

MINER YEARB

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Volume I of The

METALS AND

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N49781

Lead

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STABILITY of the lead price, the la since 1942, and good overall commercial mented by Government purchases for featured the domestic lead industry in 19 cutback in automobile production resulted of lead, but total consumption during the less than in 1955 and exceeded the average by 4 percent. The conflict in Egypt and had little effect on the supply of lead in the no fluctuation in the New York price, wh pound from January 13 through Decemb there was a delay in arrivals of lead, whi average monthly quotations for spot lea Exchange from August through December

Supplies of lead in the United States 1,318,700 short tons in 1956—a 2-percent in total, 27 percent was derived from dome percent from secondary lead recovered; and pigs and bars and lead in ores and concen increases over 1955 in mine production of secondary lead was nearly the same i total supplies exceeded consumption by 10 ducers' and consumers' stocks increased o continued Government purchases for the pile. Exports of pig lead were only 4,600 in 1955.

¹ Commodity specialist.
² Statistical assistant.

Except for the usual July decline, which was accentuated by the steel strike, variations in the monthly consumption rates were small or moderate. Loss of time at the mines caused by strikes was considerably less than in 1955.

Total mine and smelter production of lead outside the United States increased, but the rate of gain was lower than in the United States. In mine production Canada, Mexico, and Yugoslavia were the only large producing countries that reported declines. Smelter output increased in all important producing countries except Mexico.

GOVERNMENT PROGRAMS AND REGULATIONS

The Export Control Act of 1949 and the Defense Production Act of 1950, as amended, were extended to June 30, 1958 (Public Laws 631 and 632—84th Congress).

In May 1956 the office of Defense Mobilization established the eligibility of lead and zinc for acquisition to the supplemental (barter program) stockpile during the fiscal year 1957. The supplemental stockpile was authorized under the Agricultural Trade Development and Assistance Act of 1954 (Public Law 480). In June 1956 the Commodity Credit Corporation began to acquire these metals under section 303 of the act, and actual deliveries began about August. Procurement was limited to lead and zinc of foreign origin but included metal smelted in the United States from foreign ores.

TABLE 1.—Salient statistics of the lead industry in the United States, 1947-51 (average) and 1952-56, in short tons

	1947-51 (average)	1952	1953	1954	1955	1956
Production of refined primary lead:						
From domestic ores and base bullion.....	377,285	383,358	328,012	322,271	321,132	349,188
From foreign ores and base bullion.....	72,925	89,494	139,879	164,441	158,025	193,120
Total.....	450,210	472,852	467,891	486,712	479,157	542,308
Recovery of secondary lead.....	484,021	471,204	480,737	480,925	502,051	500,755
Imports (general):						
Lead in pigs, bars, and old.....	278,280	523,050	300,510	281,941	284,720	283,302
Lead in base bullion.....	3,382	380	869	41		31
Lead in ore and matte.....	73,188	104,081	180,899	161,261	177,479	106,452
Exports of refined pig lead.....	1,384	1,792	803	596	403	4,028
Consumption of primary and secondary lead.....	1,137,269	1,130,705	1,201,604	1,094,871	1,212,644	1,200,717
Prices (cents per pound):						
New York:						
Average for period.....	15.77	10.47	13.48	14.05	15.14	16.01
Quotation at end of period.....	16.00	14.12	13.50	15.00	16.54	16.00
London average for period.....	16.58	16.82	11.48	12.08	13.10	14.52
Mine production of recoverable lead.....	400,719	300,162	342,644	325,419	338,025	352,826
World smelter production of lead.....	1,680,000	1,990,000	2,060,000	2,100,000	2,220,000	2,370,000

¹ Includes Alaska.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

The DMEA program to encourage exploration and increase domestic reserves of strategic and critical minerals and metals was continued throughout 1956. On exploration contracts for lead and zinc the Government provided 50 percent of the approved cost of the project. Twenty-two such contracts were made in 1956, authorizing a maximum Government participation of \$1,162,896, which was matched by an

LEAD

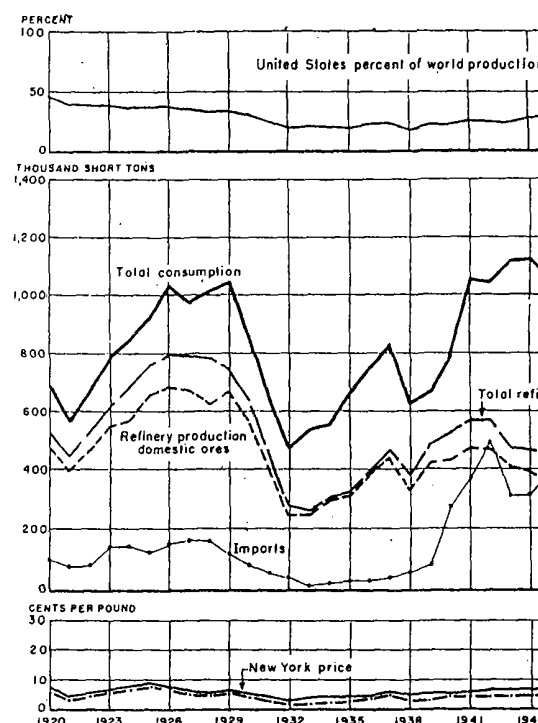


FIGURE 1.—Trends in the lead industry in the United States, 1920-1956. Consumption includes primary refined, antimonial, and antimony pigments made directly from ore. Imports are factored for the lead content of ores, mattes, and concentrates, bars, base bullion, and scrap.

equal amount of private capital for an anticipated total of \$2,325,791, an average of \$105,718 per project. The program in 1951 through December 1956 authorized lead and zinc were executed, which authorized a total of \$11,006,089² and total expenditures (including private capital) of \$22,018,886. Additional contracts for lead and zinc were authorized in 1956, is given in the Zinc chapter of this volume.

GENERAL SERVICES ADMINISTRATION

The General Services Administration (GSA) is responsible for stockpile procurement and administration of foreign aid programs as agent of the International Administration, and administration of Defense programs including domestic purchase programs.

² Includes sums provided through amendments to contracts and also sums for contracts which were subsequently canceled or terminated upon completion.

(Ouray County), the Emperius group (Mineral County) and the Resurrection Mining Co. group (Lake County) were other substantial lead producers.

Montana mines yielded 9 percent more lead than in 1955. The Anaconda Co. mines at Butte, Silver Bow County, produced 80 percent of the State total in 1956; the ore came from the Anselino, Lexington, and Orphan Girl mines (lead-zinc ore), the Emma mine (manganese ore), and the Greater Butte project (development ore). Smaller producers included the Jack Waite mine in Sanders County (idled by a strike from August 23, 1955, through January 1956) and the Maulden mine in Beaverhead County.

Lead output in Washington increased 13 percent. The principal lead producer was the Pend Oreille Mines & Metals Co. lead-zinc mine in Pend Oreille County. Other mines that produced considerable lead but were predominantly zinc producers were the Grandview (American Zinc, Lead & Smelting Co.) in Pend Oreille County and the Van Stone (American Smelting & Refining Co.) and Deep Creek (Goldfield Consolidated Mines Co.) in Stevens County. The Deep Creek mine suspended operations on November 21, 1956.

Increased output from several mines raised Arizona's lead production 22 percent over 1955. The principal producers were the Iron King mine (Shattuck Denn Mining Corp.), Yavapai County; the Flux mine (American Smelting & Refining Co.), Santa Cruz County; the San Xavier mine (Eagle-Picher Co.), Pima County; and the Athletic mine, Graham County.

Lead production in California, Nevada, and New Mexico also increased sharply. The Anaconda Co. Darwin and Shoshone groups of lead-zinc mines in Inyo County again produced the bulk of the California lead output. The gain in Nevada was due mainly to expanded operations at the Combined Metals Reduction Co. and Bristol Silver Mines Co. mines in the Pioche district, Lincoln County; to shipments of ore from the former Metals Reserve Company stockpile at Jean and of lead residues derived from manganese ores treated by Manganese, Inc., in Clark County; and to shipments of lead and lead-silver ores from small-scale operators in other counties. Most of New Mexico's lead output came from four groups of mines in the Central district, Grant County, that were predominantly zinc producers and were operated by the American Smelting & Refining Co., New Jersey Zinc Co., Peru Mining Co., and United States Smelting, Refining & Mining Co.

West Central States.—The mine output of lead in the West Central States in 1956, as in 1955, came from the Southeastern Missouri lead belt and the Tri-State zinc-lead district (Kansas, Missouri, and Oklahoma). Arkansas mines have produced no recoverable lead since 1952.

Mines in the Southeastern Missouri lead belt produced 35 percent of the United States total mine output of lead in 1956 and 37 percent in 1955. The lead-belt output of 123,400 tons in 1956 was 2 percent less than in 1955. The St. Joseph Lead Co.—much the largest lead-producing company in the Nation on a mine basis—operated continuously its Bonne Terre, Desloge, Federal and Leadwood groups of

mines (each equipped with a mill) in St. Joseph, Mo. The Indian Creek mine and mill in Washington County, Mo., with a daily capacity of the 5 mills was around 1,500 tons. The mills recover zinc concentrate as a byproduct. The Mine La Motte Corp. and the National Lead Co. are a mine group and mill. Ore mined by the National Lead Co. contained commercial quantities of copper, cobalt, and silver to lead.

In the Tri-State (Joplin) district, production was 20,400 tons in 1956—a small increase over 1955, but, however, declined 18 percent to 57,200 tons in 1957. The American Zinc, Lead & Smelting Co. operated throughout 1956, but the company 1,500-ton mill and several mines were in production. The 15 Eagle-Picher Co. operated continuously but the company was handling both company and custom ores. The company's smaller Bird Dog mill and several large gold and silver mines and Kansas was the principal producer in the Tri-State district. The National Lead Co. operated the Ballard group of mines and 2,100-ton mill. The number of other companies in Oklahoma increased from 10 ore to the Central mill.

States East of the Mississippi River.—Lead was recovered in four States east of the Mississippi River: New York, Virginia, and Wisconsin. In New York, recoverable lead but mined chiefly for fluorspar. In the Southern Illinois-Kentucky fluorspar region, some recoverable lead was mined in North Carolina.

The total Illinois lead output was 3,800 tons in 1955. The principal producers were the American Zinc, Lead & Smelting Co. zinc-lead mine in Jo Daviess County, the Ozark-Mahoning Co. and Aluminum Co. of America (mainly fluorspar) in Hardin County, South Carolina.

Wisconsin's output of lead—all from Grant County—increased sharply, along with output from other producers were the Eagle-Picher Co., American Smelting & Refining Co., and Piquette Mining & Milling Co. producers.

Lead production in Virginia was about 1,000 tons. The Austinville zinc-lead mine and 2,400-ton mill of the Zinc Co. in Wythe County operated steadily throughout its underground development program. The workings of which will be connected with the workings by a 13,000-foot tunnel that was completed in 1956.

In New York lead output, at 1,600 tons, was about 10 percent of the total. The lead was recovered from predominant Balmat mine of the St. Joseph Lead Co. in Warren County.

The 25 leading lead-producing mines in the United States, listed in table 4, yielded 76 percent of the total lead produced. The 10 leading mines produced 57 percent of the total lead produced.

TABLE 3.—Mine production of recoverable lead in the United States, 1947-51 (average) and 1952-56, by districts or regions that produced 1,000 tons or more during any year, 1952-56, in short tons

District or region	State	1947-51 (average)	1952	1953	1954	1955	1956
Southeastern Missouri region.....	Missouri.....	122,487	122,942	125,273	125,173	125,357	123,396
Coeur d'Alene region.....	Idaho.....	79,013	67,330	69,885	64,812	59,820	60,221
West Mountain (Bingham).....	Utah.....	29,205	34,328	29,311	20,071	31,712	32,891
Tri-State (Joplin region)....	Kansas, south- western Mis- souri, Okla- homa.....	28,017	27,356	13,273	18,314	10,679	20,373
Summit Valley (Butte)....	Montana.....	13,529	16,153	10,767	11,616	14,331	14,080
Metalline.....	Washington.....	4,801	(1)	8,694	(1)	(1)	9,440
Park City region.....	Utah.....	10,299	7,494	4,735	5,432	9,954	9,147
Upper San Miguel.....	Colorado.....	5,487	7,657	7,440	5,674	5,098	(1)
Coso (Darwin).....	California.....	6,945	(1)	8,269	(1)	(1)	(1)
Big Bug.....	Arizona.....	3,344	4,135	4,359	4,336	4,612	5,778
Central.....	New Mexico.....	3,023	4,486	1,460	6	2,604	4,682
Upper Mississippi Valley.....	Iowa, northern Illinois, Wiscon- sin.....	1,870	3,532	3,688	3,220	3,809	4,305
Red Cliff.....	Colorado.....	2,006	3,080	2,500	2,688	3,171	(1)
Tintic.....	Utah.....	5,177	4,279	3,500	5,026	5,017	3,061
Austinville.....	Virginia.....	3,316	3,702	2,788	4,320	2,997	3,035
Las Vegas.....	Nevada.....	(1)	(1)	(1)	(1)	956	2,098
Harshaw.....	Arizona.....	1,707	1,921	2,104	2,135	(1)	(1)
Rush Valley & Smelter (Tooele County).....	Utah.....	3,007	2,695	2,753	2,454	1,607	2,520
Kentucky-Southern Illi- nois.....	Kentucky-south- ern Illinois.....	2,344	2,790	1,849	1,348	2,683	2,336
Northport (Aladdin).....	Washington.....	690	(1)	2,165	1,275	2,212	2,085
Pioneer (Rico).....	Colorado.....	1,840	2,230	1,871	2,177	(1)	(1)
Resting Springs.....	California.....	(1)	(1)	(1)	(1)	22	(1)
Pima (Sierritas, Papago, Twin Buttes).....	Arizona.....	3,378	1,864	(1)	1	1,105	1,810
Warm Springs.....	Idaho.....	2,251	3,455	2,583	2,415	2,388	1,804
Pioche.....	Nevada.....	5,448	4,632	3,306	(1)	(1)	(1)
California (Leadville).....	Colorado.....	5,302	5,024	3,072	1,935	1,404	1,660
St. Lawrence County.....	New York.....	1,405	1,120	1,435	1,187	1,037	1,608
Bayhorse.....	Idaho.....	1,681	1,001	1,484	1,372	1,367	1,607
Elk Mountain.....	Colorado.....	(1)	(1)	(1)	(1)	(1)	(1)
Creede.....	do.....	906	1,613	1,696	2,178	1,192	1,206
Eagle.....	Montana.....	761	733	1,179	(1)	706	1,207
Opbir.....	Utah.....	866	990	1,157	1,159	(1)	(1)
Magdalena.....	New Mexico.....	1,581	1,046	(1)	47	95	688
Breckenridge.....	Colorado.....	230	409	1,056	1,000	474	553
Sniffels.....	do.....	766	1,014	1,307	1,113	634	626
Hansonberg.....	New Mexico.....	291	847	1,031	800	517	413
Heddlaston.....	Montana.....	1,730	1,251	(1)	(1)	78	168
Old Hat.....	Arizona.....	6,404	3,913	(1)	(1)	(1)	(1)
Warren (Bisbee).....	do.....	9,587	1,828	(1)	(1)	(1)	(1)
Animas.....	Colorado.....	2,819	3,464	1,212	(1)	(1)	(1)

¹ Figure not shown to avoid disclosure of individual company operations.

TABLE 4.—Twenty-five leading lead-producing mines in the United States in 1956, in order of output

Rank	Mine	District or region	State	Operator	Type of Ore
1	Federal	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead
2	United States & Lark	West Mountain (Bingham)	Utah	St. Joseph Lead Co.	Lead-zinc
3	Bunker Hill	Coeur d'Alene	Idaho	St. Joseph Lead Co.	Lead-zinc
4	Iron King	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead-zinc
5	Big Bug	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead-zinc
6	Indian Creek	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead-zinc
7	Deerhoe	do	do	do	Do
8	Bonne Terre	do	do	do	Do
9	Pend Oreille	Metalline	Washington	Pend Oreille Mines & Metals Co.	Lead-zinc
10	Mine La Motte	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead-zinc
11	Treasury Tunnel-Black Bear-Smug- ler Union	Upper San Miguel	Colorado	Idarado Mining Co.	Copper-lead-zinc
12	Star	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc
13	Darwin Group	Darwin (Coso)	California	The Anacosta Co.	Do
14	Madison	Southeastern Missouri	Missouri	National Lead Co.	Lead-copper
15	Iron King	Big Bug	Arizona	Shattuck-Denn Mining Co.	Lead-zinc
16	Bunker Hill	Indian Creek	Idaho	United Park City Mines Co.	Do
17	United Park City	do	Idaho	do	Do

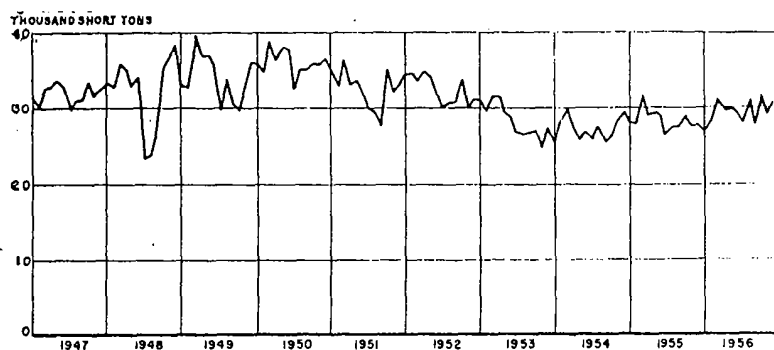


FIGURE 2.—Mine production of recoverable lead in the United States, 1947-56, by months.

TABLE 5.—Mine production of recoverable lead in the United States,¹ 1955-56, by months, in short tons

Month	1955	1956	Month	1955	1956
January.....	27,936	20,813	August.....	27,390	30,727
February.....	27,600	23,221	September.....	27,300	27,781
March.....	31,635	30,856	October.....	28,640	31,603
April.....	28,910	29,549	November.....	27,379	29,277
May.....	20,136	20,892	December.....	27,443	30,486
June.....	28,625	20,480	Total.....	338,025	352,826
July.....	26,028	28,242			

¹ Includes Alaska.

SMELTER AND REFINERY PRODUCTION

Refined lead produced in the United States was derived from three sources—domestic mine production, imports of foreign ore and base bullion, and scrap material (treated largely at secondary smelters)—and was recovered at primary refineries that treat ore, base bullion, and small quantities of scrap and at secondary plants that process scrap exclusively. Refined lead and antimonial or "hard" lead was produced by both primary and secondary plants. Because of the large quantity of hard lead (such as battery scrap) melted at secondary smelters, the output from this type of operation was principally antimonial lead. Statistics on the production of refined lead and alloys at secondary plants are given in the Secondary Lead section of this chapter.

ACTIVE LEAD SMELTERS AND REFINERIES

Primary lead smelters and refineries operating in the United States in 1956:

California: Selby—Selby plant, American Smelting & Refining Co. (smelter and refinery).
 Colorado: Leadville—Arkansas Valley plant, American Smelting & Refining Co. (smelter).
 Idaho: Bradley—Bunker Hill smelter, Bunker Hill Co. (smelter and refinery).
 Illinois: Alton—Federal plant, American Smelting & Refining Co. (smelter and refinery).
 Indiana: East Chicago—U. S. S. Lead Refinery, Inc. (refinery).

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Kansas: Galena—Galena plant, Eagle-Picher.
 Missouri: Herculaneum—Herculaneum plant, refinery).
 Montana: East Helena—East Helena plant, (smelter).
 Nebraska: Omaha—Omaha plant, American S.
 New Jersey: Barber—Perth Amboy plant, A (smelter and refinery).
 Texas: El Paso—El Paso plant, American S.
 Utah:
 Midvale—Midvale plant, United States (smelter).
 Tooele—Tooele plant, International Smo

REFINED LEAD

Primary refineries in the United States refined lead in 1956, or 13 percent more. Of the total refined lead produced, 54 percent was from domestic sources (64 percent domestic and 36 percent from foreign sources).

TABLE 6.—Chemical requirements

	Corrosion
Silver:	
Maximum.....	
Minimum.....	
Copper:	
Maximum.....	
Minimum.....	
Silver and copper together, maximum.....	
Arsenic, antimony, and tin together, maximum.....	
Zinc, maximum.....	
Iron, maximum.....	
Bismuth, maximum.....	
Lead (by difference), minimum.....	

¹ From ASTM Standard Specification B29-55.
² Corroding lead is used to describe lead that has been refined.
³ Chemical lead is used to describe the undersilverized lead.
⁴ Acid-copper lead is made by adding copper to fully refined lead.
⁵ Common desilverized lead is used to describe fully refined lead.

TABLE 7.—Refined lead produced at primary refineries, 1947-51 (average) and 1952-56, by source

Source	1947-51 (average)	1952	1956
Refined lead:			
From domestic ores and base bullion.....	377,285	383,358	
From foreign ores.....	70,061	89,092	
From foreign base bullion.....	2,864	402	
Total from primary sources.....	450,210	472,852	
From scrap.....	10,038	3,070	
Total refined lead.....	460,248	475,922	
Average sales price per pound.....	\$0.168	\$0.161	
Total calculated value of primary refined lead ¹	\$142,266,000	\$153,247,000	\$122,000,000

¹ Excludes value of refined lead produced from scrap at primary refineries.
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is from secondary sources (scrap). Table 8 gives the production of refined lead by source material and by country of origin.

Of basic interest both to lead producers and consumers was final adoption of revisions by the American Society for Testing Materials of the ASTM Standard Specification for Pig Lead (B29-55¹). The revisions were brought about by the fact that some grades that had been listed had not been commercially available for some time.

TABLE 8.—Refined primary lead produced in the United States, 1947-51 (average) and 1952-56, by source material and country of origin, in short tons

Source	1947-51 (average)	1952	1953	1954	1955	1956
Domestic ore and base bullion.....	377,285	383,358	328,012	322,271	321,132	340,188
Foreign ore:						
Australia.....	7,037	5,888	10,886	17,311	26,701	23,811
Canada.....	5,270	7,113	20,673	47,160	39,919	26,568
Europe.....	18	454	199	805	109	.....
Mexico.....	5,608	2,344	5,876	16,790	10,123	11,183
South America.....	20,204	48,625	60,828	58,341	44,855	76,073
Other foreign.....	22,834	24,068	36,240	23,806	30,166	55,469
Total.....	70,061	89,002	130,711	164,353	157,803	103,084
Foreign base bullion:						
Australia.....	1,418	.....	.....	.....	.....	.....
Mexico.....	1,233	70	42	.....	.....	.....
South America.....	124	177	126	88	162	36
Other foreign.....	89	165	.....	.....	.....	.....
Total.....	2,864	402	168	88	162	36
Total foreign.....	72,925	89,404	130,879	164,441	158,025	103,120
Grand total.....	450,210	472,852	467,891	486,712	479,167	542,308

ANTIMONIAL LEAD

Primary lead refineries produced 66,800 tons of antimonial lead in 1956, a 4-percent increase over 1955. Three of the 5 producing plants increased their output in 1956. Distribution of antimonial lead production at primary refineries in 1952-56, by source material, is shown in table 9, as is also the average antimony content.

Antimonial lead was an important byproduct of the refining of base bullion, although the quantity derived was only a small part of the total domestic output. The major production was recovered from melting antimonial lead scrap at secondary smelters.

TABLE 9.—Antimonial lead produced at primary lead refineries in the United States, 1947-51 (average) and 1952-56

Year	Production (short tons)	Antimony content		Lead content by difference (short tons)			
		Short tons	Percent	From domestic ore	From foreign ore	From scrap	Total
51 (average).....	70,302	4,600	6.8	14,638	8,700	42,274	65,702
.....	68,203	4,302	7.6	12,903	5,673	36,145	63,811
.....	62,373	4,637	7.3	10,368	10,721	30,749	67,836
.....	50,873	3,521	5.9	5,136	7,661	43,555	56,352
.....	64,044	3,555	5.6	5,259	9,327	45,903	60,489
.....	66,826	3,348	5.0	6,739	6,918	49,821	63,478

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SECONDARY LEAD

Some scrap lead was treated at primary plants and part was processed at many plants that specialize in secondary materials. Secondary lead was recovered from antimonial lead, and other lead and tin alloys.

Recovery of lead totaled 506,800 tons in 1956, more than in 1955. Lead recovered, as measured by domestic mine production for the 11th successive year, was 38 percent of the total supply. Detailed data on lead appears in the Secondary Metals—Nonferrous volume.

TABLE 10.—Secondary lead recovered in the United States, 1947-51 (average) and 1952-56, in short tons

	1947-51 (average)	1952	1953
As refined metal:			
At primary plants.....	10,038	3,070	4,210
At other plants.....	128,214	137,032	122,300
Total.....	138,252	140,102	126,510
In antimonial lead:			
At primary plants.....	42,274	35,145	36,740
At other plants.....	185,292	187,806	199,800
Total.....	227,566	222,951	236,540
In other alloys.....	118,603	108,241	123,600
Grand total:			
Short tons.....	484,921	471,294	480,730
Value.....	\$153,035,795	\$151,766,068	\$127,625,000

LEAD PIGMENTS

The principal lead pigments marketed in 1956 were red lead, basic lead sulfate, and leaded zinc. These were manufactured chiefly from metal, but some were converted directly into pigments. Detailed production are given in the Lead and Zinc chapter of this volume.

CONSUMPTION AND

Domestic lead consumption (including lead used directly in manufacturing lead pigments) totaled 1.1 million tons in 1956, less than 1-percent decrease over 1955. Of the total consumed, 767,100 tons were both primary and secondary soft lead; 311,000 tons in antimonial lead (the greater part of which was in alloys; 20,800 tons in copper-bearing alloys recovered from ore in producing leaded zinc pigments; and 43,300 tons went directly to products, such as caulking lead, weights, etc. During the year, about 71 percent went to storage batteries, 10 percent to pigments (including tetraethyl fluid), and 3 percent

classified uses. Production of the 3 principal lead-consuming items—batteries, tetraethyl lead, and cable covering—took 31 percent (the same as in 1954 and 1955), 16 percent (14 percent in 1955), and 11 percent (10 percent in 1955), respectively, for a total of 58 percent, or 697,100 tons.

Shipments of automotive replacement batteries declined 3 percent from 25.4 million units in 1955 to 24.7 million in 1956, according to the Association of American Battery Manufacturers, Inc.⁵

Of the total lead consumption (excluding lead contained in leaded zinc oxide and some other pigments and the lead scrap that went directly to end products), New Jersey took 17 percent; Illinois, 11 percent; Indiana, 8 percent; California, 7 percent; Pennsylvania and New York, each 6 percent; and Missouri 5 percent—a total of 60 percent in 7 of the leading lead-consuming States. With the addition of Louisiana and Texas, 9 States accounted for 74 percent of the lead consumed.

TABLE 11.—Consumption of lead in the United States in 1955-56, by products, in short tons

	1955	1956		1955	1956
Metal products:			Pigments:		
Ammunition.....	46,816	44,439	White lead.....	18,540	16,951
Bearing metals.....	34,567	28,321	Red lead and litharge.....	87,503	79,190
Brass and bronze.....	24,043	27,083	Pigment colors.....	15,000	13,886
Cable covering.....	121,165	134,339	Other ¹	10,383	10,354
Calking lead.....	50,406	64,070	Total.....	131,435	120,370
Casting metals.....	15,141	12,932	Chemicals:		
Collapsible tubes.....	11,136	10,945	Tetraethyl lead.....	165,133	191,990
Foil.....	5,185	4,593	Miscellaneous chemicals.....	5,492	3,146
Pipes, traps, and bends.....	29,767	28,028	Total.....	170,625	195,136
Sheet lead.....	20,466	30,249	Miscellaneous uses:		
Solder.....	88,749	75,200	Annealing.....	6,059	5,899
Terne metal.....	2,382	1,708	Galvanizing.....	2,313	1,658
Type metal.....	26,507	26,709	Lead plating.....	848	916
Total.....	495,320	489,586	Weights and ballast.....	7,673	7,250
Storage batteries:			Total.....	16,803	15,723
Antimonial lead.....	105,787	191,568	Other, unclassified uses.....	18,338	18,131
Lead oxides.....	184,246	179,203	Grand total.....	1,212,644	1,209,717
Total.....	880,033	370,771			

¹ Includes lead content of leaded zinc oxide and other nonspecified pigments.

² Includes lead which went directly from scrap to fabricated products.

TABLE 12.—Consumption of lead in the United States, 1955-56, by months, in short tons¹

Month	1955	1956	Month	1955	1956
January.....	93,301	110,562	August.....	107,168	107,711
February.....	85,290	100,201	September.....	112,091	95,676
March.....	99,677	97,755	October.....	115,289	112,179
April.....	96,700	97,836	November.....	108,649	102,408
May.....	101,029	104,418	December.....	104,615	91,176
June.....	103,451	100,571	Total.....	1,212,644	1,209,717
July.....	84,394	88,325			

¹ Includes lead content of leaded zinc oxide and other nonspecified pigments and lead which went directly from scrap to fabricated products.

² American Metal Market, vol. 64, No. 28, Feb. 8, 1957, p. 6.

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TABLE 13.—Consumption of lead in the United States in 1955-56, by product and types of material

	Soft lead	Antimony
Metal products.....	257,454	1,419
Storage batteries.....	179,203	1,419
Pigments.....	110,057	
Chemicals.....	195,067	
Miscellaneous.....	10,830	
Unclassified.....	14,462	
Total.....	767,073	2,838

¹ Excludes 43,375 tons of lead that went directly from scrap to fabricated products contained in leaded zinc oxide and other nonspecified pigments.

TABLE 14.—Lead consumption by State

State	Refined soft lead	Antimony
California.....	52,560	
Colorado.....	1,419	
Connecticut.....	18,261	
District of Columbia.....	93	
Florida.....	1,562	
Illinois.....	76,091	
Indiana.....	50,380	
Kansas.....	2,270	
Kentucky.....	121	
Maryland.....	21,073	
Massachusetts.....	8,809	
Michigan.....	10,509	
Missouri.....	61,175	
Nebraska.....	11,518	
New Jersey.....	131,943	
New York.....	50,293	
Ohio.....	21,626	
Pennsylvania.....	39,638	
Rhode Island.....	7,165	
Tennessee.....	530	
Virginia.....	1,855	
Washington.....	7,009	
West Virginia.....	16,203	
Wisconsin.....	996	
Alabama and Georgia ¹	22,022	
Iowa and Minnesota.....	2,193	
Montana and Idaho.....	7,970	
New Hampshire, Maine, and Delaware.....	1,287	
Arkansas and Oklahoma.....	2,365	
Hawaii and Oregon.....	1,100	
North and South Carolina.....	426	
Louisiana and Texas.....	144,544	
Utah, Nevada, and Arizona.....	1,389	
Undistributed.....		
Total.....	767,073	2,838

¹ Excludes 43,375 tons of lead which went directly from scrap to fabricated products contained in leaded zinc oxide and other nonspecified pigments.

² The following States are grouped to avoid disclosing individual consumption.

STOCKS

National Stockpiles.—The General Services Administration continued throughout 1956 to purchase uranium and zinc monthly from domestic producers under the authority of the President in Executive Order 10450. Purchase directives from the Office of Management and Enterprise lead and zinc of foreign origin were acquired under the year for the supplemental (barter-programs).

the quantities obtained were released, but it was generally understood that the totals acquired during the period July-December were in excess of 100,000 tons of zinc and 50,000 tons of lead. Information released by the Department of Agriculture showed that during the period July through December 1956 supplemental-type strategic material purchases included contracts for \$23.8 million worth of lead and \$41.5 million worth of zinc.

Producers' Stocks.—Lead stocks, as reported by the American Bureau of Metal Statistics, are shown in table 15. Stocks of refined and antimonial lead include metal held by all primary refiners and by some refiners of secondary metal who produced soft lead. Smelters' stocks of ore in process increased during the year, as did refiners' stocks of pig lead and antimonial lead. Supply of lead in 1956 (1,318,700 tons) exceeded consumption (1,209,700 tons) by 109,000 tons.

TABLE 15.—Stocks of lead at smelters and refineries in the United States at end of year, 1947-51 (average) and 1952-56, in short tons

(American Bureau of Metal Statistics)

	1947-51 (average)	1952	1953	1954	1955	1956
Refined pig lead.....	30,286	31,405	65,036	77,930	21,196	29,435
Antimonial lead.....	7,988	12,155	16,116	14,789	9,893	11,746
Total.....	38,271	43,560	81,152	92,719	31,080	41,181
Lead in base bullion:						
At smelters and refineries.....	11,404	17,583	17,920	18,170	10,532	12,222
In transit to refineries.....	4,422	3,105	2,867	1,723	3,764	2,846
In process at refineries.....	10,174	19,759	26,713	27,164	27,625	25,092
Total.....	32,000	40,447	47,500	47,057	47,921	40,160
Lead in ore and matte and in process at smelters.....	77,325	65,771	67,688	62,074	71,812	77,918
Grand total.....	147,596	149,778	196,340	201,850	160,822	159,259

On December 7, 1956, the British Board of Trade announced in London⁶ that it would shortly start discussions with trade officials looking to curtailment of Government-owned stocks of lead and zinc. It was announced officially that sales of lead and zinc from the Government stockpile would not begin until around the middle of January 1957 and that sales would be made in an orderly manner to avoid "unduly disturbing" the market. No details were given as to the actual quantities of the metals to be released.

Primary refiners' reports to the Bureau of Mines indicated stocks of 30,200 tons of refined lead at the end of 1956 compared with 21,900 tons on January 1; stocks of antimonial lead increased slightly from 9,100 tons to 10,700. Stocks of lead in ores and concentrates increased from 42,900 to 44,900 tons during the year, but stocks of base bullion at refineries that receive bullion and smelters that produce bullion dropped from 15,600 tons to 11,100. These data represent physical inventory at the plants, irrespective of ownership, and do not include material in process or in transit; they are therefore not directly comparable to the data in table 15.

⁶ American Metal Market, vol. 63, No. 234, Dec. 8, 1956, p. 1

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Consumers' Stocks.—Stocks of metal secondary smelters which are also consumed during the year. Stocks of soft same, with most of the increase in antimony in the alloys.

TABLE 16.—Consumers' stocks of lead in the United States at end of year, 1952-56, by type of material, in short tons

Year	Refined soft lead	Antimonial lead	Unmelted white scrap	Lead in alloys
1952.....	80,888	20,309	3,877	
1953.....	75,801	14,867	3,607	
1954.....	82,039	17,573	3,199	
1955.....	73,480	23,081	2,914	
1956 ¹	73,673	40,226		

¹ Beginning 1956, consumer stocks of scrap were added to secondary smelter metal stocks were included with consumer metal stocks.

PRICES

The New York quoted price for commercial lead at the beginning of 1956; it rose but dropped back to 16.00 cents on January 1 during the remainder of the year. The grades of lead sold in 1956 was 15.70 cents in 1955 and 13.70 cents in 1954. St. Louis and the slightly higher New York a pound. Government purchases for the important factor in sustaining the lead price and abroad.

Quotations on the London Metal Exchange high of £126½ per long ton on January 1956 per pound United States currency, commercial.

TABLE 17.—Average monthly and yearly quotations for lead, New York, and London, 1954-56, in cents per pound

Month	1954			
	St. Louis	New York	Lon- don ¹	St. Louis
January.....	13.05	13.25	10.85	14.8
February.....	12.62	12.82	10.39	14.8
March.....	12.73	12.93	10.85	14.8
April.....	13.71	13.91	11.77	14.8
May.....	13.80	14.00	11.88	14.8
June.....	13.91	14.11	12.26	14.8
July.....	13.80	14.00	12.04	14.8
August.....	13.86	14.06	12.17	14.8
September.....	14.40	14.60	12.67	14.9
October.....	14.77	14.97	13.67	15.3
November.....	14.50	15.00	13.48	15.3
December.....	14.80	15.00	12.97	15.3
Average.....	13.85	14.05	12.08	14.9

¹ St. Louis: Metal Statistics, 1957, p. 517. New York: Metal and Mineral Markets.

² Conversion of English quotations into American money by Federal Reserve Board.

change for the month) to a low of £109½ on May 31 (equivalent to 13.7 cents per pound). The bid price on December 31 was £116½ (equivalent to 14.5 cents per pound), and the average for the year was £116.33 or 14.5 cents.

FOREIGN TRADE ¹

Imports.—General imports of primary lead in all forms totaled 459,100 tons in 1956, an increase of 17,700 tons or 4 percent over 1955. The imports comprised 196,500 tons contained in ore, flue dust, and matte (an 11-percent increase from 1955) and 262,700 tons of pigs and bars (a 1-percent decrease). Of the lead contained in ore, flue dust, and matte, Peru supplied 28 percent, Union of South Africa 23, Canada and Australia each 16, Bolivia 9, Guatemala 4, and other countries 4 percent. Of the pigs and bars, Australia furnished 31 percent, Mexico 30, Yugoslavia 15, Peru 13, Canada 6, and other countries 5 percent.

Exports.—Exports of lead in 1956 amounted to 7,800 tons, of which 1,100 tons was contained in ore and bullion, 4,600 tons was in pigs and bars, and 2,100 tons was in scrap.

TABLE 18.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, 1947-51 (average) and 1952-56, in short tons, in terms of lead content ¹

[Bureau of the Census]						
Country	1947-51 (average)	1952	1953	1954	1955	1956
Ore, flue dust, and matte:						
North America:						
Canada-Newfoundland and Labrador	10,030	12,048	39,242	40,503	33,090	30,692
Guatemala	1,269	4,721	5,391	2,086	5,208	6,904
Honduras	264	565	1,090	1,530	2,767	2,069
Mexico	3,905	2,497	3,443	2,167	2,201	3,868
Other North America	345	126		(1)	3	8
Total	15,813	19,987	49,166	47,082	43,250	44,439
South America:						
Bolivia	15,757	18,473	18,984	14,946	13,812	17,177
Chile	3,132	3,197	3,341	173	409	118
Colombia	24	7	255	356	546	1,440
Peru	13,300	28,213	32,842	38,734	44,223	55,174
Other South America	331	85	90	110	82	184
Total	32,634	40,075	55,512	54,310	59,072	74,093
Europe	40	425		696		24
Asia:						
Korea	154	168				1,422
Philippines	411	2,440	2,980	2,160	2,035	2,222
Other Asia	140	160	92			
Total	705	2,664	3,072	2,160	2,035	2,644
Africa:						
French Morocco	1,837		2,633			
Union of South Africa	13,575	22,643	20,777	35,607	41,575	44,208
Other Africa	91	113	63	19		
Total	15,503	22,656	32,473	35,520	41,575	44,208

See footnotes at end of table.

¹ Figures on imports and exports compiled by Mae B. Price and Elsie D. Page, Division of Foreign Activities, Bureau of Mines, from records of the Bureau of the Census.

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TABLE 18.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, 1947-51 (average) and 1952-56, in short tons, in terms of lead content ¹—Continued

Country	1947-51 (average)	1952-56
Ore, flue dust, and matte—Continued		
Oceania:		
Australia	8,454	8,000
Other Oceania	33	1
Total	8,487	8,001
Total ore, flue dust, and matte	73,188	104,640
Base bullion:		
North America:		
Canada		
Guatemala	46	2
Mexico	1,547	
Total	1,593	2
South America:		
Bolivia	176	1
Europe:		
Italy	258	(1)
Asia:		
Africa	6	
Oceania: Australia	1,349	
Total base bullion	3,382	3
Pigs and bars:		
North America:		
Canada-Newfoundland and Labrador	56,824	104,500
Mexico	113,079	108,800
Other North America	174	
Total	180,517	303,400
South America:		
Bolivia		8
Peru	24,571	42,100
Other South America	(1)	
Total	24,571	42,800
Europe:		
Belgium-Luxembourg	1,924	1,780
Germany	3,543	4,600
Italy	4,954	
Netherlands	606	2,740
Spain	419	5,500
United Kingdom	223	4,210
Yugoslavia	21,822	53,900
Other Europe	59	71
Total	33,160	75,020
Asia:		
Burma	761	
Japan	1,564	
Other Asia	631	
Total	2,946	
Africa:		
French Morocco	456	6,670
Other Africa	117	
Total	573	6,670
Oceania: Australia	18,781	82,800
Total pigs and bars	200,638	510,720

See footnotes at end of table.

TABLE 18.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, 1947-51 (average) and 1952-56, in short tons, in terms of lead content¹—Continued

Country	1947-51 (average)	1952	1953	1954	1955	1956
Reclaimed, scrap, etc.:						
North America:						
Canada-Newfoundland and Labrador.....	4,032	0,047	371	3,023	7,508	6,808
Canal Zone.....	316	858	205	35	37	29
Cuba.....	120	147	147	319	815	850
Jamaica.....	85	101	28	28	8	8
Mexico.....	1,110	872	98	1,298	6,120	9,701
Panama.....	134	300	138	180	331	322
Other North America.....	243	622	329	298	195	340
Total.....	8,040	8,800	1,310	5,153	15,096	17,148
South America:						
Peru.....	32	207	59	173	166	209
Venezuela.....	157	196	196	1,653	1,653	230
Other South America.....	52	20	20	20	20	20
Total.....	241	513	59	173	1,819	529
Europe:						
Belgium-Luxembourg.....	266	47	202	578	117	117
Denmark.....	11	14	14	282	1,000	1,000
Germany.....	191	466	466	466	466	466
Italy.....	544	544	544	544	544	544
Netherlands.....	610	454	502	112	167	167
Spain.....	131	345	103	110	431	431
Yugoslavia.....	386	229	442	103	136	170
Other Europe.....	2,146	1,075	1,263	269	1,540	1,801
Total.....	2,146	1,075	1,263	269	1,540	1,801
Asia:						
Burma.....	41	203	21	13	4	4
Japan.....	4,668	346	21	47	20	1
Other Asia.....	1,235	141	141	47	20	1
Total.....	5,944	689	21	60	26	5
Africa.....	260	260	17	17	17	17
Oceania:						
Australia.....	2,202	924	2,666	2,009	1,255	1,255
Other Oceania.....	10	338	87	87	87	87
Total.....	2,221	1,262	2,753	2,096	1,342	1,342
Total reclaimed, scrap, etc.....	17,751	12,339	5,439	5,655	20,580	20,738
Grand total.....	354,850	628,109	562,278	443,243	462,208	479,875

¹ Data are "general imports", that is, include lead imported for immediate consumption plus material entering the country under bond.

² Less than 1 ton.

³ Republic of Korea.

⁴ West Germany.

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TABLE 19.—Lead imported for consumption (average) and 1952-56, by country (Bureau of the Census)

Year	Lead in ores, fine dust or fume, and mattes, n. s. p. f.		Lead in base bullion		Pigs and bars	
	Short tons	Value	Short tons	Value	Short tons	Value
1947-51 (average).....	65,332	\$16,143,939	2,992	\$844,818	257,853	\$73,421
1952.....	107,621	32,768,909	2,951	1,137,813	610,718	165,011
1953.....	87,030	16,214,084	742	294,068	379,119	95,281
1954.....	196,054	47,967,269	41	10,149	274,286	68,411
1955.....	156,433	38,142,741	31	11,311	262,204	77,711
1956.....	191,302	60,621,209	31	11,311	262,204	77,711

¹ In addition to quantities shown (value included in total) as follows—1947-51 (average): 17,896 tons; \$4,291,358; 1952: 11,311 tons; \$3,430,636; 1953: 18,944 tons; \$3,930,668; 1954: 20,717 tons; \$5,430,636; 1955: 18,944 tons; \$3,930,668; 1956: 20,717 tons; \$5,430,636. * Owing to changes in tabulating procedures by the Bureau of the Census with years before 1954.

TABLE 20.—Miscellaneous products containing lead in the United States, 1947-51 (average) (Bureau of the Census)

Year	Babbitt metal, solder, metal, and other combinations containing lead		
	Gross weight (short tons)	Lead content (short tons)	Value (\$1,000)
1947-51 (average).....	1,336	843	\$1,336
1952.....	1,540	999	1,540
1953.....	2,375	1,343	2,375
1954.....	2,309	1,572	2,309
1955.....	2,285	1,283	2,285
1956.....	4,106	2,626	4,106

¹ Owing to changes in tabulating procedures by the Bureau of the Census with years before 1954.

² Revised figure.

A paper¹⁰ dealt with ore-body evaluation and the application of geology to development and mining problems in the Southeastern Missouri lead belt. The paper included sections on history of the application of geology to mining operations; on the geology of the lead belt and of the ore bodies; evaluation of ore bodies; recommended development, by type of ore bodies; and geologic aids to mining.

A marked increase in smelting capacity was obtained through modernization of presintering practices at a lead smelter.¹¹ The charge uniformity and control provided by the new preparation plant that was constructed permitted consistent maintenance of all subsequent operations at their highest capacity levels.

Results of a study of diffusion in liquid lead and experiments undertaken to aid in evaluating existing theories on diffusion in liquid metals were published.¹² The following statement summarized certain data contained in the article:

The diffusion of lead and of trace amounts of bismuth in liquid lead have been investigated by the capillary method, using RaD and RaE as tracers. The results are compared with existing theories of diffusion in liquids, the agreement with theory being fair. The heat of activation for self-diffusion in lead is found experimentally to be close to the corresponding activation energy obtained from viscosity data. The pioneer data of Groh and von Hevesi for the self-diffusion of liquid lead, using ThB as a tracer, fit in with the present results.

A manufacturer reported¹³ development of a new, activated, rosin-core, lead-tin solder with outstanding noncorrosive characteristics and minimum odor. The solder spread was said to be 30 percent greater than with most conventional rosin-core solders. The activating chemicals used in the solder are not toxic to the touch or to the respiratory tract. The solder fluxes quickly and pierces oxide film and corrosion products on the parts to be soldered in less time than conventional solders.

A new process for making tetraethyl lead was being tested in a research laboratory. According to a report,¹⁴ the new process differs radically from any heretofore used or proposed for manufacturing tetraethyl lead. The chemistry of the process involves a reaction between a metal alkyl and a lead compound. It was stated that while the development work was still in its early stages the process showed considerable promise because it eliminates certain intermediate materials and steps involved in the present manufacturing operation and has proved superior to processes now known.

An article¹⁵ on lead and its alloys supplied data (including a bibliography) on engineering advances in lead alloys and in smelting and refining, research progress, corrosion studies, testing and inspection, new publications, and radiation shielding.

Pilot production of limited quantities of lead metaniobate, an unusual new high-temperature material with numerous possible defense applications in guided missiles and jet engines, was announced by a manufacturer of electric equipment and appliances.¹⁶ The lead

¹⁰ Snyder, F. G., and Emery, J. A., *Geology in Development and Mining, Southeast Missouri Lead Belt*; Min. Eng., vol. 8, No. 12, December 1956, pp. 1210-1224.

¹¹ Lee, Harold E., and Ingvaldsen, Donald, *Modernization of Bunker Hill Presintering Practices*; Min. Eng., vol. 8, No. 10, October 1956, pp. 1001-1005.

¹² Rothman, S. J., and Hall, L. D., *Diffusion in Liquid Lead*; Jour. Metals, vol. 8, No. 2, February 1956, pp. 199-203.

¹³ American Metal Market, vol. 63, No. 107, Oct. 12, 1956, p. 6.

¹⁴ American Metal Market, vol. 63, No. 235, Dec. 11, 1956, p. 1.

¹⁵ Roll, Kempton H., *Lead and Its Alloys*; Ind. Eng. Chem., vol. 48, No. 9, pt. II, September 1956, pp. 1731-1734.

¹⁶ American Metal Market, G. E. Starts Pilot Output of New Lead Material; Vol. 63, No. 176, Sept. 12, 1956, p. 12.

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metaniobate is a piezoelectric material when acted upon by outside physical forces. It retains most of its properties up to 1000°C. materials, such as barium titanate and cerium titanate, at lower temperatures. The lead is in the form of small, aspirin-size disks.

WORLD RE

World mine production of lead in 1956 was a consecutive year, reaching an estimated 1.2 million tons, or 12 percent more than in 1955. Small or medium-sized mines made in the United States, Peru, U. S. S. R., and Australia; and decreases in Canada, Italy, Spain, Yugoslavia, and Morocco. These countries, in order of size of lead production, were mined in nearly 60 countries in 1956. More than 100,000 tons) furnished 67 percent of the total lead produced in these countries, in order of size of lead production, Australia, U. S. S. R., Mexico, Canada, and the United States.

Smelter production increased for the second year in a row. The world total in 1956 was estimated to be 1.2 million tons, or 12 percent gain over 1955 and a new record for the industry. Producing countries, output increased in Australia, West Germany, and Belgium; and was almost unchanged in France; and was almost unchanged in the United States. Six countries that were the principal producers of lead in 1955 supplied 64 percent of the total world smelter production, which produced 109,000 tons of lead in 1956. World smelting and refining capacity was estimated at 1.2 million tons in 1956. The United States were listed in the 1953 chapter of the Minerals Yearbook as a new primary lead smelter of significance from 1954 through 1956.

TABLE 22.—World mine production of lead, 1952-56, in short tons

[Compiled by Augusta W. Jann and others]

Country	1947-51 (average)	1952-56 (average)
North America:		
Canada.....	187, 181	16
Cuba.....	26	
Greenland.....		
Guatemala.....	2, 484	
Honduras.....	1, 298	
Mexico.....	242, 676	27
Salvador.....	1, 470	
United States.....	400, 719	30
Total.....	813, 854	83
South America:		
Argentina.....	22, 306	2
Bolivia (exports).....	27, 550	3
Brazil.....	2, 623	
Chile.....	6, 227	
Ecuador.....	238	
Peru.....	60, 043	10
Total.....	120, 987	18

See footnotes at end of table.

short tons of ore yielding 61,800 short tons of zinc concentrate, 10,300 short tons of lead concentrate, and 6,800 tons of copper concentrate. Ore reserves at the end of the fiscal year were 2.6 million short tons. The lead and copper concentrates produced were exported, and the zinc concentrate was shipped to the company Risdon electrolytic-zinc plant.

Lead and Zinc Pigments

By Arnold M. Lansche¹ and



SHIPMENTS of lead and zinc pigments totaled 491,000 tons or 7 percent less than in 1955, but those of red lead, white lead in oil and zinc sulfate compared with 1955, but those of red lead, zinc oxide, lithopone, dry white lead, and

TABLE 1.—Salient statistics of the lead¹ and zinc² pigments, 1947-51 (average)

	1947-51 (average)	1952	1953
Shipments of principal pigments:			
White lead (dry and in oil).....short tons..	44,561	26,663	26,663
Red lead.....do.....	32,428	30,926	30,926
Litharge.....do.....	155,058	140,798	140,798
Black oxide.....do.....	69,963	78,893	78,893
Zinc oxide.....do.....	146,081	142,210	142,210
Lead zinc oxide.....do.....	58,787	37,892	37,892
Lithopone.....do.....	118,376	61,832	61,832
Value of products:			
All lead pigments.....	\$81,761,800	\$72,230,000	\$64,303,000
All zinc pigments.....	63,702,200	63,950,000	56,478,000
Total.....	145,464,000	136,180,000	120,781,000
Value per ton received by producers:			
White lead (dry).....	351	403	403
Red lead.....	355	376	376
Litharge.....	339	348	348
Zinc oxide.....	240	307	307
Lead zinc oxide.....	248	313	313
Lithopone.....	118	137	137
Foreign trade:			
Lead pigments:			
Value of exports.....	1,020,400	933,000	799,000
Value of imports.....	613,400	451,000	161,000
Zinc pigments:			
Value of exports.....	4,837,600	4,352,000	1,468,000
Value of imports.....	459,000	90,000	287,000
Export balance.....	4,786,600	4,744,000	1,984,000

¹ Excludes basic lead sulfate, data withheld to avoid disclosure of operations.

² Production by battery manufacturers.

Throughout 1956 the production of lead and zinc salts was adequate for all demands for lead and zinc, their ores, and scrap—whereas lead and zinc prices fluctuated slightly in early 1956.

¹ Commodity specialist.
² Statistical assistant.

at 16 and 13.5 cents a pound, respectively, from mid-January throughout the rest of the year. Slight price increases were noted in most of the pigments and salts during the year.

DOMESTIC PRODUCTION

The value of shipments of lead and zinc pigments in 1956 (except for basic lead sulfate and zinc sulfide, which cannot be shown) was \$122 million, a 4-percent decrease below the 1955 value. Lead pigments comprised 55 percent of the total value and zinc pigments 45 percent, compared with 54 and 46 percent, respectively, in 1955.

Lead and zinc pigments and zinc salts manufacturers, their plants and products, were listed in Minerals Yearbook, volume 1, 1953, and subsequent changes have been noted annually in the yearbooks. In 1956 the New Jersey Zinc Co. discontinued producing lithopone because of decreasing demand. Pacific Smelting Co. began producing lead-free zinc oxide at Torrance, Calif., during the year.

LEAD PIGMENTS

Combined shipments of the lead pigments declined 9 percent in quantity and 3 percent in value in 1956.

White lead (dry) shipments were down 2 percent from those of 1955, but the "in oil" variety increased 7 percent. Total 1956 white-lead shipments were slightly higher than those in 1955 and composed 14 percent of all lead pigments shipped in 1956, whereas in 1955 shipments were 13 percent of the total.

In addition to these lead pigments, production and shipments of which are given in table 2, 107,000 tons of black or gray suboxide of lead was manufactured by battery-makers for their own use in 1956. This suboxide, which is sometimes called a leady litharge, is used in place of litharge. Comparable quantities in 1954 and 1955 were 79,000 and 113,900 tons, respectively. Suboxide production required 102,500 tons of pig lead in 1956, 109,000 in 1955, and 76,000 in 1954.

TABLE 2.—Production and shipments of lead pigments¹ in the United States, 1955-56

Pigment	1955				1956			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value ¹			Short tons	Value ¹	
			Total	Average			Total	Average
White lead:								
Dry	18,249	17,868	\$7,006,318	\$392	17,248	17,448	\$7,206,668	\$413
In oil ²	7,801	7,717	3,638,660	472	7,203	8,250	4,133,609	501
Red lead	26,017	29,272	10,018,471	342	28,612	27,975	10,186,102	364
Litharge	148,346	148,511	48,470,892	326	132,659	131,826	45,671,080	346
Black oxide	113,874				106,956			

¹ Except for basic lead sulfate and orange mineral; data withheld to avoid disclosing individual company confidential operations.

² At plant, exclusive of container.

³ Weight of white lead only, but value of paste.

LEAD AND ZINC PIGMENTS AND

TABLE 3.—Lead pigments¹ shipped by manufacturers, 1947-51 (average) and 1952-56, in

Year	White lead		
	Dry	In oil	Total
1947-51 (average).....	28,642	17,919	44,561
1952.....	16,779	10,884	20,663
1953.....	16,784	9,433	20,217
1954.....	17,235	8,336	25,571
1955.....	17,868	7,717	25,585
1956.....	17,448	8,250	25,698

¹ Excludes basic lead sulfate and orange mineral; data withheld to avoid disclosing individual company confidential operations.

² Production by battery manufacturers.

TABLE 4.—Lead content of lead and zinc pigments manufactured, by sources, 1955-56,

Pigment	1955			Total lead in pigments	Lead in pigments produced from—
	Lead in pigments produced from—		Pig lead		
	Ore				
	Domestic	Foreign			
White lead.....			20,888	20,888	
Red lead.....			26,304	26,304	
Litharge.....			133,511	133,511	
Black oxide.....			109,023	109,023	
Leaded zinc oxide.....	4,616	1,930		6,546	4
Total.....	4,616	1,930	289,726	296,272	4

¹ Excludes lead in basic lead sulfate and orange mineral; data withheld to avoid disclosing individual company confidential operations.

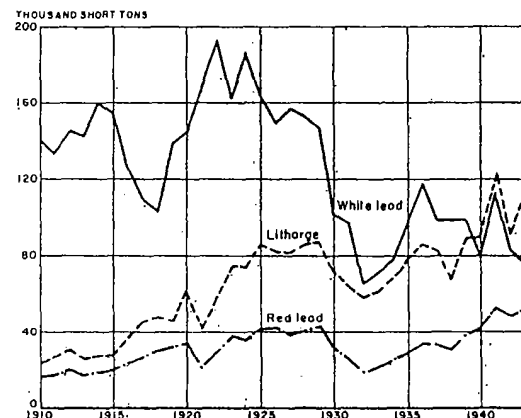


FIGURE 1.—Trends in shipments of lead pigments

White lead, red lead, litharge, and the gray and black suboxide were made directly or indirectly from refined lead and constituted 98 percent of all lead used in pigments. The lead content of leaded zinc oxide made up the remaining 2 percent of the lead used in pigments. Basic lead sulfate is not reported herein, except to the degree that it enters leaded zinc oxide; lead silicate is included with white lead.

ZINC PIGMENTS AND SALTS

Combined shipments of the major zinc pigments declined 10 percent in quantity and 5 percent in value in 1956. Shipments of lead-free zinc oxide decreased 8 percent. Shipments of leaded zinc oxide were down 17 percent and those of lithopone 10 percent.

Average values of zinc pigments, as reported by producers, were above prices in 1955. The average price for zinc oxide in 1956 increased \$13 per ton to \$271; leaded zinc oxide was up \$23 to \$282 per ton and lithopone up \$7 per ton to \$147.

Zinc sulfate shipments were above those in 1955 by 35 percent, but declined 2 percent for zinc chloride (50° B). The average value of zinc sulfate increased \$6 to \$153 per ton, and that of zinc chloride was up \$32 to \$124 per ton.

Zinc ore, refined metal, and such secondary materials as scrap metal, residues, drosses, skimmings, and zinc ashes serve as source materials for manufacturing zinc pigments and salts.

As in preceding years, zinc oxide was made from ores, metal, and scrap. Of the lead-free zinc oxide, 21 percent was made by the French process from metal, 69 percent by the American process from ores and residues, and 10 percent by "other" processes from scrap residues and scrap materials. Lithopone and zinc sulfate were made from ores and scrap and leaded zinc oxide from ores only. The proportion of zinc oxide production derived from metal and scrap was 31 percent in 1956 compared with 32 percent in 1955.

Zinc Oxide.—Lead-free zinc oxide shipments declined 8 percent from the 1955 total.

Leaded Zinc Oxide.—Four grades of leaded zinc oxide classified according to lead content were produced in the United States. The 5- to 35-percent grade constituted the bulk of production; smaller quantities were produced as less than 5-percent grade, over 35- to 50-percent grade, and over 50-percent grade. Output in 1956 (comparison with 1955 in parentheses) for the 35-percent lead and under grade was 24,100 (27,900) tons and 2,100 (1,900) tons of over 35-percent lead.

Lithopone.—Lithopone shipments were down 10 percent from those in 1955.

The lithopone statistics in this report are given on the basis of ordinary lithopone sold as such, plus the ordinary lithopone content of the high-strength product.

An insignificant quantity of titanated lithopone was produced in the United States in 1956. The trend has been downward almost continuously since 1937, when 19,400 tons of ordinary lithopone was used in making the titanated pigment.

LEAD AND ZINC PIGMENTS

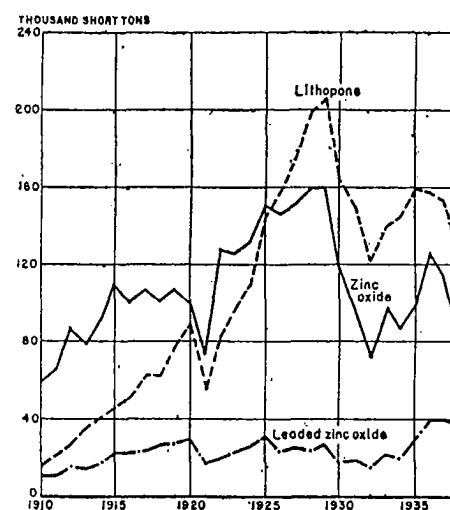


FIGURE 2.—Trends in shipments of lead and zinc pigments, 1910-1955

TABLE 5.—Production and shipments of zinc pigments and salts, 1955

Pigment or salt	Production (short tons)	1955		
		Shipments (short tons)	Value (dollars)	
			Total	Average
Zinc oxide ¹	169,630	168,541	\$43,561,776	
Leaded zinc oxide ²	29,725	32,061	8,400,456	
Lithopone	43,819	42,845	6,002,832	
Zinc chloride, 50° B	54,877	54,161	4,957,800	
Zinc sulfate	24,280	23,864	3,497,445	

¹ Value at plant, exclusive of container.

² Zinc oxide containing 5 percent or more lead is classed as leaded zinc oxide; a small quantity containing less than 5 percent lead is classed as zinc oxide.

TABLE 6.—Zinc pigments and salts¹ shipped, 1947-51 (average) and 1956

Year	Zinc oxide (short tons)	Lithopone (short tons)
1947-51 (average)	146,081	42,210
1952	142,210	42,210
1953	148,627	40,285
1954	140,285	40,285
1955	168,541	42,845
1956	164,955	42,845

¹ Excludes zinc sulfide, data withheld to avoid disclosing

MINERALS YEARBOOK, 1956

Fig. 7.—Zinc content of zinc pigments¹ and salts produced by domestic manufacturers, by sources, 1955-56, in short tons

Product or salt	1955					1956				
	Zinc in pigments and salts produced from—				Total zinc in pigments and salts	Zinc in pigments and salts produced from—				Total zinc in pigments and salts
	Ore		Slab zinc	Secondary material :		Ore		Slab zinc	Secondary material :	
	Domestic	Foreign				Domestic	Foreign			
Lead	58,280	34,421	22,139	22,473	137,293	57,320	20,831	18,894	21,083	127,128
Zinc oxide	10,822	4,892	—	(1)	15,714	9,535	5,362	—	(1)	14,897
Other	(1)	(1)	—	(1)	16,839	(1)	(1)	—	(1)	18,839
Pigments	—	—	22,139	—	169,846	—	—	18,894	—	160,864
Salts	(1)	(1)	—	12,871	12,871	(1)	(1)	—	12,133	12,133
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)

¹ Zinc sulfide; data are withheld to avoid disclosing individual company confidential operations. ² Figures are higher than those shown in the report on Secondary Metals—Nonferrous because they include zinc recovered from byproduct sludges, residues, etc., not classified as purchased scrap material. ³ Withheld to avoid disclosing individual company confidential data. ⁴ Zinc sulfate production. ⁵ Withheld to avoid disclosing individual company confidential data. ⁶ Withheld to avoid disclosing individual company confidential data. ⁷ Withheld to avoid disclosing individual company confidential data. ⁸ Withheld to avoid disclosing individual company confidential data. ⁹ Withheld to avoid disclosing individual company confidential data. ¹⁰ Withheld to avoid disclosing individual company confidential data. ¹¹ Withheld to avoid disclosing individual company confidential data. ¹² Withheld to avoid disclosing individual company confidential data. ¹³ Withheld to avoid disclosing individual 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CONSUMPTION AND USES

A general decline in consumption, as measured by shipments, attributed to decreases in the volume of business in industries consume large quantities of the pigments and salts. Production of passenger automobiles at 5.8 million units, was less than three-fourths of 1955 output and trucks, at 1.1 million units, were down 12 percent. The value of public and private construction increased 5 percent to \$44 billion in 1956, but the \$16-million increase in the construction of paint industry resulted from higher prices, as the total value of paints, varnish, and lacquer at 503 million gallons was less than in 1955.

The paint industry was the principal user of white lead and red lead and a minor user of litharge (chrome pigments and varnish), receiving 79, 51, and 5 percent, respectively, of the total shipments of these products. The paint industry was the principal user of zinc oxide and lithopone and second in importance for zinc pigments. Of the total quantity of lead and zinc pigments shipped, the paint industry received 129,000 tons in 1956 and 142,000 tons in 1955, a 9-percent decline.

Titanium pigments continued to furnish the chief competition to lead and zinc pigments in paintmaking. Production and shipments of titanium pigments, based on the titanium dioxide content, established new records, increasing about 18 and 6 percent, respectively, over the previous highs established in 1955. The use of titanium pigments has doubled over the past 12 years, displacing lead and zinc pigments, especially white lead and lithopone, in paint formula-

LEAD AND ZINC PIGMENTS AND SALTS

Shipments of replacement automotive batteries to 24.8 million units. The storage-battery industry received 62 percent, respectively, of the red lead and lithopone, a net decline from that received in 1955.

The tonnage of natural and synthetic rubber for various purposes declined 5 percent, and the output of rubber was 34 million and 34 million units, respectively, was less than in 1955. The rubber industry was in first place in lead-free zinc oxide, taking over half of the total production. The industry also used small quantities of litharge, lithopone.

The ceramics industry received 2 percent of the red lead, 15 percent of the litharge, and 15 percent of the lead-free zinc oxide shipped in the United States.

LEAD PIGMENTS

White Lead.—Paintmaking was the principal user of white lead in 1956; shipments reported to the paint industry were 21 percent of the total. During the past 8 years a decline of white lead has gone to other uses. In 1950, 1955 21 percent; and in 1956, 19 percent. Shipments of white lead makers accounted for 2 percent of the total. Other uses for the pigment were as plasticizers in dry colors, and unspecified purposes. A substantial portion of the "unspecified" category doubtless belongs proper-

TABLE 8.—Distribution of white lead (dry and in oil) and lithopone, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952	1953
Paints	38,816	21,223	21,030
Ceramics	1,468	1,079	785
Other	4,287	4,361	4,402
Total	44,561	26,663	26,217

¹ Excludes basic lead sulfate, data withheld to avoid disclosing individual company confidential operations.

² Includes the following tonnages for plasticizers and stabilizers: 1952-56, 1,355.

³ Data for plasticizers and stabilizers withheld to avoid disclosing individual company confidential operations.

Basic Lead Sulfate.—Substantial quantities of basic lead sulfate are used as an intermediate product in manufacturing. Such quantities have always been shown in this report as basic lead sulfate. Such quantities have always been shown in this report as basic lead sulfate.

Red Lead.—The paint industry was the principal user of red lead in 1956, receiving 51 percent of the total shipments. Battery makers received 36 percent of total shipments in 1955. The ceramics industry received 15 percent of the shipments. The "Other" classification con-

TABLE 9.—Distribution of red-lead shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952	1953	1954	1955	1956
Paints.....	12,140	13,149	14,570	12,508	14,308	14,331
Storage batteries.....	16,420	13,796	13,975	12,062	11,998	9,953
Ceramics.....	934	388	1,188	1,207	607	1,483
Other.....	2,934	8,593	1,600	1,326	2,299	2,208
Total.....	32,428	36,926	31,333	27,163	29,272	27,976

Orange Mineral.—This pigment was reported used in the manufacture of ink.

Litharge.—In 1956 the proportion of litharge shipments going to storage-battery makers was 62 percent, to the ceramics industry 15 percent, to chrome-pigment manufacturers 3 percent, and the other receiving industries (varnish, oil refining, and rubber) obtained 3, 3, and 2 percent, respectively. The "Other" classification, composed of insecticides, floor coverings, driers, friction materials, lead chemicals, and unspecified uses, received 12 percent. Total shipments for all purposes decreased 11 percent.

In addition to the litharge reported above, battery makers produced 107,000 tons of leady litharge, commonly termed black or gray suboxide, for use in making the paste for filling the interstices of the battery plates.

TABLE 10.—Distribution of litharge shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952	1953	1954	1955	1956
Storage batteries.....	97,854	97,656	103,849	94,656	90,200	82,041
Ceramics.....	20,445	16,906	20,924	17,118	24,173	19,802
Varnish.....	4,580	5,572	3,915	4,162	5,206	3,571
Chrome pigments.....	9,275	8,376	8,821	4,335	6,025	3,568
Oil refining.....	6,643	4,080	4,342	3,775	3,853	3,523
Insecticides.....	7,003	2,724	2,305	2,501	3,521	(1)
Rubber.....	2,425	2,100	2,230	1,768	1,947	2,266
Floor coverings.....	469	701	803	896	803	(1)
Other.....	6,364	3,584	7,529	10,966	12,783	16,764
Total.....	155,058	140,798	154,518	139,877	148,511	131,525

¹ Included under "Other."

ZINC PIGMENTS AND SALTS

Zinc Oxide.—The rubber industry was the largest consumer of this pigment, receiving 52 percent of the total shipments. Zinc oxide shipments to the rubber industry in 1956 were 7 percent below those in 1955. Paint manufacturers were the second largest users of zinc oxide; 21 percent of the total shipments went to them, or 4 percent less than in the preceding year. Shipments to the coated-fabrics and textile, ceramics, and floor-covering industries were 25, 4, and 37 percent, respectively, below those in 1955. Other industries (including petroleum, agriculture, chemical, and printing) and dealers who resell and export received 14 percent of the zinc oxide shipped.

LEAD AND ZINC PIGMENT

Shipments to all consuming industries in 1956 were 7 percent below those in 1955.

TABLE 11.—Distribution of zinc oxide shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952
Rubber.....	75,618	70,000
Paints.....	31,897	28,000
Ceramics.....	10,733	10,000
Coated fabrics and textiles.....	7,468	7,000
Floor coverings.....	3,824	3,500
Other.....	16,741	16,000
Total.....	146,081	134,500

¹ Includes the following tonnages for rayon: 1952-56, 5,852.

Leaded Zinc Oxide.—Paint manufacturers received 52 percent of the total shipments, rubber and miscellaneous industries received the remainder.

TABLE 12.—Distribution of leaded zinc oxide shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952
Paints.....	57,105	52,000
Rubber.....	150	150
Other.....	1,523	1,500
Total.....	58,778	53,650

Lithopone.—Seventy-three percent of the total shipments of lithopone were for use in the paint, varnish, and lacquer industries; 4 percent of the total shipments of lithopone for use in coated fabrics and textiles, 14 percent in printing ink, and "Other" were 14 percent below their 1947-51 average.

TABLE 13.—Distribution of lithopone shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952
Paint, varnish, and lacquers.....	90,042	85,000
Coated fabrics and textiles.....	7,243	7,000
Floor coverings.....	7,554	7,000
Rubber.....	3,582	3,500
Paper.....	4,308	4,000
Printing ink.....	5,647	5,000
Other.....	5,647	5,000
Total.....	118,376	111,500

¹ Includes a small quantity, not separable, used for printing ink.

² Included under "Other."

Zinc Chloride.—Statistics on end-use distribution of zinc chloride are not available. The principal uses of the salt were for soldering and tinning fluxes, batterymaking, galvanizing, vulcanized fiber, wood preserving, oil refining, and fungicides.

Zinc Sulfate.—Rayon and agriculture were the chief consumers of the salt in 1956, receiving 67 and 22 percent of the shipments (dry basis), respectively. The remainder was consumed in electrogalvanizing, dyeing and printing, paint manufacture, and other miscellaneous uses.

TABLE 14.—Distribution of zinc sulfate shipments, by industries, 1947-51 (average) and 1952-56, in short tons

Industry	1947-51 (average)	1952		1953		1954		1955		1956	
	Gross weight	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis
Rayon.....	9,998	8,181	6,812	9,008	7,012	6,015	5,740	10,732	9,537	21,093	18,825
Agriculture.....	6,779	5,111	4,445	6,773	5,894	7,007	6,139	8,187	7,089	7,051	6,291
Chemicals.....	1,990	1,675	1,489	2,539	2,105	2,300	1,973	(1)	(1)	(1)	(1)
Glue.....	523	391	329	601	601	648	545	(1)	(1)	(1)	(1)
Electrogalvanizing.....	257	242	243	337	225	454	301	258	177	(1)	(1)
Flotation reagents.....	1,095	1,070	950	736	648	357	317	226	202	(1)	(1)
Paint and varnish processing.....	213	172	130	106	70	130	114	(1)	(1)	(1)	(1)
Textile dyeing and printing.....	347	350	301	155	138	4	4	(1)	(1)	(1)	(1)
Other.....	1,940	2,295	1,422	1,965	1,219	1,452	1,024	4,461	3,343	4,006	3,100
Total.....	22,112	19,587	16,122	22,220	18,412	10,027	16,157	23,804	20,348	32,200	28,306

¹ Included under "Other."

PRICES

Total and average values received by producers for lead and zinc pigments and zinc salts are given in tables 1, 2, and 4. Average values of white lead, red lead, and litharge increased in 1956, \$21, \$22, and \$20 per ton, respectively, above 1955. The average prices of lead pigments declined from 1951 to 1954 and then increased to that in 1956, when they were within 3, 8, and 10 percent, respectively, of the 1951 high. The average quoted price for common lead at New York was 16.0 cents compared with 15.1 cents in 1955. The average weighted sale price of lead was 15.7 cents a pound, compared with 14.9 cents in 1955.

Average values of zinc oxide, leaded zinc oxide, and lithopone increased \$13, \$23, \$7 per ton, respectively, in 1956. The average quoted price of Prime Western zinc was 13.5 cents per pound, compared with 12.3 cents in 1955; the average weighted sale price for all grades was 13.7 cents a pound compared with 12.3 cents last year.

LEAD AND ZINC PIGMENT

TABLE 15.—Range of quotations on lead pigments at New York (or delivered in the East) (Oil, Paint and Drug)

Product	1952	
White lead (basic lead carbonate), dry, carlots, bags.....	16.25-20.10	16.2
Basic lead sulfate (sublimed lead), less than carlots, bags.....	15.75-20.19	15.0
Red lead, dry, 95 percent or less, less than carlots, barrels.....	17.25-22.57	15.7
Orange mineral, American, less than carlots, barrels.....	19.00-24.92	18.7
Litharge, commercial, powdered, less than carlots, barrels.....	16.25-21.65	14.7
Zinc oxide:		
American process, lead-free, bags, carlots.....	14.25-17.60	13.0
American process, 5 to 35 percent lead, bags, carlots.....	14.40-18.35	14.0
French process, red seal, bags, carlots.....	15.25-18.85	14.7
French process, green seal, bags, carlots.....	16.00-19.35	16.2
French process, white seal, bags, carlots.....	16.50-19.85	15.7
Lithopone, ordinary, less than carlots, bags.....	8.25-8.90	8.2
Zinc sulfide, less than carlots, bags, barrels.....	26.30	25.3
Zinc chloride, works:		
Solution, tanks.....	4.10-5.35	4.1
Fused, drums.....	9.60-9.85	9.8
Zinc sulfate, crystals, less than carlots, barrels.....	18.10-11.20	8.2

¹ Includes granulated.

FOREIGN TRADE

The tonnage and value of imports in 1956 about doubled those in 1955. On lead and zinc pigments and salts the increase was 7 and 22 percent, respectively, over 1955. The value of imports was \$2 million in 1955. The value of major imports compared with \$2.3 million in 1955.

Imports of litharge were exceptional compared with those in any of the years composed 92 percent of the lead pigments. Lead products imported in 1956 were those for 1955.

Imports of most zinc products have increased since 1952. Imports of zinc oxide were last year, 56 percent above those of 1953. In 1956, 63 percent of the zinc imported was attributable to zinc oxide. Imports of zinc products in 1956 were 143 tons of lithopone, 51 tons of zinc chloride, 17 tons of zinc arsenate. Total zinc products imported in 1956 were \$2.3 million, compared with \$2.3 million in 1955.

¹ Figures on imports and exports compiled by Mae B. Activities, Bureau of Mines from records of the Bureau of

Litharge exports (2,000 tons) in 1956 were the highest since 1946, when 2,200 tons was shipped out of the country. Lead arsenate showed the largest percentage increase of the lead products exported, amounting to 137 percent above 1955.

Total zinc pigments exported were down 9 percent from 1955. Zinc oxide exports were up 4 percent to 2,700 tons. Lithopone exports continued the decline in progress since the 1951 high of 20,500 tons. They were 27 percent below exports of the material in 1955.

TABLE 16.—Value of foreign trade of the United States in lead and zinc pigments and salts, 1954-56

[Bureau of the Census]

	Imports for consumption			Exports		
	1954	1955	1956	1954	1955	1956
Lead pigments:						
White lead.....			\$5,980	\$289,901	\$284,735	\$199,628
Red lead.....	\$508	\$923	30,706	124,613	133,580	147,617
Litharge.....	134,413	174,895	1,388,733	457,078	658,029	744,628
Other lead pigments.....	14,219	18,708	39,241	(1)	(1)	(1)
Total.....	149,140	194,526	1,464,660	(1)	(1)	(1)
Zinc pigments:						
Zinc oxide.....	\$475,913	\$85,186	770,156	897,065	771,621	846,833
Zinc sulfide.....	31,868	83,732	168,675	(1)	(1)	(1)
Lithopone.....	7,020	4,355	19,931	454,401	300,960	239,892
Total.....	\$514,800	773,273	948,762	1,351,526	1,072,581	1,086,725
Lead and zinc salts:						
Lead arsenate.....				161,607	215,206	575,745
Other lead compounds.....	\$20,337	72,089	65,610	23,555	21,181	22,874
Zinc arsenate.....		1,760	2,570	(1)	(1)	(1)
Zinc chloride.....	34,075	72,369	112,702	(1)	(1)	(1)
Zinc sulfate.....	32,957	56,301	84,058	(1)	(1)	(1)
Total.....	\$87,369	202,619	264,940	(1)	(1)	(1)
Grand total.....	\$751,309	1,170,318	2,676,362	(1)	(1)	(1)

¹ Data not available.

² Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with earlier years.

TABLE 17.—Lead pigments and salts imported for consumption in the United States, 1947-51 (average) and 1952-56

[Bureau of the Census]

Year	Short tons							Total value
	White lead (basic carbonate)	Red lead	Litharge	Lead sub-oxide	Lead pigments n. s. p. f.	Lead arsenate	Other lead compounds	
1947-51 (average).....	777	115	689	40	13	13	37	\$632,006
1952.....	300	2	621	63	(1)	81	32	469,980
1953.....	(1)	(1)	60	1	4		18	22,507
1954.....		3	596	28			85	\$169,477
1955.....		751	34		6		352	266,616
1956.....	20	113	5,371	78			269	1,530,270

¹ Less than 1 ton.

² Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with earlier years.

LEAD AND ZINC PIGMENTS AND SALTS

TABLE 18.—Zinc pigments and salts imported for consumption in the United States, 1947-51 (average) and 1952-56

[Bureau of the Census]

Year	Short tons			
	Zinc oxide		Lithopone	Zinc sulfide
	Dry	In oil		
1947-51 (average).....	1,450	3	401	7
1952.....	173	(1)	11	
1953.....	1,167	29	30	23
1954.....	2,348		65	100
1955.....	3,320		30	205
1956.....	3,667		143	510

¹ Less than 1 ton.

² Owing to changes in tabulating procedures by the Bureau of the Census data known to be not comparable with earlier years.

TABLE 19.—Lead pigments and salts exported for consumption in the United States, 1947-51 (average) and 1952-56

[Bureau of the Census]

Year	Short tons	
	White lead	Red lead
1947-51 (average).....	761	783
1952.....	675	435
1953.....	818	417
1954.....	951	335
1955.....	957	325
1956.....	654	352

¹ Classification established 1949; quantity and value not included in earlier years.

² In addition, lead acetate and sugar of lead exported as follows: 1947-51, 19,973 pounds; 1951, 140,427 pounds; 1956, 191.

TABLE 20.—Zinc pigments exported for consumption in the United States, 1947-51 (average) and 1952-56

[Bureau of the Census]

Year	Short tons		Total value
	Zinc oxide	Lithopone	
1947-51 (average).....	8,951	15,701	\$4,837,659
1952.....	7,615	9,085	4,352,300
1953.....	2,971	3,927	1,468,100