ABRASIVE MATERIALS.

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INTRODUCTION.

The abrasive materials treated in this report are as follows: Oilstones and whetstones, grindstones and pulpstones, buhrstones and millstones, pumice, infusorial earth and tripoli, crystalline quartz, garnet, corundum and emery, carborundum, crushed steel, artificial corundum, and adamite. These abrasive materials can readily be divided into three groups:

1. Those which occur as a rock formation and are cut and manufactured directly into the form desired, while retaining their original rock structure and appearance, as grindstones, whetstones, etc.
2. Those which occur as a constituent of either a rock or a vein and have to be mechanically separated from the associated gangue and cleaned, as corundum, garnet, etc.
3. Artificial abrasives, as carborundum, crushed steel, etc.

A few of the materials included under the head of abrasives are not used entirely for abrasive purposes, as crystalline quartz and infusorial earth. In the present report there is included only that production of the former that is used in the manufacture of sandpaper, scouring soaps, etc., and in the manufacture of wood finishing materials, the greater production of the quartz being used in the pottery and glass industries.

The entire production of infusorial earth and tripoli is included in this report, although but a small amount is actually used for any abrasive purposes.

While the aggregate amount of these abrasives produced each year is increasing, there is a noticeable variation in the production of the different kinds of abrasive materials. As their use is to a certain extent dependent on the growth of manufacturing industries, there will be a change in their production corresponding to the increase or decrease of these industries.

In 1902 the total value of all the natural abrasives produced in the United States was $1,326,755, as compared with $1,194,772 in 1901. A list of the values of the production of the different abrasives for the years 1900, 1901, and 1902 is given in the following table:

Value of abrasives produced in United States during 1900, 1901, and 1902.

Kind of abrasive.	Value.		
	1900.	1901.	1902.
Oilstones and scythestones	$174,087	$158,300	$221,762
Grindstones	710,026	580,703	667,431
Buhrstones and millstones	32,858	57,179	59,808
Pumice	.....	.....	2,750
Infusorial earth and tripoli	24,207	52,950	53,244
Crystalline quartz	40,705	41,500	84,335
Garnet	123,475	158,100	132,820
Corundum and emery	102,715	146,040	104,605
Total	1,208,073	1,194,772	1,326,755

Artificial abrasives produced in United States during 1900, 1901, and 1902.

Kind of abrasive.	1900.	1901.	1902.
	Pounds.	*Pounds.*	*Pounds.*
Carborundum	2,401,000	3,838,175	3,741,500
Crushed steel	700,000	690,000	735,000

OILSTONES, WHETSTONES, ETC.

There is included under this head all kinds of oilstones, whetstones, water hones, knife sharpeners of all varieties, razor hones, dental points, etc., that are manufactured from various sandstones and schists.

PRODUCTION.

There was a decided increase in the production of oilstones and scythestones in the United States during 1902, the value of which amounted to $221,762.[a] This is an increase of $63,462 over the value of the production of 1901, which was $158,300, and it is also the highest value recorded for these abrasives since their first publication in 1880. Until 1902, the year of maximum production was 1899, when the value of the output amounted to $208,283. This general increase in the production of this type of abrasives is due to the larger demand for the various abrasive articles manufactured from the novaculite (sandstone) found in Arkansas, and also to the successful introduction of the American stones into foreign markets.

As the producers of the abrasive materials used in the manufacture of oilstones and whetstones are in nearly all cases also the manufac-

[a] The crude product in 1902 as reported by the Census was valued at $113,968.

turers, the statistics given are for the finished product instead of the raw material. This production was confined to the following States: Arkansas, Michigan, Indiana, Ohio, and Kentucky, in which the material used was sandstone; and New Hampshire and Vermont, in which a quartz-schist was the material used.

The following table gives the value of the oilstones, whetstones, etc., produced from 1891 to 1902, inclusive:

Value of oilstones, whetstones, etc., produced in the United States, 1891–1902.

Year.	Value.	Year.	Value.
1891	$150,000	1897	$149,970
1892	146,730	1898	180,486
1893	135,173	1899	208,283
1894	136,873	1900	174,087
1895	155,881	1901	158,300
1896	127,098	1902	221,762

From 1880 to 1890, inclusive, the production and value of the rough stone have been published in these reports, except in the case of the output for 1890, when the value for the unfinished product was given for the novaculite of Arkansas, while in all other cases the value of the finished stones was given. The annual production from 1880 to 1890 was as follows:

Production of oilstones and whetstones, 1880–1890.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Pounds.			*Pounds.*	
1880	420,000	$8,000	1886	1,160,000	$15,000
1881	500,000	8,580	1887	1,200,000	16,000
1882	600,000	10,000	1888	1,500,000	18,000
1883	600,000	10,000	1889	5,982,000	32,980
1884	800,000	12,000	1890	.....	69,909
1885	1,000,000	15,000			

IMPORTS.

Although there has been a general increase in the production of oilstones and whetstones in the United States, there continues to be imported into this country from $30,000 to $60,000 worth of these abrasives. In 1902 this amounted to $56,456. They consist principally of razor hones from Belgium and Germany, and of "Turkey" oilstones from France and Italy.

The total value of all kinds of hones, oilstones, etc., imported into the United States since 1880 is shown in the following table:

Imports of hones and whetstones, 1880–1902.

Year ending—	Value.	Year ending—	Value.
June 30—		December 31—	
1880	$14,185	1891	$35,344
1881	16,631	1892	33,420
1882	27,882	1893	25,301
1883	30,178	1894	26,671
1884	26,513	1895	32,439
1885	21,434	1896	50,588
December 31—		1897	34,485
1886	21,141	1898	30,856
1887	24,093	1899	34,510
1888	30,676	1900	39,316
1889	27,400	1901	64,655
1890	37,454	1902	56,456

EXPORTS.

Although no separate record is kept of the exports of oilstones and scythestones, it is undoubtedly true that the value of these is in excess of the imports and that it is gradually increasing in quantity, while there will be but little increase in the imports. The material exported consists chiefly of New Hampshire scythestones, with smaller amounts of Indiana and Arkansas oilstones. There is a growing demand for the latter stone at good prices.

GRINDSTONES.

PRODUCTION.

The States producing grindstones in 1902 were Michigan, Montana, Ohio, West Virginia, and Wyoming, with by far the largest amount from Ohio. Pulpstones were produced in Ohio alone, and the Tippecanoe Pulp and Grindstone Company, of Empire, which is the largest producer, is using nearly all of its stone for this purpose. The total value of all kinds of grindstones produced in 1902 was $667,431, which is $86,728 greater than their value in 1901, which was $580,703. The production of 1900, valued at $710,026, is still the largest production recorded for any year. In comparing the values of the productions of the earlier years with those of the last few years it must be borne in mind that the price per ton has decreased from $15 to from $8 to $10, and that, therefore, the tonnage of grindstones used in the last four years is greater than that of any year before. Of the value of the production of 1902, $667,431, the sum of $23,088 is due to pulpstones, an increase of $4,288 over the value in 1901, which was $18,800.

This decided increase in the production of grindstones since 1898 has been largely due to the marked increase in all kinds of manufacturing industries during the same period.

In making reports of production to the Survey, some manufacturers use the ton as the unit of measurement and others state the number of grindstones made. In 1902, exclusive of pulpstones, the number of grindstones reported aggregated 29,543 pieces, valued at $100,875, as compared with 40,948 pieces, valued at $396,238, in 1901. The product reported by weight amounted to 44,504 tons, valued at $543,428, as compared with 16,807 tons, valued at $165,665, in 1901.

The value of the grindstones, including pulp stones, produced in the United States during 1902, by States, is given in the table below.

Value of grindstones produced in the United States during 1902, by States.

State.	Value.
Ohio	$560,412
West Virginia	22,347
Michigan, Montana, and Wyoming	84,672
Total	667,431

In the following table is given the value of the production of grindstones, including pulpstones, from 1880 to 1902, inclusive. The table illustrates the depression and revival of this industry during and since the financial depression of 1893 and the years immediately following.

Value of grindstones produced in the United States, 1880–1902.

Year.	Value.	Year.	Value.
1880	$500,000	1892	$272,244
1881	500,000	1893	338,787
1882	700,000	1894	223,214
1883	600,000	1895	205,768
1884	570,000	1896	326,826
1885	500,000	1897	368,058
1886	250,000	1898	489,769
1887	224,400	1899	675,586
1888	281,800	1900	710,026
1889	439,587	1901	580,703
1890	450,000	1902	667,431
1891	476,113		

IMPORTS.

There has been a gradual decrease in the imports of grindstones during the last three years. In 1902 these imports amounted to 5,456 long tons, valued at $76,906, as compared with a value of $88,871 in 1901, and of $92,581 in 1900. A large proportion of the above importation was of pulpstones from Newcastle-upon-Tyne, England. Other grindstones imported were from Bavaria and from Scotland. In reporting the imports of grindstones the Bureau of Statistics of the Department of Commerce and Labor has not made any separation of the amount of the finished and of the unfinished products since 1883.

The quantity and value of the grindstones imported into the United States since 1868 are given below.

Grindstones imported and entered for consumption in the United States, 1868–1902.

Year ending—	Finished.		Unfinished or rough.		Total value.
	Quantity.	Value.	Quantity.	Value.	
June 30—	*Long tons.*		*Long tons.*		
1868	.....	$25,640	.....	$35,215	$60,855
1869	.....	15,878	.....	99,715	115,593
1870	.....	29,161	.....	96,444	125,605
1871	385	43,781	3,957.15	60,935	104,716
1872	1,202	13,453	10,774.80	100,494	113,947
1873	1,437	17,033	8,376.84	94,900	111,933
1874	1,443	18,485	7,721.44	87,525	106,010
1875	1,373	17,642	7,656.17	90,172	107,814
1876	1,681	20,262	6,079.34	69,927	90,189
1877	1,245	18,546	4,979.75	58,575	77,121
1878	1,463	21,688	3,669.41	46,441	68,129
1879	1,603	24,904	4,584.16	52,343	77,247
1880	1,573	24,375	4,578.59	51,899	76,274
1881	2,064	30,288	5,044.71	56,840	87,128
1882	1,705	30,286	5,945.61	66,939	97,225
1883	1,755	28,055	6,945.63	77,797	105,852
1884	.....	.....	.....	.....	[a]86,286
1885	.....	.....	.....	.....	50,579
December 31—					
1886	.....	.....	.....	.....	39,149
1887	.....	.....	.....	.....	50,312
1888	.....	.....	.....	.....	51,755
1889	.....	.....	.....	.....	57,720
1890	.....	.....	.....	.....	45,115
1891	.....	.....	.....	.....	21,028
1892	.....	.....	.....	.....	61,052
1893	.....	.....	.....	.....	59,569
1894	.....	.....	.....	.....	52,688
1895	.....	.....	.....	.....	54,276
1896	.....	.....	.....	.....	66,195
1897	.....	.....	.....	.....	49,496
1898	.....	.....	.....	.....	62,973
1899	.....	.....	.....	.....	63,852
1900	.....	.....	.....	.....	92,581
1901	.....	.....	.....	.....	88,871
1902	.....	.....	.....	.....	76,906

[a] Since 1884 not separately classified.

As the production of the American pulpstone increases, a constant decrease in the importation of these stones is to be expected, since the American stone is giving good satisfaction. The export of grindstones is on the increase, and now the total of the exports is about equal to the total of the imports.

BUHRSTONES AND MILLSTONES.

The American millstone varies from a sandstone to a quartz conglomerate. The rock from which it is made occurs along the eastern

slopes of the Appalachian Mountains from New York to North Carolina, and is known by various names, according to the locality from which it is obtained. Most of the buhrstones are obtained from New York, though smaller amounts are made in Vermont, Pennsylvania, Virginia, and North Carolina. Besides the production recorded from these States, a small number of buhrstones are made in the mountain sections of North Carolina and Tennessee for local uses. There were formerly a very large number of buhrstones used in the United States, principally in grinding wheat, but at the present time there are but very few used for this purpose on account of the introduction of the roller-mill process. They are, however, now used extensively for grinding the coarser cereals, mineral-paint ores, fertilizers, cement rock, barytes, and other minerals, and for these uses the demand is increasing each year. For this kind of grinding the American stone is as satisfactory as the foreign stones which were formerly imported in large numbers from France, Germany, and Belgium.

PRODUCTION.

The value of the production of buhrstones in 1902 was $59,808, an increase of $2,628 over that of 1901, which was $57,179. This was more than twice the value of the production of 1900, which amounted to $28,115. From 1886 to 1894 there was a very large decrease, from $140,000 to $13,887, in the production of buhrstones. Since 1894, however, there has been a gradual increase in the production. This increase will probably continue for some years to come.

The production of 1902 was divided as follows: New York, $39,570; Pennsylvania, $1,978; Virginia, $11,435; North Carolina and Vermont, $6,825.

In the following table are given the value of the production of buhrstones in the United States since 1880:

Value of buhrstones produced in the United States, 1880–1902.

Year.	Value.	Year.	Value.
1880	$200,000	1892	$23,417
1881	150,000	1893	16,639
1882	200,000	1894	13,887
1883	150,000	1895	22,542
1884	150,000	1896	22,567
1885	100,000	1897	25,932
1886	140,000	1898	25,934
1887	100,000	1899	28,115
1888	81,000	1900	32,858
1889	35,155	1901	57,179
1890	23,720	1902	59,808
1891	16,587		

IMPORTS.

The importation of buhrstones began to decline sharply in 1883, and there has been a gradual falling off since then. There was some increase in the value of the imports in 1900 and 1901, but in 1902 they amounted to only $16,158, which is the smallest importation recorded. This general decrease in the imports is due not only to the introduction of the roller-mill process for making wheat flour, but also because the buhrstones produced in this country are as satisfactory as the foreign ones for the purposes for which the stones are now used.

The value of buhrstones and millstones imported into the United States since 1868 is given in the table below:

Value of buhrstones and millstones imported into the United States, 1868–1902.

Year ending—	Rough.	Made into millstones.	Total.	Year ending—	Rough.	Made into millstones.	Total.
June 30—				December 31—			
1868	$74,224	.....	$74,224	1886	$29,273	$662	$29,935
1869	57,942	$2,419	60,361	1887	23,816	191	24,007
1870	58,601	2,297	60,898	1888	36,523	705	37,228
1871	35,406	3,698	39,104	1889	40,432	452	40,884
1872	69,062	5,967	75,029	1890	32,892	1,103	33,995
1873	60,463	8,115	68,578	1891	23,997	42	24,039
1874	36,540	43,170	79,710	1892	33,657	529	34,186
1875	48,068	66,991	115,059	1893	29,532	729	30,261
1876	37,759	46,328	84,087	1894	.....	.....	[a]18,087
1877	60,857	23,068	83,925	1895	.....	.....	[a]20,316
1878	87,679	1,928	89,607	1896	.....	.....	[a]26,965
1879	101,484	5,088	106,572	1897	.....	.....	[a]22,956
1880	120,441	4,631	125,072	1898	22,974	1,025	23,999
1881	100,417	3,495	103,912	1899	18,368	513	18,881
1882	103,287	747	104,034	1900	27,960	944	28,904
1883	73,413	272	73,685	1901	40,885	1,302	42,187
1884	45,837	263	46,100	1902	15,243	915	16,158
1885	35,022	455	35,477				

[a] Not separately classified.