washington county, New York, and a somewhat wider one lying next to it in Rutland county, Vermont. It extends from Castleton, Vermont, on the north, to Salem, New York, on the south, a distance of 35 or 40 miles, and has a maximum width of 6 miles, but the average is not more than $1\frac{1}{2}$ miles. With the exception of red slate, the production of which is at present limited to Washington county, New York, the general character of the slate in Vermont and New York is the same. It happens, however, that red slate is produced only in Washington county, New York, it being the only locality in the country producing this variety of slate.

LABOR AND WAGES.

The slate quarrymen of the country, and to a considerable extent the firms operating the quarries, are either Welsh or of Welsh descent, many of them having learned the methods of quarrying slate in the celebrated quarries of Wales.

The quarries are operated on an average of about 220 days in the year. The idle days are the result of rainy weather and holidays. The first day of every month is regarded as a holiday by the Welsh quarrymen, and no work is ever done by them on Saturday afternoons.

The average wages for the entire country paid to foremen or overseers is \$2.48 per day; for quarrymen and millmen, \$1.56; for mechanics, \$1.64; for laborers, \$1.27, and for boys, \$0.76. The highest wages are paid in California, while those paid in the most important regions naturally approximate more closely the figures above given as the averages. The following figures represent the average daily wages paid in Pennsylvania: foremen, \$2.25; quarrymen, \$1.88; mechanics, \$1.54; laborers, \$1.40, and boys, \$0.73. In the Vermont and New York region foremen receive an average of \$2.65; quarrymen and millmen, \$1.77; mechanics, \$1.97; laborers, \$1.51, and boys, \$0.89.

TABLE OF GENERAL DEDUCTIONS, BY STATES.

STATES.	Total value of product.	Total wages.	Total expenses.	Total capital.	PERCENTAGE OF PROFIT ON—		Percentage of wages to total expense.	Percentage of wages to total value.
					Capital.	Value of product.		
Total	\$3,482,513	\$2,218,982	\$2,762,122	\$10,569,593	6.82	20.69	80.34	63.72
California.....	18,089	31,085	44,245	85,800	-30.48	-144.60	70.26	171.84
Georgia.....	15,330	11,371	13,551	155,000	1.15	11.60	83.91	74.17
Maine.....	219,500	125,640	151,090	1,141,000	6.00	31.17	83.16	57.24
Maryland.....	110,008	65,255	85,444	534,000	7.35	22.33	76.37	59.32
New Jersey.....	10,925	7,367	9,127	103,550	1.74	16.46	80.72	67.43
New York.....	126,603	81,797	98,289	287,680	9.84	22.36	83.22	64.61
Pennsylvania.....	2,011,726	1,283,535	1,631,022	6,863,002	5.55	18.92	78.70	63.80
Vermont.....	842,013	517,257	616,113	1,299,451	17.38	26.83	83.95	61.43
Virginia.....	113,079	80,920	95,246	181,500	9.83	15.77	84.06	71.56
Other states (a).....	15,240	14,755	17,905	118,610	-2.32	-18.08	81.99	96.82

a There are here grouped, in order that the business of individual establishments may not be disclosed to the public, Arkansas, Michigan, and Utah.

TABLE OF GENERAL DEDUCTIONS, BY REGIONS.

REGIONS.	Total value of product.	Total wages.	Total expenses.	Total capital.	PERCENTAGE OF PROFIT ON--		Percentage of wages to total expenses.	Percentage of wages to total value.
					Capital.	Value of product.		
Total	\$3,482,513	\$2,218,982	\$2,762,122	\$10,569,593	6.82	20.69	80.34	63.72
California	18,089	31,085	44,245	85,800	-30.48	-144.69	70.26	171.84
Maine	219,590	125,649	151,090	1,141,000	6.00	31.17	83.16	57.24
Peach Bottom region, comprising Harford county, Maryland, and York county, Pennsylvania.	146,565	81,066	105,037	458,000	9.07	28.33	77.18	55.31
New Jersey.....	10,925	7,367	9,127	103,559	1.74	16.46	89.72	67.43
Bangor region, Pennsylvania	707,162	446,272	555,239	1,888,575	8.04	21.48	80.37	63.11
Lehigh region, Pennsylvania	690,582	590,578	598,219	2,352,993	7.74	26.39	76.85	56.57
Northampton Hard Vein region, Pennsylvania	184,595	143,969	177,695	972,699	0.71	3.74	81.62	77.99
Pen Argyl region, Pennsylvania.....	393,030	286,905	370,276	1,524,825	1.49	5.79	77.48	73.00
Vermont and New York region, comprising Rutland county, Vermont, and Washington county, New York.	968,016	599,054	714,402	1,587,131	16.02	26.25	83.85	61.85
Virginia.....	113,079	80,920	95,246	181,500	9.83	15.77	84.96	71.56
Georgia.....	15,339	11,371	13,551	155,000	1.15	11.60	83.91	74.17
Other states (a).....	15,240	14,755	17,995	118,610	-2.32	-18.08	81.99	96.82

a There are here grouped, in order that the business of individual establishments may not be disclosed to the public, Arkansas, Michigan, and Utah.

GRINDSTONES.

The value of grindstones produced in the United States in 1889 was \$439,587 (a), distributed as follows: Ohio, \$430,398; South Dakota, \$7,131, and California, \$2,058.

It will be seen from the above that production was almost wholly confined to Ohio. The formation which furnishes material suitable for grindstones is that most generally known as the Berea grit. It is a member of the subcarboniferous measures of Ohio, and outcrops in different places in the northern and eastern portions of the state and near the shores of Lake Huron in Michigan. The stone varies in different places, being valuable for building purposes in some localities and suitable for grindstones in others. The principal centers for the quarrying of this rock for grindstones are Berea, Amherst, Independence, Massillon, Lorain, Grafton, and Marietta. The manufacture of finished stones from the rough blocks is carried on principally at Cleveland.

The California production comes from Santa Clara county, and that of South Dakota from Lawrence county.

The United States imports grindstones from Nova Scotia and England, and exports to Mexico, the West Indies, and the states of South America.

The statistics of labor, wages, capital, power, etc., of the grindstone industry are included under sandstone.

The following tables show the value of the grindstones produced in the United States from 1880 to 1889, inclusive, and the imports from 1868 to 1889, inclusive:

VALUE OF GRINDSTONES PRODUCED IN THE UNITED STATES, 1880 TO 1889, INCLUSIVE.

YEARS.	Value.	YEARS.	Value.
1880.....	\$500,000	1885.....	\$500,000
1881.....	500,000	1886.....	250,000
1882.....	700,000	1887.....	224,400
1883.....	600,000	1888.....	281,800
1884.....	570,000	1889.....	439,587

a This figure is included in that representing the value of sandstone in the chapter on that subject.

MINERAL INDUSTRIES IN THE UNITED STATES.

GRINDSTONES IMPORTED AND ENTERED FOR CONSUMPTION IN THE UNITED STATES,
1868 TO 1889, INCLUSIVE.

[Long tons.]

YEARS ENDING—	Total value.	FINISHED.		UNFINISHED OR ROUGH.	
		Quantity.	Value.	Quantity.	Value.
June 30, 1868.....	\$60,855		\$25,640		\$35,215
1869.....	115,593		15,878		99,715
1870.....	125,605		29,161		96,444
1871.....	104,716	385	43,781	3,957.15	60,935
1872.....	113,947	1,202	13,453	10,774.80	100,494
1873.....	111,943	1,437	17,033	8,376.84	94,900
1874.....	106,010	1,443	18,485	7,721.44	87,525
1875.....	107,814	1,373	17,642	7,656.17	90,172
1876.....	90,189	1,681	20,262	6,079.34	69,927
1877.....	77,121	1,245	18,546	4,979.75	58,575
1878.....	68,129	1,463	21,688	3,669.41	46,441
1879.....	77,247	1,603	24,904	4,584.16	52,343
1880.....	76,274	1,573	24,375	4,578.59	51,899
1881.....	87,128	2,064	30,288	5,044.71	56,840
1882.....	97,225	1,705	30,286	5,945.61	66,939
1883.....	105,852	1,755	28,055	6,945.63	77,797
1884.....	86,286				
1885.....	50,579				
Dec. 31, 1886.....	<i>a</i> 39,149				
1887.....	<i>a</i> 50,312				
1888.....	<i>a</i> 51,755				
1889.....	<i>a</i> 57,751				

a Classed as unfinished.