

# STRUCTURAL MATERIALS.

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## THE BUILDING INDUSTRY IN GENERAL.<sup>(a)</sup>

The year 1888, while by no means an unprosperous one for the building industry throughout the country, does not show the gains in production of structural materials generally which characterized the year 1887 as compared with 1886 and former years.

The following table has been constructed on the basis of statistics furnished by the building inspectors and commissioners of the various cities considered. The figures represent in general the number of permits issued during the year and the estimated values of the buildings for which permits were given. Although the buildings for which permits are issued may not all be completed during the same year, still this fact does not diminish the value of the figures as showing the comparative condition of the industry in different years:

*Number and value of the buildings for which permits were issued in forty-four cities during the years 1885, 1886, 1887, and 1888.*

Cities.	1885.		1886.		1887.		1888.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Portland, Maine:								
Frame buildings .....	67	.....	91	.....	109	\$140,000	.....	.....
Brick, stone, and iron buildings .....	14	.....	32	.....	33	225,000	.....	.....
Total .....	81	\$250,000	123	\$300,000	142	365,000	.....	.....
Bangor, Maine.....								
Frame buildings .....							190	.....
Brick, stone, and iron buildings .....							10	.....
Total .....							200	\$300,000

<sup>a</sup> In the preparation of this report valuable aid has been rendered by the following gentlemen, to whom especial acknowledgments are hereby tendered: Mr. Robert H. Dalby, of Slatington, Pennsylvania, for general statistics in regard to slate from the Slatington region, Pennsylvania; Mr. U. Cummings, general superintendent of the Standard Cement Company, of New Haven, Connecticut, formerly of Buffalo, New York, for statistics in regard to the production of natural-rock cement in the United States; the New York *Real Estate Record and Guide*, for statistics of structural materials in New York City.

*Number and value of the buildings for which permits were issued, etc.—Continued.*

Cities.	1885.		1886.		1887.		1888.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Boston, Massachusetts:								
Frame buildings .....	1,372	\$4,552,538	1,353	\$3,992,792	1,431	\$4,153,181	1,480	\$4,455,515
Brick, stone, and iron buildings .....	348	6,218,800	346	8,813,100	417	6,108,825	315	4,994,350
Total .....	1,720	10,771,338	1,699	12,805,892	1,848	10,262,006	1,795	9,449,865
Fall River, Massachusetts:								
Frame buildings .....	200	.....	205	.....	273	.....	279	.....
Brick, stone, and iron buildings .....	12	.....	25	.....	27	.....	17	.....
Total .....	212	330,975	230	666,750	300	831,450	296	1,160,650
Salem, Massachusetts:								
Frame buildings .....	92	.....	90	.....	102	.....	121	200,000
Brick, stone, and iron buildings .....	9	.....	4	.....	10	.....	10	30,000
Total .....	101	376,000	94	317,000	112	406,000	131	230,000
New Bedford, Massachusetts:								
Frame buildings .....	.....	.....	.....	.....	.....	.....	169	338,000
Brick, stone, and iron buildings .....	.....	.....	.....	.....	.....	.....	3	160,000
Total .....	.....	.....	.....	.....	.....	.....	172	498,000
Providence, Rhode Island:								
Frame buildings .....	452	1,273,745	407	1,194,607	465	1,166,540	427	1,251,780
Brick, stone, and iron buildings .....	13	364,700	12	168,750	14	293,500	23	774,000
Total .....	465	1,638,445	419	1,363,357	479	1,460,040	450	2,025,780
Bridgeport, Connecticut:								
Frame buildings .....	280	420,000	350	630,000	.....	.....	.....	.....
Brick, stone, and iron buildings .....	25	125,000	34	170,000	.....	.....	.....	.....
Total .....	305	545,000	384	800,000	.....	.....	.....	.....
Brooklyn, New York:								
Frame buildings .....	1,261	.....	1,774	.....	2,123	.....	1,923	.....
Brick, stone, and iron buildings .....	1,377	.....	2,216	.....	1,752	.....	1,738	.....
Total .....	2,638	11,465,795	3,990	20,318,485	3,875	18,008,325	3,661	17,937,270
New York City:								
Frame buildings .....	580	1,416,683	650	1,505,735	840	2,151,765	771	1,861,965
Brick, stone, and iron buildings .....	2,788	43,957,330	3,442	57,233,998	3,504	61,917,805	2,474	49,193,016
Total .....	3,368	45,374,013	4,092	58,739,733	4,344	67,069,570	3,245	51,054,981
Newark, New Jersey:								
Frame buildings .....	809	.....	724	.....	916	.....	1,060	.....
Brick, stone, and iron buildings .....	221	.....	223	.....	252	.....	313	.....
Total .....	1,030	.....	947	.....	1,168	.....	1,373	.....
Wilmington, Delaware:								
Frame buildings .....	.....	.....	.....	.....	.....	.....	.....	.....
Brick, stone, and iron buildings .....	280	668,590	192	622,983	301	548,340	276	648,450
Total .....	280	668,590	192	622,983	301	548,340	276	648,450
Philadelphia, Pennsylvania:								
Frame buildings .....	.....	.....	.....	.....	80	.....	85	.....
Brick, stone, and iron buildings .....	.....	.....	.....	.....	7,615	.....	7,722	.....
Total .....	6,326	25,000,000	7,561	24,500,000	7,695	26,780,000	7,807	30,000,000



Number and value of the buildings for which permits were issued, etc.—Continued.

Cities.	1885.		1886.		1887.		1888.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Pittsburgh, Pennsylvania:								
Frame buildings.....	795	.....	847	.....	1,173	\$1,157,341	1,838	.....
Brick, stone, and iron buildings.....	647	.....	568	.....	737	2,757,558	926	.....
Total.....	1,442	\$3,030,429	1,415	\$2,401,809	1,910	3,914,899	2,764	\$5,341,193
Baltimore, Maryland:								
Frame buildings.....	.....	.....	.....	.....	.....	.....	.....	.....
Brick, stone, and iron buildings.....	3,237	4,340,125	2,305	3,587,900	2,464	3,244,750	2,188	3,613,480
Total.....	3,237	4,340,125	2,305	3,587,900	2,464	3,244,750	2,188	3,613,480
Washington, District of Columbia:								
Frame buildings.....	325	195,255	392	295,689	366	351,260	266	313,760
Brick, stone, and iron buildings.....	1,333	3,297,252	1,802	4,412,240	1,885	4,584,500	1,611	5,389,611
Total.....	1,658	3,492,507	2,194	4,707,929	2,251	4,935,760	1,877	5,703,371
Richmond, Virginia:								
Frame buildings.....	244	124,900	137	125,000	355	205,000	.....	.....
Brick, stone, and iron buildings.....	238	896,400	204	528,600	184	668,700	.....	.....
Total.....	482	1,021,300	341	653,600	539	873,700	555	750,000
Louisville, Kentucky:								
Frame buildings.....	604	.....	570	.....	420	.....	742	.....
Brick, stone, and iron buildings.....	243	.....	340	.....	496	.....	192	.....
Total.....	847	2,160,523	910	1,507,368	916	1,487,602	934	1,223,047
Memphis, Tennessee:								
Frame buildings.....	.....	.....	.....	.....	.....	374,007	198	441,544
Brick, stone, and iron buildings.....	.....	.....	.....	.....	.....	748,014	106	790,412
Total.....	.....	.....	.....	.....	.....	1,122,021	304	1,231,956
Nashville, Tennessee:								
Frame buildings.....	212	135,245	211	126,025	470	200,952	636	310,624
Brick, stone, and iron buildings.....	95	235,220	151	391,545	230	594,260	201	624,905
Total.....	307	370,465	362	517,570	700	795,212	837	935,619
Saint Louis, Missouri:								
Frame buildings.....	510	456,825	491	405,892	648	555,370	.....	.....
Brick, stone, and iron buildings.....	2,160	6,919,694	1,732	6,624,927	1,842	7,607,544	.....	.....
Total.....	2,670	7,376,519	2,223	7,030,819	2,490	8,162,914	.....	.....
Kansas City, Missouri:								
Frame buildings.....	2,227	1,357,207	3,420	3,098,802	3,758	2,622,306	4,263	2,987,891
Brick, stone, and iron buildings.....	793	4,401,420	629	7,244,655	650	6,646,955	715	6,679,540
Total.....	2,930	5,758,627	4,049	10,343,457	4,408	9,269,261	4,978	9,667,431
Savannah, Georgia:								
Frame buildings.....	278	.....	228	.....	190	.....	204	.....
Brick, stone, and iron buildings.....	55	.....	52	.....	28	.....	32	.....
Total.....	333	360,535	280	335,845	218	255,500	236	272,970
Galveston, Texas:								
Frame buildings.....	116	177,630	181	394,400	.....	.....	.....	.....
Brick, stone, and iron buildings.....	7	123,500	6	229,000	.....	.....	.....	.....
Total.....	123	301,130	187	623,400	.....	.....	.....	.....



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*Number and value of the buildings for which permits were issued, etc.—Continued.*

Cities.	1885.		1886.		1887.		1888.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Chicago, Illinois:								
Frame buildings								
Brick, stone, and iron buildings	4,638	\$24,530,125	4,664	\$21,324,400	4,833	\$19,778,100	4,958	\$20,360,800
Total	4,638	24,530,125	4,664	21,324,400	4,833	19,778,100	4,958	20,360,800
Minneapolis, Minnesota:								
Frame buildings							4,180	3,409,687
Brick, stone, and iron buildings							159	6,789,150
Total	3,075	7,718,668	4,485	9,179,522	4,620	9,731,068	4,339	10,198,837
Saint Paul, Minnesota:								
Frame buildings	2,964	2,238,026	3,017	2,488,271	3,780	6,452,807	4,276	6,963,265
Brick, stone, and iron buildings	385	1,921,182	553	3,567,571	675	6,486,407	616	7,724,656
Total	3,349	4,159,208	3,570	6,055,842	4,455	12,939,214	4,892	14,687,921
Fargo, Dakota:								
Frame buildings	11	35,500	17	29,000	13	31,300	8	14,600
Brick, stone, and iron buildings	4	120,000	4	49,500	2	104,000	2	12,000
Total	15	155,500	21	78,500	15	135,300	10	26,600
Omaha, Nebraska:								
Frame buildings	600	957,318	1,150	2,224,390	1,968		2,131	2,260,154
Brick, stone, and iron buildings	62	1,908,145	145	2,950,750	226		251	1,410,214
Total	662	2,865,463	1,295	5,175,140	2,194	9,000,000	2,382	3,670,368
Council Bluffs, Iowa:								
Frame buildings								
Brick, stone, and iron buildings								
Total			327	1,721,325	743	2,600,500	1,169	2,167,200
Des Moines, Iowa:								
Frame buildings							276	705,125
Brick, stone, and iron buildings							49	391,350
Total							325	1,096,475
Dubuque, Iowa:								
Frame buildings								
Brick, stone, and iron buildings								
Total		1,000,500		1,026,301		1,267,400		1,678,700
San Francisco, California:								
Frame buildings								
Brick, stone, and iron buildings								
Total							891	6,244,229

In the following table are the figures (taken from the foregoing table) showing the values for all cities, except those for which data are wanting, for 1887 and 1888, placed in parallel columns for the sake of comparison:



*Total value of buildings erected in the principal cities of the United States during 1887 and 1888.*

Names of cities.	1887.	1888.
Boston, Massachusetts.....	\$10,262,006	\$9,449,865
Fall River, Massachusetts.....	831,450	1,100,650
Salcm, Massachusetts.....	400,000	230,000
Providence, Rhode Island.....	1,400,040	2,025,780
Brooklyn, New York.....	18,008,325	17,937,270
New York City.....	67,069,570	51,054,987
Wilmington, Delaware.....	548,340	648,450
Philadelphia, Pennsylvania.....	26,780,000	30,000,000
Pittsburgh, Pennsylvania.....	3,914,899	5,341,193
Baltimore, Maryland.....	3,244,750	3,613,480
Washington, District of Columbia.....	4,935,760	5,703,371
Richmond, Virginia.....	873,700	750,000
Louisville, Kentucky.....	1,487,602	1,223,047
Memphis, Tennessee.....	1,122,021	1,231,956
Nashville, Tennessee.....	795,212	935,619
Kansas City, Missouri.....	9,269,261	9,667,431
Savannah, Georgia.....	255,500	272,970
Evansville, Indiana.....	366,273	1,050,502
Indianapolis, Indiana.....	1,089,187	1,089,198
Topeka, Kansas.....	621,596	761,290
Cleveland, Ohio.....	1,756,273	3,594,009
Toledo, Ohio.....	1,256,000	632,125
Detroit, Michigan.....	3,916,973	4,262,639
Marquette, Michigan.....	132,983	487,709
Chicago, Illinois.....	19,778,100	20,360,800
Minneapolis, Minnesota.....	9,731,068	10,198,837
Saint Paul, Minnesota.....	12,939,214	14,687,921
Fargo, Dakota.....	125,300	26,600
Omaha, Nebraska.....	9,000,000	3,670,368
Council Bluffs, Iowa.....	2,600,500	2,167,200
Dubuque, Iowa.....	1,267,400	1,678,700
Total.....	215,855,303	205,943,967

It is evident, from this table, that for the thirty-one cities compared there was a total decrease of \$9,911,336 in 1888, or 4.59 per cent. less. If New York City is left out there is a total gain of \$6,103,247, or 4.1 per cent. gain.

In the report for 1887 a consideration of the kinds of building done and the kinds of materials used in quite a number of cities and towns in the United States was given. The following is a presentation of similar information in regard to other cities and towns, and also in cases where changes have been made apparent by increased activity in building. The same cities were treated of in the 1887 report.

#### ALABAMA.

*Birmingham.*—The amount of building done in this city in 1888 falls below that of 1887 very perceptibly; this decrease is due in part to the reaction which is a natural consequence of the excessive activity of two or three preceding years. Appearances, however, point to greater activity during 1889.

Locally quarried dark gray sandstone serves for all foundation work, while limestone from the Dixon quarry, Franklin county, Alabama, and granite from the Goodwater quarry, Coosa county, Alabama, supply the greater part of the demands for ornamental stone. The granite shows as the result of analysis 96 per cent. quartz, 3.3 per cent. feldspar and 0.7 per cent. mica. The brick for rough work is produced locally, but for first-



class construction Montgomery and Riverside, Alabama, brick is preferred; front brick comes from Saint Louis, Missouri, and Zanesville, Ohio. Louisville, Kentucky, cement supplies most of the demand for that material, although Rosendale and English Portland are also in use.

*Mobile.*—Stone foundations in this city are practically unknown. Dixon, Alabama, limestone is occasionally used for superstructures. Most of the buildings erected are of wood. The common brick used is of local manufacture, unattractive in appearance, but durable in quality. Slate and cement are sparingly employed.

*Montgomery.*—There being no building stone within 70 miles of this city, foundations are constructed of brick, which is locally manufactured and of good quality.

Granite is procured from Stone Mountain, Georgia, sandstone from Blount county, Alabama, and limestone from the northern part of the State. More good taste in the use of ornamental materials is displayed than formerly, and the general character of the buildings is better. A very noticeable increase in the consumption of cement has taken place in the last eight years. Louisville cement, supplemented by a little English Portland and Rosendale, supplies the demand.

#### ARKANSAS.

*Little Rock.*—For foundations sandstone, obtained 2 miles west of the city, is the recognized material. Two miles south of the city large quantities of granite are quarried, and this stone is freely used for superstructures and is also freely shipped to other cities for paving blocks as well as for building purposes. The character of the building done is improving noticeably. The common brick is locally manufactured, but the fine brick comes from Memphis, Tennessee, Saint Louis, Missouri, and Zanesville, Ohio. Slate from Pennsylvania supplies the greater part of a limited demand. Slate of good quality exists about 6 miles west of the city, but it has not yet been satisfactorily developed.

#### CALIFORNIA.

*Los Angeles.*—Most of the foundations in this city are constructed of brick; but small quantities of granite from Riverside, 60 miles southeast, and sandstone from the Sespe quarries are sometimes applied to foundation construction. The above mentioned stones, and also sandstone from Flagstaff, Arizona, supply most of the demand for ornamental stone.

The residences are almost entirely frame structures, brick and stone being used in business buildings and blocks.

Slate is used on only one or two buildings; it came from Pennsylvania. English Portland cement supplies almost the entire demand for cement; it is brought over in English vessels landing at San Pedro.

*Sacramento.*—For foundation works brick is almost exclusively employed; but little stone is used for any purpose; the small demand is filled by sandstone from Amador county and a small quantity of



granite. Brick is locally manufactured. Slate is very little used for roofing, but the future development of slate quarries known to exist at Placerville, Eldorado county, California, may stimulate the use of slate in this and other California towns. English Portland cement is quite liberally used; much of it comes as ballast in grain ships from England.

*San Francisco.*—The foundations of buildings in this city are largely constructed of brick. Sandstone from San José and Niles Cañon, California, and also from Arizona, and granite from localities in the Sierra Nevada mountains, are employed for superstructures.

The brick used in this city comes from San José, Pleasanton, San Rafael, San Quentin, and other points situated at distances of from 30 to 75 miles from the city. The opening up of the Placerville slate quarries will probably cause an increased consumption of slate, very little of which is used at present.

#### CONNECTICUT.

*Bridgeport.*—Two kinds of locally quarried stone of granitic character, but different in color, supply the needs for foundation work, while ornamental stone comes from Hurricane Islands and Westerly, Rhode Island, sandstone being brought from Long Meadow, Massachusetts, and Portland, Connecticut.

The absence of suitable clay for brick making necessitates the introduction of common brick from North Haven and Berlin, Connecticut, and fine brick from Philadelphia, Pennsylvania, and Trenton, New Jersey. Slate from Maine and Pennsylvania quarries is used on a fair proportion of the steep roofs erected. The use of cement mixed with lime in mortar is increasing, the proportions recommended by the best authorities being one part of lime to two parts of cement in summer, or in warm weather, and one of lime to one of cement in cold weather. Rosendale cement chiefly is used, but a considerable amount of imported Portland is also utilized.

#### GEORGIA.

*Atlanta.*—Stone mountain, at a distance of 16 miles from the city, furnishes granite for superstructures, ornamental work, and trimmings, while "native blue stone," locally so called, and quarried near the city, is the material used for foundations. In addition to these stones, marble from Pickens county, limestone from Alabama, Kentucky, and Indiana, and sandstone from Kentucky are also employed in ornamental work. Indiana oolitic limestone was used in the erection of the Georgia State capitol. All brick is of local manufacture; slate is brought from Rock Mart, Georgia.

*Savannah.*—Alabama limestone, quarried at Netta, and granite from Stone mountain, Georgia, are now quite extensively used to supply demands for stone in building, and is replacing Connecticut brown stone, which was formerly very largely employed. Common brick is locally



manufactured, while pressed brick for front work is brought from Macon and Atlanta. Rosendale and Georgia natural-rock cement, and also Portland cement, manufactured at Cement, Georgia, are in use.

Cement is also used in the manufacture of an artificial stone known as "tabby" from oyster shells and cement, giving a product satisfactory in appearance and strength.

#### IDAHO.

*Boisé City.*—Sandstone locally quarried is used for foundations, while Ohio freestone and Kentucky limestone are used in superstructures. There is a marked improvement in the style and taste displayed in the erection of buildings within the past few years. Common brick is made in the vicinity, while fine brick comes from Zanesville, Ohio, and Louisville, Kentucky. Slate from Virginia and Pennsylvania is used, and cement also comes into consumption.

#### ILLINOIS.

*Aurora.*—Limestone from local quarries is the foundation material while for superstructures and ornamental work Bedford sandstone and Joliet limestone are popular. Very little slate is used. Buffalo, New York, and Utica, Illinois, cements supply most of the demand for this material.

*Chicago.*—Probably no city in the Union makes use of a greater variety of building stones than Chicago. There is hardly an important quarry in any part of the country which does not supply stone to the market of this city. The slate used is principally from the quarries of Pennsylvania and Vermont, about 10,000 squares being annually consumed. Natural-rock cement comes chiefly from Milwaukee and Louisville, while probably all the varieties of Portland are in use.

#### INDIANA.

*Indianapolis.*—For foundation construction limestone from Decatur, Jennings, and Jefferson counties, Indiana, is commonly employed. Oolitic limestone from Monroe, Lawrence, Owen, and Harrison counties is most widely adopted for ornamental work in superstructures. The introduction of natural gas has stimulated building to a very marked extent within the past two years. This statement may be made indeed of all Indiana towns in which natural gas has made its appearance. The Bangor, Pennsylvania, slate quarries furnish most of the slate used. Cement for ordinary work comes from Louisville, Kentucky, Portland cement being used for the best grades of work.

#### IOWA.

*Cedar Rapids.*—Magnesian limestone from Anamosa, Jones county, and from Cedar Valley, Cedar county, is used for foundation construction. For superstructures and fine work generally, Bedford, Indiana, limestone is popular.



Slate as a roofing material is almost unknown. A little from the Lehigh Valley region of Pennsylvania has made its appearance. Milwaukee and Louisville cements, mixed with ordinary mortar, are used to a limited extent in walls which demand such mortar.

*Des Moines.*—Local limestone for foundation walls, and Missouri and Ohio sandstones for superstructures, are the building stones used.

Eighty per cent. of the buildings erected are frame structures; the rest are of brick, with more or less stone trimmings. More iron and terra cotta are used than formerly. Common brick is made locally; fine brick comes from Saint Louis. Slate from Maine, Vermont, and Virginia is employed for steep roofs. Milwaukee and imported Portland cement mixed with lime is used in mortar when circumstances demand it. The local lime is, however, quite strong and satisfactory.

#### KANSAS.

*Hutchinson.*—The discovery and development of large beds of rock-salt is an important factor in the stimulation of building operations in this town. The brick produced locally is of very poor quality, owing to a large admixture of sand in the clay. Three-fourths of the brick used comes from other places, notably Colwich, Lyons, and Topeka, Kansas, and Kansas City and Saint Louis, Missouri. Slate is practically unknown.

#### KENTUCKY.

*Louisville.*—A hard, flinty limestone, gray in color, and quarried near the city, is used for foundation construction, while the most popular ornamental stone appears to be the oolitic limestone from Bedford, Indiana. Red sandstone from the Lake Superior region is also in use. The concentration of the leaf-tobacco trade in this city seems to be a cause of a more active growth in 1888 than that which characterized 1887.

Nearly all the brick used in this city is locally manufactured; but for the finest grades Zanesville, Ohio, Saint Louis, Missouri, and Baltimore, Maryland, are drawn upon. Slate is popular, the well known sources of supply in Pennsylvania and Virginia being most liberally patronized, but some is brought from Vermont quarries.

The Louisville cement supplies all demands of ordinary work, and English Portland is used for finer grades. As compared with twelve years ago, the use of cement has very largely increased; this is due as in many other cities to the erection of high buildings and the demand for more substantial and durable work in building.

#### LOUISIANA.

*New Orleans.*—Stone is very little used either in foundations or superstructures in this city. Frame buildings are largely in the majority. Ordinary brick is freely used and is manufactured at yards in the city



and the immediate vicinity; fine brick comes from Saint Louis, Missouri, and Baltimore, Maryland. Portland cement imported from England supplies most of the demand for cement.

#### MARYLAND.

*Baltimore.*—For foundations a trap rock locally known as Falls Road stone is in general use. For ornamental work and trimmings Baltimore county marble, Potomac sandstone, and Berea, Ohio, sandstone are most freely used; while granite from various sources is employed to a limited extent. The vast majority of the buildings erected in Baltimore are of the celebrated Baltimore brick, the ornamental varieties of which are in demand all over the United States. Comparatively little slate is used.

#### MASSACHUSETTS.

*Boston.*—For foundations Rockport and Quincy granites are in common use, but Roxbury pudding stone for the cheapest work is also employed. A large variety of building stones is used in superstructural work; the most prominent kinds are as follows: Granite from Rockport, Quincy, Concord, Dedham, and Milford; and Long Meadow and Ohio sandstone; marble from Vermont.

The brick used is mostly made at yards near the city. Slate comes almost entirely from Maine.

Much more cement is now used than formerly; the favorite brands are those of New York and New Jersey and imported Portland for the finest grades of work.

*Holyoke.*—Locally quarried sandstone is used in foundations. The buildings now erected are mostly of brick; the stone used for trimmings is Long Meadow sandstone, Vermont marble, and granite from East Dummerston, Vermont. All brick is locally made, and as frame structures are not allowed in the fire limits, is freely used. Rosendale and imported Portland cements supply the demand for this article, the proportionate consumption of which is increasing.

*New Bedford.*—Granite from local quarries is used for foundations, and Cape Ann granite and Long Meadow sandstone for ornamental purposes.

Frame buildings largely predominate as to number, and in value they are about double that of buildings made of other material. The greater part of the common brick comes from Taunton, Massachusetts, and some from Fisher's Island; pressed brick is brought from Danvers, Massachusetts. The use of cement in superstructures is regulated as in other places by the season—clear lime mortar in the spring and fall, and mortar of various proportions of lime and cement during the summer months.

*Springfield.*—Most of the foundations in this city are of brick. Sandstone from Long Meadow, and granite from Monson, Massachusetts, are the favorite stones for superstructures. Slate from Maine and Pennsylvania is quite freely used for roofing purposes.



## MICHIGAN.

*Detroit.*—Foundations are generally of limestone taken from various places on the shores of Lake Erie, principally Marble Head and Kelly's Island. Michigan and Ohio sandstones supply most of the demand for ornamental work, trimmings, etc. Many handsome residences were built during the year, but the total money value of the buildings erected in 1888 is less than that of 1887. Michigan slate is extensively used, but some is also brought from Maine and Pennsylvania. Akron, Ohio, furnishes the cement for ordinary work, while the usual varieties of imported Portland cement are in use for the finer grades of work.

*Grand Rapids.*—For foundation work in this city field bowlders have generally been used, but as they are becoming scarce sandstone is largely taking their place. Berea and Amherst, Ohio, sandstone is the stone commonly used for superstructures. The great majority of all buildings erected are, however, frame structures. This predominance of frame buildings is likely to continue as long as lumber remains at the present prices. Very little slate is consumed for roofing purposes, being used only on the best class of dwellings and public buildings. Ohio and Louisville, Kentucky, cements supply the greatest portion of the demand. For the best work Portland cement is used.

## MINNESOTA.

*Minneapolis.*—Blue limestone, which has been found locally in great abundance, suffices for all foundation purposes, but is not used at all for superstructures. The popular stone for superstructure and ornamental work is brown sandstone from the Lake Superior region and the buff sandstones from Amherst and Berea, Ohio. A small amount of Bedford, Indiana, oolitic stone has made its appearance. The materials which appear to be markedly increasing in general application are iron and steel in the form of steel beams. All common brick is locally manufactured. Pressed brick is brought from Saint Louis and Chicago. Milwaukee supplies most of the demand for cement, but other domestic cements from Louisville, Kentucky, and Utica, New York, are also in use. English Portland cement is used for the finest grades of work.

*Saint Paul.*—Locally quarried limestone is used for foundations, while for ornamental work, trimmings, etc., brown sandstone from Ashland, Wisconsin, red sandstone from Portage, Michigan, and Berea, Ohio, sandstone are in common use. The use of stone is much more general than it was a few years since. Common brick is brought from Chaska, Minnesota. Pressed brick comes from Anderson, Wisconsin, and Saint Louis, Missouri. Milwaukee supplies most of the demand for domestic cement.



## MISSISSIPPI.

*Vicksburg.*—In this city economy is a very important factor in determining the choice of building materials generally. Stone is not used in foundations, brick being applied to that purpose. What little stone is used in superstructure comes largely from Chattanooga, Tennessee, and Dickson, Alabama. Hand-made brick of local manufacture, made of clay that is well adapted to the manufacture of brick, is the only brick used in any considerable quantity. The common lime mortar is not of a quality to stand well without the use of cement, which is used in all foundation work, but only to a limited degree in superstructures.

## MISSOURI.

*Kansas City.*—Limestone taken from quarries in and around the city is used for foundation work, while for ornamental work and trimmings gray sandstone from Warrensburgh, Missouri, red sandstone from Colorado, and Lake Superior sandstone is used. Some brownstone from the Long Meadow, Massachusetts, quarries has been used. At present the tendency toward increased use of fire-proof materials is quite noticeable, brick and terra cotta being apparently quite popular. Common brick is of local manufacture, while pressed brick comes from Saint Louis. For steep roofs on buildings of the best class some slate, chiefly from Pennsylvania quarries, and a little from Vermont, is used. Louisville, Kentucky, cement is applied in all cases where the best hydraulic qualities are needed; that is, for foundations, but for superstructural work the Milwaukee, Wisconsin, and Fort Scott, Kansas, cements are of most general application. Local cement of fair quality is also made in the vicinity of the city, and this is used to a limited extent. During the last three or four years the standard of excellence in buildings has perceptibly risen in this city.

*Saint Joseph.*—No stone is used for foundation work, concrete and brick answering for this purpose. Warrensburgh, Missouri, sandstone and oolitic limestone from Bedford, Indiana, supply most of the demand for stone-work in superstructures. Most of the buildings erected are of brick, very few frame houses being constructed. The brick used is chiefly of local manufacture.

*Saint Louis.*—Local limestone, quarried in various parts of the city, supplies all demands for foundation stone in the smaller structures and dwelling houses. For the largest buildings limestone from Grafton, Illinois, is most extensively used. For superstructures a great variety of building stones is used. Granite from the Allen quarries on the Iron Mountain railroad, 70 miles south of the city, and red sandstone from the Lake Superior region, are the stones most freely used for ornamental work. Gray and blue sandstone from Warrensburgh is also used to some extent, and red sandstone from Dunreath, Iowa, has also made its appearance. The Saint Louis brick, which is gaining a high reputation all over the West for fine quality, durability, and appearance, supplies all demand for brick in this city. For all ordinary purposes, Louis-



ville, Kentucky, cement supplies the demand. Imported English and German cements are used for the best classes of work. The slate, which is freely consumed, comes from Maine and Pennsylvania. The use of cement in rapidly erected tall buildings is customary, and in foundation work is very extensively used.

#### NEBRASKA.

*Lincoln.*—The limestone used for foundation work comes from the southeastern part of the State and from Kansas. Sandstone from Carroll county, Missouri, and from Cleveland, Ohio, is used for the best work in superstructures. Red sandstone from Colorado is also employed. The great majority of the buildings erected are frame structures. The building done in the past year is greater, so far as the number of buildings is concerned, than that which characterized the year 1887, but less money was invested in 1888. Lincoln is recognized as a local center of brick manufacture, and the brick used is of local manufacture, and large shipments are made to other places in the State. The clay used is difficult to work, but is of fine quality.

*Omaha.*—There is no good building stone quarried locally. The nearest is at a point 10 miles south of the city, where a hard limestone is found, and brick is therefore chiefly used for foundations. For ornamental work, however, sandstone from Missouri and from Berea, Ohio, is most popular. Sandstone from Colorado has also been freely used within the last few years. The amount of building done in 1888 hardly comes up to the figures for 1887, the strikes which have occurred in the last two years having produced quite a depressing effect on the building industry. Common brick is of local manufacture, while the best grades of pressed brick come from Chicago and Saint Louis. The foundations of buildings in Omaha are, in many cases, unreliable. This is due to the condition of the soil, which is, in some cases, quicksand or of soapy clay. On this account great care must be observed in laying the foundations of the larger buildings. The cement which is freely used in such walls comes mainly from Milwaukee and Mankato.

#### NEW JERSEY.

*Jersey City.*—Trap rock from Bergen Hill is the stone used for foundations, while Connecticut sandstone has long been and still continues the popular stone for superstructures. The buildings erected are about equally divided in number between brick and frame. The brick comes chiefly from the North river yards. The slate, comparatively little of which is used, comes from Pennsylvania.

#### NEW YORK.

*Albany.*—Limestone from Schenectady, New York, and also Howe's Cave, is most frequently used for rough work and foundations. Brown stone from Connecticut, and also from Long Meadow, Massachusetts, is the most popular sandstone. Some from Ohio is also employed.



*Brooklyn.*—Locally quarried stone is used for foundation work, while Connecticut brownstone and red sandstone from Ohio are the most popular for superstructural work. The value of the buildings erected in 1888 exceeds that of 1887, but the number erected is less, showing of course the erection of more expensive structures. Terra cotta, in connection with pressed brick, seems to be increasing in application more than any other ornamental material. Common brick comes from various places on the Hudson river, principally Haverstraw. The finest pressed brick comes from Philadelphia, Trenton, and Baltimore. Vermont slate is used extensively on steep roofs. Rosendale cement supplies most of the demand for this material.

*Buffalo.*—For foundation work a so called flint rock, locally quarried, is used. Local limestone and brown sandstone from Medina and vicinity, and sandstone from various localities in Ohio, are the most popular materials for ornamental work. Frame buildings are, however, largely in excess. The brick, mainly, is of local manufacture. Pennsylvania slate supplies the demand for slate roofing material. Akron, New York, cement is extensively used.

*Ithaca.*—Local bluestone of good quality and of uniform color is used for foundations. Red sandstone from Medina and sandstone from various points in Ohio are the most important stones used in superstructures. About 85 per cent. of the buildings erected are frame structures. The bulk of the brick used is of local manufacture, and is of good quality for all ordinary purposes. Maine and Pennsylvania slate and Rosendale cement supply the demand for these materials.

*New York City.*—All foundations in New York City are built of stone which, in many cases, is quarried on the site of the building. The stones used for superstructures, ornamental work, trimmings, etc., are of very great variety, coming from all parts of the United States. In addition to varieties which have long been in use in the city may be mentioned as recent innovations, oolitic limestone from Bedford, Indiana, and Salem, Ohio; also limestone from Bowling Green, Kentucky, and some imported from Nova Scotia and England. The choice of stone in this city is very largely a matter of taste, expense frequently being a matter of no consequence. The amount of building done in New York City was decidedly less in 1888 than in either 1885, 1886, or 1887, in which years there was, probably, an excess above immediate demands. All brick used in this city comes from points on the North and Hudson rivers, and from places in the vicinity of the city. In the consumption of slate the quarries of Pennsylvania and Vermont supply almost the entire demand. Slate cannot be regarded as generally popular in New York, as lighter materials are more generally called for. The rapid erection of tall and fine buildings calls for a very large consumption of cement. Of the domestic varieties the Rosendale is the most popular brand, while all kinds of imported cement are in use.

*Rochester.*—Limestone quarried locally supplies all the demand for foundation work. In many cases it is taken from the site of the build-



ing itself. Sandstone from Medina, New York, and from Long Meadow, Massachusetts, is the stone principally used for superstructures. The frame buildings erected are very greatly in the majority. The number of buildings constructed in 1888 was greater than that in 1887, but the money expended in building was less. There is at present a tendency to the increased use of fire-proof materials. This necessitates an increased use of iron in building. All common brick is of local manufacture, while the finest grades of pressed brick come from Trenton and Philadelphia. Maine slate supplies the demand. Cement from Buffalo and Akron is used, and also imported Portland cement. The tendency to mix cement with lime in common mortar is increasing from year to year.

*Syracuse.*—Foundations are built largely of Onondaga blue limestone, taken from quarries 7 miles south of the city. Gray limestone, taken from the same quarries, has been used for many years in superstructures, but in the finest ornamental work Ohio limestone and Long Meadow, Massachusetts, brownstone have been used to a large extent. Frame buildings outnumber brick or stone two to one. The amount of building done in 1888 was decidedly less than that of 1887. As in many other cities, the increased use of fire proof materials is very noticeable. This necessitates the use of iron beams and girders, and terra-cotta blocks. The brick made from the local clay is not of the best quality. It does not stand frost well. The best brick comes from Philadelphia and Trenton. Slate is used only to a limited extent, most of the roofs being covered with iron, tin, or shingles. Portland cement, manufactured at Warner's, New York, is quite popular, the brand most used being Millen's.

*Utica.*—Sandstone, quarried about 3 miles east of the city, and limestone from quarries 15 miles to the north and south, supply all demands for foundation stone, while for superstructural work and trimmings Connecticut and Massachusetts brownstone has long been popular. Frame buildings are very largely in the majority. The amount of building done in 1888 falls far short of that accomplished in the preceding year. Common brick is of local manufacture, while fine brick from Philadelphia and Trenton is used to some extent. Very little slate is used, the whole demand being supplied by that from the Bangor, Pennsylvania, quarries. Akron and Rosendale cement are used for all ordinary purposes, and imported Portland cement for finer work is used with comparative freedom.

#### NORTH CAROLINA.

*Wilmington.*—Concrete and brick foundations are constructed in the majority of cases, very little stone being used for this purpose. Brownstone from Wadesborough, Anson county, North Carolina, and granite from quarries in South Carolina are used for ornamental work. The vast majority of buildings erected are frame structures. Much less



building was done in 1888 than in 1887. Economy in building is a very important consideration and cheap edifices are the rule. Good common brick is locally manufactured. Some face brick comes from Philadelphia and Baltimore. Slate is used on steep roofs to a limited extent, and comes from Virginia.

#### OHIO.

*Cleveland.*—The sandstone obtained from quarries at Amherst, Berea, and Euclid are very freely used, not only in foundation work, but also in superstructures. Recently red sandstone from Pennsylvania and the Lake Superior region has been quite freely adopted. Eighty per cent. of the buildings erected are frame structures. The erection of fine residences is going on with great rapidity and with a decided improvement in taste over what characterized the city ten years ago. An increased use of fire-proof materials characterized the buildings erected for business purposes. Slate is quite freely used for residences. It comes uniformly from Pennsylvania and Maine. For all ordinary work cement from Akron, Ohio, and Louisville, Kentucky, is used.

*Toledo.*—Local limestone is used for foundation construction, and sandstone from Berea and Amherst, Ohio, quarries, together with some from Stony Point, Michigan, is popular for ornamental work. The widely known Bedford, Indiana, limestone has also come into use and is at present quite fashionable. The common brick used is manufactured in the immediate vicinity of the city. Slate from Michigan and also from Pennsylvania and Maine is used on all steep roofs. Cement comes from Louisville, Kentucky, and Milwaukee, Wisconsin.

#### PENNSYLVANIA.

*Harrisburg.*—For foundation construction limestone quarried in the city limits supplies the demand. For superstructures quite a variety of different stones is in common use, brown sandstone being the most prominent. It is quarried mainly at Hummelstown and Derry, Pennsylvania. Common brick is locally manufactured. Slate is used for steep roofs, and comes exclusively from the quarries in various parts of Pennsylvania.

*Philadelphia.*—Conshohocken stone is the most important foundation stone in use. Some from Leipsville and from Port Deposit, Maryland, is also in use. The most popular stone now used in ornamental work is the oolitic limestone from Bedford, Indiana. For this particular variety of stone Philadelphia is one of the most important markets. Hummelstown brownstone has long been used, and is very generally known throughout the city. Port Deposit granite is also quite freely used. Georgia marble for interior decoration has become quite popular in the last two or three years. The number of buildings annually erected in Philadelphia is larger than in any other city in the country. Very few tenement houses are in use, the large amount of territory



covered by the city rendering it possible for every person, if he so desire, to occupy his own house. Many dwellings erected are quite small. At present an imitation of English brick is being used, and is generally recognized as an innovation. Pennsylvania slate is quite elaborately used on roofs that call for that material. Cement is making quite rapid strides in replacing lime in all buildings which are rapidly erected. This is brought about partly by the fact that the lime produced in the vicinity is not a first-class article, containing such a percentage of magnesia as to interfere with its good qualities.

#### RHODE ISLAND.

*Newport.*—Granite found near the city is used in stone foundations. For ornamental work Nova Scotia sandstone is quite popular. During 1888 strikes interfered to quite a marked extent with the amount of building done. Common brick is locally manufactured, but the finest kinds are obtained from Philadelphia. Vermont supplies most of the slate used.

#### SOUTH CAROLINA.

*Charleston.*—Stone is not at all used in foundations. The use of brick is universal. The use of stone is restricted to sills and steps and ornamental trimmings, but the total amount used for such purposes is very small. Owing to a lack of knowledge in the erection of brick buildings they are not popular in this city. The trouble encountered in brick buildings is their dampness, which is the natural result of plastering immediately on the brick wall without leaving an air space between. The vast majority of buildings erected are frame structures. The recent earthquake in this city has also had its effect in increasing the erection of frame buildings rather than those of other materials. The same cause has resulted in an increased use of cement in foundation work. Slate is not so much used for roofing purposes as in the past, light materials having the preference.

#### TENNESSEE.

*Memphis.*—Very little stone is used for foundation construction, and that little consists of Alabama limestone. This stone, together with Bowling Green limestone and Buena Vista, Ohio, freestone, supplies the demand for ornamental stone. The vast majority of all buildings erected are frame structures. The amount of building done in 1888 is very decidedly less than that of the preceding year. The brick is of local manufacture and of fine quality. What little slate is used comes from Virginia.

#### TEXAS.

*Austin.*—Magnesian limestone from the immediate vicinity of the city is used for foundations. This, together with granite from Burnet, supplies the greater part of the demand for superstructural stone. Brick buildings outnumber frame. The common brick used is of local



manufacture and is of a straw color. The lime locally manufactured is of good quality, and for that reason is used to the exclusion of cement, which is in demand only for purposes requiring hydraulic material. Rosendale cement and various imported varieties are in general use. Some that has been obtained from San Antonio is found to compare favorably in quality with Rosendale cement, and it is therefore becoming quite popular.

*Dallas.*—No good stone is available for foundation work in this city, and for that reason brick is the material commonly used. For ornamental work and superstructures red sandstone from Colorado has long been popular. Granite from Burnet county has recently been used quite freely. The most of the dwellings erected are frame structures. Business blocks are chiefly of brick. The brick locally made is hard and strong but rather rough in appearance and irregular in size. Saint Louis pressed brick is used largely for fronts. Slate is very little used, but within the last two years its consumption for roofing purposes has increased. The so-called Alamo cement made at San Antonio is growing rapidly in public favor. It is regarded as being equal to the Rosendale cement in quality.

*Galveston.*—Foundations in this city are made of concrete and also of granite blocks from the central and western part of the State. Granite from Burnet county and magnesian limestone from various points in the central part of the State, with gray and brown sandstone from Brown and Leon counties, supply most of the demand for ornamental stone. The general character of the building done in 1888 is better than that of former years, but the number of buildings erected is less than in 1887. The common brick in use is of two kinds—red brick, weak in constructive strength but practically fire-proof, and a light brownish-gray brick very strong but incapable of resisting intense heat. The raw clay used is believed to be of good quality but the manufacture is defective. Pressed brick from Saint Louis and Philadelphia is used. Slate for steep roofs is quite popular; it comes largely from Virginia and some also from Pennsylvania quarries.

#### VERMONT.

*Brattleboro.*—So-called slate stone from local quarries, and to some extent granite, is used for foundations. For superstructures granite from East Dummerston, Vermont, sandstone from Long Meadow, Massachusetts, and marble from Rutland, Vermont, are the stones most used. Most of the buildings erected are frame structures. A limited supply of common brick is obtained from local yards. Large contracts are filled from yards at Greenfield and Montague, Massachusetts. Pressed brick comes from Boston and Philadelphia. Slate from Monson, Maine, and Bangor, Pennsylvania, supplies all demands for this roofing material. The lime locally produced gives good satisfaction without admixture of cement, and in exposed places above ground it is used by itself. The use of cement is confined to walls below the grade line.



## VIRGINIA.

*Lynchburgh.*—Granite which exists in abundance in the immediate neighborhood is used for foundations. There are no stone buildings in the city. Trimmings are of Richmond granite and Baltimore marble. There is at present an increased tendency to indulgence in ornamental work. This consists chiefly of terra-cotta and stone. All common brick and a coarse variety of front brick are manufactured in the vicinity. James river cement manufactured at Balcony Falls, Rockbridge county, Virginia, is the only cement used in large quantities.

*Petersburgh.*—The granite which has recently been developed at quarries near the city is used not only for foundation work, but also for superstructure. The quality of this stone is very fine, being exceedingly hard and susceptible of high polish. In addition to the use of this stone, brick is also largely used for foundations. Nearly all the brick used is manufactured locally and is of good quality. Buckingham county slate and James river cement are in liberal use and supply practically all demand for these materials.

*Richmond.*—Granite from quarries in and around the city and brown-stone from Alderson, West Virginia, are used for foundations and superstructures also. Ohio sandstone is also in use. The common brick is of local manufacture, the clay for this purpose being very good. Ornamental brick comes from Philadelphia and Baltimore. Buckingham county slate and James river cement supply all demands for these materials.

## WASHINGTON.

*Tacoma.*—The year 1888 was a period of great operations in the erection of buildings in this city. The causes for this great increase are chiefly the results of efforts to develop the natural resources of this region and the large immigration resulting from the boom. The completion of the Cascade division of the Northern Pacific railroad is also a cause of increased prosperity. Brick of good quality is locally manufactured. Slate is not used at all. Imported Portland cement is exclusively used, being brought to the city as ballast in ships.

## WISCONSIN.

*Milwaukee.*—Local limestone is used without exception in all foundations. For superstructures Ohio and Indiana limestones and sandstones from the Lake Superior region are generally used. The brick of local manufacture is buff in color, no red brick being made. All red brick is imported from other points. What little slate is used comes from Pennsylvania. Milwaukee cement supplies all demands for the domestic article. It is used in all good foundation work, but very little in walls above ground.



## GRANITE AND ALLIED ROCKS.

The value at the quarries of the granite and allied rocks produced during 1888 is estimated at \$8,000,000.

Following the plan already adopted in previous reports, tabular statements are presented below giving items of production and such other information as has been received from some of the granite producing localities.

*The production of granite in 1888.*

States.	Localities.	Value of product.	Remarks.
California.....	Los Angeles.....	\$45,000	This is the value for San Diego, San Bernardino, and Los Angeles counties. This granite is quarried in Placer county, where there are about fifteen quarries. Two new quarries were developed at Lincoln, Placer county, during the year.
	Sacramento.....	12,000	
Connecticut.....	Greenwich.....	70,000	A valuable ledge of black granite was discovered in this region in 1888, and it is expected that operations will be commenced during 1890.
	Sterling.....	20,500	
Georgia.....	Atlanta.....	467,000	
Maine.....	Addison Point.....	10,000	
	Biddeford.....	80,000	
	Deer Isle.....	150,000	
	Frankfort.....	175,000	
	Franklin.....	215,000	
	North Jay.....	87,500	
	Red Beach.....	40,000	
	Round Pond.....	6,500	
	Wayne.....	1,100	
	West Sullivan.....	194,000	
Maryland.....	Baltimore.....	30,000	
	Ellicott City.....	19,250	
	Granite.....	65,000	At this place there were 33,460 tons quarried. This represents a gain of over 5,000 tons over 1887.
Massachusetts.....	Port Deposit.....	149,702	
	Fitchburg.....	100,000	
	Monson.....		
	Northbridge.....	60,000	
	Northfield.....	4,000	
	North Uxbridge.....	50,000	
	Quincy.....	500,000	
	Rockport.....	325,000	
	Sherborn.....	1,350	
	Westford.....	11,250	
	West Quincy.....	100,000	
	Worcester.....	600,000	
New Hampshire.....	Concord.....	80,000	
	Milford.....	14,800	
	Nashua.....	10,000	
New Jersey.....	Avondale.....	75,000	
New York.....	Brooklyn.....	30,000	
	New York City.....	75,000	
Pennsylvania.....	Philadelphia.....	40,000	
Rhode Island.....	Diamond Hill.....	1,836	
	Niantic.....	160,000	
Vermont.....	Barre.....	276,000	
	Woodbury.....	3,000	
Virginia.....	Lynchburgh.....	45,000	
	Petersburgh.....	13,000	
Wisconsin.....	Berlin.....	65,000	
	Oshkosh.....	40,000	
	Washburn.....	125,000	



## GRANITE.

*New discoveries and developments.*—Considerable activity has been shown during the past year in the development of new sources of granite not only for building, but also for ornamental purposes. The popularity of granite for quite a variety of purposes is increasing noticeably from year to year. Its use for tombstones and monuments, in the majority of which cases it is polished, is increasing in the most encouraging manner. In this connection the tendency is of course to replace marble for these purposes, but it can hardly be said that the marble industry is perceptibly affected by the competition of granite.

*Arkansas.*—The prospectus of the Arkansas Granite Company, of Little Rock, Arkansas, has recently been received. Judging from it, and also what has already been accomplished by this company, expectations of a very prosperous business in the production of granite seem amply justified. The quarries operated by this company are situated on the southern boundary of Little Rock. The granite is properly a syenite, and is known as the Fourche Mountain granite of Arkansas. The following is an analysis of this granite, made under the direction of Dr. John C. Branner, State Geologist:

*Analysis of Fourche Mountain granite, Arkansas.*

	Per cent.
Silica.....	60.03
Ferric oxide.....	4.01
Ferrous oxide.....	.75
Alumina.....	20.76
Lime.....	2.62
Magnesia.....	.80
Phosphoric acid.....	.07
Potash.....	5.48
Soda.....	5.96
Manganese.....	Trace.
Water 100° to 115° C.....	.06
Loss on ignition.....	.53
Total.....	101.07

This granite is well adapted not only for building stone, but more especially for monumental work. The quarries now operated have been opened only a short time. The originator of these operations was Mr. D. O. Keefe, whose connection with the granite-quarrying business dates back to 1858. For twelve years he was superintendent of quarries in New England. In 1880 he opened the Granite Bend quarries of Missouri and was in charge there of a working force of 250 men, shipping from 10 to 15 car loads of paving blocks to Saint Louis every day. He visited Little Rock in 1887. Recognizing the value of the Fourche granite, he opened the quarries now controlled by the Arkansas Granite Company. Although the operations of this company are of such recent



date, the amount of business already done by it is quite considerable. It was awarded the contracts for furnishing paving blocks to the cities of Memphis and Louisville for the year 1889.

*California.*—During the year 1888 some very fine granite was taken from the quarries located in the foot hills near Pasadena. The future prospects of operations at this point are very good. The granite quarries at Victor, San Bernardino county, yield a very good granite for paving purposes. Operations are actively going on at quarries southwest of Colton. Operations at quarries situated 3 miles north of the Southern Pacific railroad, in the vicinity of Los Angeles, were commenced in March, 1887. Since that time over 75,000 cubic feet of stone have been shipped to Los Angeles and other places. The extent of the operations already conducted point unmistakably to future prosperity. The Pacific Granite Company has recently been organized at San Diego to work the granite quarry located in Temecula cañon.

*Georgia.*—The operations of the Venable Granite Company will be materially enlarged during the current year. The Central Railroad and Banking Company, with headquarters at Savannah, has recently purchased 55 acres of land, upon which it will quarry granite to be used in ballasting the main stem of its road from Savannah to Atlanta. A company has been organized to quarry granite on land situated near Rock Mart. In this connection it proposes to build a railroad from Douglasville to Rock Mart. The Georgia Quincy Granite Company, of Macon, has recently been organized with a capital of \$200,000. Quarrying operations will probably be prosecuted during the coming year. The quarries are situated near Sparta. A granite quarry near Covington, Georgia, is to be developed by Mr. R. L. Simms. The Southern Granite Company, of Atlanta, will materially enlarge the plant at its granite quarry.

*Maine.*—A company known as the Booth Brothers and Hurricane Isle Granite Company, with a capital of \$250,000, has been organized to carry on business in New York city and a number of other places for the purpose of quarrying granite. The operations in Maine will be conducted in Hancock, Knox, and Washington counties. The operations of the Mount Waldo Granite Company will be materially enlarged in the spring of the present year.

*Maryland.*—The Coulson granite quarries at Port Deposit have been leased by parties from Elkton, Maryland, for the purpose of producing granite. Mr. W. F. Weller, of Granite, Maryland, has recently leased a stone quarry there for the purpose of producing Belgian blocks. Extensive operations are expected for the latter part of the present year. A granite quarry has been discovered on the farm of Mr. W. V. Bouie, near Rockville, and it is the owner's purpose to develop the same.

*Massachusetts.*—A granite quarry, located at Treney, New Hampshire, has recently been purchased by capitalists of Worcester. It is to be de-



veloped during 1889. The active operations which have recently been conducted at quarries situated at East Bluehill have encouraged the opening of another quarry, from which stone will probably be taken during the present year.

*New Hampshire.*—The Granite State Stone and Slate Company has recently been organized at Portsmouth, with a capital of \$300,000. The company proposes to operate granite and slate quarries.

*North Carolina.*—Messrs. Grant and Egan have leased land near Wadesborough, upon which they will open granite quarries for the purpose of filling a contract to place 100,000 tons of stone on the jetties at Charleston, South Carolina. The granite quarry near Kernersville has recently been purchased for the purpose of developing granite. The Mount Airy Granite Company, of Mount Airy, has recently been organized with Mr. J. A. Odell, of Greensborough, as president. The Gray Stone Granite Construction Company contemplates enlarging operations, as is indicated by the fact that its capital stock has been increased from \$22,000 to \$42,000.

*South Carolina.*—The Southern Construction and Quarry Company, of Kentucky, represented in Columbia by Mr. R. A. Stewart, has purchased the Granby quarry, situated 3 miles from Columbia. This company expects to develop the quarry and build a railroad to it.

*Texas.*—The granite quarry at Marble Falls, Burnet county, is now attracting considerable attention on account of the quality of the stone and the fact that this stone is to be found in the new capitol building at Austin. Quarrying operations in this region are increasing notably from year to year. The Texas Capital Granite Company, operating in Burnet county, has not yet closed its contracts for furnishing 27,000 car loads of granite. To facilitate the fulfillment of this contract the company expects to add \$10,000 worth of machinery to the plant already existing at its quarries.

*Vermont.*—The Wetmore granite quarry at Barre has recently been purchased by a company of Montpelier capitalists. This property comprises 26 acres of land 4 or 5 miles from Barre village. Operations are to be started at this quarry during the present year.

*Virginia.*—The Glen Echo Granite Company, with a capital of \$100,000, has recently been organized at Alexandria for the purpose of developing granite quarries in Montgomery county, Maryland.

#### COMMON LIMESTONE.

*Production.*—The value of the common limestone produced in the United States during 1888 is estimated at \$6,250,000—*i. e.*, the same figure as for 1887. While there have been gains in production here and there, these have been offset by quite a considerable decrease in a number of important places, so that the total output is very little, if any, greater than that of 1887. The following tabular statements



give the value of the limestone produced in some of the regions during 1888:

*Production of the principal limestone regions in 1888.*

States.	Localities.	Value of product.	Remarks.
Illinois .....	Alton .....	\$2,700	This includes the whole of Will county. The production here was less than that for 1887.
	Belleville .....	4,558	
	Grafton .....	4,500	
	Joliet and vicinity .....	450,000	
	Kankakee .....	32,000	
	Lemont .....	427,250	
Indiana .....	Quincy .....	36,400	The demand for this stone is increasing markedly from year to year.
	Rockford .....	6,000	
	Bedford .....	400,000	
	Bluffton .....	10,000	
	Decatur .....	4,000	
	Ellettsville .....	54,795	
	Fort Ritner .....	30,000	
	Laurel .....	30,000	
	Logansport .....	5,000	
	New Point .....	40,000	
Iowa .....	Romona .....	77,000	This includes Decatur and Shelby counties.
	Ridgeville .....	1,000	
	Saint Paul .....	100,000	
	Wabash .....	14,000	
	Bedford .....	650	
	Burlington .....	13,500	
	Charles City .....	3,500	
	Davenport .....	10,000	
	Dubuque .....	54,174	
	Farley .....	7,125	
	Gilmore City .....	2,337	
	Iowa Falls .....	1,000	
	Mason City .....	9,000	
	Quarry .....	40,000	
	Stone City .....	127,200	
Kansas .....	Wapello .....	2,000	
	Augusta .....	11,250	
	Florence .....	40,000	
	Oketo .....	11,000	
	Winfield .....	81,750	
Kentucky .....	Warren county .....	60,000	
Michigan .....	Alpena .....	5,700	
Minnesota .....	Dundee .....	8,000	
	Duluth .....	100,000	
	Faribault .....	3,000	
	Kasota .....	110,000	
Missouri .....	Minneapolis .....	150,000	
	Red Wing .....	6,700	
	Marshall .....	6,500	
Nebraska .....	Springfield .....	34,050	
	Omaha .....	90,000	
New York .....	Auburn .....	1,950	
	Buffalo .....	47,600	
Ohio .....	Cobleskill .....	18,000	This amount was produced by 60 quarrymen in the northern part of Ohio, near Cleveland.
	Bloomville .....	3,000	
	Bluffton .....	13,000	
	Cincinnati .....	75,000	
	Cleveland .....	1,250,000	
	Covington .....	17,000	
	Columbus .....	6,000	
	Dayton .....	35,000	
	Greenfield .....	20,000	
	Kelly's Island .....	140,000	
	New Paris .....	5,400	See statement for Cleveland.
	Point Marblehead .....	36,000	
	Sandusky .....	6,250	
	Springfield .....	1,000	
	Sunbury .....	13,000	
	Tiffin .....	1,000	
	White House .....	11,250	



*Production of the principal limestone regions in 1888—Continued.*

States.	Localities.	Value of product.	Remarks.
Pennsylvania.....	Conshohocken.....	\$80,000	This includes a region of 10 miles in length in the Beaver valley.
	Homewood .....	220,000	
Wisconsin .....	Chippewa Falls.....	5,000	This stone was quarried at Duck creek.
	Fourtain City.....	2,750	
	Milwaukee .....	60,000	
	Neenah.....	2,000	
	Racine.....	55,000	
	Washburn.....	90,000	
	West DePere.....	9,000	

**MARBLE.**

*Production.*—The value of the marble produced in the United States during 1888 was \$3,000,000. This figure falls short of that reported for 1887. Although gains in production characterized certain regions, in others business was not so good as in the preceding year. The year 1888 may be regarded pre-eminently as one of preparation for the future, considerable enterprise having been shown in the development of new marble lands, and in making important additions to existing plants.

The production of marble at some of the important producing centers is shown in the following table:

*Production of marble in the principal regions in 1888.*

States.	Localities.	Value of product.	Remarks.
California.....	Amador county.....	\$5,000	This figure is the same as was given for 1887.
Georgia.....	Atlanta.....	125,000	The operations of quarrying in this region are discussed under the head of "New Developments."
	Tate.....	30,000	This is the value of the product thus far yielded in this locality; the work done in 1887 was of a preparatory nature. The future prospects are exceedingly good.
Maryland.....	Cockeysville.....	175,000	This figure is \$15,000 greater than that for 1887. The product is largely used in Baltimore.
New York.....	Pleasantville.....	20,000	The marble business in this State is reported not so good as in 1887.
	Tuckahoe.....	30,000	
Tennessee.....	Knox county.....	125,000	Production in this region is increasing rapidly and substantially, and from present appearances the output of 1889 will show a very material increase.
Vermont.....	Hawkins county....	100,000	
	Brandon.....	200,000	
	Rutland county.....	2,000,000	

*New discoveries and developments.*—An invention recently made in England by Messrs. Randall and Carter promises to be of some importance in rendering soft oolitic limestone impervious to the disintegrating action of the atmosphere. The process by which this is effected consists



in treating the stone with a solution in which a strong acid plays an important part. This solution acts upon the stone to the depth of about half an inch. The product of the action becomes incorporated with the stone, closing up the pores and giving the surface a marble-like appearance and character, and rendering it impervious to moisture. It is claimed that great additional strength is thereby imparted to the stone, the face of which is so hard that it can be polished to a surface as smooth as that which can be produced on marble or granite. Some stone prepared by this process before it was perfected was used in building a church five years ago. It is stated that not the slightest sign of disintegration has yet made its appearance. The process is now being used by the Oolite Marble Company, of London. The future of this process will undoubtedly be regarded with considerable interest by those interested in stone construction. The additional cost involved in the application of this process adds less than 5 per cent to the original cost of the stone.

Although the quantity of marble produced in the year 1888 falls somewhat below the product of 1887, it is at the same time true that in no previous year have so many new developments, additions to quarrying capacity, etc., been made as in 1888. The prospects of a large output during 1889 are exceedingly good in all the large marble-quarrying centers.

*Alabama.*—The Chewacla Lime Works of Chewacla are making preparations to quarry marble, which has been found on their "Spring Villa" property. The examination of this stone which has thus far been made indicates that it is of fine quality. Marble quarries in the vicinity of Talladega are being investigated with a view to their future development.

*Arkansas.*—Large deposits of a gray marble, easily worked and susceptible of a high polish, have been discovered in Searcy county. Judging from the quality of the stone, its future development seems probable.

*California.*—During the first part of 1888 very little work was done in actual quarrying of marble at the Inyo marble quarries, situated near Owen's lake. The superintendent, Mr. I. V. Luce, visited eastern sources of marble for the purpose of studying recent improvements in machinery. It is proposed by the operators of these quarries to equip them with the most improved appliances for taking out the largest blocks demanded by the trade. Making use of an improved method of blasting, the Inyo Marble Company has found that it can split out large blocks of marble without injuring or destroying them. The method is similar to that used in large sandstone quarries, and consists in drilling a hole half through the block and then cutting notches on each side of this in the direction of splitting. A small quantity of black powder is poured loosely into the hole, a fuse inserted, and a piece of wadding then forced into the hole, leaving a considerable air space between that and the powder. On firing the blast the block is neatly split without injury. The openings already made in these quarries allow the extrac-



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tion of blocks 25 feet in length by 10 or 12 feet in the other dimensions. The railroad has completed the new side track from the main line to the present works and the quarry dumps. Near Julian, in San Diego county, an immense ledge of white marble has been discovered. As soon as railroad facilities have been completed and the operations are under way, it is expected that quarrying operations will be commenced. Another ledge of marble has also been discovered in the San Gabriel mountains, in Los Angeles county. No developments are yet reported. A large deposit of unusually fine marble has also been discovered in the northern end of Death valley, San Bernardino county. The location is such that quarrying operations can be conducted without great cost.

*Georgia.*—Georgia marble continues to attract the attention which was bestowed upon it immediately after the commencement of the operations of the Georgia Marble Company. This marble is in great demand in a number of the largest cities of the country, particularly for the purposes of interior decoration. The Georgia Marble Company, of Tate, has been obliged to enlarge its plant and to introduce additional machinery for quarrying. A number of Wardwell & Ingersoll channelers have been purchased and put in operation. The American Marble Company, of Marietta, Georgia, will probably develop marble quarries during 1889, and ultimately it proposes to establish marble works. A quarry of black marble has been discovered at a distance of  $2\frac{1}{2}$  miles from Spring place and 9 miles from Dalton. It is proposed to develop these quarries at once.

*North Carolina.*—The Natla Consolidated Iron, Marble and Tale Company commenced operations at its quarries in the early spring of the present year. These quarries are situated at a distance of 5 miles from Murphy.

*Tennessee.*—The Tennessee Producers' Marble Company was incorporated, with a capital stock of \$200,000, early in the spring of the present year. The operations of this company will undoubtedly be very considerable. It will operate quarries of its own as well as others to be leased from various parties. The Standard Marble and Stone Company, of Chattanooga, contemplates the development of marble quarries at Loudon. Operations, however, have not yet been commenced. A marble mill will probably be built during the present year near Rogersville. The operations will include quarrying as well as the manufacture of marble. The Knoxville Marble Company has recently been reorganized. The quarries of this company are near Knoxville. Additional machinery is to be employed. A marble quarry is to be developed near Clarksville during 1889. New quarries have also been opened at Madisonville.

*Utah.*—Apparently valuable marble quarries have been located in Iron county. Samples from these quarries have been examined, and the quality of the stone appears to be sufficient to justify operations, which, however, have not yet been commenced.



*Virginia.*—Quarries in the neighborhood of Roanoke will probably be developed during the summer of 1889.

*Washington.*—Four miles south of Rattle Snake springs an extensive ledge of landscape marble has been discovered. The stone is very attractive in appearance, but as yet no quarrying operations have been inaugurated.

### SANDSTONE.

*Production.*—The value of the sandstone produced in the United States in 1888 is estimated at \$6,750,000, a figure only \$250,000 greater than the value of the product of 1887. While the gains in production in Ohio, Colorado, and one or two other western localities, were quite striking, they were offset by a falling off in production in New York State.

The developments in Colorado are very promising for an increased output in 1889. Sandstone production in Michigan and Wisconsin also bids fair to become quite considerable in the course of a few years.

The following items of information in regard to important localities are presented :

*Production of sandstone in the principal localities in 1888.*

States.	Localities.	Value of product.	Remarks.
Colorado.....	Denver .....	\$50,000	This was produced at Buckhorn, Lyons, Stout, and Fort Collins.
	Fort Collins .....	200,000	
	Trinidad .....	30,000	
Idaho.....	Boisé City .....	2,160	
Iowa.....	Dunreath .....	106,300	
Kansas.....	Ritchie .....	1,000	
Michigan.....	Craig .....	175,000	A part of this product was quarried at Grindstone City and Caseville.
	Detroit .....	90,000	
Minnesota .....	Marquette .....	160,000	
	Duluth .....	32,000	
	Fond du Lac .....	35,000	
	Minneapolis .....	166,440	
	Pipe Stone .....	5,610	
New Jersey .....	Winona .....	2,150	
	Avondale .....	63,000	
	Martinsville .....	6,000	
	Newark .....	200,000	
	Stockton .....	125,000	
	Wilburtha .....	60,000	
	Albany .....	23,000	
New York.....	Atwater .....	3,300	
	Brooklyn .....	450,000	
	Cooperstown .....	410	
	Hulburton .....	100,000	
	Jamestown .....	5,250	
	Malden .....	1,100,000	This includes the value of all bluestone in this State. This was produced by sixteen firms near North river. About 20 per cent. of this was used for building; the remainder for street purposes.
	New York.....	900,000	
	Pond Eddy .....	600,000	
	Phœnicia .....	14,000	
	Saugerties .....	1,250,000	
	Schenectady .....	25,000	
	Walton .....	12,000	



*Production of sandstone in the principal localities in 1888—Continued.*

States.	Localities.	Value of product.	Remarks.
Ohio .....	Akron .....	\$5, 100	This was produced by quarries situated in the northern counties of this State, chiefly Cuyahoga and Loran. It does not include Buena Vista stone.
	Bedford .....	3, 000	
	Buena Vista.....	30, 000	
	Cincinnati.....	51, 000	
	Cleveland .....	700, 000	
	Columbus .....	2, 550	
	Elyria .....	100, 000	
	Newark .....	7, 980	
	Peninsula .....	7, 500	
	Steubenville.....	6, 000	
Pennsylvania.....	Twinsburgh.....	2, 900	See chapter on "New Discoveries and Developments."
	Zanesville .....	13, 750	
	Meshoppen and vicinity.	50, 000	
	Nicholson .....	88, 000	
	Reading .....	18, 600	
Wisconsin .....	Skinner's Eddy.....	80, 000	
	Yardley .....	130, 000	
	Ashland .....	125, 000	

*New discoveries and developments.*—The California Stone Company has recently been incorporated to work sandstone quarries in Kern county, California. The capital stock of the company is \$25,000. The Wadesborough Brown Stone Quarry Company has recently added new machinery to its quarry plant, which is situated near Wadesborough, North Carolina. The development of sandstone quarries in Colorado continued during 1888 with undiminished activity. The quarries of this State are capable of supplying the very best quality of sandstone of all varieties of color. A large portion of this Colorado sandstone is shipped to the Missouri River valley, whence it goes to a large number of cities in the west, and south as far as New Orleans. The rapid rise of the sandstone business in Colorado has called forth many comments from persons interested in stone production.

The operations of the Cleveland Stone Company, working quarries at some fourteen or fifteen different localities, are at present regarded with much interest by those engaged in the sandstone business. One of the most important localities at which the operations of this company are conducted is Berea, Ohio. At this place large and very extensive quarries are being actively operated by a force of 600 men. In connection with the quarries are two plants for sawing and manufacturing the stone into flagging. A grindstone mill is also on the spot, from which grindstones of all sizes and thicknesses are rapidly turned out for shipment to all parts of the country. The quarrying operations are conducted with all the most modern improvements. The method of blasting is a patented process, and, briefly described, consists in drilling holes of the depth of about 6 feet at short intervals in the line along which the



stone is to be split. In this line holes of less depth are drilled at intervals to determine the direction of the split. Into the deeper holes is placed a small charge of black powder. Above this, and inclosing a column of air below it, is placed a wad, which is then tamped in place. The edges of the hole containing the powder are then notched in the direction of the split. Upon firing the powder by means of an electrical fuse, the rock is split with perfect smoothness and without chipping or breaking along the intended line. This blasting process is only applied when very large blocks are to be taken out. In cutting the largest blocks into smaller sizes channeling machines are freely used. Still smaller blocks may be cut by means of wedges. The stone splits with the greatest ease and into quite thin slabs. All the quarrying operations are conducted with ease and certainty, as the structure of the stone is so perfectly uniform that safe predictions in regard to its conduct in the various operations may be made. The company has recently purchased a large amount of additional property situated in the town. A considerable amount of this property was used for residences of the inhabitants. On a part of it stands the Berea College, which is to be moved to give way to the quarrying operations. The demand for this stone is very great, and operations are limited only by the transportation facilities. As many as 78 car loads per day are shipped from the quarries. The earth lying above the stone is stripped by means of steam shovels, which operate with great rapidity. During the winter the entire force of men is employed in stripping operations to prepare for the quarrying of the coming season. A certain force, however, is employed the year round in stripping off the earth, which has an average depth of 25 feet. The stone itself is quarried to a depth of 40 feet, at which point it is found to be comparatively inferior in quality, and is therefore not quarried. It is the policy of the company to buy up only such property as will yield easily-quarried stone.

Within the last two years the Prentice Brown Stone Company has been operating sandstone quarries at Houghton, Bayfield county, Wisconsin. The main office of the company is at Ashland, Wisconsin. Branch offices are also located at the quarries and in New York City. The company has been incorporated under the laws of the State of Wisconsin, with a capital of \$1,250,000. The property comprises 578½ acres of land, all underlaid with brown stone. The present plant includes five steam channelers, together with other machinery of the most improved character. Explorations have been liberally made, and there seems to be little doubt that the supply of this brown stone is practically inexhaustible, and it is believed to be only a question of men, machinery, and transportation facilities to furnish very large quantities of stone. The product of these quarries is already well known in the following cities: Chicago, Cincinnati, Saint Louis, Saint Paul, Minneapolis, Kansas City, and Omaha. The Chicago, Saint Paul, Minneapolis and Omaha railroad has extended side tracks to the quarries, and cars are now



supplied immediately at the works and are rapidly loaded by means of machinery. The president of the company is Mr. Frederick Prentice, to whose energy and activity the magnitude of the present operations is due. The property operated by the company was purchased by Mr. Prentice thirty-four years ago with the idea of ultimately quarrying the brown stone which was known to exist there. The time appears to have come now when transportation facilities are sufficient for shipment to cities in the East as well as to the larger Western cities. The stone is easily quarried, and there is very little waste. The operations conducted previous to the year 1888 amounted to very little in comparison with the work done since that time. There are now about 60 acres cleared for quarrying purposes, and the operations of clearing away surface material are steadily going on. The ultimate prosperity of the company seems already entirely assured as well as the magnitude of the operations which it will carry on.

## SLATE.

*Product.*—The following table shows the product of slate for the years 1884 to 1888, inclusive :

*Product of roofing slate in all sections during the years 1884 to 1888.*

[Squares of 100 square feet each.]

Sections.	1884.	1885.	1886.	1887.	1888.
Bangor and Pen Argyl region, Pennsylvania .....	195,505	196,832	215,341	230,000	260,000
Slatington region, Pennsylvania .....	104,000	108,000	109,000	112,000	114,000
Chapman's, Pennsylvania .....	29,499	26,328	24,464	28,439	42,000
Peach Bottom, Pennsylvania .....	10,000	14,500	12,000	20,000	19,000
Maine .....	41,000	34,000	36,000	37,000	37,000
Michigan .....	7,000	10,000	12,000	7,200	7,000
Vermont .....	85,000	130,000	111,385	120,000	160,000
Virginia .....	9,000	17,300	16,600	19,000	17,400
New Jersey .....					6,000
Total .....	481,004	536,960	536,790	573,639	662,400

*Total yearly product of roofing slate from 1879 to 1888, inclusive.*

Years.	Number of squares.	Average price per square, delivered on cars.	Value.
1879 .....	367,857	.....	.....
1880 .....	382,867	.....	.....
1881 .....	454,070	.....	.....
1882 .....	501,000	.....	.....
1883 .....	506,200	.....	.....
1884 .....	481,004	\$3.85	\$1,851,865
1885 .....	536,960	3.07	1,648,467
1886 .....	536,790	3.00	1,610,370
1887 .....	573,439	3.00	1,720,317
1888 .....	662,000	3.10	2,053,440

The above table shows the year 1888 to have been the most prosperous one, so far as product is concerned, of all the years considered. The



average price also, while not coming up to that of 1884, is higher than for any other year since 1884.

The demand for slate is extending from year to year not only in regions which have long employed it as a roofing material, but also in sections of the country, particularly in the West and South, where its use is almost, if not entirely, new. There appears to be among architects no prejudice against slate, while the same statement can by no means be made of roofing tiles.

*Prices.*—The prices of slate in New York for different times are given in the following table, which shows a decidedly more encouraging condition of business than last year:

*Comparative prices of roofing slate at New York January 1.*

	1885.		1886.		1887.		1888.		1889.	
Purple .....	\$6.00 to \$7.00		\$6.00 to \$7.00		\$5.00 to \$6.00		\$5.00 to \$6.00		\$6.00 to \$7.50	
Green .....	6.00	7.00	6.00	7.00	5.00	6.00	5.00	6.00	6.00	7.50
Red .....		15.00		15.00		10.00		12.50	12.00	15.00
Black .....	4.50	5.00	4.50	5.00	3.50	4.00	3.50	5.00	4.25	5.50

*Exports.*—The exports of roofing slate from New York show a very large gain, as indicated by the following tables. The increase in the amount exported to British Australia is particularly noticeable, the figure for 1887 being 2,303,551 pieces, while for 1888 it is 4,125,858. This favorable competition with England in one of her own provinces must be very gratifying to American producers, as it probably means an advantage in quality as well as in price.

*Exports of roofing slate from New York for 1888.*

Destinations.	Pieces.	Value.
South America .....	68,600	\$2,700
West Indies .....	68,490	2,739
Africa .....	12,600	351
New Zealand and Tasmania .....	78,067	2,244
British Australia .....	3,898,101	108,085
Total .....	4,125,858	116,119

*Exports of roofing slate from the port of New York from 1876 to 1888, inclusive.*

Years.	Tons.	Pieces.	Value.
1876 .....	10,475	646,985	\$377,233
1877 .....	25,565	2,895,428	646,272
1878 .....	12,320	1,834,225	308,852
1879 .....	4,792	3,085,124	166,220
1880 .....	11,207	1,698,522	220,292
1881 .....	2,027	3,522,527	138,004
1882 .....	864	4,537,801	153,318
1883 .....	187	1,488,226	54,063
1884 .....	50	2,776,236	90,262
1885 .....		4,113,204	115,200
1886 .....		2,825,246	79,064
1887 .....		2,303,551	62,072
1888 .....		4,125,858	116,119



*Exports of manufactured slate from the port of New York, 1876 to 1888, inclusive.*

Years.	Cases.	Value.	Years.	Cases.	Value.
1876.....	10,612	\$87,500	1883.....	8,943	\$40,674
1877.....	8,675	68,437	1884.....	12,189	53,021
1878.....	13,274	88,215	1885.....	10,573	49,965
1879.....	17,505	74,251	1886.....	9,498	40,804
1880.....	15,674	76,709	1887.....	9,433	39,560
1881.....	14,414	62,109	1888.....	11,538	46,142
1882.....	14,625	68,150			

*Exports of all kinds of slate from the port of New York, 1876 to 1888, inclusive.*

Years.	Value.	Years.	Value.
1876.....	\$464,733	1883.....	\$94,737
1877.....	714,709	1884.....	143,283
1878.....	397,067	1885.....	165,171
1879.....	240,471	1886.....	119,868
1880.....	297,001	1887.....	101,612
1881.....	201,013	1888.....	162,261
1882.....	221,468		

The consumption of slate for purposes other than roofing or building is becoming greater every year, as its adaptability to new uses becomes apparent. In Vermont alone about 2,000,000 square feet, 1 inch thick, are worked up into various mill products. This amount is valued at from \$350,000 to \$400,000.

*New discoveries and developments.*—A discovery of slate which bids fair to be of considerable importance was incidentally made by the Eldorado Big Tunnel and Mining Company, while prosecuting the driving of a tunnel 3,400 feet in length on their mining property. At a distance of 470 feet from the mouth of the tunnel a large mass of superior slate was met with. Its quality, according to the opinions of experts, is very fine. Operations of quarrying the slate have already begun, and it is probable that the report for 1889 will show a record of production during that year.

Preparations made by the State of Maine Slate Company in adding considerably to their plant at the Blanchard quarry indicate a decidedly increased output for 1889.

In the Vermont slate region during the past year a slate combination, otherwise known as the "slate trust," was formed. Each member was required to deposit 10 cents for every square of slate sold, as a guaranty that he would not violate the rules or deviate from the schedule of prices established by the organization. After an existence of ten months these deposits aggregated about \$12,000, which amount was then divided among the members, all having been faithful to the terms of agreement. The formation of this combination doubtless had much to do with the better prices which have prevailed during the past year. Similar combinations have been formed in other slate regions.



During the year a stock company was formed to develop slate property in Blount county, Tennessee; it is probable that an output will be reported for the year 1889.

Developments of slate property in the vicinity of Rock Mart, Georgia, were also under way during the year.

Slate deposits at Tellico Plains, Tennessee, were examined by experts during 1888, and the quality was found to be such as to justify quarrying operations, which may be prosecuted during the current year.

*Marble imported and entered for consumption in the United States, 1867 to 1883, inclusive.*

Fiscal years ending June 30—	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, Brocatella, etc.	Not otherwise specified.	Total.
1867.....						\$192,514	\$2,540	\$51,978	\$247,032
1868.....						309,750	4,403	85,783	399,936
1869.....						359,881	3,898	101,309	465,088
1870.....						332,839	3,713	142,785	479,337
1871.....	\$5,973	\$168	\$77	\$44	\$28	400,158	1,134	118,016	525,598
1872.....	3,499	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.....	108	11	8			376,936	592	43,915	421,660
1879.....	184					329,155	427	54,857	384,623
1880.....						331,908	7,239	62,715	601,862
1881.....	339					470,047	1,468	82,046	553,900
1882.....	655					486,331	3,582	84,577	575,145
1883.....	619					533,096	2,011	71,905	607,631

During the calendar years ending December 31, from 1886 to 1888, and fiscal years ending June 30 for 1884 and 1885, the classification has been as follows:

Classification.	1884.	1885.	1886.	1887.	1888.
Marble:					
In blocks, rough or squared, of all kinds.	\$511,287	\$429,186	\$408,895	\$355,648	\$357,220
Veined marble, sawed, dressed, or otherwise, including marble slabs and marble paving tiles.	12,941	43,923	96,625	142,405	107,957
All manufactures of, not specially enumerated.	67,829	54,772	44,053	31,880	69,086
Total.	592,057	527,881	549,573	529,933	534,263



*Marble and stone, and manufactures of marble and stone, of foreign production exported from the United States, 1872 to 1888, inclusive.*

Years. (a)	Value.	Years. (a)	Value.
1872 .....	\$1, 229	1881 .....	\$769
1873 .....	4, 571	1882 .....	4, 848
1874 .....	1, 928	1883 .....	490
1875 .....	3, 428	1884 .....	3, 420
1876 .....	13, 371	1885 .....	14, 406
1877 .....	8, 475	1886 .....	2, 251
1878 .....	3, 448	1887 .....	3, 738
1879 .....	6, 364	1888 .....	6, 174
1880 .....	6, 816		

a Calendar years ending December 31 from 1886 to 1888; previous years end June 30.

## CEMENT.

*Production.*—The following table shows the product of the natural rock cements in the leading districts during 1888:

*Production of cement from natural rock in the leading districts in 1888.*

Localities.	Barrels of 300 pounds.	Localities.	Barrels of 300 pounds.
Rosendale, Ulster county, N. Y.	2, 262, 984	Howes Cave, New York .....	49, 256
Akron, New York .....	715, 000	Eastern Ohio .....	80, 000
Louisville, Kentucky .....	1, 214, 000	Onondaga, New York .....	250, 000
La Salle, Illinois .....	332, 055	Kansas City, Missouri .....	50, 000
Mankato, Minnesota .....	160, 000	Cement, Georgia .....	20, 000
Milwaukee, Wisconsin .....	400, 000	Virginia, Texas, and New	
Lehigh Valley, Pennsylvania ..	400, 000	Mexico .....	180, 000
Potomac River .....	100, 000		
Fort Scott, Kansas .....	40, 000	Total .....	6, 253, 295

The average price per barrel of the above natural rock cement was 72½ cents, making a total of \$4,533,639 as the value of the product of 1888.

The following tables show the product for the past seven years:

*Product of cement made from natural rock in the United States from 1882 to 1888.*

Years.	Barrels of 300 pounds.	Average price per barrel.	Total value.
1882 .....	3, 165, 000	\$1. 10	\$3, 481, 560
1883 .....	4, 100, 000	1. 00	4, 100, 000
1884 .....	3, 900, 000	. 90	3, 510, 000
1885 .....	4, 000, 000	. 80	3, 200, 000
1886 .....	4, 350, 000	. 85	3, 697, 500
1887 .....	6, 692, 774	. 77½	5, 186, 900
1888 .....	6, 253, 295	. 72½	4, 533, 639



*Estimated product of American Portland cement from 1882 to 1888.*

Years.	Barrels of 400 pounds.	Average price per barrel.	Total value.
1882 .....	85,000	\$2.25	\$191,250
1883 .....	90,000	2.15	193,500
1884 .....	100,000	2.10	210,000
1885 .....	150,000	1.95	292,500
1886 .....	150,000	1.95	292,500
1887 .....	250,000	1.95	487,500
1888 .....	250,000	1.95	487,500

The total product of all kinds of cement during the past six years was about as follows:

*Total product of all kinds of cement in the United States from 1882 to 1887.*

Years.	Barrels.	Value.
1882 .....	3,250,000	\$3,672,750
1883 .....	4,190,000	4,293,500
1884 .....	4,000,000	3,720,000
1885 .....	4,150,000	3,492,500
1886 .....	4,500,000	3,990,000
1887 .....	6,942,744	5,674,400
1888 .....	6,503,295	5,021,139

*Imports of cement at New York, in casks of 400 pounds.*

Years.	From Great Britain.	From Eu- ropean continent.	Total casks.	Cost on pier per cask.	Total value.
1877 .....	47,632	10,818	58,450	.....	.....
1878 .....	51,477	19,040	70,517	.....	.....
1879 .....	80,834	25,212	106,046	.....	.....
1880 .....	120,833	45,080	165,913	.....	.....
1881 .....	149,486	73,186	222,672	.....	.....
1882 .....	171,202	190,924	362,126	\$2.60	\$941,528
1883 .....	158,602	143,363	301,965	2.70	815,306
1884 .....	155,477	201,085	356,562	2.50	891,405
1885 .....	187,955	250,860	438,815	2.05	899,571
1886 .....	261,464	301,687	563,151	.....	.....
1887 .....	432,327	385,903	818,230	.....	.....
1888 .....	501,958	399,798	901,756	.....	.....

*Cement imported and entered for consumption in the United States, 1868 to 1888.*

Years. (a)	Quantity.	Value.	Years. (a)	Quantity.	Value.
	<i>Barrels.</i>			<i>Barrels.</i>	
1868 .....		\$10,168	1879 .....		\$212,719
1869 .....		9,855	1880 .....		373,264
1870 .....		18,057	1881 .....		441,512
1871 .....		52,103	1882 .....	370,406	683,684
1872 .....		172,339	1883 .....	456,418	862,294
1873 .....		209,097	1884 .....	(b)585,768	825,695
1874 .....		286,429	1885 .....	554,396	874,070
1875 .....		261,741	1886 .....	915,255	962,649
1876 .....		247,200	1887 .....	1,514,095	1,470,846
1877 .....		201,074	1888 .....	1,835,504	1,731,456
1878 .....		184,086			

a Calendar years ending December 31 from 1886; previous years end June 30.

b Classed simply as cement; kind not specified since 1883. It is probable, however, that about 95 per cent. of the total imports is Portland cement.



*Comparative prices per barrel of cement in New York January 1, 1885 to 1889.*

	1885.	1886.	1887.	1888.	1889.
Rosendale.....	\$1.00	\$1.10 to \$1.25	\$1.20 to \$1.25	\$1.15 to \$1.20	\$1.15 to \$1.20
Portland .....	\$2.50 to 3.00	2.25 2.50	2.00 2.25	2.25 2.50	2.10 2.35
Roman .....	2.75 3.50	2.75 3.25	2.65 2.85	2.65 2.85	2.65 2.85
Keene's com- mon.	5.00 6.00	4.50 6.00	4.50 5.50	4.50 5.50	4.50 5.50
Keene's fine...	9.50 10.00	9.00 10.00	7.50 8.50	7.00 8.25	7.00 8.25

*New developments.*—The Catasauqua Cement Company established a new mill at Catasauqua, Lehigh county, Pennsylvania. The capacity of the mill is estimated at an annual product of 100,000 barrels.

A new mill, capacity 400 barrels per day, was established in the Louisville, Kentucky, cement region during 1888; also one at Fort Scott, Kansas, with an annual capacity of 150,000 barrels.

A new discovery of cement rock was made during the year at Llewellyn, Lane county, Oregon. The material, when burned, yields a product of very satisfactory properties, and there are indications that the deposit will be developed.

Cement rock, which upon analysis showed very satisfactory composition, was discovered during the year at some point between Ogden and Provo City, Utah Territory. Efforts were being made during the year to form a company to develop and manufacture it.

A suggestion was made in the latter part of 1888 to make use of materials, suitable for the manufacture of Portland cement, which are to be found in large quantities in the vicinity of Charleston, South Carolina. It remains yet to be seen, however, whether the suggestion is to be carried out.

*Cement tests.*—At a meeting of the Engineers' Club of Philadelphia, Mr. A. Marichal read a paper upon the testing of cements, calling the attention of the club to the waste of money resulting from the incomplete knowledge of the properties of cements. Some engineers spend many hundred dollars to test their cement; yet the mortar used in their work is not worth a penny. The author noted the following points: If masonry work is made under contract, the specifications should state the required properties of the mortar and not of the cement. A cement may give splendid results when tested by itself, and yet the mortar may be of the poorest kind. Tests of pure cement alone are entirely useless. When the object is to determine the relative value of different brands of cement, tests should be made with different proportions of sand in order to ascertain which is the most economical cement. These tests should be made under similar conditions: the temperature, the manipulation, the quality of sand, the speed and uniformity in applying the load, etc., are all important factors. They should be constant; otherwise the results will not be reliable. The compressive strength is of the greatest importance in ordinary construction. Unfortunately it can-



not be ascertained with any degree of accuracy. The cement is injured before it is crushed.

It was observed that an expansion of 4 per cent. was taking place in a cement pavement. It was due to the hydration of magnesia contained in excess in the cement. As a test, mortar should be placed in a glass tube and some water poured on top. If the glass breaks, the cement is unfit for work exposed to dampness, and should be analyzed.

*Magnesia cement.*—The *London Engineer* says: Attention is being directed to the use of magnesia as a cement. The need of finding some use for the refuse magnesia salts arising as by-products in the manufacture of potash at Stassfurt has caused the subject to attract attention again. The question is of all the more importance in that the other compounds, the chlorides combined with the magnesia at Stassfurt, are valuable for the production of bleaching powder and hydrochloric acid. When Sorel pointed out, in 1867, that a cement could be produced by mixing chloride of magnesium and magnesia, it was hoped that good results would ensue. The composition of this cement was based upon much the same principle as the white stopping used by dentists, made of zinc oxide and chloride of zinc. This cement of Sorel, in spite of many attempts to use it, proved a failure in consequence of a tendency, often noticed also in calcareous cements, to swell and blow, owing to deferred hydration. Dr. Grundmann, of Hirschberg, has recently invented a new method of treating the magnesia, for whereas formerly the material was merely calcined and made up with water, he now carefully slakes the calcined magnesia, and subsequently exposes the compound or casting to the action of carbonic-acid gas, much in the same way that builders have been in the habit of drying and hardening plastered rooms by confining the air and burning coke in them, so as to liberate carbonic acid gas. The natural carbonate of magnesia, known as magnesite, is a mineral of great hardness and density, and the similar substance obtained by the above treatment resembles magnesite in its hardness and in its capacity for taking a good polish. Grundmann also employs the magnesia as a cementing agent for various materials. For instance, by the use of marble dust an artificial dolomite is obtained. The magnesia can also be improved by adding to it soluble silicates of the nature of water glass, and it can be used as a stucco for building purposes.

#### LIME.

The product of lime in the United States during 1888 is estimated at 49,087,000 barrels, valued at \$24,543,500.

The following table shows the product and value of lime for the past seven years:



*Estimated product of lime in the United States from 1882 to 1888.*

Years.	Barrels of 200 pounds.	Average value at kiln.	Total value.
1882 .....	31,000,000	\$0.70	\$21,700,000
1883 .....	32,000,000	.60	19,200,000
1884 .....	37,000,000	.50	18,500,000
1885 .....	40,000,000	.50	20,000,000
1886 .....	42,500,000	.50	21,250,000
1887 .....	46,750,000	.50	23,375,000
1888 .....	49,087,000	.50	24,543,500

Following the plan pursued in the report for 1887, the following is a presentation of statistics and other information relative to the lime production of a number of localities in the United States:

*Product of lime in selected districts of the United States.*

States.	Localities.	Production, barrels of 200 pounds.	Remarks.
California.....	San Francisco .....	147,000	This figure represents the lime consumed in San Francisco during the year. It was produced at kilns in Santa Cruz, El Dorado, and Kern counties.
Connecticut .....	Canaan .....	102,000	This is the output of four operators; three in Canaan and one in Clayton, Mass., two miles from Canaan.
	Danbury.....	45,000	This includes the output of Danbury, Redding, and Brookfield.
	Fairfield county (entire).	50,000	
District of Columbia..	Washington .....	100,000	
Illinois .....	Alton.....	46,620	One new kiln; capacity, 180 bushels per day.
	Anna.....	3,000	
	Kankakee .....	16,000	
	Port Byron .....	110,000	
Indiana.....	Quincy.....	250,000	
	Huntington.....	371,000	
	Markle.....	72,800	
Iowa.....	Maquoketa .....	152,500	
	Wilton Junction .....	100,000	
Maine .....	Knox county (entire).	1,750,000	
	Rockland .....	1,215,884	This figure is of course included in the above figure for Knox county. Two new kilns at Rockland were built during the year, combined capacity of 1,500 barrels per week.
Maryland.....	Rockport .....	200,000	Including Camden.
	Baltimore.....	230,000	
	Buckeystown .....	245,000	
	Cockeysville .....	227,000	
	Lime Kiln .....	262,500	
	Texas .....		Included in report for Cockeysville.
Massachusetts.....	Adams.....	60,000	
	New Lenox .....	19,035	
	North Adams.....	100,000	
Michigan .....	Detroit .....	73,100	
Minnesota .....	Red Wing .....	120,000	
	Saint Paul .....	6,400	
Montana.....	Helena.....	80,000	
Missouri.....	Ash Grove.....	320,875	This figure includes the products of Ash Grove, Springfield, and Phoenix.
	Cape Girardeau.....	15,000	



*Product of lime in selected districts of the United States—Continued.*

States.	Localities.	Production, barrels of 200 pounds.	Remarks.
Missouri.....	Carthage.....	350,000	This includes South Springfield.
	Hannibal.....	300,000	
	Pierce City.....	70,000	
	Saint Louis.....	275,757	
	Springfield.....	90,000	This figure is also included in that given for Ash Grove.
New Jersey.....	Califon.....	40,950	
	Clinton.....	70,000	
New York.....	Buffalo.....	100,000	
	Elmira.....	14,000	
	Rochester.....	80,215	
	Sodus Centre.....	42,000	
	Tomkins Cove.....	57,862	
	Troy.....	16,800	
Ohio.....	Canton.....	8,750	
	Casey.....	29,750	
	Cincinnati.....	33,250	
	Cleveland and vicinity	600,000	This includes Kelly's Island and Sandusky.
	Fremont.....	60,000	
	Gibsonburgh.....	100,000	
	Marion.....	262,500	Including the whole of Marion county.
	Owen's Station.....	119,700	
	Rocky Ridge.....	74,000	
	Sandusky.....	375,000	This is included also in figures for Cleveland.
	Springfield.....	255,500	A part of this was produced at Cedarville and Yellow Springs.
	Woodville.....	37,192	
	Yellow Springs.....	17,500	
Pennsylvania.....	Allentown.....	70,000	
	Annaville.....	105,000	
	Bellefonte.....	180,000	One new establishment, capacity 900 bushels per day, was erected this year.
	Easton.....	50,500	
	Erie.....	12,611	
	High Spire.....	35,000	
	Keystone Junction.....	70,000	
	Philadelphia.....	1,218,093	This amount was manufactured in the following places: Philadelphia, Plymouth Meeting, Norristown, Bridgeport, and Fort Washington.
	Pittsburgh.....	26,618	
	Plymouth Meeting.....	318,500	
	Scranton.....	26,250	
	Wampum.....	146,300	This includes Duck Run on P. and W. R. R.
	Winfield.....	56,000	Including Penny's Store and Shamokin.
Tennessee.....	Erin.....	100,000	
Texas.....	Austin.....	128,975	
	San Antonio.....	500	
Vermont.....	Leicester.....	50,000	
	Plymouth.....	2,500	
	Plymouth Union.....	4,000	
	Saint Albans.....	157,500	One new kiln, capacity 100 barrels per day, was erected during the year.
Virginia.....	Middletown.....	14,000	
	Richmond.....	158,000	This includes Indian Rock and Riverton.
	Riverton.....	72,000	
	Tonis Brook.....	26,880	
Wisconsin.....	Mayville.....	145,000	
	Milwaukee.....	2,060,000	This includes Oshkosh, Eden, Sheboygan, Waukesha, Mayville, Ketchum, Cedarburgh, Appieton, and Racine.
	Sheboygan.....	5,500	See Milwaukee.



*Comparative prices per barrel of eastern lime at New York on January 1, 1878 to 1889, inclusive.*

Years.	Common.	Fine.	Years.	Common.	Fine.
1878.....	\$0.80	\$1.00	1884.....	\$1.00	\$1.20
1879.....	.80	.90	1885.....	1.00	1.20
1880.....	.85	1.00	1886.....	1.00	1.20
1881.....	.90	1.60	1887.....	1.00	1.20
1882.....	1.25	1.40	1888.....	1.00	1.10
1883.....	1.10	1.40	1889.....	1.00	1.20

*Lime and cement of domestic production exported from the United States, 1864 to 1888.*

Years. (a)	Quantity.	Value.	Years. (a)	Quantity.	Value.
	<i>Barrels.</i>			<i>Barrels.</i>	
1864.....		\$86,386	1879.....	60,657	\$74,097
1865.....		94,606	1880.....	41,989	52,584
1870.....	31,175	61,490	1881.....	57,555	83,508
1871.....	27,575	51,585	1882.....	67,030	100,169
1872.....	39,686	69,218	1883.....	74,687	120,156
1873.....	27,873	52,848	1884.....	65,768	108,437
1874.....	41,349	69,080	1885.....	79,627	127,523
1875.....	64,087	98,630	1886.....	83,247	123,687
1876.....	53,827	77,568	1887.....	63,520	97,771
1877.....	78,341	97,923	1888.....	100,070	147,309
1878.....	82,507	98,334			

*a* Calendar years ending December 31 from 1886 to 1888; previous years end June 30.

### BRICK.

*Production.*—The year 1888 was not an active one in the production of brick. This fact is due to a variety of causes, one of which was over-production in 1887, and another, which was felt in quite a number of producing centers, namely, bad weather during the brick season. The value of the brick and drain tile produced in the United States in 1888 is estimated at \$48,213,000. There was a falling off in production at a number of the most important sources of supply, while for the whole country the total figure represents a gain. This gain is due to the regularly increasing number of plants rather than to increased production at the leading localities.

The following table gives the production of a number of localities in the United States:

*Condition of the brick industry in 1888.*

States.	Towns.	Number of bricks made in 1888.	Remarks.
Alabama.....	Choccolocco.....	7,000,000	The output in 1888 was greater than in the preceding year, but the value was less.
	Eufaula.....	4,000,000	
	Davisville.....	300,000	This figure represents an increase of 1,000,000 over 1887.
	Montgomery.....	15,000,000	
	Selma.....	1,600,000	One new yard of the annual capacity of 4,000,000 was established during 1888. The output of 1888 is less than that of 1887. The outlook for 1889 is encouraging.