DEPARTMENT
UNITED STATES G
CHARLES D. W

MINERAL

OF

UNITED

CALEND
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DAVID
CHIEF OF DIVISION OF MIN

SLATE GROUND FOR PIGMENT.

PRODUCTION.

Mineral black is the name applied to the product of the dark colored slates and shales that are ground for paint, and in 1903 the total quantity of these materials that were used for this purpose amounted to 7,106 short tons, valued at $59,029, an increase of 3,035 tons in quantity and of $19,628 in value as compared with the production of 4,071 short tons, valued at $39,401, in 1902.

The following table does not include the production of the graphitic or carbonaceous shale or schist of Michigan, which is known as "Baraga graphite," nor the graphitic material obtained from Rhode Island. Both are used to some extent in the manufacture of graphite paints, as are also the purer forms of graphite from New York and Pennsylvania, the statistics of the production and value of which are included in those of graphite.

The annual production of pigments made from slate and shale since 1880 have been as follows:

Quantity and value of slate and shale ground for pigment, 1880–1903.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Short tons.			*Short tons.*	
1880	1,120	$10,000	1892	3,787	$23,623
1881	1,120	10,000	1893	3,253	25,567
1882	2,240	24,000	1894	3,300	35,370
1883	2,240	24,000	1895	4,331	45,682
1884	2,240	20,000	1896	4,795	44,835
1885	2,212	24,687	1897	4,666	46,681
1886	3,360	30,000	1898	4,571	46,216
1887	2,240	20,000	1899	4,676	43,703
1888	2,800	25,100	1900[a]	6,395	53,942
1889	2,240	20,000	1901	4,865	41,211
1890	2,240	20,000	1902	4,071	39,401
1891	2,240	20,000	1903	7,106	59,029

[a] Includes mineral and carbon black.

LEAD PAINTS.

WHITE LEAD, SUBLIMED LEAD, ZINC LEAD, RED LEAD, LITHARGE, AND ORANGE MINERAL.

Although the lead pigments do not represent mineral paints in the sense of those just described, they are included under this head as they are the products of metallic lead, from which they are manufactured, but their value is excluded from the tabulation in order to avoid duplication. The lead pigments included here are white lead, sublimed lead, zinc lead, red lead, litharge, and orange mineral.

PRODUCTION.

During 1903 the aggregate production of all lead pigm
to 141,486 short tons, valued at $15,711,595, an incre
short tons in quantity, and of $3,058,810 in value as
the production of 123,391 short tons, valued at $12,65
The imports of these lead pigments in 1903 amounted
tons, valued at $103,312, as against 1,334 short tons, v
671, in 1902. This makes the total amount of lead pigm
in the United States in 1903 equal to 142,689 short t
$15,814,907, as against 124,725 short tons, valued a
in 1902.

WHITE LEAD.

PRODUCTION.

The total production of white lead in 1903 amounted to
tons, valued at $12,837,647, a decrease of 772 short tons
but an increase of $859,473 in value as compared with th
of 114,658 short tons, valued at $11,978,174, in 1902.
production, the quantity of white lead in oil was 62,67
valued at $7,482,487, and the quantity of dry white le
oxide was 50,212 short tons, valued at $5,355,160.

The import of white lead during 1903 amounted to o
tons, valued at $24,495, which indicates the gradual disp
imported pigments by those of domestic production.

There is a tendency to substitute zinc white and baryt
lead pigments on account of the poisonous effects on the
the fumes given off in the manufacture of the white lead.
experiments have recently been conducted by M. N.
French scientist, as to the relative merits of different whit
the results of his works are summed up as follows:

White lead resists the action of certain acids better than its sub
the other hand it is quite inferior under the action of heat or sudden
perature, also of hydrosulphurous emanations and of certain strong o
such as hypochlorite of soda. Besides, the white-lead paints are muc
to the surfaces to which they are applied and have a marked tenden
The addition of sulphate of barium to white lead, while diminishi
power considerably, does not seem to render the paint any less resist
tion of a siccative to zinc oxide in the proportion needed to give thes
ing quality equal to that of the white-lead paint does not diminish t
the paint, and often, on the contrary, at least in certain cases, increas
The white lead forms a simple mixture with linseed oil and not a co
the mixture is less homogeneous than that which is formed by oxide

In experimenting as to the covering power of white le
oxide M. Breton found that for equal weights the spread
of zinc oxide is nearly double that of white lead; for eq

[a] Scientific American, Dec. 19, 1903.

the covering power of zinc oxide is superior to that of white lead; but as zinc oxide forms a more fluid mixture with the oil, it is necessary in practice to make the zinc paint thicker in order to obtain the same result as with the white lead.

The annual production of white lead since 1884 has been as follows:

Production of white lead in the United States, 1884–1903.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Short tons.			*Short tons.*	
1884	65,000	$6,500,000	1894	76,343	$6,623,071
1885	60,000	6,300,000	1895	90,513	8,723,632
1886	60,000	7,200,000	1896	88,608	8,371,588
1887	70,000	7,560,000	1897	95,658	9,676,816
1888	84,000	10,080,000	1898	96,047	9,100,622
1889	80,000	9,600,000	1899	110,197	11,317,967
1890	77,636	9,382,967	1900	98,210	10,657,956
1891	78,018	10,454,029	1901	100,787	11,252,658
1892	74,486	8,733,620	1902	114,658	11,978,174
1893	72,172	7,695,130	1903	112,886	12,837,647

PRICES.

The following table shows the average yearly market prices of corroding pig lead, the net price of white lead in oil (both at New York), and the difference between the two since 1874:

Average yearly net prices, at New York, of pig lead and white lead in oil, 1874–1903.

[Per 100 pounds.]

Year.	Pig lead.	White lead in oil.	Difference.	Year.	Pig lead.	White lead in oil.	Difference.
1874	$6.00	$11.25	$5.25	1889	$3.80	$6.00	$2.20
1875	5.95	10.50	4.55	1890	4.33	6.25	1.92
1876	6.05	10.00	3.95	1891	4.33	6.37	2.05
1877	5.43	9.00	3.57	1892	4.05	6.39	2.34
1878	3.58	7.25	3.67	1893	3.73	6.03	2.30
1879	4.18	7.00	2.82	1894	3.28	5.26	1.98
1880	5.05	7.60	2.55	1895	3.28	5.05	1.77
1881	4.80	7.25	2.45	1896	3.03	4.90	1.87
1882	4.90	7.00	2.10	1897	3.64	5.00	1.36
1883	4.32	6.88	2.56	1898	3.79	5.08	1.29
1884	3.73	5.90	2.17	1899	4.53	5.35	.82
1885	3.95	6.00	2.05	1900	4.55	5.57	1.02
1886	4.63	6.25	1.62	1901	4.51	5.87	1.36
1887	4.47	5.75	1.28	1902	4.21½	5.62	1.40½
1888	4.41	6.75	1.34	1903	4.23	6.39	2.16

SUBLIMED LEAD.

Another lead pigment which is sometimes classed as a white lead is known as sublimed lead and is obtained as a by-product in the oxidizing smelting of galena ores; it consists essentially of lead sulphates

and lead oxide. The output of this pigment in 1903 Picher Lead Company, of Joplin, Mo., amounted to 8 valued at $386,640, as against 9,465,500 pounds, val in 1902.

ZINC LEAD.

There is manufactured at Canyon, Cal., by the Unit tion and Refining Company, a product known as zinc le ment consisting of the mixture of an oxide compoun obtained by an oxidizing, smelting treatment of lead furnace of special design. The production of this amounted to 4,500 short tons, valued at $247,500, as a tons, valued at $225,000, in 1902, and 2,500 short $150,000, in 1901.

RED LEAD, LITHARGE, AND ORANGE MI

The production of red lead during 1903 shows a cons from that of 1902, being 8,832 short tons, valued at $1 pared with 11,669 short tons, valued at $1,263,112, in decrease of 2,837 short tons in quantity and of $240,3

The combined production of litharge and orange mi was 10,972 short tons, valued at $1,217,054, as comp short tons, valued at $1,437,692, in 1902, a decrease quantity and of $220,638 in value.

There is still a considerable quantity of red lead an imported into the United States, and in 1903 this amou pounds of red lead and 756,742 pounds of orange litharge 42,756 pounds were imported during 1903. table is given the production of white lead, sublime red lead, litharge, and orange mineral for the years 1903:

Production of white lead, sublimed lead, zinc lead, red lead, litharg during 1901, 1902, and 1903.

	1901.		1902.	
	Quantity.	Value.	Quantity.	Value.
White lead:	*Pounds.*		*Pounds.*	
In oil	164,606,670	$8,978,441	179,473,588	$9,755,197
Dry[a]	46,966,945	2,274,212	49,841,821	2,222,977
Sublimed lead			9,465,500	449,611
Zinc lead	5,000,000	150,000	8,000,000	225,000
Red lead	26,206,096	1,448,550	23,338,252	1,263,112
Litharge	18,919,036	979,586	25,510,690	1,298,348
Orange mineral	2,174,727	224,667	1,978,521	130,349

[a] Including white oxide.

IMPORTS.

The quantity and value of the imports of white lead, red lead, litharge, and orange mineral from 1867 to 1903, inclusive, are given in the following table:

White lead, red lead, litharge, and orange mineral imported, 1867–1903.

Year ending—	White lead.		Red lead.		Litharge.		Orange mineral.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
June 30—	*Pounds.*		*Pounds.*		*Pounds.*		*Pounds.*	
1867	6,636,508	$430,805	926,843	$53,087	230,382	$8,941	.....	.....
1868	7,533,225	455,698	1,201,144	76,773	250,615	12,225	.....	.....
1869	8,948,642	515,783	808,686	46,481	187,333	7,767	.....	.....
1870	6,228,285	365,706	1,042,813	64,626	97,898	4,442	.....	.....
1871	8,337,842	483,392	1,295,616	78,410	70,889	3,870	.....	.....
1872	7,153,978	431,477	1,513,794	85,644	66,544	3,396	.....	.....
1873	6,331,373	408,986	1,583,039	99,891	40,799	2,379	.....	.....
1874	4,771,509	323,926	756,644	56,305	25,687	1,450	.....	.....
1875	4,354,131	295,642	1,048,713	73,131	15,767	950	.....	.....
1876	2,546,776	175,776	749,918	54,884	47,054	2,562	.....	.....
1877	2,644,184	174,844	387,260	28,747	40,331	2,347	.....	.....
1878	1,759,608	113,638	170,608	9,364	28,190	1,499	.....	.....
1879	1,274,196	76,061	143,237	7,237	38,495	1,667	.....	.....
1880	1,906,931	107,104	217,033	10,397	27,389	1,222	.....	.....
1881	1,068,030	60,132	212,423	10,009	63,058	2,568	.....	.....
1882	1,161,889	64,493	288,946	12,207	54,692	2,191	.....	.....
1883	1,044,478	58,588	249,145	10,503	34,850	1,312	.....	.....
1884	902,281	67,918	265,693	10,589	54,183	1,797	.....	.....
1885	705,536	40,437	216,449	7,641	35,283	1,091	.....	.....
Dec. 31—								
1886	785,554	57,340	597,247	23,038	51,409	1,831	.....	.....
1887	801,320	58,602	371,299	16,056	35,908	1,302	.....	.....
1888	627,900	49,903	529,665	23,684	62,211	2,248	.....	.....
1889	661,694	56,875	522,026	24,400	41,230	1,412	.....	.....
1890	742,196	57,659	450,402	20,718	48,283	2,146	.....	.....
1891	718,228	40,773	651,577	23,807	94,586	3,108	.....	.....
1892	744,838	40,032	812,703	28,443	56,737	1,811	1,409,601	$64,133
1893	686,490	34,145	854,982	27,349	42,582	1,310	1,385,828	61,360
1894	796,480	40,939	947,873	29,064	38,595	1,064	1,386,464	58,614
1895	1,897,892	79,887	1,764,274	53,139	97,667	2,812	1,689,367	66,492
1896	1,183,536	52,409	1,643,262	47,450	61,050	1,615	1,359,651	51,077
1897	1,101,829	48,988	1,386,070	46,092	60,984	1,931	1,466,042	67,549
1898	606,739	24,334	682,449	25,780	56,417	2,021	795,116	37,745
1899	583,409	30,212	776,197	30,479	55,127	3,614	1,141,387	58,142
1900	456,872	28,366	549,551	25,532	77,314	2,852	1,068,793	61,885
1901	384,673	21,226	485,467	19,370	49,306	1,873	977,644	62,409
1902	506,423	25,320	1,075,839	37,383	88,115	2,908	997,494	49,060
1903	463,284	21,696	1,162,715	40,846	42,756	1,464	766,742	36,407

ZINC WHITE.

As was stated under the head of white lead, the
erable work done in experimenting as to the actual
as a pigment in competition with white lead, and th
resulted in showing that zinc white can be used sa
petition with white lead. As has already been sta
also the advantage of the fact that in its manufactu
not subject to any poisonous fumes as they are in t
white lead. The production of zinc white has inc
the last ten years, and during 1903 it amounted to
valued at $4,801,718, as compared with 52,730 sh
$4,023,299, in 1902, an increase of 10,232 short to
of $778,419 in value.

The following table gives the production of zinc
from 1880 to 1903, inclusive, and illustrates the co
the manufacture of this pigment:

Production of zinc white, 1880–1903.

Year.	Quantity.	Value.	Year.
	Short tons.		
1880	10,107	$763,738	1892
1881	10,000	700,000	1893
1882	10,000	700,000	1894
1883	12,000	840,000	1895
1884	13,000	910,000	1896
1885	15,000	1,050,000	1897
1886	18,000	1,440,000	1898
1887	18,000	1,440,000	1899
1888	20,000	1,600,000	1900
1889	16,970	1,357,600	1901
1890	.....	1,600,000	1902
1891	23,700	1,600,000	1903

IMPORTS.

There continues to be a considerable import of z
United States each year, but it represents but a sm
the total quantity of this pigment consumed. During
of zinc oxide were: Dry, 3,487,042 pounds; in oil
total, 3,653,076 pounds, as compared with dry, 3,2
oil, 163,081 pounds; total, 3,434,466 pounds in 190
1903 of 218,610 pounds, or about 6 per cent over the

The following table shows the quantity of zinc white, dry, and in oil, imported into the United States since 1885.

Imports of zinc oxide (dry and in oil), 1885–1903.

Year ending—	Dry.	In oil.	Year ending—	Dry.	In oil.	Total value.
	Pounds.	*Pounds.*	Dec. 31—	*Pounds.*	*Pounds.*	
June 30, 1885	2,233,128	98,566	1894	3,371,292	59,291	$122,690
Dec. 31—			1895	4,646,049	129,343	153,641
1886	3,536,289	79,788	1896	4,572,781	311,023	161,188
1887	4,961,080	123,216	1897	5,564,763	502,357	206,636
1888	1,401,342	51,985	1898	3,342,235	27,050	130,039
1889	2,686,861	66,240	1899	3,012,709	41,699	172,359
1890	2,631,468	102,298	1900	2,618,808	38,706	142,395
1891	2,839,351	128,140	1901	3,199,778	128,198	166,908
1892	2,442,014	111,190	1902	3,271,386	163,081	167,084
1893	3,900,749	264,807	1903	3,487,042	166,034	188,494

In addition to the imports given in the preceding table there were imported during 1903, 1,129,805 pounds of white sulphide of zinc, valued at $33,077. Zinc sulphide is known commercially as lithopone.

ASBESTOS.

By JOSEPH HYDE PRATT.

INTRODUCTION.

In previous reports on the subject of asbestos de
have been given of the two minerals which form th
mercial asbestos, the chrysotile and the amphibole
have been compared as to their relative market valu
for them. The American localities for both these va
have also been described somewhat at length. In t
therefore, these points are only touched upon,
asbestos and the origin of the chrysotile variety a
in detail.

The demand for the chrysotile asbestos is still inc
for the amphibole is only just holding its own. It
cheapness with which the amphibole asbestos can be
factured and because of the scarcity of the chrysotile
the small demand for the inferior amphibole asbesto

OCCURRENCE AND LOCALITI

The amphibole asbestos, which is usually found in
tose rocks, either in pockets or in well-defined vei
quantity and forms such a very high percentage of t
is removed in mining or quarrying it, that its cost p
is very low. On the other hand, the chrysotile variet
found in serpentine rocks, does not occur in any re
tion, but as seams of varying width which pinch out
times clustering together and again occurring spar
necessary to mine from 30 to 90 tons of the rock to
the asbestos. The heat-resisting properties of both
of asbestos is approximately the same, so that when
of the asbestos is the only quality desired the amphil
give as good satisfaction as the chrysotile, but whe
fiber as well as nonconductivity of heat is desired, the
is the only one that can be used satisfactorily.