

MINER YEARB

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Volume 1 of Three

METALS AND

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of deposits, and descriptions of the kyanite group and accessory minerals.⁸

Results of X-ray, optical, and chemical studies were published for a wide variety of sillimanites and synthetic and natural mullites. A new type of mullite, called S mullite, was described.⁹ A study was made to obtain data on the solid solubility of Fe_2O_3 , Cr_2O_3 , and TiO_2 in the $3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ mullite composition, using X-ray lattice parameters and cell volumes as the major criteria. New X-ray data were obtained and lattice constants determined for pure mullite.¹⁰

A study was made to determine if the polymorphic relations of kyanite, sillimanite, and andalusite might be influenced by the trace elements present. Although certain trace-element anomalies were found, the investigators concluded that the anomalies were not responsible for the polymorphic relations.¹¹

Research indicated that alumina-mullite ceramic reinforced with molybdenum fiber can be produced that has a modulus of rupture greater than 30,000 p.s.i. after four thermal shocks at 2,200° F. and that the modulus of rupture is actually increased by thermal shock. The material may find use in the leading edges of hypersonic aircraft.¹²

Production methods were described and chemical and physical properties were compared for fused and sintered synthetic mullite made from various raw materials.¹³

⁸ Espenshade, G. H., and Potter, D. B., Kyanite, Sillimanite, and Andalusite Deposits of the Southeastern States: Geol. Survey Prof. Paper 836, 1960, 121 pp.

⁹ Furcron, A. S., Kyanite, Sillimanite, and Andalusite in Georgia: Georgia Miner. News-letter, vol. 13, No. 1, spring 1960, pp. 9-21.

¹⁰ Agrell, S. O., and Smith, J. V., Cell Dimensions, Solid Solution, Polymorphism, and Identification of Mullite and Sillimanite: Jour. Am. Ceram. Soc.—Ceram. Abs., vol. 43, No. 2, February 1960, pp. 69-76.

¹¹ Murthy, M. Krishna, and Hummel, F. A., X-Ray Study of the Solid Solution of TiO_2 , Fe_2O_3 , and Cr_2O_3 in Mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$): Jour. Am. Ceram. Soc.—Ceram. Abs., vol. 43, No. 5, May 1960, pp. 267-273.

¹² Pearson, G. R., and Shaw, D. M., Trace Elements in Kyanite, Sillimanite, and Andalusite: Am. Mineral., vol. 45, Nos. 7 and 8, July-August, 1960, pp. 808-817.

¹³ Swica, J. J., and others, Metal Fiber Reinforced Ceramics: State University of New York, College of Ceramics, Alfred Univ., WADC Tech. Rept. 58-452, pt. 2, Project 7350, January 1960, 41 pp.

¹⁴ Thomas, Everett A., and Smith, Karl W., Synthetic Mullite as a Ceramic Raw Material: Paper pres. at Ann. Meeting, AIMM, New York City, Feb. 17, 1960, 11 pp.

Lead

By G. Richards Gwinn¹ and

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INCREASES were counted in output in lead recovered at secondary smelters, in lead-base and tin-base scrap in 1960. Increases were noted in mine output of recoverable lead and in imports of metal. Import quotations for the year. The price of common grade remained at 12 cents a pound until December 11 cents a pound. This latter price held for the year.

TABLE 1.—Salient lead

	1951-55 (average)	1959
United States:		
Production:		
Domestic ores, recoverable		
lead content... short tons..	350,883	352,826
Value.....thousands..	\$107,921	\$110,787
Primary lead (refined):		
From domestic ores and		
base bullion		
short tons..	330,483	340,188
From foreign ores and		
base bullion		
short tons..	126,378	193,120
Antimonial lead (primary		
lead content)... short tons..	18,745	13,657
Secondary lead (lead con-		
tent).....short tons..	401,823	506,756
Imports, general:		
Lead in ores and matte		
short tons..	134,357	100,452
Lead in base bullion....do....	716	31
Lead in pigs, bars, and old		
short tons..	333,683	283,392
Exports of refined pig lead....do....	969	4,628
Stocks Dec. 31 (lead content):		
At primary smelters and re-		
fineries.....short tons..	107,010	97,043
At consumer plants....do....	116,230	123,905
Consumption of metal, primary		
and secondary.....short tons..	1,164,941	1,209,717
Price: New York, common lead,		
average, cents per pound.....	15.33	16.01
World:		
Mine production.....	2,170,000	2,490,000
Smelter production.....	2,075,000	2,400,000
Price: London, common lead,		
average, cents per pound.....	14.66	14.52

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³ Figures on imports and exports compiled by Division of Foreign Activities, Bureau of Mines, from Commerce, Bureau of the Census.

LEGISLATION AND GOVERNMENT PROGRAMS

The import quotas established in October 1958 by Presidential proclamation continued without revision throughout 1960. The U.S. Tariff Commission completed an investigation, made under section 332 of the Tariff Act of 1930 pursuant to Senate resolution (S. Res. 162, 86th Cong.) adopted August 21, 1959, and published the results on March 30, 1960. Section 2 of Senate Resolution 162 requested the Tariff Commission to include in its report recommendations as to what additional import restrictions, if any (such as increased duties or import quotas or both), need be imposed in order that lead and zinc mining operations in the United States might be conducted on a sound and stable basis. The Tariff Commission, however, decided by a 4-to-2 decision that the making of recommendations or suggestions to Congress regarding the need for import restrictions was not a function of the Tariff Commission. Such a recommendation, therefore, would be an extra legal act.⁴

On September 30, 1960, the U.S. Tariff Commission made its first report under paragraph 1 of Executive Order 10401, with regard to developments in the trade in lead and zinc since the modification of the tariff concession on lead and zinc granted in the General Agreement on Tariffs and Trade. The Tariff Commission was of the opinion that developments in the trade in lead and zinc did not warrant a formal investigation under the provisions of paragraph 2 of Executive Order 10401.⁵

No surplus-agricultural-product barter contracts for lead were negotiated by the U.S. Department of Agriculture, Commodity Credit Corporation (CCC), and no Government purchases of lead were made for the strategic stockpile. The Government procurement program for purchases of lead for the strategic stockpile had terminated at the end of 1958. A total of 221,993 short tons of lead were in the supplemental stockpile on December 31, 1960.

A bill to subsidize small lead-zinc mines passed both Houses of Congress, but was vetoed by President Eisenhower. The proposed bill carried authority for subsidizing lead-zinc mines producing less than 2,000 tons of each metal a year when world prices fell below 17 cents a pound for lead and 14.5 cents a pound for zinc. The bill also limited payments to \$4.84 millions a year for 5 years.

The Office of Minerals Exploration (OME), which limited Government participation to one-half of approved costs and a maximum of \$250,000 for any one contract, continued its program of assistance for long-range exploration and received 13 applications for assistance for lead-bearing ore deposits. Five new contracts were executed, authorizing total expenditures of \$448,000, of which the maximum Government participation was \$224,000. Five of the 1960 applications were denied, and three applications plus two from 1959 were still pending at yearend. In addition, five OME contracts were terminated. Four contracts from the Defense Minerals Exploration

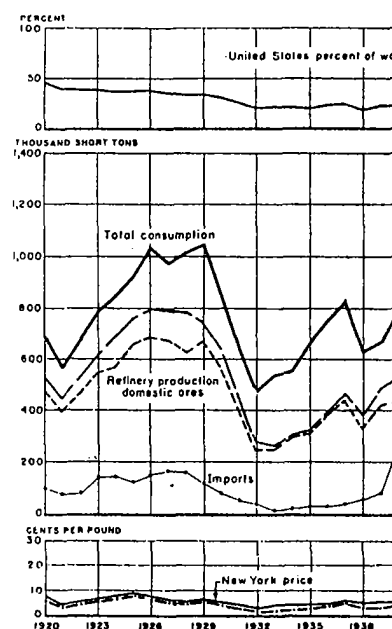


FIGURE 1.—Trends in the lead industry, 1920-1936. Consumption includes primary refined, and pigments made directly from ore. Imports of the lead content of ores, mattes, and concentrates, bars, base bullion, and scrap.

Administration (DMEA), predevelopment projects, and 14 were terminated. Development projects, raising to 94 the total number of projects in lead-bearing ores accomplished.

The International Lead-Zinc Study Commission, from January 27 to February 1, 1960, continued its efforts to bring free world production of lead into a favorable balance. The Commission, and Australia, major mine and metal producing countries. The overall lead situation improved, and a further reduction in stocks was

DOMESTIC

MINE PRODUCTION

Mines in the United States produced 1,000,000 tons of lead in 1960, the lowest domestic production since 1900. Production increased slightly in the second quarter, but declined through the remainder of the year.

⁴ U.S. Tariff Commission, Lead and Zinc, Report to the Congress on Investigation No. 332-20 (Supplemental, under sec. 332 of the Tariff Act of 1930). Made pursuant to Senate Resolution 162, 86th Cong. Adopted Aug. 21, 1959; Mar. 30, 1960, pp. 148-150.
⁵ U.S. Tariff Commission, Lead and Zinc, Report to the President (1960) under Executive Order 10401: October 1960, 18 pp.

TABLE 4.—Mine production of recoverable lead in the United States, by months
(Short tons)

Month	1959	1960	Month	1959	1960
January.....	23,626	21,423	August.....	21,922	19,857
February.....	21,449	22,776	September.....	20,719	18,208
March.....	21,156	25,690	October.....	21,208	18,369
April.....	21,432	24,105	November.....	20,270	19,089
May.....	20,375	20,871	December.....	22,129	20,182
June.....	21,634	19,686	Total.....	255,586	246,669
July.....	19,657	16,413			

day throughout the year. Tonnage and grade of ore was about the same as that of the past several years, and new ore developed substantially exceeded ore extracted. The strike at the Tooele smelter, which had lasted about 6 months, was settled on February 15, 1960. Evidence of high-grade silver-lead-zinc mineralization was reported in the Keystone Mining Co. properties in the Park City district of Utah, which were being developed with aid of an OME loan by Keystone and Park City Mines Co. Development of the silver-lead-zinc ore body in the Tintic district by the Bear Creek Mining Co., domestic exploration affiliate of Kennecott Copper Corp., continued throughout the year.

The output of lead from mines in Colorado increased 40 percent over 1959. Scheduled requirements for lead ore production at the Eagle mine of The New Jersey Zinc Co. at Gilman were maintained throughout the year except for the August-November period when the mine was shut down by a labor strike. The Argentine and Mountain Springs mines of the Rico Argentina Mining Co. also contributed significant quantities to the State's lead production. The newly built 500-ton-a-day ore-dressing mill, at the Camp Bird mine near Ouray, of Camp Bird Colorado Inc., subsidiary of Camp Bird Mining Ltd., of London, England, went on stream in October 1960. Progress also was made by the Standard Metals Corp. toward reopening the Shenandoah Dive mine, rehabilitating the Shenandoah-Dive's mill, and reopening the Sunnyside mine, under lease from United States Smelting Refining and Mining Co.

The Iron King mine operated by the Shattuck-Denn Mining Corp. retained its position as Arizona's leading producer. Lead-zinc and lead-zinc-copper ore also was mined at the Flux mine in the Harshaw district and Pride of the West mine in the Duquesne district. The ore from both mines was treated at the Trench mill in the Harshaw district.

The Pend Oreille mine of Pend Oreille Mines and Metals Co. and the Grandview mine of American Zinc-Lead and Smelting Co. were again the major lead-producing mines in Washington. Clayloon Uranium Co. discovered a new vein of lead ore at the Lead Trust mine in Stevens County, and Uranium-Lead-Zinc Mines, Inc., developed a chimney of lead-silver-zinc ore at the former Columbia Lead and Zinc Mining Co. property near Z Canyon, Metaline mining district.

The decline in lead production in Montana continued through 1960 and was attributed largely to the extended closure of The Anaconda

LEAD

Co.'s zinc concentrator where lead was a byproduct. The testing of an enlarged cyanide mill at Bannock, to handle lead, zinc, and silver, was completed by the New Departure mine near Dillon. The Western Milling Co., Inc., with the assistance of the U.S. Geological Survey, is to explore for lead and zinc at the west of Townsend, Broadwater County.

The 2,000 tons of lead produced in 1960 was more than the 1959 output. The increase in output from New Jersey Zinc Co.'s the leased Linchburg mine at Magdeburg was throughout the year.

About 5 percent of the U.S. output of lead is produced in the Mississippi River where lead was a byproduct during the recovery of zinc from the Western States; and from Wisconsin and Minnesota in the Mississippi Valley lead-zinc region.

TABLE 5.—Twenty-five leading lead-producing mines in order of output

Rank	Mine	District or region	State
1	Federal.....	Southeastern Missouri.	Missouri..
2	United States & Lark.....	West Mountain (Bingham).	Utah.....
3	Leadwood.....	Southeastern Missouri.	Missouri..
4	Indian Creek.....	do.....	do.....
5	Lucky Friday.....	Coeur d'Alene.....	Idaho.....
6	Bunker Hill.....	do.....	do.....
7	Star.....	do.....	do.....
8	Treasury Tunnel-Black Bear-Smuggler Union.	Upper San Miguel.	Colorado..
9	Bonne Terre.....	Southeastern Missouri.	Missouri..
10	Madison.....	do.....	do.....
11	Iron King.....	Big Bug.....	Arizona..
12	Pend Oreille.....	Metaline.....	Washington
13	United Park City.....	Utah.....	Utah.....
14	Viburnum.....	Southeastern Missouri.	Missouri..
15	Eagle.....	Red Cliff (Battle Mountain).	Colorado..
16	Mayflower-Galena.....	Blue Ledge.....	Utah.....
17	Page.....	Coeur d'Alene.....	Idaho.....
18	Austinville.....	Austinville.....	Virginia..
19	Emperius.....	Croede.....	Colorado..
20	Butte Mines.....	Summit Valley.....	Montana..
21	Sunshine.....	Coeur d'Alene.....	Idaho.....
22	Grandview.....	Metaline.....	Washington
23	Rico-Argentina.....	Pioneer.....	Colorado..
24	Linchburg Group.....	Magdalena.....	New Mexico
25	Flux.....	Harshaw.....	Arizona..

SMELTER AND REFINERY PRODUCTION

Refined lead was produced in the United States at primary refineries that treated ore, base bullion, and small quantities of scrap, and at secondary plants that process scrap exclusively. The lead was derived from three principal sources—domestic mine production, imports of foreign ore and base bullion, and scrap material (treated largely at secondary smelters). Refined lead and antimonial (hard) lead were produced at both primary and secondary plants. Antimonial lead was the principal product at secondary plants because the smelter feed was composed largely of hard lead, much of it in the form of battery scrap.

The four smelters, five combination smelter-refineries, and two refineries which treated ore, base bullion, and other primary materials in 1960 are listed below:

Smelters:

American Smelting and Refining Co.:
Leadville (Arkansas Valley), Colo.
East Helena, Mont.
El Paso, Tex.

International Smelting and Refining Co.:
Tooele, Utah

Smelter-refineries:

American Smelting and Refining Co.:
Selby, Calif.
Barber (Perth Amboy), N.J.

Bunker Hill Co.:
Kellogg, Idaho
St. Joseph Lead Co.:
Herculaneum, Mo.

The Eagle-Picher Co.:
Galena, Kans.

Refineries:

United States Smelting Lead Refinery, Inc.:
East Chicago, Ind.
American Smelting and Refining Co.:
Omaha, Nebr.

The list of major secondary smelting firms and their plant locations presented in the 1959 Lead Chapter remained virtually unchanged.

Refined Lead—Primary and Secondary.—Domestic primary lead smelters and refineries produced 387,200 tons of refined lead and 28,700 tons of lead in antimonial lead. Lead content of primary raw materials consumed was 425,900 tons; that of scrap was 34,100 tons.

Domestic ores were the source of 60 percent (66 percent in 1959) of the 387,200 tons of refined lead produced from primary sources, and foreign ores and bullion supplied 40 percent (34 percent in 1959).

Primary lead smelters also produced 4,800 tons of refined lead from scrap and secondary smelters 143,400 tons from scrap. Refined and remelt lead from all sources was 530,700 tons.

Antimonial Lead—Primary and Secondary.—Production at primary and secondary smelters (lead content), 28,700 tons (lead content) and 179,200 tons from secondary smelters. 92 percent of the primary smelter output and 4 percent came from domestic ores and 4 percent from foreign ores. Battery-lead plates accounted for 63 percent of the total scrap melted, and antimonial lead was 37 percent.

Other Secondary Lead.—Secondary lead production, assuming lead-base and tin-base scrap treated as secondary lead, of 4 percent over 1959. Secondary lead was 4 percent of the total in 235 plants; primary lead was 96 percent. Of the total in 235 plants; primary lead was 96 percent and manufacturers, foundries, and scrap processors combined, 7 percent.

TABLE 6.—Refined lead produced at primary and secondary source materials (Short tons)

	1951-55 (average)	1959
Refined lead:		
From primary sources:		
Domestic ores and base bullion...	330,483	341,000
Foreign ores.....	124,601	179,200
Foreign base bullion.....	777	
Total.....	455,861	520,200
From secondary sources.....	4,064	143,400
Grand total.....	459,925	663,600
Average sales price..... per pound.....	\$0.150	\$0.150
Calculated value of primary refined lead thousands \$.....	\$130,468	\$171,000

* Excludes value of refined lead produced from scrap at secondary sources.

TABLE 7.—Antimonial lead produced at primary and secondary sources (Short tons)

Year	Production (short tons)	Antimony content (short tons)	Percentage of total
1951-55 (average).....	61,960	4,084	6.4
1956.....	66,826	3,348	5.0
1957.....	67,786	3,084	4.5
1958.....	50,246	2,803	5.6
1959.....	37,487	1,924	5.1
1960.....	30,230	1,575	5.2

TABLE 8.—Stocks and consumption of new and old lead scrap in the United States in 1960
(Short tons, gross weight)

Class of consumers and type of scrap	Stocks Jan. 1 ¹	Receipts	Consumption			Stocks Dec. 31
			New scrap	Old scrap	Total	
Smelters and refiners:						
Soft lead.....	2,025	51,473		50,919	50,919	3,479
Hard lead.....	932	16,331		16,311	16,311	962
Cable lead.....	1,894	29,812		30,052	30,052	1,654
Battery-lead plates.....	28,615	371,749		382,282	382,282	18,102
Mixed common babbitt.....	1,008	5,107		4,671	4,671	1,144
Solder and tinny lead.....	591	9,481		9,638	9,638	434
Type metals.....	1,080	24,877		24,163	24,163	1,794
Drosses and residues.....	16,621	82,066	80,625		80,625	18,052
Total.....	53,066	590,886	80,625	518,316	598,941	45,611
Foundries and other manufacturers:						
Soft lead.....	39	511	175	263	438	112
Hard lead.....	183	284	4	250	254	183
Cable lead.....	40	303		256	256	87
Battery-lead plates.....	88	472		505	505	65
Mixed common babbitt.....	234	9,534		9,497	9,497	271
Solder and tinny lead.....	9	132	74	53	127	4
Type metals.....						
Drosses and residues.....	252	77	1		1	328
Total.....	815	11,313	254	10,834	11,088	1,040
Grand total:						
Soft lead.....	2,964	51,984	175	51,182	51,357	3,591
Hard lead.....	1,085	16,615	4	16,501	16,505	1,135
Cable lead.....	1,934	30,115		30,308	30,308	1,741
Battery-lead plates.....	28,703	372,221		382,767	382,767	18,157
Mixed common babbitt.....	1,242	14,041		14,468	14,468	1,415
Solder and tinny lead.....	600	9,613	74	9,701	9,775	438
Type metals.....	1,080	24,877		24,163	24,163	1,794
Drosses and residues.....	10,873	82,133	80,626		80,626	18,380
Total.....	54,481	602,100	80,879	520,150	601,029	46,661

¹ Revised figures.

TABLE 9.—Secondary metal recovered¹ from lead and tin scrap in the United States in 1960, by type of products
(Short tons, gross weight)

	Lead	Tin	Antimony	Other	Total
Refined pig lead.....	119,366				119,366
Remelt lead.....	28,853				28,853
Total.....	148,219				148,219
Refined pig tin.....		3,091			3,091
Remelt tin.....		287			287
Total.....		3,378			3,378
Lead and tin alloys:					
Antimonial lead.....	205,487	364	12,594	186	218,621
Common babbitt.....	16,621	1,127	1,833	113	19,694
Genuine babbitt.....	42	265	27	10	344
Solder.....	24,754	5,058	357	97	30,266
Type metals.....	30,887	1,802	4,879	118	37,686
Cable lead.....	27,786	6	273		28,065
Miscellaneous alloys.....	1,210	420	141	78	1,849
Total.....	300,787	9,051	20,104	602	330,544
Composition foil.....		1,015			1,015
Tin content of chemical products.....					
Grand total.....	455,000	13,444	20,104	602	489,150

¹ Most of the figures herein represent actual reported recovery of metal from scrap.

TABLE 10.—Secondary lead recovered from scrap and from other sources in 1960
(Short tons, gross weight)

	1951-55 (average)
As refined metal:	
At primary plants.....	4,004
At other plants.....	132,720
Total.....	136,724
In antimonial lead:	
At primary plants.....	30,131
At other plants.....	196,071
Total.....	226,202
In other alloys.....	119,837
Grand total:	
Quantity.....	491,823
Value (thousands).....	\$147,986

TABLE 11.—Lead recovered from scrap and from other sources in 1960
(Short tons, gross weight)

Kind of scrap	1959	1960
New scrap:		
Lead-base.....	52,101	55,850
Copper-base.....	6,098	6,214
Tin-base.....	426	430
Total.....	58,625	61,506
Old scrap:		
Battery-lead plates.....	241,639	255,879
All other lead-base.....	129,848	134,011
Copper-base.....	21,272	18,602
Tin-base.....	8	8
Total.....	392,762	408,397
Grand total.....	451,387	469,903

¹ Includes 23,161 tons of lead recovered in antimonial lead in 1959 and 26,270 tons in 1960.

CONSUMPTION

The relatively high level of industrial production combined with a substantial drawdown of lead, gave rise to optimistic forecasts of lead, gave rise to optimistic forecasts of metal. Monthly consumption through the forecasts, but a downtrend began in 1959, continued through the third and fourth year was 6 percent below 1959. The materials and technological improvements for the decline. Consumption decreased for lead, red lead and litharge, annealing type metal, and weights and ballast. Soft lead, primary and secondary, total consumed; 24 percent was lead in percent was lead in alloys; 1.6 percent

4 percent was lead content of scrap which went directly to an end product; and 0.4 percent was lead recovered from ore in the production of leaded zinc oxide and other pigments.

Monthly consumption varied throughout the year. The high of 91,100 tons and the low of 75,400 tons were reached in March and July, respectively.

Of the lead consumed during the year, 71 percent went to metal products, the largest quantity being for storage batteries (35 percent of all lead consumed), which took antimonial lead for grids and posts, and soft lead for oxides. The second largest quantity (16 percent) was used for chemicals, 98 percent of which was for tetraethyl lead. Lead pigments used 10 percent, and 76 percent of the lead used in pigments was for manufacturing red lead and litharge.

The two largest uses of lead, batteries and tetraethyl lead, which together represented about 50 percent of the total consumption, were related directly to the automotive industry.

TABLE 12.—Lead consumption in the United States, by products
(Short tons)

Product	1959	1960	Product	1959	1960
Metal products:			Pigments—Continued		
Ammunition.....	45,328	43,577	Pigment colors.....	13,827	11,445
Bearing metals.....	23,298	20,717	Other ¹	4,773	3,763
Brass and bronze.....	24,284	20,455	Total.....	103,671	98,541
Cable covering.....	61,620	60,350	Chemicals:		
Calking lead.....	80,091	66,527	Tetraethyl lead.....	160,020	163,826
Casting metals.....	8,395	7,023	Miscellaneous chemicals.....	4,485	2,805
Collapsible tubes.....	9,442	8,705	Total.....	164,505	166,632
Foil.....	3,745	3,684	Miscellaneous uses:		
Pipes, traps, and bends.....	24,825	22,119	Annealing.....	5,120	5,153
Sheet lead.....	28,158	20,607	Galvanizing.....	1,184	1,383
Solder.....	68,871	60,013	Lead plating.....	302	218
Storage batteries:			Weights and ballast.....	8,748	9,045
Antimonial lead.....	187,284	175,458	Total.....	15,363	15,799
Lead oxides.....	103,448	177,738	Other, unclassified uses.....	10,368	17,273
Terne metal.....	1,511	1,765	Grand total ²	1,091,140	1,021,172
Type metal.....	27,966	28,159			
Total metal products.....	788,252	722,027			
Pigments:					
White lead.....	10,955	8,432			
Red lead and litharge.....	74,116	74,901			

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

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

TABLE 13.—Lead consumption in the United States, by months
(Short tons)

Month	1959	1960	Month	1959	1960
January.....	89,122	80,781	August.....	92,601	90,069
February.....	85,124	84,583	September.....	95,162	86,640
March.....	85,431	91,055	October.....	97,698	85,806
April.....	91,564	83,011	November.....	84,903	83,022
May.....	95,443	90,321	December.....	80,168	77,263
June.....	95,285	87,197	Total ¹	1,091,140	1,021,172
July.....	90,648	75,444			

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

LEAD

TABLE 14.—Lead consumption in the United States, by types of metal
(Short tons)

Product	Soft lead	Antimonial lead
Metal products.....	209,880	
Storage batteries.....	177,738	
Pigments.....	94,778	
Chemicals.....	166,629	
Miscellaneous.....	9,515	
Unclassified.....	15,114	
Total.....	673,654	

¹ Excludes 39,649 tons of lead that went directly from scrap to fabricated products.

TABLE 15.—Lead consumption in the United States, by State
(Short tons)

State	Refined soft lead	Antimonial lead
California.....	74,153	
Colorado.....	1,379	
Connecticut.....	14,141	
District of Columbia.....	122	
Florida.....	1,730	
Illinois.....	65,310	
Indiana.....	52,279	
Kansas.....	5,474	
Kentucky.....	5	
Maryland.....	5,723	
Massachusetts.....	5,978	
Michigan.....	11,180	
Missouri.....	51,190	
Nebraska.....	10,677	
New Jersey.....	114,563	
New York.....	27,078	
Ohio.....	11,177	
Pennsylvania.....	34,577	
Rhode Island.....	2,411	
Tennessee.....	275	
Virginia.....	1,722	
Washington.....	8,653	
West Virginia.....	13,619	
Wisconsin.....	686	
Alabama, Georgia, and Mississippi ¹	27,376	
Arkansas and Oklahoma.....	2,782	
Hawaii and Oregon.....	606	
Iowa and Minnesota.....	937	
Louisiana and Texas.....	111,365	
Montana and Idaho.....	1,300	
New Hampshire, Maine, and Delaware.....	3,254	
North and South Carolina.....	26	
Utah, Nevada, and Arizona.....	134	
Undistributed.....	570	
Total.....	673,654	

¹ Excludes 39,649 tons of lead which went directly from scrap to fabricated products.

² Included in "Undistributed" to avoid disclosing individual State consumption.

³ The following States are grouped to avoid disclosing individual State consumption.

Shipments of 26,329,600 units of replacement batteries were reported by the Association of Battery Manufacturers, Inc., 4 percent below the record output of 27,495,400 batteries shipped in 1959.

Nine States accounted for 74 percent of the total lead consumed (excluding scrap). New Jersey used 15 percent; Louisiana and Texas combined, 13 percent; California and Illinois, 10 percent each; Indiana, 9 percent; Pennsylvania and Missouri, 6 percent each; and New York, 5 percent.

LEAD PIGMENTS¹

Production of lead pigments declined in 1960. The major lead-pigment-consuming industries fared as follows: The production of automobiles and trucks rose 17 percent; the value of public and private construction increased slightly; paint sales were unchanged; and the combined consumption of natural and synthetic rubber declined 3 percent.

Production.—Lead shipped to manufacturers of lead pigments totaled about 265,000 tons compared with 280,000 tons in 1959, a decrease of 6 percent.

White lead, red lead, litharge, and black oxide were made from refined lead and again constituted 99 percent of all lead used in pigments. The remaining 1 percent of the lead came from ores from which leaded zinc oxide was produced. Basic lead sulfate production is withheld to avoid disclosing individual company confidential data. Lead silicate, as it is derived from litharge, is included with litharge.

Consumption and Uses.—*White Lead.*—Shipments of white lead decreased 7 percent. The requirements of the paintmaking and ceramic industries were 79 and 1 percent, respectively, of the total, unchanged from 1959. Other uses for the pigments were in chemicals, greases, plasticizers, and stabilizers for plastics. A substantial part of the amount listed as "Other" belongs properly under paint.

Basic Lead Sulfate.—Most of the lead sulfate was used in making leaded zinc oxide. Production figures are withheld to avoid disclosing individual company confidential data.

Red Lead.—The paint industry used 57 percent of the red lead consumed, compared with 55 percent in 1959. Other uses were in colors, lubricants, petroleum, rubber, and unspecified miscellaneous products.

Orange Mineral.—No consumption of this pigment was reported.

Litharge.—"Other" uses (77 percent) continued to claim most of the litharge shipped to industry. Battery makers were the largest single consumer; chemicals, chrome pigment, driers, floor covering, friction material, ink, insecticides, and unspecified uses made up the remainder of "Other" uses. Ceramics received 16 percent, varnish 4 percent, oil refining 2 percent, and rubber 1 percent. Battery makers produced

¹ Prepared by John E. Shelton, commodity specialist, and Esther B. Miller, statistical assistant.

140,000 tons of leaded litharge, containing suboxide, for making the paste used in plates.

Prices.—The quoted price of white lead was \$360 a ton in carlots in 1960. The white lead was \$408 a ton, up \$26 from \$382 in 1959. The quoted price of red lead was \$455 a ton, down \$13 to \$442. The quoted price of litharge was \$295 a ton, up 15.75 cents a pound, or \$295 to \$310.75. The average value of shipments decreased 14.2 percent. The price of litharge ranged from 14.2 cents a pound to \$315 a ton in less than carlots; average value of shipments was \$2 a ton to \$273.

TABLE 16.—Production and shipments of lead pigments

Pigment	1959		
	Production (short tons)	Shipments	
		Short tons	Value
			Total
White lead:			
Dry.....	12,352	12,436	\$4,761,792
In oil ¹	6,540	6,788	3,174,138
Total.....	18,892	19,224	7,925,930
Red lead.....	21,949	21,905	6,789,381
Litharge.....	105,086	106,013	29,119,870
Black oxide.....	162,341		

¹ Except for basic lead sulfate, figures withheld to avoid disclosing individual company confidential data.

² At plant, exclusive of container.

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

TABLE 17.—Lead content of lead and lead pigments produced from lead pigments

Pigment	1959		
	Lead in pigments produced from—		Fig lead
	Ore		
	Domestic	Foreign	
White lead.....	-----	-----	15,114
Red lead.....	-----	-----	19,974
Litharge.....	-----	-----	98,288
Black oxide.....	-----	-----	147,066
Leaded zinc oxide.....	2,500	1,405	-----
Total.....	2,500	1,405	280,442

¹ Excludes lead in basic lead sulfate; figures withheld to avoid disclosing individual company confidential data.

TABLE 18.—Distribution of white lead (dry and in oil) shipments,¹ by industries
(Short tons)

Industry	1951-55 (average)	1956	1957	1958	1959	1960
Paints.....	22,345	20,283	19,253	15,288	15,148	14,145
Ceramics.....	877	633	667	268	243	219
Other.....	4,660	4,777	3,064	2,804	3,833	3,678
Total.....	27,882	25,693	23,574	18,360	19,224	17,942

¹ Excludes basic lead sulfate; figures withheld to avoid disclosing individual company confidential data.
² Figures for plasticizers and stabilizers withheld to avoid disclosing individual company confidential data.

TABLE 19.—Distribution of red lead shipments, by industries
(Short tons)

Industry	1951-55 (average)	1956	1957	1958	1959	1960
Paints.....	13,867	14,331	15,003	13,720	12,008	12,003
Storage batteries.....	13,710	9,953	(¹)	(¹)	(¹)	(¹)
Ceramics.....	857	1,483	(¹)	(¹)	(¹)	328
Other.....	2,376	2,208	11,005	8,266	9,807	9,400
Total.....	30,809	27,976	26,998	21,992	21,905	22,631

¹ Included with "Other."

TABLE 20.—Distribution of litharge shipments, by industries
(Short tons)

Industry	1951-55 (average)	1956	1957	1958	1959	1960
Ceramics.....	20,187	19,802	18,071	(¹)	15,340	15,763
Chrome pigments.....	7,735	3,558	3,955	3,731	4,682	(¹)
Floor coverings.....	913	(¹)	(¹)	(¹)	(¹)	(¹)
Insecticides.....	3,348	(¹)	(¹)	(¹)	(¹)	(¹)
Oil refining.....	4,424	3,523	3,359	2,598	3,096	2,371
Rubber.....	2,139	2,266	1,298	1,247	1,808	1,373
Storage batteries.....	96,085	82,041	(¹)	(¹)	(¹)	(¹)
Varnish.....	4,888	3,671	3,227	3,223	4,725	3,471
Other.....	7,972	16,764	76,878	81,366	76,362	75,072
Total.....	147,691	131,525	106,788	92,165	106,013	98,640

¹ Included with "Other."

TABLE 21.—U.S. imports for consumption of lead pigments and compounds

Kind	1959		1960	
	Short tons	Value (thousands)	Short tons	Value (thousands)
White lead.....	1,073	\$323	1,497	\$461
Red lead.....	408	96	537	111
Litharge.....	11,352	2,218	13,371	2,581
Other lead pigments.....	20	5	23	9
Other lead compounds.....	280	54	301	62
Total.....	13,233	2,695	15,729	3,224

Source: Bureau of the Census.

Foreign Trade.—Imports of lead pigments increased 40, 15, 17, and 8 percent, respectively, in 1959, 1958, 1957, and 1956. Imports of white lead, red lead, litharge, and lead arsenate decreased 7 tons (23 percent). Exports of lead pigments and salts increased 15, 17, and 21 percent in quantity compared with 1959, 1958, and 1957, respectively. Data for lead compounds.

TABLE 22.—U.S. exports of lead

Kind	
Lead pigments ¹	
Lead arsenate.....	
Total.....	

¹ Includes white lead, red lead, and litharge.
Source: Bureau of the Census.

STOCKS

The decline in stocks of refined lead which began in March of 1959, continued through 1960 to a low of 95,400 tons on March 31, 1960, and continued through April, however, and continued through the year. Year-end stocks, which represent the total stock at the plants, irrespective of ownership, in process or in transit, were 250,100 tons. Stocks reported by the American Bureau of Mines for December 31, 1959, an additional 25,000 tons of bullion in refineries and about 24,000 tons of ore of nearly 299,100 tons of primary raw materials.

Consumer and secondary smelter stocks of refined lead were 120,500 tons on January 31 to 128,200 tons in June, reached a peak of 128,400 tons, then declined to 97,300 tons by the end of the year. Total was 23 percent below 1959.

TABLE 23.—Stocks of lead at primary smelters, States, Dec. 31, 1959 and 1960
(Short tons)

Stocks	1951-55 (average)	1956	1957
Refined pig lead.....	43,151	30,237	
Lead in antimonial lead.....	10,820	10,740	
Lead in base bullion.....	14,052	11,141	
Lead in ore and matte.....	38,087	41,025	
Total.....	107,010	97,043	

TABLE 24.—Consumer stocks of lead in the United States, Dec. 31, by types of material
(Short tons, lead content)

Year	Refined soft lead	Antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
1956.....	73,673	40,226	8,007	2,089	123,995
1957.....	80,708	39,375	7,651	1,574	129,310
1958.....	76,924	37,511	7,050	1,409	122,900
1959.....	80,277	38,088	6,436	1,094	125,900
1960.....	49,725	30,230	7,216	1,097	97,268

PRICES

The quoted New York price for common lead was 12 cents a pound on January 1. This price held constant until December 13 when the price dropped to 11 cents. It remained at that level to the end of the year. The weak domestic market caused by decreased consumption and increased stocks was largely responsible for the decline in prices.

Quotations on the London Metal Exchange ranged from a low of \$61.75 per long ton on December 29 (equivalent to 7.74 cents a pound U.S. currency—computed on the average monthly rate of exchange) to a high of \$78.50 (9.83 cents a pound) on May 24. The bid quotation on December 31 was \$62.00 a long ton (7.77 cents a pound) and the average for the year was \$72.15 (9.04 cents a pound).

TABLE 25.—Average monthly and yearly quoted prices of lead at St. Louis, New York, and London¹
(Cents per pound)

Month	1959			1960		
	St. Louis	New York	London ²	St. Louis	New York	London ²
January.....	12.42	12.62	9.00	11.80	12.00	9.35
February.....	11.38	11.58	8.77	11.80	12.00	9.24
March.....	11.21	11.43	8.73	11.80	12.00	9.55
April.....	11.00	11.20	8.68	11.80	12.00	9.72
May.....	11.70	11.80	8.60	11.80	12.00	9.70
June.....	11.80	12.00	8.75	11.80	12.00	9.18
July.....	11.80	12.00	8.82	11.80	12.00	8.63
August.....	12.07	12.27	9.05	11.80	12.00	8.90
September.....	12.80	13.00	8.85	11.80	12.00	8.78
October.....	12.80	13.00	8.85	11.80	12.00	8.44
November.....	12.80	13.00	9.03	11.80	12.00	8.50
December.....	12.32	12.52	9.08	11.18	11.38	8.14
Average.....	12.01	12.21	8.88	11.75	11.95	9.04

¹ St. Louis: Metal Statistics, 1961, p. 491. New York: Metal Statistics, 1961, p. 485. London: E&MJ Total and Mineral Markets.

² Based on monthly average rates of exchange by Federal Reserve Board.

FOREIGN TRADE

Imports.—General imports of lead were 12 percent under 1959. The decline was attributed partly to the failure of Peru and Mexico to meet import quota goals. Imports of ore and concentrate increased 5 percent, and bullion 266 percent, but pigs and bars and scrap decreased 22 and 8 percent, respectively. About 57 percent of the lead

LEAD

imported was pigs and bars, 41 percent; the remaining 2 percent scrap and bullion. Imports of ores and concentrates were 5 percent. Imports of ores and concentrates were 5 percent of South Africa, Peru, Canada, and Australia.

Exports.—Total lead exported, although it totaled only 5,843 tons. The increase was due by larger exports of scrap, ore, matte, and pigs and bars declined from 2,756 tons in 1960.

Tariff.—The duties on pig lead and concentrates remained 1½ cents and ¾ cent, respectively. Duties on scrap were the same as on pig lead.

TABLE 26.—U.S. imports¹ of lead
(Short tons, lead content)

Country	1951-55 (average)	1960
Ore, fine dust, and matte:		
North America:		
Canada.....	25,445	30,000
Greenland.....		
Guatemala.....	4,235	6,900
Honduras.....	1,282	2,000
Mexico.....	2,666	3,800
Other North America.....	89	100
Total.....	34,627	44,400
South America:		
Bolivia.....	16,441	17,100
Chile.....	1,813	1,000
Colombia.....	240	1,400
Peru.....	32,192	55,100
Other South America.....	73	100
Total.....	50,759	74,000
Europe.....	226	100
Asia:		
Philippines.....	2,202	2,200
Other Asia.....	68	100
Total.....	2,270	2,300
Africa:		
Morocco.....	527	100
Union of South Africa.....	28,013	44,200
Other Africa.....	41	100
Total.....	28,581	44,200
Oceania: Australia.....	17,894	31,000
Total ore, fine dust, and matte.....	134,357	196,400
Base bullion:		
North America.....	201	100
South America.....	69	100
Europe.....	(1)	100
Asia.....		100
Oceania.....	440	100
Total base bullion.....	716	100
Pigs and bars:		
North America:		
Canada.....	60,966	16,200
Mexico.....	107,735	77,500
Other North America.....	60	100
Total.....	168,761	93,700

See footnotes at end of table.

TABLE 26.—U.S. imports¹ of lead, by countries—Continued
(Short tons, lead content)

Country	1951-55 (average)	1956	1957	1958	1959	1960
Pigs and bars—Continued						
South America:						
Peru.....	34,094	33,540	34,999	42,473	20,311	25,107
Other South America.....	173		1,601	146		
Total.....	34,267	33,540	36,600	42,619	20,311	25,107
Europe:						
Belgium-Luxembourg.....	941	1,206	1,852	5,872	1,503	610
Germany ²	2,418	168	1,550	3,118	2,893	551
Spain.....	4,347	6,700	3,119	14,237	9,395	4,116
United Kingdom.....	1,619	115	2,566	8,836	988	7
Yugoslavia.....	43,262	38,601	40,262	36,789	32,731	30,027
Other Europe.....	2,070	2,162	2,654	2,139	1,872	1,388
Total.....	55,247	49,262	52,033	70,901	52,382	38,698
Asia:	41					
Africa: Morocco ³	8,802	5,428	9,018	10,577	5,384	1,328
Oceania: Australia.....	55,044	80,573	95,617	86,516	47,655	46,783
Total pigs and bars.....	323,082	202,064	324,270	368,452	263,416	200,033
Reclaimed, scrap, etc.:						
North America:						
Canada.....	3,754	5,898	2,558	1,908	2,251	4,050
Mexico.....	2,095	9,701	2,583	1,639	1,293	1,054
Other North America.....	1,255	1,649	552	420	245	180
Total.....	7,104	17,148	5,793	4,207	3,789	5,273
South America:						
Peru.....	171	299	4	48	(⁴)	
Venezuela.....	503	230				
Other South America.....	44		53		120	
Total.....	718	529	57	48	120	
Europe:						
Belgium-Luxembourg.....	156	117		7		
Denmark.....	69	1,000	84			
Germany ²	12	348	168		1	1
Netherlands.....	217	167				
Other Europe.....	399	179	32			4
Total.....	853	1,801	284	7	1	6
Asia:						
Japan (including Nansei and Nanpo Islands).....	170	4		10	18	6
Other Asia.....	108	1				
Total.....	278	5		10	18	5
Africa.....	3					
Oceania:						
Australia.....	1,572	1,255	3,079	2,220	4,361	2,355
Other Oceania.....	103					
Total.....	1,675	1,255	3,079	2,220	4,361	2,355
Total reclaimed, scrap, etc.....	10,631	20,738	9,213	6,570	8,279	7,638
Grand total.....	468,766	470,876	632,055	577,081	410,699	359,917

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

² Revised figure.

³ French Morocco prior to Jan. 1, 1957.

⁴ Less than 1 ton.

⁵ West Germany, effective Jan. 1, 1952.

⁶ Includes 90 tons from Northern Rhodesia in 1951-55 (average) and from the Federation of Rhodesia and Nyasaland, 1,052 tons in 1959, and 224 tons in 1960.

⁷ Includes material classified by the Bureau of the Census as being from Algeria but believed by Bureau of Mines to be from French Morocco.

Source: Bureau of the Census.

TABLE 27.—U.S. imports for consumption¹
(Short tons)

Country	1951-55 (average)	1956
Ore, flue dust, and matte (lead content):		
North America:		
Canada.....	26,225	26,733
Greenland.....		
Guatemala.....	3,610	5,613
Honduras.....	558	3,018
Mexico.....	1,904	2,620
Other North America.....	97	1
Total.....	32,401	38,194
South America:		
Bolivia.....	10,632	19,771
Chile.....	4,360	2,967
Colombia.....	181	852
Peru.....	25,132	58,383
Other South America.....	252	163
Total.....	40,526	82,095
Europe.....	208	24
Asia:		
Philippines.....	2,202	2,227
Other Asia.....	69	187
Total.....	2,271	2,414
Africa:		
Morocco ²	525	
Union of South Africa.....	21,956	35,417
Other Africa.....	38	
Total.....	22,520	35,417
Oceania:		
Australia.....	13,776	32,999
Other Oceania.....		180
Total.....	13,776	33,188
Total ore, flue dust, and matte.....	111,702	191,802
Base bullion (lead content):		
North America.....	203	31
South America.....	10	
Europe.....	(³)	
Asia.....	534	
Oceania.....		
Total base bullion.....	747	31
Pigs and bars (lead content):		
North America:		
Canada.....	60,966	16,220
Mexico.....	108,116	76,242
Other North America.....	50	
Total.....	169,132	92,462
South America:		
Peru.....	34,070	33,540
Other South America.....	173	
Total.....	34,243	33,540
Europe:		
Belgium-Luxembourg.....	941	1,206
Denmark.....	1,524	1,289
Germany ²	2,418	168
Spain.....	4,347	6,700
United Kingdom.....	1,619	115
Yugoslavia.....	43,251	38,901
Other Europe.....	1,142	778
Total.....	55,242	49,262
Asia.....	41	

See footnotes at end of table.

TABLE 27.—U.S. imports for consumption¹ of lead, by countries—Continued
(Short tons)

Country	1951-55 (average)	1956	1957	1958	1959	1960
Pig and bars—Continued						
Africa:						
Morocco ⁴	8,712	* 5,428	9,018	0,700	5,032	1,243
Other Africa.....	110	849	726	.....	703	460
Total.....	8,822	6,277	9,744	9,780	5,735	1,703
Oceania: Australia.....	56,944	80,673	95,517	78,036	51,051	46,816
Total pigs and bars.....	321,424	262,204	321,708	351,750	262,632	213,147
Reclaimed, scrap, etc. (lead content):						
North America:						
Canada.....	8,781	5,881	2,558	1,787	2,300	4,053
Mexico.....	2,095	10,109	4,000	2,433	1,350	1,189
Other North America.....	1,285	1,542	645	228	602	220
Total.....	7,141	17,532	7,203	4,448	4,348	5,462
South America:						
Peru.....	171	299	4	274	(*)	.....
Venezuela.....	503	230	.....	.....	.....	.....
Other South America.....	44	.....	53	34	120	.....
Total.....	718	529	57	308	120	.....
Europe:						
Belgium-Luxembourg.....	155	117	.....	7	.....	.....
Denmark.....	69	1,000	84	.....	.....	.....
Germany ⁵	12	348	168	273	1	1
Netherlands.....	217	157	.....	.....	.....	.....
Other Europe.....	398	179	32	172	.....	15
Total.....	852	1,801	284	457	1	10
Asia.....	278	4	.....	19	17	5
Africa.....	3	.....	.....	.....	.....	.....
Oceania:						
Australia.....	746	598	32	3,387	3,411	115
Other Oceania.....	102	.....	.....	.....	.....	.....
Total.....	848	598	32	3,387	3,411	115
Total reclaimed, scrap, etc.....	9,840	20,464	7,676	8,619	7,897	5,698
Sheets, pipe, and shot:						
North America:						
Canada.....	153	130	101	252	452	213
Canal Zone.....	.....	.....	10	.....	.....	.....
Mexico.....	272	6,830	4,770	559	.....	.....
Total.....	425	6,960	4,800	811	452	213
South America.....	14	.....	.....	.....	.....	.....
Europe.....	139	688	1,027	1,813	3,156	2,641
Asia.....	.....	.....	.....	1	(*)	1
Total sheets, pipe, and shot.....	578	7,654	5,817	2,625	3,603	2,855
Grand total.....	444,291	481,655	609,842	901,044	* 410,097	350,407

¹ Excludes imports for manufacture in bond and export, which are classified as "imports for consumption" by the Bureau of the Census.

² Revised figure.

³ Less than 1 ton.

⁴ French Morocco prior to Jan. 1, 1957.

⁵ West Germany, effective Jan. 1, 1952.

⁶ Includes material classified by the Bureau of the Census as being from Algeria but believed by the Bureau of Mines to be from French Morocco.

Source: Bureau of the Census.

TABLE 28.—U.S. imports for consumption¹ of lead, by countries—Continued

Year	Lead in ores, slag, dust or fume, and mattes, n.s.p.f. (lead content)		Lead in base bullion (lead content)	
	Short tons	Value (thousands)	Short tons	Value (thousands)
1951-55 (average).....	111,702	*\$28,492	747	\$288
1956.....	191,302	50,621	31	11
1957.....	234,616	62,284	25	8
1958.....	237,626	50,772	416	136
1959.....	*136,626	*27,035	34	18
1960.....	137,674	27,816	293	* 62

¹ Excludes imports for manufacture in bond and export, which are classified as "imports for consumption" by the Bureau of the Census.

² In addition to quantities shown (value included in following)—1951-55 (average): 9,840 tons, *\$2,317,557; 1956: 8,619 tons, \$1,440,639; 1957: 7,897 tons, \$1,304,107; 1958: 8,619 tons, \$1,440,639; 1959: 7,897 tons, \$1,304,107; 1960: 7,897 tons, \$1,304,107.

³ Data known to be not comparable with other years.

⁴ Revised figure.

⁵ Adjusted by Bureau of Mines.

Source: Bureau of the Census.

TABLE 29.—U.S. imports for consumption¹ of lead, by countries—Continued

Year	Rabbit metal, solder, and other combined lead	
	Gross weight (short tons)	Lead content (short tons)
1951-55 (average).....	2,009	1,23
1956.....	4,106	2,52
1957.....	3,602	2,10
1958.....	4,244	2,04
1959.....	11,840	3,75
1960.....	* 9,274	* 1,51

¹ Data known to be not comparable with other years.

Source: Bureau of the Census.

TABLE 30.—U.S. exports of lead, by countries¹
(Short tons)

Destination	1951-55 (average)	1956	1957	1958	1959	1960
Ore, matte, base bullion (lead content):						
North America:						
Canada.....	402	6	54	—	3	10
Mexico.....	284	1,049	851	912	108	107
Total.....	786	1,055	905	912	111	123
Europe.....	17	—	1	30	113	1,174
Asia.....	—	—	—	70	—	—
Total ore, matte, base bullion.....	773	1,055	906	1,012	224	1,297
Pigs, bars, anodes:						
North America:						
Canada.....	48	38	266	19	11	24
Cuba.....	38	44	62	33	37	10
Mexico.....	14	2	18	4	28	60
Other North America.....	87	53	136	79	153	149
Total.....	187	137	482	135	229	243
South America.....	466	306	104	96	63	18
Europe.....	12	2,128	560	3	9	80
Asia:						
Japan.....	5	1,178	2,305	—	5	—
Nansai and Nanpo Islands.....	1	5	16	7	3	—
Philippines.....	158	180	451	427	473	34
Taiwan.....	17	2	224	566	1,916	1,536
Other Asia.....	120	688	106	126	27	103
Total.....	302	2,051	3,102	1,126	2,424	1,073
Africa.....	2	6	1	—	1	2
Oceania.....	(²)	—	—	(²)	—	1
Total pigs, bars, anodes.....	969	4,628	4,339	1,359	2,766	1,907
Scrap:						
North America.....	124	11	—	5	7	1,220
South America.....	—	—	—	—	(²)	2
Europe:						
Belgium-Luxembourg.....	178	20	—	—	—	6
Germany.....	142	543	264	292	81	129
Netherlands.....	29	783	304	157	460	297
United Kingdom.....	803	554	126	382	513	851
Other Europe.....	107	14	55	178	110	74
Total.....	1,259	1,939	748	1,000	1,134	1,357
Asia:						
Japan.....	667	186	137	—	—	—
Other Asia.....	—	—	—	1	—	(²)
Total.....	667	186	137	1	—	(²)
Total scrap.....	2,050	2,136	885	1,015	1,141	2,579
Grand total.....	3,792	7,819	6,130	3,386	4,121	5,843

¹ In addition foreign lead was reexported as follows: Ore, matte, base bullion 1951-55 (average): Less than 1 ton; 1956: 6 tons; 1957: 4 tons; 1958-60: None. Pigs, bars, anodes, 1951-55 (average): 160 tons; 1956: 50 tons; 1957: 300 tons; 1958: 25 tons; 1959: 83 tons; 1960: None. Scrap: 1951-55 (average): 24 tons; 1956-58: None; 1959: 11 tons; 1960: None.

² Less than 1 ton.

³ West Germany, effective Jan. 1, 1952.

Source: Bureau of the Census.

WORLD

World production of lead in 1959 as voluntary curbs on output of 1959 as voluntary curbs on output of world producing countries and U.S. World smelter production was estimated and free-world consumption at 2.4 increase in stocks. This imbalance of the major problems of the free industries. Demand for lead continued in the European markets through admitted to trading on the London year.

NORTH AMERICA

Canada.²—Mine production from 19 mines reached 205,000 tons and Refined-lead production came from smelter, a unit of the smelting and Mining & Smelting Co. of Canada which processed concentrates from Bluebell, and H. B. mines in British Columbia were Canadian Exploration Donald Mines, Ltd., at Remac; and operated its Mineral King mine and began rehabilitation of its Paradise land Hill, Ltd., an important silver and zinc concentrates.

TABLE 31.—World mine production of lead (Short tons)

Country	1951-55 (average)	1956	1957	1958	1959	1960
North America:						
Canada.....	188,407	18	—	—	—	—
Cuba.....	—	—	—	—	—	—
Greenland.....	—	—	—	—	—	—
Guatemala.....	4,760	—	—	—	—	—
Honduras.....	1,038	—	—	—	—	—
Mexico.....	247,024	—	—	—	—	—
United States.....	356,858	—	—	—	—	—
Total.....	798,120	18	—	—	—	—
South America:						
Argentina.....	22,476	—	—	—	—	—
Bolivia (exports).....	26,832	—	—	—	—	—
Brazil.....	3,182	—	—	—	—	—
Chile.....	6,001	—	—	—	—	—
Colombia (U.S. imports).....	7,291	—	—	—	—	—
Ecuador.....	99	—	—	—	—	—
Peru.....	114,975	—	—	—	—	—
Total.....	173,826	—	—	—	—	—

See footnotes at end of table.

¹ When zinc or copper were coproducts with lead, the lead content of the concentrates may be found in the Zinc and Copper Mineral Resources Division, Department of Mineral Survey of the Canadian Mineral Industry, February 1961, pp. 24-27.

glass industry. Commercial mica and sphene (a calcium titanium silicate) were reported to occur on the company's property.³

Metal.—Production of titanium sponge metal was 5,300 tons compared with 3,900 tons in 1959. Activity in other phases of the titanium metal industry increased 20 to 58 percent.

Commercial producers of titanium sponge were as follows: Union Carbide Metals Co., Division of Union Carbide Corp., Ashtabula, Ohio; E. I. du Pont de Nemours & Co., Inc., Newport, Del.; Reactive Metals, Inc. (formerly Mallory Sharon Metals Corp.), Ashtabula, Ohio; and Titanium Metals Corp. of America (TMCA), Henderson, Nev. Du Pont and TMCA used magnesium to reduce titanium tetrachloride to titanium metal; Reactive Metals and Union Carbide used aluminum.

TABLE 3.—Titanium-metal data

(Short tons)

	1956	1957	1958	1959	1960
Sponge metal:					
Production.....	14,695	17,249	4,585	3,898	5,311
Imports for consumption.....	2,048	2,832	2,073	1,563	2,231
Industry stocks.....	3,000	2,800	1,000	1,100	1,100
Government stocks (DPA inventories).....	9,316	19,321	22,463	22,474	22,474
Consumption.....	10,936	8,221	4,147	3,953	5,457
Sponge-metal consumption.....	2,033	1,743	1,330	1,600	2,027
Castings:					
Production.....	11,688	10,009	5,408	6,017	8,297
Consumption.....	10,860	10,428	4,071	5,904	7,978
Castings production.....	6,166	5,058	2,594	3,211	5,080

¹ Includes alloy constituents.

Titanium melters were: Harvey Aluminum, Inc., Torrance, Calif.; Reactive Metals, Inc., Niles, Ohio; Oregon Metallurgical Corp., Albany, Oreg.; Crucible Steel Co. of America, Midland, Pa.; Republic Steel Corp., Masillon and Canton, Ohio; and TMCA, Henderson, Nev.

Oregon Metallurgical Corp. produced ingots and castings. The other companies produced and processed ingots into mill products such as sheet, strip, plate, forging billets, and bars. Harvey Aluminum, Inc., produced titanium castings in addition to other mill products. Edish Co., Cudahy, Wis., processed ingots into forged products.

Pigments.—On a gross-weight basis, production of titanium dioxide pigments decreased 11 percent and shipments decreased 3 percent below the record levels of 1959. Data on domestic production and shipments in table 4 are based on TiO₂ content. Data in table 10 show capacity of titanium dioxide plants in the United States and foreign countries.

Titanium pigments were produced by the following companies: American Cyanamid Co., Piney River, Va., and Savannah, Ga.; The Hidden Co., Baltimore, Md.; E. I. du Pont de Nemours & Co., Inc., Edge Moor, Del., Baltimore, Md., and New Johnsonville, Tenn.; National Lead Co., St. Louis, Mo., and Sayreville, N.J.; and The New Jersey Zinc Co., Gloucester City, N.J.

³ Rocks and Minerals, M & T Expands Mineral Mining Operations: Whole No. 275, March-April 1960, p. 113.

TITANIUM

TABLE 4.—Titanium dioxide

Year
1950.....
1951.....
1952.....
1953.....
1954.....
1955.....
1956.....
1957.....
1958.....
1959.....
1960.....

¹ Includes interplant transfers. ² Not available.

Source: Facts for Industry and Current Industrial Reports series, published jointly by the Bureau of the Census and the Business Administration, U.S. Department of Commerce.

Construction of a 25,000-ton-a-year titanium plant at an undisclosed location on the west coast was announced. The plant, 85-percent owned by the American Potash & Chemical Corp., is 100 percent by Laporte Titanium, Ltd., a subsidiary of Laporte Industries, Ltd., of England. The plant will be located on the west bank of the Mississippi River.⁴

Welding-Rod Coatings.—A total of 222,000 tons of titanium-containing titaniferous materials in their coatings were produced in 1959, the total output, 40 percent contained rutile; 30 percent, a mixture of rutile and manufactured titanium dioxide; 15 percent, other.

CONSUMPTION AND

Concentrates.—Consumption of ilmenite, used for making titanium dioxide pigments, decreased 16 percent below 1959. Titanium slag consumption, also used for making titanium pigments, declined 16 percent below 1959. Consumption of rutile for making titanium tetrachloride decreased 16 percent, more than offset a decrease in its use in welding rods. Overall consumption increased.

Metal.—Titanium sponge metal consumption increased over 1959 to 5,500 tons. About 500 pounds of sponge metal are used in producing a ton of titanium ingot. Consumption of mill products, using shipments as a gauge, was higher than in 1959. High-speed aircraft, missiles, and space vehicles were the major end uses of titanium metal.

One titanium producer estimated that requirements for titanium metal in missile and space applications were increasing. Broadening of the missile base contributed

⁴ American Potash & Chemical Corporation, AP&CC, Laporte Titanium Dioxide: The Brine Line, vol. 8, No. 5, December 1959.

TABLE 5.—Consumption of titanium concentrates in the United States, by products
(Short tons)

Year and product	Ilmenite ¹		Titanium slag		Rutile	
	Gross weight	Estimated TiO ₂ content	Gross weight	Estimated TiO ₂ content	Gross weight	Estimated TiO ₂ content
1951-55 (average).....	700,923	366,670	183,386	158,720	21,028	19,805
1956.....	805,211	464,009	162,434	115,148	46,853	44,453
1957.....	840,719	434,077	116,465	82,545	53,393	50,870
1958.....	731,424	379,765	117,581	82,937	21,677	20,579
1959:						
Pigments (mfg. TiO ₂) ²	913,017	473,471	142,048	100,186	6,001	5,721
Titanium metal.....	(³)	(³)	(³)	(³)	14,687	13,819
Welding-rod coatings.....	704	470	860	614	4760	4733
Alloys and carbide.....	3,906	2,700	(³)	(³)	421	394
Ceramics.....	27	17			992	968
Fiberglass.....					890	827
Miscellaneous ⁴	3	2	421	306		
Total.....	917,747	470,660	143,320	101,106	23,741	22,462
1960:						
Pigments (mfg. TiO ₂) ²	964,794	462,023	119,308	84,267	8,073	7,685
Titanium metal.....	(³)	(³)			13,406	12,668
Welding-rod coatings.....	658	390	995	680	377	360
Alloys and carbide.....	2,584	1,574	(³)	(³)	374	350
Ceramics.....	27	17			704	686
Fiberglass.....					1,295	1,193
Miscellaneous ⁴	17	10	216	158		
Total.....	968,080	461,914	120,402	85,095	24,220	22,942

¹ Includes a mixed product containing rutile, leucosene, and altered ilmenite used to make pigments and metal.

² 1952-55 only.

³ Pigments include all manufactured dioxide.

⁴ Included in "Pigments" to prevent disclosing individual company confidential data.

⁵ Included in "Miscellaneous" to prevent disclosing individual company confidential data.

⁶ Revised figure.

⁷ Includes consumption for chemicals and experimental purposes and losses in grinding.

extent; in certain missile applications, however, titanium was reported to be cheaper than other suitable materials, and part of the increase in these uses was attributed to substitution of titanium for other metals.

A double shell of titanium reportedly was used in the midsection of the space capsule used in Project Mercury, America's man-in-space program.⁸ The shells were supported by titanium rings and stringers. Other significant applications for titanium in space vehicles and missiles included cryogenic pressure vessels for liquid-fueled missiles, rocket motor cases for solid-fueled vehicles, rocket nozzle exit cones, control mechanisms and housings, and skin.

The use of titanium in the honeycomb-core construction for jet inlet guide ramps of the Navy's Mach 2 attack aircraft, the A3J Vigilante, was described. Titanium's immunity to salt-water corrosion reportedly was so effective in replacing aluminum cover sheets and channels that the A3J aircraft already built were to be fitted with the new design.⁹

Use of high-strength titanium alloy in the barrel of the new U.S. Army recoilless infantry gun, the Davy Crockett, announced early in

⁸ Crucible Steel Co. of America, Titanium Review: Vol. 9, No. 1, March 1961, pp. 1-8.
⁹ Aviation Week and Space Technology, Corrosion-Fighting Titanium Sheet Pays Way for Honeycomb in Navy A3J: Vol. 72, No. 11, Mar. 14, 1960, pp. 104-106.

1960, represented the first major nonaircraft application of titanium. One company estimated that titanium would be needed for this application from 1960 to 1970.

Increased commercial utilization of titanium in pumps and heat exchangers was reported. A cooking kettle was reportedly unaffected by exposure to several foods which seriously corrode stainless steel vessels.¹⁰

Cast titanium parts, such as pumps, in use in hot nitric acid, hypochlorites, chlorides, and other chemicals, were reported to be cheaper than castings of nickel alloys when downtime is considered.¹¹

Welded-titanium-tube heat exchangers for metal sulfates in sulfuric acid, such as in plants, were reportedly more efficient than lead-covered copper tubing. Forty-five heat exchangers, each consisting of 120 linear feet of welded titanium tubing, were being constructed at pigment plants of the National Lead Co.¹²

Pigments.—Consumption of titanium pigments, by weight and using shipments as a gauge, decreased in 1960. Consumption of pigments not separately reported for use in ceramics, roofing, siding, gems, titania,

STOCKS

Rutile stocks increased slightly and rutile metal stocks at the 1960 rate of consumption. Ilmenite stocks but stocks of titanium slag decreased. Titanium sponge held by producers, melters, and refiners, the same as stocks at the end of 1959, were reported to be cheaper than the supply at the 1960 consumption rate. A report that titanium held in Defense Production Act inventory was increased from 3,400 tons at the beginning of 1960 to 3,500 tons at the year-end.

PRICES

Concentrates.—The price quoted for ilmenite concentrates remained unchanged in 1960 (59.5 percent TiO₂, f.o.b. Atlantic seaboard).

Rutile prices continued to decline. The price for rutile (90 percent TiO₂, f.o.b. Atlantic seaboard) quoted by

¹⁰ Daily Metal Reporter, 2 Million Lbs. Titanium Metal Sold: May 4, 1960, pp. 1, 4.

¹¹ Steel, Success of Corrosion Test Widens Field for Titanium: 1960, p. 88.

¹² Aschoff, W. A., Why to Use Titanium and Zirconium: Eng., vol. 51, No. 1, January 1960, pp. 102-104.

¹³ Chemical Engineering, Big Equipment Sale Set for Gimmick Phase: Vol. 67, No. 20, Dec. 26, 1960, p. 31.

¹⁴ Chemical Week Titanium Equipment Costs Turned Down: pp. 28-30.

TABLE 18.—Slab-zinc consumption in the United States in 1960, by industries and States

(Short tons)

State	Galvanizers	Brass mills ¹	Diecasters ²	Other ³	Total
Alabama.....	(⁴)	(⁴)	(⁴)	(⁴)	33,170
Arizona.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Arkansas.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
California.....	20,983	(⁴)	12,274	(⁴)	35,282
Colorado.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Connecticut.....	3,041	32,008	(⁴)	(⁴)	37,421
Delaware.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
District of Columbia.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Florida.....	(⁴)	(⁴)	(⁴)	(⁴)	646
Georgia.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Hawaii.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Idaho.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Illinois.....	40,803	14,330	62,653	17,674	135,469
Indiana.....	41,866	(⁴)	21,200	(⁴)	80,695
Iowa.....	821	(⁴)	(⁴)	(⁴)	1,504
Kansas.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Kentucky.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Louisiana.....	712	(⁴)	(⁴)	(⁴)	712
Maine.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Maryland.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Massachusetts.....	(⁴)	1,555	(⁴)	(⁴)	6,020
Michigan.....	(⁴)	10,643	84,163	(⁴)	99,223
Minnesota.....	1,893	(⁴)	(⁴)	(⁴)	1,917
Mississippi.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Missouri.....	3,807	(⁴)	3,008	(⁴)	7,756
Montana.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Nebraska.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
New Hampshire.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
New Jersey.....	4,186	5,672	16,331	1,057	27,146
New York.....	6,015	(⁴)	30,706	(⁴)	49,168
North Carolina.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Ohio.....	75,155	(⁴)	46,071	(⁴)	129,262
Oklahoma.....	(⁴)	(⁴)	(⁴)	(⁴)	5,789
Oregon.....	(⁴)	(⁴)	(⁴)	6	897
Pennsylvania.....	54,129	6,598	13,759	(⁴)	97,240
Rhode Island.....	558	(⁴)	(⁴)	(⁴)	592
South Carolina.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Tennessee.....	(⁴)	(⁴)	(⁴)	(⁴)	1,896
Texas.....	11,873	(⁴)	(⁴)	(⁴)	36,950
Utah.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Virginia.....	(⁴)	(⁴)	(⁴)	(⁴)	294
Washington.....	930	(⁴)	(⁴)	(⁴)	1,375
West Virginia.....	6,006	(⁴)	(⁴)	(⁴)	6,127
Wisconsin.....	1,978	(⁴)	(⁴)	(⁴)	10,052
Total ⁵	309,445	97,048	336,917	67,852	871,262

¹ Includes brass mills, brass ingotmakers and brass foundries.² Includes producers of zinc-base diecastings, zinc-alloy dies, and zinc-alloy rods.³ Includes slab zinc used in rolled-zinc products and in zinc oxide.⁴ Figure withheld to avoid disclosing individual company confidential data.⁵ Includes States not individually shown; excludes remelt zinc.ZINC PIGMENTS AND SALTS¹

Production.—Production of zinc pigments and salts was below the 1959 output. The value of public and private construction was up slightly, and the value of paint, varnish, and lacquer shipments remained unchanged at \$1.8 million; however, consumption of natural and synthetic rubber, a large outlet for zinc oxide, decreased 3 percent to 1.6 million long tons.

Production of lead-free and leaded zinc oxide was 15 and 39 percent, respectively, below 1959. Output of zinc chloride decreased 5 percent and that of zinc sulfate decreased 33 percent. Data for production of 50° Baumé zinc chloride have been changed to show the zinc chlo-

¹ Prepared by John E. Shelton, commodity specialist, and Esther B. Miller, statistical assistant.

ZINC

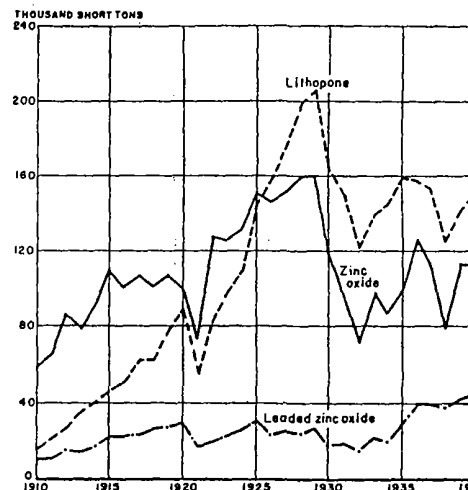


Figure 2.—Trends in shipments of zinc

ride equivalent of zinc ammonium chloride.

Pigments and salts were made from various sources, including ore, slab zinc, scrap, and residues. Zinc pigments and salts produced directly from ore, both in 1959 and 1960, exceeded 78,900 tons; that in zinc oxide and zinc chloride exceeded 15,400 tons; and the zinc derived from zinc pigments and salts exceeded 37,300 tons.

TABLE 19.—Production and shipments of zinc pigments and salts, United States

Pigment or salt	Production (short tons)	1959		
		Shipments		
		Short tons	Total	Average price per ton
Zinc oxide ¹	161,806	154,234	\$41,483,742	\$268
Leaded zinc oxide ²	23,550	22,626	6,037,604	268
Zinc chloride, 50° B ³	58,797	58,985	(⁴)	(⁴)
Zinc sulfate.....	41,353	40,670	6,322,882	153

¹ Excludes lithopone; figure withheld to avoid disclosing individual company confidential data.² Value at plant, exclusive of container.³ Zinc oxide containing 5 percent or more lead is classed as leaded zinc oxide.⁴ Includes zinc chloride equivalent of zinc ammonium chloride.⁵ Corrected figure.⁶ Figure withheld to avoid disclosing individual company confidential data.

TABLE 20.—Zinc content of zinc pigments¹ and salts produced by domestic manufacturers, by sources

(Short tons)

Pigment or salt	1959					1960				
	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 ¹		Ore		Slab zinc	Secondary material ¹	
	Domestic	Foreign				Domestic	Foreign			
Zinc oxide.....	71,126	16,339	18,000	23,680	129,145	57,296	13,028	15,393	24,716	110,433
Leaded zinc oxide..	4,620	2,798			7,418	5,704	2,831			8,535
Total pigments....	75,946	19,137	18,000	23,680	136,563	63,000	15,859	15,393	24,716	118,968
Zinc chloride ²	(1)	(1)	(1)	13,663	13,663	(1)	(1)	(1)	12,625	12,625
Zinc sulfate.....					14,234				(1)	9,740

¹ Excludes zinc sulfide and lithopone; figures withheld to avoid disclosing individual company confidential data.² These 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 Includes zinc content of zinc ammonium chloride.⁴ Figure withheld to avoid disclosing individual company confidential data.⁵ Corrected figure.

Lead-free zinc oxide was made by several processes: 64 percent from ores and residues by the American process, 24 percent from metal by the French process, and 12 percent by "Other" process from scrap residues and scrap materials. Leaded zinc oxide was made from ores; zinc chloride, from slab zinc and secondary zinc materials; and zinc sulfate, from ores and scrap zinc.

Four grades of leaded zinc oxide, classified according to lead content, were produced. Only a very small quantity of 5 percent or less leaded zinc oxide was produced; the grade of more than 5 to 35 percent lead constituted most of the production. Small quantities of the more than 35 through 50 percent and over 50 percent grades were produced.

Both ordinary and high strength (titanated) lithopone were produced.

Consumption.—Shipments of lead-free zinc oxide were 6 percent below 1959. Shipments to floor-covering industries increased 9 percent; to rubber, paint, ceramics and other industries decreased 6 percent; and to the coated fabric and textile industries declined 37 percent.

Consumption of leaded zinc oxide by the paintmaking industries (91 percent of the total consumption) declined 15 percent below 1959.

Lithopone was used in paint, varnish and lacquer, floor covering, coated fabrics and textiles, rubber, printing inks, and chemicals.

Statistics on distribution of zinc chloride shipments were not available. The principal uses were for soldering and tinning fluxes, battery making, galvanizing, vulcanizing fiber, preserving wood, refining oil, and fungicides.

Rayon and agriculture were the chief consumers of zinc sulfate, receiving 55 and 15 percent, respectively, of the total shipments. Other uses were in chemicals, flotation reagents, glue manufacturing, and

ZINC

the medicinal, mineral, and rubber industries received 30 percent of the shipments. by rayon manufacturers decreased 40 percent; increased 18 percent; and other uses decreased with 1959.

TABLE 21.—Distribution of zinc oxide shipments

(Short tons)

Industry	1951-55 (average)	1956	1957
Rubber.....	76,091	80,460	81,000
Paints.....	32,273	32,485	32,485
Ceramics.....	9,311	10,180	8,000
Coated fabrics and textiles ¹	7,966	8,447	3,000
Floor coverings.....	2,358	1,436	1,000
Other.....	21,477	21,968	23,000
Total.....	149,476	154,956	158,485

¹ Includes the following tonnages for rayon: 1956—7,721; 1957—2,800 and 1958 withheld to avoid disclosing individual company confidential data.

TABLE 22.—Distribution of leaded zinc oxide shipments

(Short tons)

Industry	1951-55 (average)	1956	1957
Paints.....	37,286	26,825	23,000
Rubber.....	430	339	300
Other.....	-----	-----	-----
Total.....	37,716	27,164	23,300

TABLE 23.—Distribution of zinc sulfate shipments

(Short tons)

Year	Rayon		Agriculture		Other
	Gross weight	Dry basis	Gross weight	Dry basis	
1951-55 (average).....	8,922	7,825	6,545	5,683	6,000
1956.....	21,083	18,825	7,051	6,291	4,000
1957.....	19,903	17,785	9,818	8,261	3,000
1958.....	19,798	17,747	11,525	9,819	2,000
1959.....	26,062	23,354	5,262	4,695	9,000
1960.....	15,727	14,097	4,320	3,848	8,000

Prices.—American process lead-free zinc oxide was sold at 15.375 cents per pound, and the 5- to 35-percent leaded zinc oxide at 15.375 cents per pound for carlots during the year. White-seal French process zinc oxide was sold at 16.75 cents per pound in carlots, respectively. Lithopone was quoted at 9.125 cents per pound for the year. Zinc chloride (50 percent solution)

than carlots), and zinc sulfide (carlots) were quoted at 5.15, 9.75, and 25.30 cents per pound, respectively, all year.

Foreign Trade.—Imports of zinc pigments and salts declined 17 percent in value and 19 percent in quantity below 1959. Of the 15,600 tons imported, 12,700 tons, or 81 percent, was zinc oxide.

Exports of zinc oxide and lithopone were down 15 percent and 65 percent, respectively.

TABLE 24.—U.S. imports for consumption of zinc pigments and salts

Kind	1959		1960	
	Short tons	Value (thousands)	Short tons	Value (thousands)
Zinc oxide.....	10,510	\$3,301	12,605	\$2,632
Zinc sulfide.....	235	72	193	63
Lithopone.....	73	9	62	8
Zinc arsenate.....			(¹)	(¹)
Zinc chloride.....	766	127	880	151
Zinc sulfate.....	1,643	160	1,743	198
Total.....	19,147	3,678	15,582	3,052

¹ Less than 1 ton.
² Less than \$1,000.

Source: Bureau of the Census.

TABLE 25.—U.S. exports of zinc pigments

Kind	1959		1960	
	Short tons	Value (thousands)	Short tons	Value (thousands)
Zinc oxide.....	2,516	\$765	2,137	\$659
Lithopone.....	638	99	100	35
Total.....	3,054	864	2,327	694

Source: Bureau of the Census.

STOCKS

National Stockpile.—Inventories in the national stockpile at yearend approximately equaled or exceeded the basic and maximum objectives. No domestically produced zinc was reported by industry * to have been shipped to Government account. The total of such shipments reported by industry for 1945 through 1959 was 1,173,951 tons. GSA acquired 1,840 tons of foreign zinc in 1960, under surplus agricultural-product barter contracts, authorized under the Agricultural Trade Development and Assistance Act of 1954 and amendments. The 323,925 tons acquired from 1956 through 1960 under this program was placed in the supplemental stockpile.

Producer Stocks.—Smelter stocks of slab zinc began the year at 156,200 tons, rose to over 200,000 tons by the end of July, declined to 182,000 tons at the end of November, and increased to 188,000 tons by yearend.

* Kimberly, J. L., A Review of the Zinc Industry in the United States During 1960, Am. Zinc Inst., New York, N.Y., 16 pp.

ZINC

TABLE 26.—Stocks of zinc at zinc-reduction plants (Short tons)

	1958	1959
At primary reduction plants.....	64,794	153,200
At secondary distilling plants.....	2,081	2,000
Total.....	66,875	155,200

¹ Revised figure.

Consumer Stocks.—Stocks of slab zinc 102,400 tons at the beginning of the year and 102,400 tons at the end of the year. In the first quarter, the stocks were 102,400 tons, but by November they had declined to 102,400 tons. On December 31, total stocks were 67,800 tons of slab zinc was in transit to consumers at the monthly rate of consumption, total consumer stocks represented about 4 weeks' supply.

TABLE 27.—Consumer stocks of slab zinc at yearend (Short tons)

	Galvanizers	Brass mills ¹	Zinc die-casters ²	Zinc rod mills ³
Dec. 31, 1959.....	56,910	13,627	25,199	4,300
Dec. 31, 1960.....	56,269	7,825	18,052	3,300

¹ Includes brass mills, brass ingot makers, and foundries.
² Includes producers of zinc-base die castings, zinc-alloy dies, and zinc-base die castings.
³ Figures partly revised.

⁴ Stocks on Dec. 31, 1959 and 1960, exclude 728 tons and 1,461 tons, respectively.

PRICES

The quoted price for Prime Western zinc increased to 13 cents per pound at the beginning of the year, declined to 10.5 cents per pound by December 19, and then increased to 12.5 cents. On December 19, the price was 12 cents where it remained for the remainder of the year.

The average monthly zinc quotation on the London market was £88.412 a long ton (equivalent to 11.0 cents per pound) at the exchange rate recorded by the Federal Reserve Bank of New York. The average price for January was £91.747 (11.3 cents per pound). By March the average had declined to £88.88 (10.9 cents per pound). By May the price had increased to £91.452 (10.9 cents per pound). Thereafter an almost continual decrease brought the price to £82.747 (10.34 cents per pound) in December.

Prices of new and old zinc scrap varied widely. Sales of clean new zinc clippings or lithographers' plates averaged slightly above 7 cents per pound. In December, the price of old zinc scrap was 7.08 cents per pound but it averaged 7.08 cents for the year in price from 3.87 to 4.75 cents a pound, average.