MINERA
YEARBO
1964

Volume I of Four V

METALS AND MI
(Except Fuels)

Prepared by staff of the
BUREAU OF MINES

Synthetic mullite and other high alumina refractories were tested for reheat and hot load properties in a furnace equipped to test two bricks simultaneously. This assured identical heating times, temperatures, and heating rates. Rapid expansion of the mullite brick, which was caused by mullite growth at grain boundries did not occur until after the brick became thermoplastic.[7]

Uncalcined kyanite was one of the principal ingredients in a patented castable refractory for alkali-resistant blast furnace linings.[8] The durability of conventional steel furnace linings was improved by a patented coating material containing 55 percent sillimanite and smaller amounts of magnesia, alumina, and fluorspar.[9]

Results of a study were published giving information on the minor elements present and the optical properties of a number of kyanites from various geological settings, mostly in Minas Gerais, Brazil. One comparison sample was from a magnesite deposit in Bahia. There was no correlation between optical and chemical data or between optical data and mode of occurrence.[10]

Revised data were submitted for high pressure-high temperature experiments on andalusite, sillimanite, kyanite, and 1:1 alumina-silica gel. Pressure-temperature data for kyanite and the gel were nearly identical, but were considerably different from the sillimanite and andalusite data.[11]

[7] Churovich, M. D., K. Weisenstein, and W. L. Babianic. Simultaneous Hot Load and Reheat Testing of High Alumina Refractories. Am. Ceram. Soc. Bull., v. 43, No. 11, November 1964, pp. 842–845.
[8] Harbison-Walker Refractories Co. British Pat. 946,905, Jan. 15, 1964.
[9] Dortmund-Horder Huttenunion A. G. British Pat. 962,205, July 1, 1964.
[10] Herz, Norman, and C. V. Dutra. Geochemistry of Some Kyanites From Brazil. Am. Mineral., v. 49, Nos. 9 and 10, September-October 1964, pp. 1290–1305.
[11] DeVries, R. C. The System Al_2SiO_5 at High Temperatures and Pressures. J. Am. Ceram. Soc., v. 47, No. 5, May 1964, pp. 230–237.

Lead

By Donald E. Moulds

Contents

PRODUCTION and consumption of le
domestic lead industry continued to rise i
consumption of ores and metal declined
refined and antimonial lead at both primary
secondary plants were reduced. Mine produ
increased 13 percent to 286,000 tons, a tot
and production of primary refined and antim
to 458,000 tons. Recovery of lead from sec
primary and secondary plants increased 10 p
tons. Consumption of lead as reported incre
over 1.2 million tons with gasoline antiknoc
the major portion of the increase, while stor
declined from the high level of 1963. Gover
of lead from the stockpile in August and
completed the 50,000 tons authorized under

The price of common lead in New York
cents per pound quoted at the end of 1963 t
1964; three subsequent increases of 1 cent
price to 16 cents per pound on December 1
Exchange price ranged from a low of 9.6 cer
to a high of 19.2 cents, U.S. equivalent, in
price for the year was 13.6 cents per pound, l
on the London Metal Exchange.

LEGISLATION AND GOVERNME

The small mines stabilization program u
enacted in October 1961, applied to eligible
the year. Qualifications for participation
amended by enactment of Public Law 88–75

[1] Commodity specialist, Division of Minerals.

ment of the program rules and regulations. As of December 31, 1964, those mines certified under the amended program totaled 61. Payment of $144,902 was made on sales of 6,144 tons of eligible lead during the year to 48 small mining concerns. The New York price of lead exceeded the 14.5 cents per pound, below which payment is authorized, in October.

The Government did not acquire lead for the stockpile during the year. Disposal of 50,000 tons of lead to meet indicated commercial shortage was authorized under Public Law 88-373 enacted in July. During August approximately 41,000 tons was sold by General Services Administration and the remaining 9,000 tons was sold in November. Sale was restricted to domestic use and allocated to domestic producers of primary and secondary refined lead, qualified importers of refined lead, and consumers qualifying as small business concerns. Shipment of lead by the Government as a result of the sale reduced the Government stockpile inventory to 1,338,130 tons of lead at yearend, all of which has been determined by the Office of Emergency Planning to be surplus to stockpile requirements for conventional war.

Government participation in exploration projects for lead and zinc, under the program of the Office of Minerals Exploration, was withdrawn at the end of June 1962. Of the four projects for lead and zinc approved prior to this action and active in 1964, one was certified as a discovery and the remaining projects terminated during the year.

Import quotas on lead ores and metal, established October 1, 1958, continued in effect. The quotas subdivided into quarterly quotas for specified countries were essentially filled for lead metal in all of the quarters, while receipts of lead in ores and bullion were less than the quota limitation in each quarter and represented only 90 percent of that allowable for the year. The President, on March 2, 1964, requested the U.S. Tariff Commission to advise him in determinating whether or not to relax or terminate the import quotas pursuant to the provisions of the Trade Expansion Act of 1962. This investigation was still in progress at yearend.

Legislation was reintroduced in Congress in February to establish flexible quotas on lead and zinc ores and metal and also on specified manufactured lead and zinc products. This legislation was still pending in Congress at yearend.

The International Lead and Zinc Study Group held its eighth session in Madrid, Spain, from October 26 to October 30. Representatives of 24 of the participating countries attended the sessions. The Group reviewed statistics on free world production and consumption of lead and zinc, as well as trade with countries with centrally planned economies. The Group concluded that free world consumption in 1963-64 had exceeded production and resulted in a drastic reduction of producer stocks and increased prices for lead and zinc, and while a significant increase in production was indicated in 1965-67, the imbalance in supply-demand would be likely to persist in 1965. Discussions of the Group stressed the importance of trade liberalization in lead and zinc and the study of intergovernmental agreements designed to achieve greater stability in lead and zinc. Measures to continue study in these two areas and also in medium-range aspects of supply and demand were approved.

TABLE 1.—Salient lead

	1955-59 (average)	1960
United States:		
Production:		
Domestic ores, recoverable lead content.....short tons	310,406	246,66
Value.....thousands	$85,920	$57,72
Primary lead (refined):		
From domestic ores and base bullion.....short tons	302,409	228,89
From foreign ores and base bullion.....short tons	170,748	153,53
Antimonial lead (primary lead content).....short tons	15,392	2,38
Secondary lead (lead content) short tons	470,242	469,90
Imports, general:		
Lead in ores and matte.....do	182,668	145,09
Lead in base bullion.....do	131	29
Lead in pigs, bars, and old short tons	300,666	213,67
Exports of refined pig lead.....do	2,697	1,96
Stocks December 31 (lead content):		
At primary smelters and refineries short tons	147,154	260,14
At consumer plants.....do	124,032	97,26
Consumption of metal, primary and secondary.....short tons	1,127,602	1,021,17
Price: New York, common lead, average, cents per pound	14.03	11.9
World:		
Production:		
Mine	2,555,000	2,620,00
Smelter	2,415,000	2,560,00
Price: London, common lead, average, cents per pound	11.35	9.0

' Revised.

DOMESTIC PRODU

MINE PRODUCT

Domestic mine production was essenti
year. The output of 286,000 tons of
a 13-percent increase in relation to the
affected by the strike closure of the south
out the first quarter of 1963. The pr
stable, ranging from 22,800 tons in the s
top of 25,000 tons in December. Mis
lead-producing State with an output of
in 1957, followed by Idaho, 71,300 to
Colorado, 20,600 tons. These four St
or 88 percent of the U.S. total; the rema
the output of 15 States. Of the 19 Stat
the 1964 output increased in 10 of the S
other 9 in comparison to that of 1963.
mines contributed 264,300 tons or 92 p
output. Production from the 4 largest
of the total and from the 10 leading min

The continuing demand for lead, es
augment diminishing receipts and sto
smelting provided an incentive for e
of lead deposits as well as for reopenin
production.

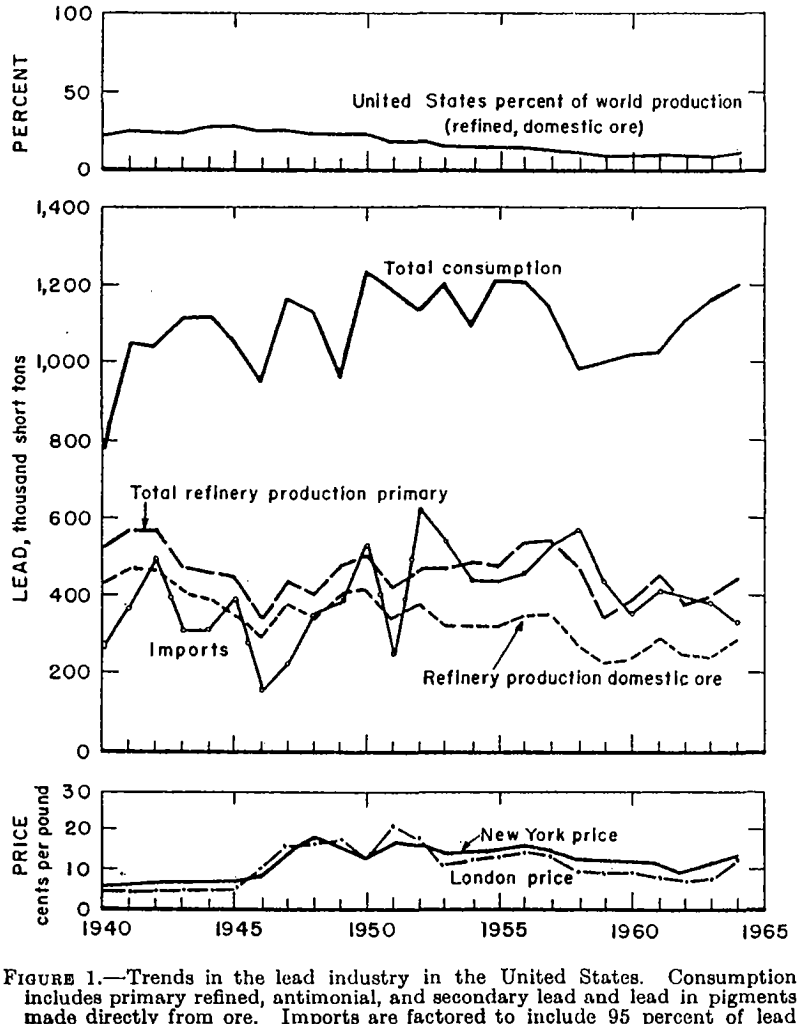

FIGURE 1.—Trends in the lead industry in the United States. Consumption includes primary refined, antimonial, and secondary lead and lead in pigments made directly from ore. Imports are factored to include 95 percent of lead content or ores, mattes, and concentrates and 100 percent of pigs, bars, base bullion, and scrap.

TABLE 2.—Mine production of recoverable l

(Short tons)

State	1955–59 (average)	1960
Arizona	11,220	8,495
Arkansas	8	
California	4,277	440
Colorado	16,737	18,080
Idaho	63,224	42,907
Illinois	3,105	3,000
Kansas	3,834	781
Kentucky	315	558
Missouri	118,765	111,948
Montana	13,015	4,879
Nevada	4,232	987
New Mexico	3,315	1,990
New York	1,074	775
North Carolina	4	424
Oklahoma	7,590	936
Utah	44,292	39,398
Virginia	2,970	2,152
Washington	10,812	7,725
Wisconsin	1,595	1,105
Other States	7	23
Total	310,406	246,869

Developments of major significance
continued in the southeast Missouri le
created a new division to operate its
Reynolds County. This project, alo
from the Viburnum mine, was expec
100,000 tons of lead annually, and the
was being expanded accordingly.

Montana Phosphate Products Co., a
Mining & Smelting Co. of Canada, L
Industries Inc., announced developme
facilities at the Magmont property nea
of 50,000 tons of lead annually, and sc
1967 or early 1968.

American Metal Climax, Inc., a
announced plans for joint developme
properties near Buck, Mo., with a ca
annually. Shaft sinking, mine develo
were expected to be completed by la
also announced plans for a smelter-refi
100,000 tons of lead annually to sme
mine and those produced by the COM

TABLE 3.—Ores yielding lead and zinc in the United States in 1964

(Short tons)

State	Lead ore			Zinc ore			Lead-zinc ore			Copper-lead, copper-zinc, and copper-lead-zinc ores			All other sources [1]			Total		
	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc
Arizona	3,157	479	30	15,714	23	874	314,187	5,527	15,804	114,314	90	7,307	27,924,313	28	675	28,371,685	6,147	24,690
California	1,999	1,078	2				3,600	467	140				580	1	1	6,179	1,546	143
Colorado	1,320	104	11	294,264	3,245	27,562	224,375	6,714	10,246	477,678	10,276	15,738	53,175	224	125	1,050,812	20,563	53,882
Idaho	211,036	21,220	1,897	(2)	(2)	(2)	[3] 922,111	[3] 47,091	252,944				443,626	3,001	4,457	1,577,773	71,312	33,298
Illinois				177,894	28	4,618							359,247	2,152	9,182	537,141	2,180	13,800
Kansas				93,190	441	2,714	112,063	744	1,951				134,029	838	1,162	245,253	1,185	4,665
Kentucky	4,965,814	120,148	1,501	8,068		901										142,097	858	2,063
Missouri	6,359	473	104	1,080,743	2,682	20,251	201	16	15				166,101	1,367	6,689	4,965,814	120,148	1,501
Montana	1,960	242	71	1,491	18	442							21,555	549	69	1,253,404	4,538	29,059
Nevada	119	16	1	384,318	738	28,462	16,926	814	1,334				7,412,754	38	36	25,036	809	382
New Mexico				243,021	1,038	7,720	243,524	1,743	4,439							7,814,117	1,626	29,833
Oklahoma				3,655,328		106,043				1,447,120		9,900	44,403	497	2,531	496,545	2,781	12,159
Tennessee				9		1	514,038	33,630	28,590	1,207	201	78				5,102,448	40,249	115,943
Utah	6,568	921	228				[3] 985,968	[3] 5,712	[3] 24,296							566,245	5,731	31,428
Washington	282	19		(2)	(2)	(2)										996,250	1,742	24,296
Wisconsin				849,943	1,742	26,278										849,943		26,278
New Jersey						32,926												32,926
New York				902,140		11,392	1,242,953	732	49,362							2,145,093	732	60,754
Pennsylvania						30,754		3,857	21,004								3,857	30,754
Virginia													1,704	6	W	1,704	6	21,004
Other States																		W
Total	5,198,664	144,700	3,845	7,706,123	9,975	300,938	4,590,946	112,047	210,125	2,040,319	10,567	33,023	36,561,487	8,721	25,927	56,097,539	286,010	574,558

W Withheld to avoid disclosing individual company confidential data.

[1] Lead and zinc recovered from other ores (copper, gold, silver, etc.) and from mill slags, tailings, and dumps.

[2] Combined with lead-zinc ore to avoid disclosing individual company confidential data.

TABLE 4.—Mine production of recoverable lead

(Short tons)

Month	1963	1964	
January	15,476	24,907	August
February	13,180	22,799	Septemb
March	14,772	24,454	Octobor
April	20,786	24,054	Novemb
May	24,083	23,547	Decemb
June	22,322	24,037	
July	23,599	23,445	T

TABLE 5.—Twenty-five leading lead-producing
1964, in order of ou

Rank	Mine	District or region	State
1	Federal	Southeastern Missouri.	Missouri
2	Viburnum	do	do
3	Bunker Hill	Coeur d'Alene	Idaho
4	United States and Lark.	West Mountain (Bingham).	Utah
5	Lucky Friday	Coeur d'Alene	Idaho
6	Indian Creek	Southeastern Missouri.	Missouri
7	Star-Morning unit.	Coeur d'Alene	Idaho
8	Idarado	Upper San Miguel.	Colorado
9	Page	Coeur d'Alene	Idaho
10	United Park City	Uintah and Blue Ledge.	Utah
11	Iron King	Big Bug	Arizona
12	Pend Oreille	Metaline	Washington
13	Mayflower Unit	Blue Ledge	Utah
14	Austinville and Ivanhoe Mines.	Austinville	Virginia
15	Sunnyside	Eureka	Colorado
16	Eagle	Red Cliff (Battle Mountain).	do
17	Butte Hill Zinc Mines.	Summit Valley	Montana
18	Ophir Unit	Ophir	Utah
19	Keystone	Elk Mountain	Colorado
20	Emperius	Creede	do
21	Fairview-Blue Diggings.	Upper Mississippi Valley.	Illinois
22	Jubilee	Resting Springs	California
23	Shullsburg	Upper Mississippi Valley.	Wisconsin
24	Van Stone	Northport	Washington
25	Dyers Hill	Western Kentucky.	Kentucky

National Lead Co. and The Bunker Hill Co. signed an agreement for development of National Lead's Higdon property near Fredericktown, Mo. Exploration and development was in progress, but construction schedules and production tonnages were not announced. Ozark Mining Co., a subsidiary of Kennecott Copper Corp., was actively exploring its lead ore property in the Blair Creek, Mo., area. Several other companies continued exploration of leased areas in the new lead belt which occupies an area some 30 miles long by 10 miles wide.

Production of lead in Idaho declined from 75,800 tons in 1963 to 71,300 tons in 1964. The Bunker Hill Co. lead smelter was closed for 2 weeks in August for annual overhaul and again closed for 2 weeks in mid-October due to fire damage to the Cottrell plant and baghouse. Construction of a new sinter handling and storage system was initiated in September. The company also began handling custom milling of ore from small mine operators in the area. The incentive of improved prices for lead and silver resulted in major development programs, and reactivation of lead-silver mines in Idaho by many small operators as well as the larger producing companies. Day Mines, Inc., reactivated the Dayrock mill north of Wallace to treat ore from the reopened Monitor mine. Federal Resources Corp.'s new 300-ton-per-day mill at Bellevue started operations in April and will process ores from the company's mines as well as from custom shippers in the area. At yearend, approximately 1,200 feet remains to be driven to complete the 17,000-foot crosscut to connect the Bunker Hill and Crescent mines at an elevation 400 feet below sea level.

Utah mine output decreased from 45,000 tons in 1963 to 40,200 tons in 1964. The following mines were significant producers in 1964: United States and Lark (United States Smelting, Refining, and Mining Co. (USSR & M Co.)), United Park City (United Park City Mines Co.), Mayflower (Hecla Mining Co.), and Ophir (USSR & M Co.). New Park Mining Co. conducted exploration work on the 2,400-foot level of the Mammoth mine about 50 miles south of Salt Lake City.

Production of lead in Colorado was essentially the same as that of 1963. The revival of small mining operations continued, assisted in part by the reopening of the Bachelor mill north of the Ouray Badger Flats mill west of Colorado Springs. Nine properties operated by the following companies produced 98 percent of the State total: Idarado Mining Co., New Jersey Zinc Co., Standard Metals Corp., Camp Bird Colorado, Inc., Emperius Mining Co., McFarland and Hullinger, Humphreys Engineering Co., Wellington Mines Assoc., and Rico Argentine Mining Co.

Washington output increased to 5,700 tons, compared with 5,400 tons in 1963. The Pend Oreille mine, operated by Pend Oreille Mines and Metals Co., and the Van Stone mine, operated by American Smelting and Refining Co., were the principal producers. The Tri-Nite Mining Co. was preparing to reopen the Schumaker mine in Stevens County and install a concentrating plant. An open-pit mining operation by the Triton Mining Co. was underway at the old Castell mine.

Arizona output increased to 6,100 tons, of Shattuck Denn Mining Corp. the princip Mining Corp. completed remodeling and and produced a copper-lead concentrate fr near Ruby. E. W. McFarland operated t Cruz County and was proceeding with the and January mines which were last opera and Refining Co. in 1949.

Montana production decreased to 4,500 decline in production by The Anaconda C mine near Saltese was being unwatered by after being flooded since 1918. Explorati Cumberland mine near Lennep and at t County. Spokane National Mines, Inc., o mine near Dillon.

Reopening of the Hanover mine and 1963, along with the Dearney mine produc output to 1,600 tons from the 1,000 tons reactivated mines include the Lynchburg and the Princess mine in Grant County.

California output, 1,500 tons, was alm The Santa Rosa, Defense, Jubilee, and I County were the principal producers.

Production from the Kansas-Oklahon district, processed principally at the Con Eagle-Picher Co., decreased to 4,000 tons Wisconsin area output also declined to ab

Nevada output declined to 800 tons fr The Silver King Mines, Inc., operated its White Pine County, and 300-ton-per-day Ely to produce both lead and zinc conc of the Fad shaft at Eureka was comple underway by the Ruby Hill Mining Co.

Lead production, as a byproduct of pr New York, North Carolina, and Virgin Kentucky, was approximately the sam expanded production of Virginia did, h registered in the other States.

SMELTER AND REFINERY P

The domestic production of commercial and as antimonial (hard lead) was der sources: domestic mine production, impor bullion, and scrap materials of domestic o operated by the following companies—A fining Co., The Bunker Hill Co., St. Joseph Co., International Smelting & Refining Smelting Lead Refinery, Inc.—process c bullion, and small amounts of scrap. Sec process only lead-base and tin-base scrap lead predominantly in the form of antimo cation lead-base alloys and refined lead.

perating secondary plants and reporting to the Bureau of Mines were listed in the Minerals Yearbook, 1963. Secondary plants in 1964 produced a record 397,800 tons of refined lead and lead in ntimonial lead and 121,900 tons of lead in other alloys.

Refined Lead, Primary and Secondary.—Refined lead produced the United States from all sources—primary and secondary, plus melt—totaled 598,600 tons, a 13-percent increase in relation to ie 529,300 tons produced in 1963. Primary plants produced 19,400 tons from primary materials, of which 65 percent was supplied y domestic mines. An additional 8,500 tons of refined lead was oduced by primary plants from scrap, in comparison with 3,700 ns in 1963 and the 2,900-ton average for the period 1955–62. econdary plants produced a record 140,700 tons of refined lead om scrap, approximately 23 percent of the total. Remelt lead om all secondary materials amounted to 28,200 tons.

Antimonial Lead, Primary and Secondary.—The lead content of ntimonial lead produced in the United States totaled 279,100 tons mpared with the revised total of 254,100 tons in 1963. Secondary ant output was 257,100 tons, a record amount and 92 percent of e total. Primary plant output was 22,000 tons, of which 20 rcent represented lead in domestic ore; 19 percent, foreign ore; d 61 percent, lead from scrap materials.

Raw Material Source.—Primary lead materials smelted and refined primary plants provided 449,400 tons of refined lead and 8,600 ns of lead in antimonial lead. Domestic ores contributed 65 rcent of the total, compared with 60 percent in 1963. Foreign d ores and bullion consumed by primary smelters provided 159,300 ns, compared with 159,800 tons in 1963.

Secondary lead recovered from scrap amounted to 541,600 tons, the gest yearly recovery ever recorded by the Bureau of Mines. Of is, 149,200 tons was recovered as refined and remelt soft lead, 270,500 ns in antimonial lead, and 121,900 tons in the form of other alloys cluding copper-base and tin-base. Scrap consumed to obtain the d amounted to 705,200 tons, gross weight, and an average recover-

BLE 6.—Refined lead produced at primary refineries in the United States, by source material

(Short tons)

	1955–59 (average)	1960	1961	1962	1963	1964
ined lead:						
From primary sources:						
Domestic ores and base bullion	302,469	228,890	288,078	245,045	239,060	294,254
Foreign ores and base bullion	170,748	153,537	161,487	130,418	165,072	155,175
Total	473,217	382,436	449,565	376,003	304,732	449,429
From secondary sources	2,989	4,776	1,509	1,842	3,741	8,505
Grand total	476,206	387,212	451,134	377,905	398,473	457,934
erage sales price per pound	$0.136	$0.117	$0.103	$0.093	$0.108	$0.131
culated value of primary refined lead housands)[1]	$128,715	$89,490	$92,610	$69,948	$85,262	$117,750

[1] Excludes value of refined lead produced from scrap at primary refineries.

able lead content of slightly less than 74 perce sented 87 percent of the total and storage batt 74 percent of the old scrap. Secondary lead re $142 million in comparison with $107 million i

TABLE 7.—Antimonial lead produced at primary lead States

Year	Production (short tons)	Antimony content		Lead c
		Short tons	Percent	From domest ore
1955–59 (average)	57,278	2,930	5.1	7,3
1960	30,230	1,575	5.2	1,2
1961	35,080	1,894	5.4	12,9
1962	33,325	2,249	6.7	14,8
1963	r 18,818	1,890	r 10.0	r 4,5
1964	24,023	1,995	8.3	4,6

r Revised.

TABLE 8.—Stocks and consumption of new and old States in 1964

(Short tons, gross weight)

Class of consumers and type of scrap	Stocks Jan. 1 r	Receipts	New scra
Smelters and refiners:			
Soft lead	2,968	59,957	
Hard lead	1,132	14,416	
Cable lead	1,339	30,857	
Battery-lead plates	35,256	458,570	
Mixed common babbitt	383	2,922	
Solder and tinny lead	402	11,079	
Type metals	1,587	25,301	
Drosses and residues	22,484	93,143	91,3
Total	65,551	696,245	01,3
Foundries and other manufacturers:			
Soft lead	130	56	
Hard lead	207	73	
Cable lead	21	48	
Battery-lead plates	13		
Mixed common babbitt	114	13,939	
Solder and tinny lead		14	
Type metals			
Drosses and residues	201	2	
Total	740	14,132	
All consumers:			
Soft lead	3,098	60,013	
Hard lead	1,339	14,480	
Cable lead	1,360	30,905	
Battery-lead plates	35,269	458,570	
Mixed common babbitt	497	16,861	
Solder and tinny lead	402	11,093	
Type metals	1,587	25,301	
Drosses and residues	22,685	93,145	91,
Grand total	66,297	710,377	91,

r Revised.

TABLE 9.—Secondary metal recovered [1] from lead and tin scrap in the United States in 1964, by type of products

(Short tons, gross weight)

	Lead	Tin	Antimony	Other	Total
Refined pig lead	121,028				121,028
Remelt lead	28,179				28,179
Total	149,207				149,207
Refined pig tin		3,355			3,355
Remelt tin		379			379
Total		3,734			3,734
Lead and tin alloys:					
Antimonial lead	270,522	307	16,109	234	287,322
Common babbitt	19,556	926	1,767	79	22,328
Genuine babbitt	67	283	30	12	392
Solder	30,178	6,188	488	25	36,879
Type metals	29,150	1,710	3,589	12	34,461
Cable lead	19,740	6	226		19,978
Miscellaneous alloys	1,578	586	40	39	2,243
Total	370,797	10,066	22,339	401	403,603
Tin content of chemical products		1,085			1,085
Grand total	520,004	14,885	22,339	401	557,629

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

TABLE 10.—Secondary lead recovered in the United States

(Short tons)

	1955–59 (average)	1960	1961	1962	1963	1964
As metal:						
At primary plants	2,989	4,776	1,569	1,842	3,741	8,505
At other plants	122,955	143,443	139,100	110,626	130,788	140,702
Total	125,944	148,219	140,669	118,468	134,529	149,207
In antimonial lead:						
At primary plants	38,947	26,276	8,220	3,693	7,672	13,421
At other plants	186,600	179,217	197,349	225,699	237,125	257,101
Total	225,547	205,487	205,569	229,392	244,797	270,522
In other alloys	118,751	110,197	100,554	96,342	114,145	121,853
Grand total:						
Quantity	470,242	469,903	452,792	444,202	493,471	541,582
Value (thousands)	$129,298	$109,957	$93,275	$82,622	$106,590	$141,894

TABLE 11.—Lead recovered from scrap processed in the United States, by kind of scrap and form of recovery

(Short tons)

Kind of scrap	1963	1964	Form of recovery	1963	1964
New scrap:			As soft lead:		
Lead-base	59,577	64,876	At primary plants	3,741	8,505
Copper-base	6,094	6,490	At other plants	130,788	140,702
Tin-base	611	555	Total	134,529	149,207
Total	66,282	71,921	In antimonial lead [1]	244,797	270,522
Old scrap:			In other lead alloys	92,203	99,168
Battery-lead plates	272,412	304,523	In copper-base alloys	21,878	22,618
All other lead-base	135,844	144,900	In tin-base alloys	64	67
Copper-base	18,928	20,233	Total	358,942	392,375
Tin-base	5	5			
Total	427,189	469,661	Grand total	493,471	541,582
Grand total	493,471	541,582			

[1] Includes 7,672 tons of lead recovered in antimonial lead from secondary sources at primary plants in 1963 and 13,421 tons in 1964.

CONSUMPTION AND

Consumption of lead in the United Stat successive year and the gain in 1964 was sumption in January was the largest mo smallest. The monthly average for the yea tons. Soft lead consumed amounted to 7 with 740,200 tons in 1963 and represents crease. The lead in antimonial lead consu tons, slightly below the 314,400 tons in 1 sumed, lead in copper-base scrap, and lea scrap to other fabricated products increas while lead used in zinc oxide and othe decreased.

The use pattern reflected increased requ essentially unchanged requirements for h comparison with 1963. Storage battery hard lead, decreased slightly and other e metal and cable covering also declined, wh a gain. Gasoline additives requiring soft increase, about 16 percent, a record amoun end products of soft lead, such as pigment also registered gains.

Storage battery requirements totaled 42 10,000 tons less than in 1963. The Asso facturers, Inc., reported shipments of 29.3 batteries and total battery shipments of 3 exports, compared with shipments of 41.1

Industrial consumption of lead was w United States. Thirteen States accounte States—New Jersey, Illinois, Indiana, percent.

New applications of lead in the ceramics areas, developed by research sponsored b consumers, while not individually of majo tively added to the lead consumption ton control applications have assumed greater through availability of thin sheets, 0.5 to which can be continuously cast and rein compound composed of lead pellets in an rubber has found application. Solder gl percent lead oxide is of importance in se ceramic industry is using lead compound enamels; a porcelain enamel for aluminum a high-quality product for architectural a ide-silica compound forms a high-temperat 375 tons of lead shot provides the test lo III missile system, and other applications incorporate the high dimensional weight o

TABLE 12.—Lead consumption in the United States, by products

(Short tons)

Product	1963	1964	Product	1963	1964
tal products:			Pigments—Continued		
Ammunition	49,804	56,493	Pigment colors	11,767	11,921
Bearing metals	21,713	22,754	Other [1]	7,813	8,111
Brass and bronze	21,943	23,328	Total	99,075	103,636
Cable covering	57,707	56,225			
Caulking lead	70,308	73,628	Chemicals:		
Casting metals	7,856	6,961	Gasoline antiknock additives	192,811	223,466
Collapsible tubes	14,832	14,904	Miscellaneous chemicals	632	451
Foil	3,952	3,976	Total	193,443	223,917
Pipes, traps, and bends	20,100	20,480			
Sheet lead	26,495	29,605	Miscellaneous uses:		
Solder	67,945	71,186	Annealing	4,847	5,099
Storage batteries:			Galvanizing	1,631	1,592
Battery grids, posts, etc	222,280	221,594	Lead plating	220	179
Battery oxides	216,795	207,754	Weights and ballast	12,207	12,760
Terne metal	1,083	1,009	Total	18,905	20,230
Type metal	26,009	25,374	Other, unclassified uses	16,057	18,484
Total	835,878	835,871	Grand total [2]	1,163,368	1,202,138
ments:					
White lead	8,846	8,802			
Red, lead and litharge	70,049	74,802			

[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	1963	1964	Month	1963	1964
nuary	100,789	107,603	August	93,833	99,670
bruary	96,023	94,425	September	94,587	101,705
arch	92,606	92,844	October	111,149	105,571
ril	95,340	98,981	November	101,723	101,985
ay	98,204	98,786	December	99,372	106,616
ne	94,024	102,448			
ly	85,648	91,438	Total [1]	1,163,368	1,202,138

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

TABLE 14.—Lead consumption in the United States in 1964, by class of products and types of material

(Short tons)

Product	Soft	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Total products	208,440	88,061	49,594	17,857	363,952
Storage batteries	215,394	214,504			429,898
Pigments	99,713	233			99,946
Chemicals	223,915	2			223,917
Miscellaneous	10,517	8,868	10		19,385
Unclassified	15,787	2,257	643		18,687
Total	773,766	313,915	50,247	17,857	[1] 1,155,785

[1] Excludes 42,603 tons of lead which went directly from scrap to fabricated products and 3,690 tons of lead contained in leaded zinc oxide and other nonspecified pigments.

TABLE 15.—Lead consumption in

(Short tons)

State	Refined soft lead	Lead i antimon lead
California	74,700	25,4
Colorado	1,651	2,2
Connecticut	13,663	11,9
District of Columbia	123	
Florida	6,341	4,0
Georgia	33,743	10,8
Illinois	86,274	43,7
Indiana	68,417	42,2
Kansas	8,213	9,0
Kentucky	3,134	4,2
Maryland	5,294	15,3
Massachusetts	6,145	3,6
Michigan	17,642	19,0
Missouri	21,963	4,2
Nebraska	5,048	
New Jersey	133,401	19,8
New York	35,250	3,8
Ohio	12,607	5,9
Pennsylvania	50,206	30,2
Rhode Island	1,370	
Tennessee	191	7,3
Virginia	2,717	1,1
Washington	8,204	
West Virginia	16,912	0,3
Wisconsin	1,973	3,5
Alabama and Mississippi	679	1,3
Arkansas and Oklahoma	3,390	2,9
Hawaii and Oregon	450	2,8
Iowa and Minnesota	2,050	8,0
Louisiana and Texas	135,167	14,8
Montana and Idaho	10,152	
New Hampshire, Maine, Delaware	6,101	3,6
North and South Carolina	412	3,9
Utah, Nevada, Arizona	123	
Total	773,760	313,9

[1] Excludes 42,603 tons of lead which went directly from scrap to
contained in leaded zinc oxide and other nonspecified pigments.

LEAD PIGMENTS

The lead content of pigments produced
amounted to 300,900 tons, a slight increase
tons produced in 1963. Refined pig lead
the small amount used in leaded zinc ox
oxides) represented 57 percent of the lead
about 31 percent. Production of basic le
and lead silicate, a derivative of litharge, is

Consumption and Uses, White Lead.—
both as dry and in oil, declined, althoug
turers continued at approximately the sa
quirements for paint continued to decl
ceramics and other uses, including chem
and stabilizers, was significantly higher.

Red Lead.—Production and shipments
increase. Requirements of the paint indu
were well above the amount required in re
lubricants, petroleum, rubber, and miscel
creased and remained approximately 50 pe

Litharge.—Production of litharge increased about 6 percent and slightly exceeded shipments, in contrast to the large stock drawdown in 1963. Ceramics, the largest individual use, required 21 percent of the total. To avoid disclosing company confidential data, about 65 percent of the litharge shipped is incorporated into the classification "Other." Production of high lead oxide used by battery manufacturers and known as "black oxide" declined about 3 percent from the 1963 output.

Prices.—Prices of lead pigments and oxides advanced in accordance with the advance in the price of lead. The quoted price of white lead in carload lots, freight allowed, advanced from the 17.75 cents per pound established on September 9, 1963, to 19 cents on February 3 and to 20.5 cents on November 2. The average value per ton at plant was $383 dry and $519 in oil. Red lead, quoted at 16.75 cents per pound, f.o.b. works, in less than carload lots, at the beginning of the year, advanced to 17.75 cents on September 7, to 18.75 cents on October 19, and to 19.75 cents on December 28. The average value per ton at plant was $327. Litharge price held at 16.25 cents per pound, f.o.b. works, in less than carload lots, until October 19, when a 1-cent increase became effective followed by additional 1-cent increases on October 26 and December 28 and a yearend price of 19.25 cents per pound. The average value per ton at plant was $308. Total value of shipments of white lead, red lead, and litharge was $46.4 million in comparison with $38.2 million in 1963.

Foreign Trade.—Litharge imports constituted 81 percent of the total lead pigments and compounds, and receipts were about 2,700 tons less than in 1963. Increased tonnages of white lead and red lead were received and the total imports of lead pigments and compounds was about 8 percent less than those received in 1963. Exports amounted to 2,600 tons in the form of pigments and lead arsenate. The value of imports was $5.2 million; exports were valued at $0.9 million.

TABLE 16.—Production and shipments of lead pigments[1] and oxides in the United States

Pigment	1963				1964			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value[2]			Short tons	Value[2]	
			Total	Average per ton[3]			Total	Average per ton
White lead:								
Dry	10,239	10,075	$3,688,456	$366	9,298	10,432	$3,997,056	$383
In oil[4]	3,758	5,327	2,485,367	467	3,298	5,014	2,600,233	519
Total	13,997	15,402	6,173,823	401	12,596	15,446	6,597,289	427
Red lead	25,780	26,245	7,391,928	282	27,812	23,090	9,172,654	327
Litharge	93,958	103,834	24,672,270	238	100,230	99,393	30,653,873	308
Black oxide	182,934				178,038			

[1] Except for basic lead sulfate, figures withheld to avoid disclosing individual company confidential data.
[2] At plant, exclusive of container.
[3] Corrected figures.
[4] Weight of white lead only, but value of paste.

TABLE 17.—Lead content of lead and zinc pigme by domestic manufacturers,

(Short tons)

Pigment	1963			
	Lead in pigments produced from—			Total lead in pigments
	Ore		Pig lead	
	Domestic	Foreign		
White lead			11,198	11,198
Red lead			23,370	23,370
Litharge			87,381	87,381
Black oxide			176,005	176,005
Leaded zinc oxide	1,555	869		2,424
Total	1,555	869	296,954	299,378

[1] Excludes lead in basic lead sulfate; figures withheld to avoid d data.

TABLE 18.—Distribution of white lead (dry and

(Short tons)

Industry	1955–59 (average)	1960	1961
Paints	17,960	14,145	12,
Ceramics	459	219	
Other	4,067	[1] 3,578	3,
Total	22,486	17,942	16,

[1] Excludes basic lead sulfate; figures withheld to avoid disclos
[2] Figures for plasticizers and stabilizers withheld to avoid di data.

TABLE 19.—Distribution of red lead sh

(Short tons)

Industry	1955–59 (average)	1960	1961
Paints	14,091	12,903	12,
Storage batteries	(1)	(1)	(1)
Ceramics	(1)	328	(1)
Other	11,537	9,400	9,
Total	25,628	22,631	22,

[1] Included with "Other."

TABLE 20.—Distribution of litharge sh

(Short tons)

Industry	1955–59 (average)	1960	196
Ceramics	(1)	15,753	14,
Chrome pigments	4,390	(1)	(1)
Floor covering	(1)	(1)	(1)
Insecticides	(1)	(1)	(1)
Oil refining	3,286	2,371	2
Rubber	1,713	1,373	1
Storage batteries	(1)	(1)	(1)
Varnish	3,990	3,471	3
Other	103,621	75,672	77
Total	117,000	98,640	98

[1] Included with "Other."

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

Kind	1963		1964	
	Short tons	Value (thousands)	Short tons	Value (thousands)
White lead	2,434	$549	2,674	$748
Red lead	1,171	198	1,613	351
Litharge	22,440	3,592	19,763	4,001
Other lead pigments	12	9	5	13
Other lead compounds	238	52	195	61
Total	26,295	4,400	24,250	5,174

Source: Bureau of the Census.

TABLE 22.—U.S. exports of lead pigments and compounds

Kind	1963		1964	
	Short tons	Value	Short tons	Value
Lead pigments [1]	1,845	$620	1,680	$608
Lead arsenate	401	135	930	278
Total	2,246	755	2,610	886

[1] Includes white lead, red lead, and litharge.

Source: Bureau of the Census.

STOCKS

The high level of demand for lead and the shortage of foreign and domestic concentrates for smelting resulted in a continued decline in stocks at primary plants. Stocks of refined lead amounted to 48,800 tons at the beginning of the year and decreased to 34,100 tons at yearend. Lead in antimonial lead decreased from 7,900 tons to 4,000 tons. Total yearend stocks representing physical inventories at primary plants regardless of ownership, but not including material in process or in transit, were 84,400 tons, a decline of 36,400 tons. The most recent comparable low for stocks was in 1955 when yearend stocks totaled 89,400 tons.

Stocks reported by the American Bureau of Metal Statistics indicate an additional 21,600 tons of lead in base bullion in process or in transit to primary plants and about 30,900 tons of lead in ores and matte in process. Total stocks of lead in metal and primary materials was thus 141,900 tons in comparison to 166,900 tons at the end of 1963.

Consumer and secondary smelter stocks of lead declined from 119,900 tons to 113,400 tons at yearend. About 61 percent of the stocks was refined lead and 31 percent was antimonial lead, a slightly higher percentage of refined lead than held in recent years.

As of December 31, 1964, the total lead inventory in all Government stockpiles was 1,338,130 tons, indicating a delivery of 40,270 tons of lead pursuant to the sale in August under Public Law 88-373.

TABLE 23.—Stocks of lead at primary smelter
States, Dec. 31

(Short tons)

Stocks	1955-59 (average)	1960
Refined pig lead	82,017	148,415
Lead in antimonial lead	10,818	10,483
Lead in base bullion	11,581	20,026
Lead in ore and matte	42,741	65,219
Total	147,154	250,142

r Revised.

TABLE 24.—Consumer stocks of lead in the Uni
material

(Short tons, lead conten

Year	Refined soft lead	Ant mon lea
1960	49,725	39,
1961	55,951	33,
1962	51,121	34,
1963	71,558	40,
1964	69,361	35,

PRICES

The year opened with the quoted price c
per pound at New York. The price adv
on January 2, to 13 cents and held until
13 to 14 cents existed until firmed at 14
October 14 an increase to 15 cents was a
10 a range of 15 to 16 cents existed until fi
ing day. The price of 16 cents held thr
The average New York price for the year

TABLE 25.—Average monthly and yearly quot
New York, and Lond

(Cents per pound)

Month	1963		
	St. Louis	New York	Lond
January	10.12	10.32	
February	10.30	10.50	
March	10.30	10.50	
April	10.30	10.50	
May	10.30	10.50	
June	10.52	10.72	
July	10.88	11.08	
August	11.16	11.36	
September	11.44	11.64	
October	11.75	11.95	
November	11.96	12.16	
December	12.30	12.50	
Average	10.94	11.14	

[1] St. Louis: Metal Statistics, 1965, p. 447. New York: Meta
Metal and Mineral Markets.
[2] Based on monthly rates of exchange by Federal Reserve Bo

Quotation on the London Metal Exchange gradually climbed from a low of £76.88 per long ton in January (equivalent to 9.6 cents per pound, U.S. currency, computed on the average monthly rate of exchange) to a high of £154 (19.2 cents) on December 15 and closed the year at £122 (15.2 cents). The average for the year was 12.6 cents per pound (U.S. equivalent).

FOREIGN TRADE

Receipts of lead materials as general imports amounted to 341,000 tons, a 12-percent decrease, and continued the decline in imports initiated in 1962. Primary materials for domestic smelting and refining totaled 128,100 tons, 16-percent less than had been received in 1963. Imports of metal amounted to 207,800 tons, an 8-percent decrease; scrap receipts also decreased. Imports for consumption of materials for domestic processing totaled 135,100 tons and imports of metal amounted to 211,140 tons. The primary raw materials entered under the quota amounted to 90 percent of the allowable limitation for the year, while the quota for lead metal was essentially filled in each quarter. Imports for consumption of scrap decreased as did semifabricated products such as sheet, pipe, and shot.

The major suppliers of ore in descending order of importance were Peru, Republic of South Africa, Canada, Australia, Bolivia, and Mexico. Mexico supplied 34 percent of the metal, followed by Australia, Canada, Yugoslavia, and Peru.

TABLE 26.—U.S. imports [1] of lead, by countries

(Short tons)

Country	1955–59 (average)	1960	1961	1962	1963	1964
Ore, flue dust, and matte (lead content):						
North America:						
Canada	28,694	26,473	34,361	27,728	23,634	27,951
Guatemala	5,250	1,809	9,817	2,135	305	5
Honduras	3,180	4,006	5,512	4,965	6,809	6,375
Mexico	2,435	1,249	1,166	1,180	1,071	1,069
Other	1,128					
Total	40,687	34,437	50,856	36,008	31,819	35,400
South America:						
Bolivia	15,049	9,021	11,370	8,242	9,791	6,073
Chile	208	1,283	610			
Colombia	682	705	722	439	9	
Peru	52,537	36,300	28,970	32,999	43,950	28,243
Other	308	103				
Total	68,784	47,412	41,672	41,680	53,750	34,316
Europe	151	222	300	280		
Asia:						
Philippines	1,424	228	238	57	23	58
Other	202	504		181	244	117
Total	1,626	732	238	238	267	175
Africa:						
South Africa, Republic of	41,359	39,352	34,089	33,881	34,273	34,080
Other	5	5,238				
Total	41,364	44,590	34,089	33,881	34,273	34,080
Oceania: Australia	29,956	18,209	20,031	26,544	27,633	19,280
Total ore, flue dust, and matte	182,568	145,692	147,186	138,631	147,742	123,257

See footnotes at end of table.

TABLE 26.—U.S. imports [1] of lead, by

(Short tons)

Country	1955–59 (average)	1960
Base bullion (lead content):		
North America	15	284
South America	116	39
Europe		
Asia	(2)	
Oceania		
Total base bullion	131	293
Pigs and bars (lead content):		
North America:		
Canada	32,348	26,088
Mexico	96,621	69,930
Other	65	9
Total	129,034	96,027
South America:		
Peru	32,966	25,197
Other	350	
Total	33,316	25,197
Europe:		
Belgium-Luxembourg	2,133	610
Denmark	2,473	
Germany, West	1,646	551
Spain	8,820	4,115
United Kingdom	2,530	7
Yugoslavia	36,808	30,027
Other	349	1,388
Total	54,818	36,698
Asia	11	
Africa	7,633	1,328
Oceania: Australia	71,778	46,783
Total pigs and bars	296,590	206,033
Reclaimed, scrap, etc. (lead content):		
North America:		
Canada	4,043	4,059
Mexico	4,327	1,054
Other	849	160
Total	9,219	5,273
South America:		
Peru	103	
Venezuela	377	
Other	35	
Total	515	
Europe:		
Belgium-Luxembourg	140	
Denmark	273	
Germany, West	104	1
Netherlands	54	
Other	155	4
Total	726	5
Asia	14	5
Oceania: Australia	2,602	2,355
Total reclaimed, scrap, etc	13,070	7,638
Grand total	402,305	359,656

[1] Data are general imports; that is, they include lead imported entering the country under bond.
[2] Less than ½ unit.

Source: Bureau of the Census.

TABLE 27.—U.S. imports for consumption [1] of lead, by countries

(Short tons)

Country	1955–59 (average)	1960	1961	1962	1963	1964
Ore, flue dust, and matte (lead content):						
North America:						
Canada	31,045	27,944	31,439	29,523	r 30,037	27,973
Guatemala	5,152	1,519	5,527	4,691	387	5
Honduras	3,410	4,457	4,803	5,959	8,602	6,489
Mexico	2,964	943	1,060	1,899	1,850	458
Other	1,063					
Total	44,234	34,863	42,829	42,072	r 41,866	34,925
South America:						
Bolivia	15,420	10,581	10,470	7,479	10,055	8,373
Chile	2,114	27	401	3		
Colombia	690	628	514	480	95	
Peru	56,410	33,571	32,318	32,327	32,140	32,314
Other	294	103		3		
Total	74,934	44,910	43,703	40,292	42,290	40,687
Europe	30	(2)		220		
Asia:						
Philippines	1,428	187	380	111	31	86
Other	166	427			223	121
Total	1,594	614	380	111	254	207
Africa:						
South Africa, Republic of	30,129	30,784	29,736	29,756	29,740	29,760
Other	371	5,238		2		
Total	30,500	36,022	29,736	29,758	29,740	29,760
Oceania:						
Australia	30,977	20,894	20,132	20,627	21,295	22,488
Other	32					
Total	31,009	20,894	20,132	20,627	21,295	22,488
Total ore, flue dust, and matte	191,301	137,303	136,780	133,080	r 135,445	128,067
Base bullion (lead content):						
North America	15	254	134	5	904	3,094
South America	86	39	102	2,078	854	603
Europe			(2)		3	560
Oceania					1,937	2,786
Total base bullion	101	293	236	2,083	3,758	7,043
Pigs and bars (lead content):						
North America:						
Canada	32,337	26,154	54,902	56,807	29,674	30,777
Mexico	93,893	73,748	71,289	68,147	78,254	72,078
Other	52	29	6			45
Total	126,282	99,931	126,197	124,954	107,928	102,900
South America:						
Peru	32,955	25,197	26,195	22,103	22,224	23,114
Other	349				35	
Total	33,304	25,197	26,195	22,103	22,259	23,114
Europe:						
Belgium-Luxembourg	1,892	1,733	41	1,085	4,300	4,375
Denmark	1,448	88				700
Germany, West	1,507	654	911	614	577	3,092
Spain	8,249	0,056	8,775	3,958	7,713	847
United Kingdom	2,484	133	16		1,462	1,697

See footnotes at end of table.

TABLE 27.—U.S. imports for consumption [1] of l

(Short tons)

Country	1955–59 (average)	1960
Pigs and bars (lead content)—Continued		
Europe—Continued		
Yugoslavia	36,797	30,159
Other	997	1,877
Total	53,434	40,700
Asia	11	
Africa:		
Morocco	7,408	1,243
Other	456	460
Total	7,864	1,703
Oceania: Australia	71,561	45,816
Total pigs and bars	292,456	213,347
Reclaimed, scrap, etc. (lead content):		
North America:		
Canada	4,044	4,053
Mexico	4,802	1,189
Other	886	220
Total	9,732	5,462
South America:		
Peru	149	
Venezuela	377	
Other	41	
Total	567	
Europe:		
Belgium-Luxembourg	140	
Denmark	273	
Germany, West	160	1
Netherlands	54	
Other	190	15
Total	817	16
Asia	13	5
Oceania:		
Australia	1,560	115
Other	11	
Total	1,571	115
Total reclaimed, scrap, etc.	12,700	5,598
Sheets, pipe, and shot:		
North America:		
Canada	253	213
Canal Zone	4	
Mexico	2,690	
Total	2,947	213
Europe	1,423	2,641
Asia	(3)	1
Total sheets, pipe and shot	4,370	2,855
Grand total	500,928	359,306

r Revised.

[1] Excludes imports for manufacture in bond and export, classifi
Bureau of the Census.

[2] Less than ½ unit.

Source: Bureau of the Census.

TABLE 28.—U.S. imports for consumption of lead, by classes [1]

Year	Lead in ore, flue dust or fume, and mattes, n.s.p.f. (lead content)		Lead in base bullion (lead content)		Pigs and bars (lead content)		Reclaimed, scrap, etc. (lead content)		Sheets, pipe, and shot		Not otherwise specified value (thousands)	Total value (thousands)
	Short tons	Value (thousands)	Short tons	Value (thousands)	Short tons	Value (thousands)	Short tons	Value (thousands)	Short tons	Value (thousands)		
1955–59 (average)	191,301	$45,771	101	$35	292,456	$72,393	12,700	$2,717	4,370	$1,075	$348	$122,339
1960	137,303	27,816	293	62	213,347	45,065	5,598	1,034	2,855	696	710	75,383
1961	130,780	24,332	236	51	247,427	45,881	3,894	592	2,845	641	807	72,304
1962	133,080	21,003	2,083	710	257,866	41,570	2,078	269	2,276	474	978	65,004
1963	r135,445	r21,534	3,758	1,792	220,398	r40,126	15,405	2,009	2,429	513	792	r66,766
1964	128,067	21,789	7,043	2,058	211,140	45,790	1,907	350	1,523	369	713	71,069

r Revised.
[1] Excludes imports for consumption in bond and export, classified as "imports for consumption" by the Bureau of the Census.

Source: Bureau of the Census.

TABLE 29.—U.S. imports for consumption of miscellaneous products containing lead

Year	Babbitt metal, solder, white metal, and other combinations containing lead			Type metal and antimonial lead		
	Gross weight (short tons)	Lead content (short tons)	Value (thousands)	Gross weight (short tons)	Lead content (short tons)	Value (thousands)
1955–59 (average)	5,195	2,342	$5,967	8,036	7,223	$2,212
1960	9,274	1,512	16,024	4,500	3,915	970
1961	7,930	1,409	14,207	6,430	5,705	1,340
1962	2,438	1,030	3,443	8,576	7,512	1,393
1963	2,535	1,246	3,207	[1] 3,747	[1] 3,196	[1] 621
1964	3,425	1,619	5,785	NA	NA	NA

NA Not available.
[1] Due to changes in classification, effective Sept. 1, 1963, data no longer separately classified. January–August data tabulated.

Source: Bureau of the Census.

TABLE 30.—U.S. exports of lead

(Short tons)

Destination	1955–59 (average)
Ore, matte, base bullion (lead content):	
North America:	
Canada	15
Mexico	848
Other	
Total	863
South America	
Europe	6
Asia	37
Total, ore, matte, base bullion	906
Pigs, bars, anodes:	
North America:	
Canada	69
Cuba	42
Mexico	14
Other	90
Total	215
South America	171
Europe	542
Asia:	
Japan	697
Philippines	325
Taiwan	542
Other	203
Total	1,767
Africa	2
Oceania	
Total pigs, bars, anodes	2,697
Scrap:	
North America	5
South America	(2)
Europe:	
Belgium-Luxembourg	155
Germany, West	333
Italy	19
Netherlands	371
United Kingdom	491
Other	96
Total	1,465
Asia:	
Japan	162
Other	(2)
Total	162
Total scrap	1,632
Grand total	5,235

[1] In addition foreign lead was reexported as follows: Ore, matte 1960–64 none. Pigs, bars, anodes, 1955–59 (average) 91 tons; 1960 4,367 tons. Scrap, 1955–59 (average) 2 tons; 1960–64, none.
[2] Less than ½ unit.

Source: Bureau of the Census.

WORLD REVIEW

World mine production of lead in 1964 declined to less than 2.7 million tons; decreases were indicated for South America, Europe, and, especially, Africa. Smelter production increased for all areas except Africa and Australia. Lead consumption, according to the American Bureau of Metal Statistics, continued to increase substantially with the 1964 free world above 2.3 million tons, a gain of some 374,000 tons or 19 percent since 1959.

Demand for lead metal and, especially, for lead in concentrates continued strong throughout the year and the average monthly London Metal Exchange price for lead increased each month to a high of £139.2 in December. New York price likewise increased from 12.5 cents at the close of 1963 to 16 cents per pound at the close of 1964. World producer stocks, as published by the International Lead and Zinc Study Group, declined from 228,000 tons to 185,000 tons. Of this Europe held 50,000 tons; the United States, 50,000; and other countries, 85,000.

The strong demand and price of lead, along with improvement in market for associated metals, induced a substantial increase in exploration, development, and planned expansion of old mines and construction of new plants throughout the world. Some additional lead from these projects will be forthcoming in 1965, but the major increases will not become available until after mid-1966.

TABLE 31.—World mine production of lead (content of ore) recoverable where indicated, by countries [1] [2]

(Short tons)

Country	1955–59 (average)	1960	1961	1962	1963	1964 p
North America:						
Canada	[3] 180,295	[3] 205,650	[4] 182,557	[4] 211,321	[4] 198,988	[4] 200,359
Cuba	73					
Greenland	[4] 8,627	7,635	10,104	891		
Guatemala [5]	8,351	9,432	9,458	1,067	825	e 220
Honduras	3,042	5,913	6,702	6,522	[6] 10,913	e 500
Mexico	224,409	210,177	199,877	213,074	209,425	187,345
United States [5]	310,400	246,669	261,921	236,956	253,369	286,010
Total	744,203	685,476	670,679	669,831	673,520	680,434
South America:						
Argentina	30,754	29,432	31,306	32,600	28,991	28,264
Bolivia (exports)	23,580	23,610	22,403	20,504	22,226	19,491
Brazil e	6,200	12,200	15,400	16,800	19,200	[7] 19,200
Chile	3,317	2,094	2,252	1,603	957	1,230
Colombia (U.S. imports)	681	705	722	430	9	
Ecuador	118	119	122	137	179	153
Peru [5]	139,851	145,097	150,353	141,290	163,468	164,508
Total	204,510	213,857	222,558	213,379	235,030	232,846
Europe:						
Austria [5]	5,691	5,758	6,051	5,855	5,504	5,727
Bulgaria	70,618	92,341	88,229	104,058	97,905	100,641

See footnotes at end of table.

TABLE 31.—World mine production of lead (co indicated, by countries [1] [2]

(Short tons)

Country	1955–59 (average)	1960
Europe—Continued		
Czechoslovakia e	6,500	7,20
Finland	1,928	1,76
France	13,289	20,45
Germany:		
East e	7,300	7,70
West	70,316	64,91
Greece	8,731	10,14
Ireland	1,808	1,48
Italy	58,118	54,52
Norway	1,409	2,78
Poland	37,010	43,21
Portugal	1,100	3
Rumania e [8]	13,000	13,20
Spain	72,327	80,36
Sweden	42,334	60,96
U.S.S.R. e [9]	310,000	350,00
United Kingdom	[6] 0,697	1,54
Yugoslavia	99,101	100,55
Total e	827,300	908,90
Asia:		
Burma	10,031	19,07
China e	49,600	88,00
India	3,890	4,99
Iran e [8]	18,500	16,50
Japan	36,290	43,57
Korea:		
North e	41,000	55,00
South	993	1,01
Philippines	1,523	13
Thailand	3,223	2,02
Turkey	2,215	1,83
Total e	176,300	232,10
Africa:		
Algeria	11,602	11,52
Congo, Republic of (Brazzaville)	3,609	4,74
Morocco	100,048	104,44
Nigeria	309	22
South Africa, Republic of	581	13
South-West Africa [10]	87,983	71,54
Tanzania (exports)	5,320	6,92
Tunisia	25,306	19,98
Uganda (exports)	110	
United Arab Republic (Egypt) e	331	8
Zambia [5]	16,505	16,16
Total	251,704	235,77
Oceania: Australia	352,208	345,14
World total e	2,555,000	2,620,00

e Estimate. p Preliminary.

[1] Data derived in part from United Nations Statistical Yea Metal Statistics, and annual issues of the Statistical Summary Surveys, London), and Metal Statistics (Metallgesellschaft) C

[2] This table incorporates some revisions. Data do not add where estimated figures are included in the detail.

[3] Recoverable.

[4] Data for 1961, 1962, 1963, and 1964 not strictly comparable

[5] Average annual production 1956–59.

[6] Exports.

[7] 1963 data.

[8] Smelter production.

[9] Year ended March 21 of year following that stated.

[10] Includes lead content of lead-vanadium concentrates.

CONSUMPTION OF SLAB ZINC, BY GEOGRAPHIC AREAS

...io, Pennsylvania, Indiana, and Illinois accounted for 59 percent ...he slab zinc used in galvanizing. The iron and steel industry used ... to galvanize steel sheets, wire, tube, pipe, cable, chain, bolts, ...way-signal equipment, building and pole-line hardware, and other ...s.

...onnecticut again ranked first in consuming slab zinc in brass ...ing, followed by Illinois and Michigan.

...ichigan led in the consumption of slab zinc in making zinc-base ...ys. Other large consuming States were Illinois, Ohio, New York, ... Indiana.

TABLE 19.—Reported slab zinc consumption in the United States in 1964, by industries and States

(Short tons)

State	Galvanizers	Brass mills [1]	Die casters [2]	Other [3]	Total
...na	35,245	W		W	36,328
...a	W			W	W
...sas				W	W
...nia	28,635	1,715	10,088	697	42,015
...do	W	W	W		W
...ecticut	3,340	43,486	W	W	49,709
...are	W	W	W	W	W
...	W		W		2,912
...	W				W
...n	W				W
...l	W				W
...			W	W	W
...s	45,913	18,199	75,453	21,403	160,968
...na	60,039	W	38,683	W	122,475
...	W			W	1,846
...s			W		W
...ucky	W	W			W
...iana	W			W	1,696
...	W				W
...land	W	W		W	33,719
...chusetts	3,809	2,326		W	8,198
...gan	W	14,668	133,172	W	164,071
...sota	2,301				2,301
...ippi	W				W
...ri	5,379	W	8,208	W	14,803
...ska	W	W		W	1,889
...Hampshire		W			W
...Jersey	3,025	6,050	W	W	28,977
...York	5,585	W	55,483	W	78,008
... Carolina	W		W		W
...	91,971	W	75,109	W	170,078
...oma	2,916		W	W	5,727
...	W	W		W	537
...sylvania	70,604	W	23,640	W	134,056
...e Island	W	W		W	702
... Carolina	W				W
...essee	W	W	W	W	2,138
...	14,423	W	W	W	47,340
...	W	W			W
...ia	180	W	W	W	1,120
...ington	W			W	1,444
...Virginia	11,507	W		W	12,176
...nsin	2,064	W	7,215	W	16,745
...tributed	65,927	45,928	95,223	68,670	60,763
Total [4]	453,631	132,378	523,152	90,770	1,199,831

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes brass mills, brass ingot makers, and brass foundries.
[2] Includes producers of zinc-base alloy for diecastings, stamping dies, and rods.
[3] Includes slab zinc used in rolled zinc products and in zinc oxide.
[4] Includes remelt zinc.

ZINC PIGMENTS AND COMPOUNDS

Production.—Output of zinc pigments and compo... lithopone, increased to the highest level since 1959. ...crease was accounted for by the highest output of lea... since 1955 and a record production of zinc sulfate. Z... rose 3 percent, while leaded zinc oxide declined, conti... ward trend during the past 17 years.

TABLE 20.—Production and shipments of zinc pigments and ... United States

Pigment or compound	1963				1964	
	Production (short tons)	Shipments			Production (short tons)	Sho... ton...
		Short tons	Value [1]			
			Total	Average per ton		
Zinc oxide [2]	157,371	162,271	$37,747,259	$233	163,305	174,3
Leaded zinc oxide [3]	15,060	15,478	3,508,621	227	12,237	13,6
Zinc chloride, 50° B [4]	49,728	50,922	W	W	50,977	49,6
Zinc sulfate	40,109	40,111	5,460,019	136	46,314	46,6

W Withheld to avoid disclosing individual company confidential data.
[1] Excludes lithopone; figure withheld to avoid disclosing individual company co...
[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 and chromated zi...

Pigments and compounds were made from vario... materials, including ore, slab zinc, scrap, and residue... ducing zinc pigments and compounds numbered 16 fo... for zinc sulfate, 8 for zinc chloride, and 1 for lithopone.

TABLE 21.—Zinc content of zinc pigments [1] and compounds pro... manufacturers, by sources

(Short tons)

Pigment or compound	1963					1964		
	Zinc in pigments and compounds produced from—				Total zinc in pigments and compounds	Zinc in pigmen... pounds produ...		
	Ore		Slab zinc	Secondary material		Ore		
	Domestic	Foreign				Domestic	Foreign	
Zinc oxide	65,245	16,250	16,037	28,026	125,558	70,728	13,487	1...
Leaded zinc oxide	5,165	4,087			9,252	4,714	2,780	
Total pigments	70,410	20,337	16,037	28,026	134,810	75,442	16,267	1...
Zinc chloride [2]			W	11,130	11,130			
Zinc sulfate	W	W		W	13,372	W	W	

W Figure withheld to avoid disclosing individual company confidential data.
[1] Excludes zinc sulfide and lithopone; figures withheld to avoid disclosing individual data.
[2] Includes zinc content of zinc ammonium chloride and chromated zinc chloride.

Lead-free zinc oxide was made by several processes; 66 percent was made from ores and residues by the American process, 19 percent from metal made by the French process, and 15 percent from scrap residues and secondary materials by other processes. Leaded zinc oxide was made from ores, zinc chloride was made from slab zinc and secondary zinc materials, and zinc sulfate was made from ores and secondary materials.

Four grades of leaded zinc oxide, classified according to lead content, were produced. The more than 5 to 35 percent grade constituted most of the production. Relatively small quantities of the 5 percent or less, the more than 35 to 50 percent, and over 50 percent grades were produced.

Lithopone, a coprecipitate of zinc sulfide and barium sulfate, was produced, but figures are withheld to avoid disclosing individual company confidential data.

Consumption and Uses.—Shipments of lead-free zinc oxide were 174,300 tons, 7 percent greater than in 1963. The quantity received by the rubber, paint, and ceramic industries accounted for 77 percent of the total shipped.

The paint industry received 96 percent of the 13,600 tons of leaded zinc oxide shipped.

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

The principal uses of zinc chloride were for battery making, galvanizing, vulcanizing fiber, preserving wood, and refining oil, as well as for fungicides, solder and tinning fluxes.

The chief uses of zinc sulfate were in rayon and agriculture. Other uses were in glue manufacture, flotation reagents, rubber, and medicine.

Prices.—Prices for lead-free zinc oxides advanced 0.50 cent in May and 0.75 cent in October. Yearend quotations in cents per pound in carlots, freight allowed, was 14.75 cents for American-process zinc oxide, and quotations for Green-seal and White-seal French-process zinc

TABLE 22.—Distribution of zinc oxide and leaded zinc oxide shipments, by industries

(Short tons)

Industry	1955-59 (average)	1960	1961	1962	1963	1964
Zinc oxide:						
Rubber	79,313	76,120	71,534	80,247	82,776	93,568
Paints	33,213	31,610	30,405	31,381	34,382	31,176
Ceramics	9,763	9,840	10,058	11,092	9,381	9,447
Coated fabrics and textiles [1]	5,557	1,331	1,185	202	(2)	(2)
Floor coverings	1,429	1,316	1,174	457	(2)	438
Other	23,723	25,561	30,852	31,470	35,732	39,674
Total	152,998	144,778	145,208	154,849	162,271	174,303
Leaded zinc oxide:						
Paints	25,335	17,616	16,533	14,959	14,899	13,124
Rubber	653	1,662	1,474	735	574	489
Other						
Total	26,088	19,278	18,007	15,694	15,473	13,613

[1] Figures for zinc oxide used for rayon are withheld to avoid disclosing individual company confidential data.
[2] Included with "Other."

oxide were 16.50 and 16.75 cents, respectively. Lead
the 5 to 35 percent grade advanced 0.325 and 1.125 ce
quotation of 15.75 cents.

Zinc chloride (50° Baumé) was quoted at 5.25 cents
September when it increased to 5.55 cents, where it r
balance of the year. Zinc sulfate (Monohydrate, 36
than carlots was quoted at 9.50 cents per pound thro

Foreign Trade.—A substantial reduction in imports
ceeded increases for zinc chloride, zinc sulfate, and o
resulting in a 25-percent decline for all zinc pigments

TABLE 23.—Distribution of zinc sulfate shipments, by

(Short tons)

Year	Rayon		Agriculture		Other	
	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis
1955-59 (average)	19,515	17,450	8,369	7,231	4,934	3,9
1960	15,727	14,097	4,320	3,848	8,749	7,8
1961	12,284	11,007	5,673	5,086	10,934	9,9
1962	W	W	8,544	7,313	22,087	20,3
1963	W	W	10,785	9,407	29,326	23,6
1964	18,006	16,103	11,248	9,807	17,292	11,2

W Figure withheld to avoid disclosing individual company confidential data, i

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

Kind	1963	
	Short tons	Value (thousands)
Zinc oxide	13,957	$2,532
Zinc sulfide	423	133
Lithopone	159	22
Zinc arsenate	(1)	(1)
Zinc chloride	936	140
Zinc sulfate	885	84
Zinc cyanide	27	20
Zinc compounds, n.s.p.f.	115	23
Total	r 16,502	r 2,954

r Revised.
[1] Less than ½ unit.

Source: Bureau of the Census.

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

Kind	1963	
	Short tons	Value (thousands)
Zinc oxide	2,962	$827
Lithopone	839	136
Total	3,801	963

Source: Bureau of the Census.

Canada and Mexico supplied 39 and 38 percent, respectively, of the zinc oxide imports.

Exports of zinc oxide declined 18 percent, with shipments to 40 countries. Lithopone exports increased by 41 percent, with Viet-Nam receiving 65 percent of the total.

STOCKS

Stocks of slab zinc at producer plants were 47,900 tons at the beginning of the year; they declined to a low of 26,000 tons at the end of July and then increased to 31,200 tons by December 31, the lowest yearend stocks recorded since 1951.

TABLE 26.—Stocks of zinc at zinc-reduction plants in the United States, Dec. 31

(Short tons)

	1960	1961	1962	1963	1964
At primary reduction plants	178,209	143,494	142,059	46,374	30,680
At secondary distilling plants	7,673	3,393	2,687	1,536	498
Total	185,882	146,887	144,746	47,910	31,178

Stocks of slab zinc at consumer plants of 97,500 tons at the start of the year were drawn down about 8,000 tons by the end of August, followed by at generally upward trend resulting in yearend stocks of 107,500 tons.

TABLE 27.—Consumer stocks of slab zinc at plants, Dec. 31, by industries

(Short tons)

Date	Galvanizers	Brass mills [1]	Zinc die-casters [2]	Zinc rolling mills	Oxide plants	Other	Total
Dec. 31, 1963	r 55,898	r 9,939	r 23,227	4,849	r 234	r 3,328	r [3] 97,475
Dec. 31, 1964	53,870	11,981	34,802	3,535	282	3,008	107,478

r Revised.
[1] Includes brass mills, brass ingot makers, and foundries.
[2] Includes producers of zinc-base alloy for diecastings, stamping dies, and rods.
[3] Stocks on Dec. 31, 1963, and Dec. 31, 1964, include 300 and 381 tons, respectively, of remelt spelter.

PRICES

The quoted price of Prime Western grade z
ket, advanced one-half cent in April and 1 ce
yearend price of 14.50 cents per pound.

About midyear, major producers outside t
lished a "producers' price" in reaction to a co
and high prices on the London Metal Exch
adversely affect zinc consumption. During
L.M.E. and "producers' price" were well
equivalent.

TABLE 28.—Average monthly quoted prices of 60-p
Joplin, and common zinc (prompt delivery or
London [1]

Month	1963			
	60-percent zinc concentrates in the Joplin region (per ton)	Metallic zinc (cents per pound)		
		East St. Louis	London [2] [3]	
January	$68.00	11.50	8.45	
February	68.00	11.50	8.69	
March	68.00	11.50	8.96	
April	68.00	11.50	9.27	
May	68.00	11.50	9.50	
June	68.00	11.57	9.49	
July	72.46	12.06	9.29	
August	76.00	12.50	9.55	
September	76.00	12.50	9.58	
October	76.00	12.50	10.02	
November	76.00	12.50	10.51	
December	79.68	12.98	11.84	
Average for year	72.01	12.01	9.60	

[1] Joplin: Metal Statistics, 1965, p. 503. East St. Louis: Metal Statist
Metal and Mineral Markets.
[2] Conversion of English quotations into U.S. money based on avera
Federal Reserve Board.
[3] Average of daily mean of bid and asked quotations at morning sessio

TABLE 29.—Average price received by producers

(Cents per pound)

Grade	1960	1961
Special High Grade	13.68	11.58
High Grade	13.19	11.42
Intermediate	13.34	12.12
Brass Special	12.89	11.62
Select	12.64	11.60
Prime Western	12.15	11.32
All grades	12.85	11.45
Prime Western; spot quotation at St. Louis [1]	12.96	11.55

[1] Metal Statistics, 1965, p. 501.