

MINE YEAR

19

Volume 1 of THE

METALS AND

(Except



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each system.¹⁴ It also differs from the boundary proposed in 1951 by N. A. Toropov and F. Ya. Galakhov.¹⁵ Revised ternary diagrams were constructed.

The stability and reactions of synthetic mullite in the presence of foreign oxide additives at temperatures of 1,200° to 1,700° C. were determined.¹⁶ Ions of oxides that can be absorbed either contract, have no effect on, or expand the mullite lattice dimensions, depending on the radius of the absorbed ions. Certain ions, such as Na⁺, K⁺, Ca²⁺, and Mg²⁺, which are too large to be absorbed into the lattice, destroy mullite.

A process was developed to make improved mullite refractories from Canadian kyanite concentrate. Different quantities of calcined alumina and phosphoric acid were added, depending on economic factors and the type of refractory products required.¹⁷

The National Metallurgical Laboratory, Jamshedpur, India, developed a process for making high-temperature hot-face insulation and high-temperature dense refractories from coarse-bladed Indian kyanite. The process differed from conventional methods in preparation and blending of the raw materials and in temperature schedules for firing. It may result in a market for previously unusable material.¹⁸

The first iron blast furnace to be built with an all-sillimanite stack lining was completed at Scunthorpe, England. Operation of this furnace was of interest to iron makers and refractories manufacturers throughout the world.¹⁹

¹⁴ Aramaki, Shigeo, and Roy, Rustrum, The Mullite-Corundum Boundary in the Systems MgO-Al₂O₃-SiO₂ and CaO-Al₂O₃-SiO₂; Jour. Am. Ceram. Soc., vol. 42, No. 12, Dec. 1, 1959, pp. 644-646.

¹⁵ Toropov, N. A., and Galakhov, F. Ya. [The System Al₂O₃-SiO₂]; Doklady Akad. Nauk. S.S.S.R., vol. 78, No. 2, 1951, pp. 299-302.

¹⁶ Geisdorf, Günter, Müller-Hesse, Hermann, and Schwiete, H. E. [Additive Experiments on Synthetic Mullite and Substitution Experiments With Gallium Oxide and Germanium Dioxide: II]; Arch. Eisenhüttenw., vol. 29, No. 8, 1958, pp. 513-519; Ceram. Abs., vol. 42, No. 9, September 1959, p. 236.

¹⁷ Sivkis, V. D. Properties of Improved Phosphate-Stabilized Refractory Materials Made From Canadian Kyanite Concentrate; Bull. Am. Ceram. Soc., vol. 38, No. 5, May 1959, pp. 204-208.

¹⁸ Iron and Coal Trades Review (London), Mullite Refractories From Kyanite: Vol. 179, No. 4757, Sept. 18, 1959, p. 348.

¹⁹ Metallurgia (Manchester, England), First Sillimanite-Lined Blast Furnace: Vol. 60, No. 362, December 1958, p. 278.

Lead

By G. Richards Gwinn¹ and Ed

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THE DOMESTIC lead industry in 1959 had a considerably lower supply of metal than in 1958, because of a decrease in production, an increase in consumption, and a restocking of secondary lead. Recovery of secondary lead was slow. Refinery production and imports decreased. Export quotas remained in effect throughout the year. Lead (New York market) fluctuated from

TABLE 1.—Salient statistics of the lead industry

	1950-54 (average)	1955
United States:		
Production:		
Mine production of recoverable lead.....	375,443	338,025
Value (thousands).....	\$111,040	\$100,731
Primary lead (refined):		
From domestic ores and base bullion.....	350,019	321,132
From foreign ores and base bullion.....	111,673	158,025
Antimonial lead (primary lead content).....	18,842	14,586
Secondary lead (lead content).....	487,868	502,061
Imports:		
Lead in ores and matte.....	114,165	177,479
Lead in base bullion.....	1,414	1,414
Lead in pigs, bars, and old scrap.....	369,102	284,729
Exports of refined pig lead.....	1,435	403
Stocks (lead content):		
At primary smelters and refineries.....	106,931	89,443
At consumer plants.....	120,716	117,468
Consumption of metal, primary and secondary.....	1,170,009	1,212,644
Price, common lead, New York, average, cents per pound.....	14.96	15.14
World:		
Mine production.....	2,060,000	2,430,000
Smelter production.....	1,995,000	2,260,000
Price, common lead, London, average, cents per pound.....	14.78	12.19

¹ Commodity specialist.

² Statistical assistant.

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

LEGISLATION AND GOVERNMENT PROGRAMS

The third session of the United Nations Lead and Zinc Committee, April 28 to May 6, 1959, and the inaugural meeting of the Lead and Zinc Study Group, May 4 to 6, 1959, were held at United Nations Headquarters, New York, N.Y. No concrete intergovernmental agreements were made on the curtailment of metal production. The Lead and Zinc Study Group, an autonomous intergovernmental body, replaced the Lead and Zinc Committee. Membership was opened to governments of any countries that were members of the United Nations or appropriate specialized agencies, also to contracting parties to the General Agreements on Tariffs and Trade interested in the production or consumption of, or trade in, lead and zinc. The committee was charged with providing continuous, accurate information on the supply and demand position of lead and zinc and its probable development. For this purpose the group was asked to arrange for the collection of internationally comparable statistical data on lead and zinc.

The import quotas established in October 1958 by Presidential proclamation continued without revision throughout 1959. The value of the quota system was questioned. Some opinions were that (1) quotas should be expanded and extended; (2) quotas should be removed immediately with no increase in duties; and (3) quotas should be removed immediately with an increase in tariff rates.

In addition to maintaining import quotas, the Federal Government took additional measures to assist the domestic lead industry. A number of bills were introduced (and still pending) in Congress; an investigation was initiated by the Tariff Commission to study import trends of manufactured lead products not covered by quotas; and a Senate Resolution (S. Res. 162), adopted August 21, 1959, directed the U.S. Tariff Commission to investigate the domestic lead industry. This investigation would include specific findings of the Commission on the condition of the lead mining industry and would indicate what additional import restrictions, if any, were needed so that domestic lead mining might be conducted on a sound and stable basis. The report was to be submitted to Congress on or before March 31, 1960.

Under the Office of Minerals Exploration, which limited Government participation to one-half the cost and a maximum of \$250,000 for any one contract, six new contracts were certified in 1959. Total expenditure authorized under the contracts was \$221,796, of which the Government paid one-half or \$110,898. Five of the contracts were for exploration of lead-zinc deposits and one for lead alone.

No surplus-agricultural-product barter contracts for lead were negotiated by the Commodity Credit Corporation (CCC), as lead had been removed from the list of materials eligible for barter late in December 1958. The addition of 45,000 short tons of lead to the CCC stockpile between February and October 1959 represented deliveries on contracts negotiated in earlier years. The last contract was completed on August 12, 1959.

No Government purchases of lead were made for the strategic stockpile as the Government procurement program had terminated at the end of 1958.

LEAD

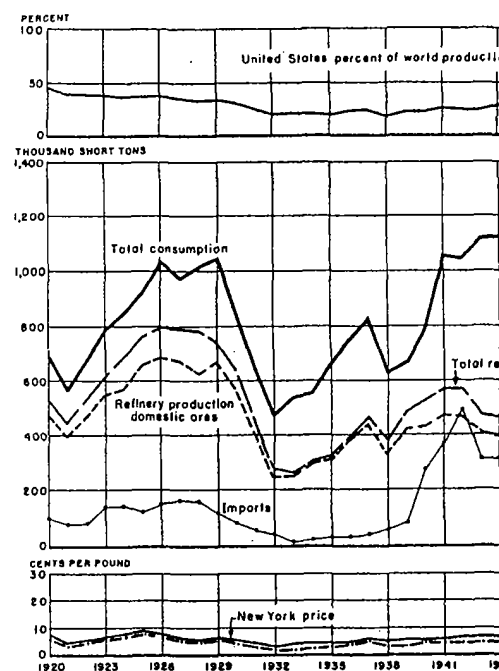


FIGURE 1.—Trends in the lead industry in the United States, 1920-1958. Production includes primary refined, antimonial, and pig lead, and pigments made directly from ore. Imports are of the lead content of ores, mattes, and concentrates, bars, base bullion, and scrap.

DOMESTIC PRODUCTION

MINE PRODUCTION

The domestic output of 255,600 short tons in 1958 was the lowest in 60 years. It was 4 percent below the 1957 output and only 37 percent of the record production of 680,000 short tons in 1918. The decline was attributed to large lead-industry stockpiles. The accumulation of stocks was due largely to the production cutbacks from August 26 to almost the end of the year because of the disputes. Monthly production declined from 19,700 in July. An upturn began in August, and production rose to 22,000 tons in December.

The production of lead in the Western States was the same as in 1958 but accounted for 56 percent of the total compared with 53 percent in 1958.

Idaho produced 62,400 tons, an increase of 10 percent over 1958 and again ranked first among the lead-producing States and second in the United States. The Bureau of

d'Alene district continued to be the State's largest producer. The increase in the Idaho output resulted chiefly from an increased extraction rate at the principal mines in Shoshone County. In the development of deeper ore in the Coeur d'Alene district depths in excess of 4,000 feet were reached. Mining at a depth of 4,420 feet, or 1,720 feet below sea level, was planned for the Sunshine mine. The Hercules mine of Day Mines, Inc., was closed in the latter part of the year.

Utah continued to hold second place among the producers of lead in the Western States. The United States and Lark mine maintained its position as the largest producer in the State; other important producers were the United Park City and Mayflower-Park Galena mines. A merger agreement was reached by Chief Consolidated Mining Co. and Shattuck-Denn Mining Corp. The Bear Creek Mining Co., domestic exploration affiliate of Kennecott Copper Corp., discovered and commenced development of a major silver-lead-zinc ore body in the Tintic district.

Colorado was the third largest lead producer in the Western States. The Eagle mine of New Jersey Zinc Co. at Gilman and the San Miguel property of Idarado Mining Co. were the two major lead producers in Colorado. The newly reopened Rico mine in Dolores County and the Emperius mine at Creede also made significant contributions to the State's lead production.

TABLE 2.—Mine production of recoverable lead in the United States, by States, in short tons

	1950-54 (average)	1955	1956	1957	1958	1959
Western States:						
Alaska.....	36	1	1	9	2	9,000
Arizona.....	15,622	9,817	11,999	12,441	11,890	227
California.....	10,466	8,265	9,205	3,458	140	12,907
Colorado.....	25,397	15,805	19,859	21,003	14,112	62,395
Idaho.....	78,874	64,163	64,321	71,637	53,603	7,672
Montana.....	10,393	17,028	18,642	13,300	8,434	1,367
Nevada.....	6,152	3,291	6,354	5,979	4,150	820
New Mexico.....	4,109	3,295	6,042	5,294	1,117	1
Oregon.....	6	3	5			
South Dakota.....	3					
Texas.....	46					
Utah.....	40,382	50,452	49,555	44,471	40,355	38,630
Washington.....	10,216	10,340	11,667	12,734	9,020	10,310
Total.....	216,762	182,461	197,758	190,331	142,824	142,326
West Central States:						
Arkansas.....	9					38
Kansas.....	6,346	5,498	7,635	4,257	1,299	481
Missouri.....	127,744	125,412	123,783	128,345	113,123	105,165
Oklahoma.....	15,189	14,126	12,350	7,183	3,692	601
Total.....	149,288	145,036	143,708	137,785	118,114	108,285
States East of the Mississippi River:						
Illinois.....	3,355	4,544	3,832	2,970	1,010	2,570
Kentucky.....	73	228	411		516	400
New York.....	1,345	1,037	1,008	1,067	579	481
Tennessee.....	31		5			
Virginia.....	2,133	2,009	3,045	3,152	2,034	2,770
Wisconsin.....	1,456	1,948	2,582	1,900	800	745
Total.....	9,393	10,628	11,800	10,100	6,439	6,975
Grand total.....	376,443	338,025	352,826	338,216	267,377	255,586

* Includes 4 tons from North Carolina in 1954, 2 tons in 1955, 10 tons in 1956, and 9 tons in 1957.

TABLE 3.—Principal ores yielding lead and zinc in the United States in 1959, in short tons*

States	Lead ore			Zinc ore			Lead-zinc ores			Copper-lead, copper-zinc and copper-lead-zinc ores			Total		
	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Ore, gross weight	Lead	Zinc
Alaska.....	4,087	239	18	16,139			345,147	9,720	23,617	86,299	26	10,309	462,672	9,985	37,208
Arizona.....	485	62	1	1,555	160	49	345,147	9,720	23,617	86,299	26	10,309	462,672	9,985	37,208
Arkansas.....	10,457	701	4	67	2		201,792	4,853	24,938	359,054	7,171	10,423	1,600	222	75
California.....	84,917	7,670	835	(¹)	(¹)		201,792	4,853	24,938	359,054	7,171	10,423	671,380	12,727	33,387
Colorado.....	688	510		6,499	13		848,960	50,377	46,231				933,877	53,047	47,066
Idaho.....	31			700			625,265	890	19,340				633,013	1,370	13,615
Illinois.....	5,299	101	12	596,080	4,622	22,809	15,185	437	966				16,385	1,481	1,017
Kentucky.....	17,557	2,813	64							282,879	4,025		5,573,517	6,953	23,026
Missouri.....	4,701	45		350	1		1,272	133	4,643				3,735	751	109
Montana.....							1,272	133	4,643				3,735	751	109
Nevada.....							1,272	133	4,643				3,735	751	109
New Mexico.....							1,272	133	4,643				3,735	751	109
Oklahoma.....							1,272	133	4,643				3,735	751	109

Washington was one of the few States showing an increase in lead output. The Pend Oreille mine of Pend Oreille Mines and Metal Co. and the Grandview mine of American Zinc Lead and Smelting Co. were again the major producers. Mining companies opposed the planned construction of two large power dams in the Metaline district, Pend Oreille County, on the grounds that large resources of lead and zinc would be irrevocably lost by flooding.

The decline in lead output in Arizona, which began in 1958, continued through 1959. The Iron King mine operated by the Shattuck-Denn Mining Corp. was the State's leading producer. McFarland & Hullinger closed the San Xavier mine late in the year. The Ari-Vada Corp. began operating the McCracken lead-silver mine near Signal in Mohave County and constructed a new 150-ton mill to process the ore.

Lead production from Montana was the lowest since the economic depression of the early 1930's. The reduced output was attributed chiefly to a prolonged labor strike at the mines in Butte. A sizable block of lead-zinc-silver-gold ore was opened by leasers in a supposedly mined-out area of the Snowshoe mine. A new 100-ton selective flotation concentrator, utilizing jig tailings and ore from the mine, was placed in operation near Libby Mountain by St. Paul Lead Co., of Kellogg, Idaho, and Merger Mines Corp. of Coeur d'Alene, Idaho, joint owners

of the Snowshoe mine. The mill also was operated on a custom basis.

Most of the Nevada lead production was processing manganese and gold-silver ore. Jersey Zinc Co.'s Hanover mine-mill under lease and the lease of the Lynchburg mine increased the monthly production level in 1959.

Missouri continued in first place among the Nation. Mines in Oklahoma and Kansas were among the lowest in 1959 because of continued low metal prices.

The output of lead from the mines of the West, although 7 percent below 1958, represented 85 percent of the U.S. total. St. Joseph Lead Co. reduced its workweek from a 5-day to a 4-day workweek in February. The 5-day week was resumed in March. The output of the company's new Viburnum ore bodies in Crawford and Boone Counties, continued. One of the three shafts was sunk to approximately 800 feet, and a new shaft was sunk to a considerable depth. Lateral extension of the shaft. Ore reserves were large, and estimated to be considerably higher than that of parts of the Eastern States.

A small quantity of lead was recovered from dumps; however, no mine production of lead was reported from the richly productive Tri-State mines in Missouri, Kansas, and southwest Missouri.

Lead production from mines east of the Mississippi was almost exclusively from processing zinc and silver ores in small quantities. Improved zinc metal prices foreshadowed a possible improvement in lead production in the Eastern States.

SMELTER AND REFINERY

Refined lead produced in the United States was almost exclusively from domestic mine production, including bullion, and scrap material (treated lead). The lead was recovered at primary refineries from bullion, and small quantities of scrap metal were processed scrap exclusively. Refined

TABLE 4.—Leading lead-producing mines in the United States in 1959, in order of output

Rank	Mine	District or region	State	Operator	Type of ore
1	Federal.....	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
2	Bunker Hill.....	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
3	United States & Lark.....	West Mountain (Bingham)	Utah	U.S. Smelting, Refining & Mining Co.	Gold-silver, lead-zinc.
4	Leadwood.....	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
5	Indian Creek.....	do.	do.	do.	Do.
6	Star.....	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
7	Bonne Terre.....	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
8	Pend Oreille.....	Metaline	Washington	Pend Oreille Mines & Metals Co.	Lead-zinc.
9	Iron King.....	Big Bug	Arizona	Shattuck-Denn Mining Corp.	Do.
10	Treasury Tunnel-Black Bear-Smuggler Union.	Upper San Miguel	Colorado	Idarado Mining Co.	Copper-lead-zinc.
11	Page.....	Coeur d'Alene	Idaho	American Smelting & Refining Co.	Lead-zinc.
12	Lucky Friday.....	do.	do.	Lucky Friday Silver-Lead Mines Co.	Lead.
13	United Park City.....	Utah	Utah	United Park City Mines Co.	Lead-zinc.
14	Butte Mines.....	Summit Valley	Montana	The Anaconda Co.	Do.
15	Madison.....	Southeastern Missouri	Missouri	National Lead Co.	Lead-copper.
16	Mayflower-Galena.....	Blue Ledge	Utah	New Park Mining Co.	Lead-zinc.
17	Eagle.....	Red Cliff (Battle Mountain)	Colorado	The New Jersey Zinc Co.	Copper, lead-zinc.
18	Austinville.....	Austinville	Virginia	do.	Zinc-lead.
19	Grandview.....	Metaline	Washington	American Zinc, Lead & Smelting Co.	Lead-zinc.
20	Jack Walte.....	Eagle	Montana	American Smelting & Refining Co.	Lead.
21	Emperius.....	Creede	Colorado	Emperius Mining Co.	Lead-zinc.
22	Sunshine.....	Coeur d'Alene	Idaho	Sunshine Mining Co.	Silver.
23	Hercules.....	do.	do.	Day Mines, Inc.	Lead-zinc.
24	Flux.....	Harshaw	Arizona	Nash & McFarland	Do.
25	Dayrock.....	Coeur d'Alene	Idaho	Day Mines, Inc.	Lead.

TABLE 5.—Mine production of recoverable lead in short tons

Month	1958	1959	
January.....	26,123	23,626	August.....
February.....	23,827	21,449	September.....
March.....	18,440	21,156	October.....
April.....	25,896	21,432	November.....
May.....	24,528	20,875	December.....
June.....	22,901	21,634	
July.....	21,142	19,657	

lead were produced by both primary and secondary plants. Because of the large quantity of hard lead (such as battery scrap) melted at secondary smelters, the output from this type of operation was principally antimonial lead.

A list of primary smelters and refiners was presented in the Lead chapter of the 1957 Minerals Yearbook. The only changes are the deletion of the United States Smelting, Refining & Mining Co.'s smelter at Midvale, Utah, which shut down late in 1958, and a correction in the location of the Bunker Hill smelter and refinery, which is at Kellogg, Idaho. A list of the major secondary smelting firms and their plant locations follows:

American Smelting & Refining Co. (including Federated Metals Division) plants: Los Angeles, San Francisco, and Selby, Calif.; Whiting, Ind.; Omaha, Nebr.; Newark and Perth Amboy, N.J.; Houston, Tex.
Bers & Co., Inc., Philadelphia, Pa.
The Bunker Hill Co., Seattle, Wash.
Caswell, Strauss & Co., Inc., Sewaren, N.J.
Continental Smelting & Refining Co., McCook, Ill.
Detroit Lead Corp., Detroit, Mich.
Eastern Smelting & Refining Co., Los Angeles, Calif.
Electric Storage Battery Co., Philadelphia, Pa.
Goldsmith Bros., Div. of National Lead Co., Chicago, Ill.
Gopher Smelting & Refining Co., St. Paul, Minn.
Imperial Type Metals Co. plants: Chicago, Ill., and Philadelphia, Pa.
Industrial Metal Melting Co., Inc., Baltimore, Md.
Inland Metals Refining Co., Chicago, Ill.
Nassau Smelting & Refining Co., Inc., Tottenville, N.Y.
National Lead Co. (including Magnus Metal Division, Morris P. Kirk & Son, Inc., and Master Metals, Inc.) plants: Los Angeles, Calif.; Denver, Colo.; Atlanta, Ga.; Chicago and Granite City, Ill.; Indianapolis, Ind.; Topeka, Kans.; Baltimore, Md.; Boston and Fitchburg, Mass.; St. Louis Park, Minn.; St. Louis, Mo.; Omaha, Nebr.; Perth Amboy, N.J.; Albany and Depew, N.Y.; Cincinnati and Cleveland, Ohio; Portland, Oreg.; Pittsburgh, Pa.; Dallas and Houston, Tex.
National Metal & Smelting Co., Fort Worth, Tex.
North American Smelting Co., Wilmington, Del.
Price Battery Corp., Hamburg, Pa.
Revere Smelting & Refining Co., Newark, N.J.
Schuykill Products Co., Baton Rouge, La.
Seltzinger's Inc., Atlanta, Ga.
Southeastern Lead Co., Tampa, Fla.
Southern Lead Co., Dallas, Tex.
U.S.S. Lead Refinery, Inc., East Chicago, Ind.
Hyman Viener & Sons, Richmond, Va.
Western Lead Products Co., Los Angeles, Calif.
Willard Smelting Co., Inc., Charlotte, N.C.
Winston Lead Smelting Co., Winston-Salem, N.C.

Refined Lead—Primary and Secondary.—The 12 active domestic primary lead smelters and refineries produced 342,100 tons of refined lead and 35,600 tons of lead in antimonial lead. A total of 379,900 tons of lead in primary raw materials and 27,700 tons in scrap was consumed. Smelter output, however, was interrupted during the year because of labor disputes which closed a large proportion of the smelters from August 20 until almost the end of the year.

Domestic ores were the source of 66 percent of the 340,900 tons of refined lead produced from primary sources, and foreign ores and bullion supplied 34 percent (57 and 43 percent, respectively, in 1958).

LEAD

TABLE 6.—Refined lead produced at primary re
source material, in sho

Source	1950-54 (average)	1955
Refined lead:		
From domestic ores and base bullion..	359,019	321,132
From foreign ores.....	110,276	167,883
From foreign base bullion.....	1,397	162
Total from primary sources.....	470,692	479,157
From scrap.....	4,339	4,079
Total refined lead.....	475,031	483,236
Average sales price per pound.....	\$0.147	\$0.149
Total calculated value of primary refined lead (thousands).....	\$138,383	\$142,789

¹ Excludes value of refined lead produced from scrap at primary

Primary lead smelters also produced 1,2 scrap and secondary lead smelters, 124,200 and remelt lead from all sources totaled 46

Antimonial Lead—Primary and Secondary smelters produced 230,800 tons of antimo content)—about 9 percent above the 19 smelter output of 35,600 tons (lead cont scrap, most of which was battery-lead plat domestic sources, and 17 percent from f smelters produced 181,200 tons (lead cont

Battery-lead plates accounted for 62 per tin-base scrap melted. Antimonial lead recovered.

Other Secondary Lead.—Secondary lead summing scrap totaled 451,400 tons—an i 1958. Secondary lead and copper smelters total, primary lead smelters 5 percent, and ries 5 percent. Soft lead accounted for 1 in antimonial lead, 204,350 tons; lead-bas babbitts, and cable lead), 96,300 tons; and tons. A small quantity was recovered fr

TABLE 7.—Antimonial lead produced at prima
States

Year	Produc- tion (short tons)	Antimony content	
		Short tons	Percent
1950-54 (average).....	60,743	4,274	7.0
1955.....	64,044	3,555	5.6
1956.....	60,826	3,348	5.0
1957.....	67,780	3,004	4.5
1958.....	50,246	2,803	5.0
1959.....	37,487	1,024	2.1

TABLE 8.—Stocks and consumption of new and old lead scrap in the United States in 1959, gross weight, in short tons

Class of consumers and type of scrap	Stocks beginning of year ¹	Receipts	Consumption			Stocks end of year
			New scrap	Old scrap	Total	
Smelters and refiners:						
Soft lead.....	2,945	46,231		46,251	46,251	2,025
Hard lead.....	938	16,401		16,497	16,497	932
Cable lead.....	2,223	27,366		27,095	27,095	1,894
Battery-lead plates.....	32,674	367,017		361,976	361,976	28,615
Mixed common babbitt.....	1,159	5,416		5,567	5,567	1,008
Solder and tinny lead.....	397	11,105		10,911	10,911	591
Type metals.....	1,505	24,662		25,087	25,087	1,080
Drosses and residues.....	15,228	77,482	76,089		76,089	16,621
Total.....	57,069	566,670	76,089	403,984	570,073	53,606
Foundries and other manufacturers:						
Soft lead.....	92	99	9	160	160	22
Hard lead.....	165	461	1	473	474	152
Cable lead.....	34	316		310	310	40
Battery-lead plates.....	90			57	57	33
Mixed common babbitt.....	205	9,748		9,809	9,809	234
Solder and tinny lead.....	60	178	88	141	229	9
Type metals.....						
Drosses and residues.....	282		30		30	252
Total.....	1,018	10,802	128	10,950	11,078	742
Grand total:						
Soft lead.....	3,037	46,330	9	46,411	46,420	2,047
Hard lead.....	1,103	16,862	1	16,970	16,971	1,084
Cable lead.....	2,257	27,682		28,005	28,005	1,934
Battery-lead plates.....	32,764	367,017		362,033	362,033	28,648
Mixed common babbitt.....	1,454	15,164		15,376	15,376	1,242
Solder and tinny lead.....	457	11,283	88	11,052	11,140	600
Type metals.....	1,505	24,662		25,087	25,087	1,080
Drosses and residues.....	15,510	77,482	76,119		76,119	16,873
Total.....	58,087	577,472	76,217	504,934	581,151	54,408

¹ Revised figures.TABLE 9.—Secondary metal recovered¹ from lead and tin scrap in the United States in 1959, by type of products, gross weight in short tons

	Lead	Tin	Antimony	Other	Total
Refined pig lead.....	103,474				103,474
Remelt lead.....	21,905				21,905
Total.....	125,379				125,379
Refined pig tin.....		3,268			3,268
Remelt tin.....		336			336
Total.....		3,604			3,604
Lead and tin alloys:					
Antimonial lead.....	204,346	394	12,343	186	217,269
Common babbitt.....	16,958	1,192	1,904	139	20,293
Genuine babbitt.....	38	204	41	6	289
Solder.....	21,487	4,772	332	77	26,768
Type metals.....	30,329	1,827	4,929	138	37,223
Cable lead.....	25,655	4	207		25,866
Miscellaneous alloys.....	1,716	650	136	26	2,508
Total.....	300,629	9,043	20,042	574	330,288
Composition foil.....	37	2	1		40
Tin content of chemical products.....		956			956
Grand total.....	426,045	13,604	20,043	574	460,266

¹ Most of the figures herein represent actual reported recovery of metal from scrap rather than secondary metal content of shipments as in years before 1956.

TABLE 10.—Secondary lead recovered

	1950-54 (average)
As refined metal:	
At primary plants.....	4,339
At other plants.....	132,643
Total.....	136,982
In antimonial lead:	
At primary plants.....	37,627
At other plants.....	193,163
Total.....	230,790
In other alloys.....	120,096
Grand total:	
Short tons.....	487,868
Value (thousands).....	\$144,107

TABLE 11.—Lead recovered from scrap by type of scrap and form of recovery

Kind of scrap	1958	1959
New scrap:		
Lead-base.....	53,456	52,101
Copper-base.....	4,779	6,098
Tin-base.....	283	426
Total.....	58,518	58,625
Old scrap:		
Battery-lead plates.....	202,007	241,639
All other lead-base.....	123,461	129,848
Copper-base.....	17,795	21,272
Tin-base.....	6	3
Total.....	343,269	392,762
Grand total.....	401,787	451,387

¹ Includes 30,997 tons of lead recovered in antimonial lead in 1958 and 23,161 tons in 1959.

CONSUMPTION

Domestic consumption of lead was 12 percent below the peak year 1950. The largest portion was soft lead, primary and secondary; 4 percent was antimonial lead; 4 percent was lead in copper-base scrap; 3.6 percent was lead in other alloys; and 1.4 percent went directly to an end product; and 1.4 percent was recovered from ore in the production of lead.

Monthly consumption varied through the year, with a high of 97,700 tons in November and the low of 84,900 tons in January, respectively.

Approximately 72 percent of all lead consumed in the manufacture of metal products, the largest portion being for grids and posts and soft lead (15 percent) was used for

was for tetraethyl lead. Lead pigments used 10 percent; approximately 71 percent of the lead used in pigments was for manufacturing red lead and litharge.

Shipments of 27 million units of replacement batteries were reported by the Association of Battery Manufacturers, Inc., or about 7 percent above the 25.2 million units shipped in 1958.

TABLE 12.—Consumption of lead in the United States, by products, in short tons

	1958	1959		1958	1959
Metal products:			Pigments:		
Ammunition.....	40,215	45,328	White lead.....	13,589	10,955
Bearing metals.....	18,980	23,208	Red lead and litharge.....	64,802	74,118
Brass and bronze.....	20,379	24,264	Pigment colors.....	11,853	13,827
Cable covering.....	74,981	61,626	Other ¹	5,567	4,773
Calking lead.....	70,807	80,001	Total.....	95,901	103,671
Castings metals.....	8,574	8,305	Chemicals:		
Collapsible tubes.....	8,432	9,442	Tetraethyl lead.....	159,412	160,020
Foil.....	4,586	3,745	Miscellaneous chemicals.....	3,233	4,485
Pipes, traps, and bends.....	23,044	24,825	Total.....	162,645	164,505
Sheet lead.....	25,104	28,158	Miscellaneous uses:		
Solder.....	59,653	68,871	Annealing.....	5,114	5,129
Tinplate metal.....	1,227	1,611	Galvanizing.....	1,220	1,184
Type metal.....	28,740	27,006	Lead plating.....	438	302
Total.....	382,822	407,520	Weights and ballast.....	7,577	8,748
Storage batteries:			Total.....	14,365	15,363
Antimonial lead.....	159,795	187,284	Other, unclassified uses.....	17,939	10,358
Lead oxides.....	152,930	193,448	Grand total².....	986,387	1,091,149
Total.....	312,725	380,732			

¹ Corrected figure.

² Includes lead content of leaded zinc oxide and other pigments.

³ Includes lead which went directly from scrap to fabricated products.

TABLE 13.—Consumption of lead in the United States, by months, in short tons

Month	1958	1959	Month	1958	1959
January.....	82,385	89,122	August.....	84,456	92,601
February.....	72,096	85,124	September.....	90,222	95,182
March.....	77,723	85,431	October.....	92,611	97,098
April.....	79,969	91,604	November.....	84,367	84,903
May.....	76,214	90,443	December.....	84,578	86,108
June.....	81,131	95,285	Total¹.....	986,387	1,091,149
July.....	80,635	90,648			

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

TABLE 14.—Consumption of lead in the United States in 1959, by class of product and types of material, in short tons

	Soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products.....	235,002	69,353	45,054	18,511	368,910
Storage batteries.....	107,733	182,089	40	380,732	
Pigments.....	90,108	102		90,300	
Chemicals.....	104,407	8		164,505	
Miscellaneous.....	8,819	0,544		15,363	
Unclassified.....	16,531	1,760	358	18,655	
Total.....	722,680	260,822	45,462	18,511	1,047,465

¹ Excludes 39,313 tons of lead that went directly from scrap to fabricated products and 4,371 tons of lead contained in leaded zinc oxide and other pigments.

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TABLE 15.—Lead consumption, by State

State	Refined soft lead	Lead in antimonial lead
California.....	74,113	
Colorado.....	1,509	
Connecticut.....	15,707	
District of Columbia.....	106	
Florida.....	1,035	
Illinois.....	71,594	
Indiana.....	48,456	
Kansas.....	6,597	
Kentucky.....	8	
Maryland.....	7,777	
Massachusetts.....	6,084	
Michigan.....	11,766	
Missouri.....	48,825	
Nebraska.....	10,671	
New Jersey.....	112,229	
New York.....	47,615	
Ohio.....	22,472	
Pennsylvania.....	36,962	
Rhode Island.....	3,015	
Tennessee.....	381	
Virginia.....	1,735	
Washington.....	9,063	
West Virginia.....	14,929	
Wisconsin.....	913	
Alabama and Georgia ¹	28,599	
Iowa and Minnesota.....	1,132	
Montana and Idaho.....	15,535	
New Hampshire, Maine, and Delaware.....	3,572	
Arkansas and Oklahoma.....	2,619	
Hawaii and Oregon.....	778	
North and South Carolina.....	36	
Louisiana and Texas.....	114,851	
Utah, Nevada, and Arizona.....	98	
Undistributed.....	961	
Total.....	722,680	260,822

¹ Excludes 39,313 tons of lead which went directly from scrap to fabricated products and 4,371 tons of lead contained in leaded zinc oxide and other nonspecified pigments.

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

Nine States accounted for 71 percent (excluding scrap). New Jersey used 10 percent each; Indiana, California, 10 percent each; Pennsylvania, 6 percent each; Missouri, Texas combined, 12 percent.

LEAD PIGMENTS

Activity increased in all of the major industries compared with 1958. The production of trucks rose 31 percent; the value of pigments increased 6 and 13 percent, respectively; and the combined value of synthetic rubber rose 20 percent.

Production and Shipments.—Lead consumption totaled about 280,000 tons compared with 1958, an increase of 19 percent.

White lead, red lead, litharge, and refined lead constituted 99 percent of the total. The lead content of leaded zinc oxide and other pigments

¹ Prepared by Arnold M. Lansche, commodity specialist.

TABLE 16.—Salient statistics of the lead pigments¹ industry of the United States

	1950-54 (average)	1955	1956	1957	1958	1959
Shipments:						
White lead (dry and in oil) short tons	31,808	25,575	25,098	23,574	18,360	19,224
Red lead.....do	31,069	29,272	27,975	26,908	21,992	21,905
Litharge.....do	163,521	148,511	131,525	106,788	92,165	100,013
Black oxide ¹.....do	78,741	113,874	106,956	127,583	120,609	152,341
Value of pigments.....	\$73,484,000	\$69,133,000	\$67,106,000	\$54,148,000	\$39,442,000	\$43,835,000
Value per ton received by producers:						
White lead (dry).....	382	392	413	416	388	382
Red lead.....	345	342	364	354	289	310
Litharge.....	321	326	346	321	277	275
Foreign trade:						
Value of exports.....	907,000	976,000	1,100,000	1,404,000	1,094,000	1,054,000
Value of imports.....	551,000	195,000	1,465,000	1,806,000	1,769,000	2,640,000
Export balance.....	356,000	781,000	-350,000	-492,000	-665,000	-586,000

¹ Excludes basic lead sulfate; figure withheld to avoid disclosing individual company confidential data.² Production.TABLE 17.—Production and shipments of lead pigments¹ in the United States

Pigment	1958				1959			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value ¹			Short tons	Value ¹	
			Total	Average			Total	Average
White lead:								
Dry.....	12,700	12,689	\$4,883,065	\$388	12,352	12,436	\$4,751,792	\$382
In oil ²	5,648	5,771	2,692,205	407	6,540	6,788	3,174,138	468
Red lead.....	21,934	21,992	6,303,384	289	21,949	21,905	6,789,381	310
Litharge.....	92,070	92,165	26,503,104	277	105,686	106,013	29,119,870	275
Black oxide.....	120,609				152,341			

¹ Except for basic lead sulfate and orange mineral; 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.⁴ Revised figure.TABLE 18.—Lead pigments¹ shipped by manufacturers in the United States, in short tons

Year	White lead			Red lead	Litharge	Black oxide ¹
	Dry	In oil	Total			
1950-54 (average).....	20,332	11,478	31,808	31,069	163,521	78,741
1955.....	17,858	7,717	25,575	29,272	148,511	113,874
1956.....	17,448	8,250	25,698	27,975	131,525	106,956
1957.....	14,808	8,676	23,574	26,908	106,788	127,583
1958.....	12,689	5,771	18,360	21,992	92,165	120,609
1959.....	12,436	6,788	19,224	21,905	106,013	152,341

¹ Excludes basic lead sulfate and orange mineral; figures withheld to avoid disclosing individual company confidential data.² Production by battery manufacturers.³ Revised figure.

TABLE 19.—Lead content of lead and zinc manufacturers, by sources

Pigment	1958			Total lead pig- ments
	Lead in pigments produced from—			
	Ore		Pig lead	
	Domestic	Foreign		
White lead.....			14,646	14,646
Red lead.....			19,883	19,883
Litharge.....			85,625	85,625
Black oxide.....			115,499	115,499
Leaded zinc oxide.....	2,675	727		3,402
Total.....	2,675	727	235,653	239,052

¹ Excludes lead in basic lead sulfate and orange mineral; figures withheld to avoid disclosing individual company confidential data.² Revised figure.

TABLE 20.—Distribution of white lead (dry and in oil) in short tons

Industry	1950-54 (average)	1955	
Paints.....	26,104	19,825	
Ceramics.....	1,143	484	
Other.....	4,601	5,286	
Total.....	31,808	25,575	

¹ Excludes basic lead sulfate; figures withheld to avoid disclosing individual company confidential data.² Includes 1,355 tons for plasticizers and stabilizers.³ Figures for plasticizers and stabilizers withheld to avoid disclosing individual company confidential data.

cent. Basic lead sulfate is not reported. Lead silicate, as it is included with litharge.

Consumption and Uses.—*White Lead.*—About 90 percent of the white lead shipments come from the ceramic industry for use as an intermediate product in the production of glazes, greases, and plasticizers and stabilizers. The remainder is part of the unspecified category below.

Basic Lead Sulfate.—Substantial quantities of basic lead sulfate are used as an intermediate product in the manufacture of white lead.

Red Lead.—The paint industry receives about 62 percent of the red lead compared with 62 percent in 1958. It is used in the manufacture of lubricants, petroleum, rubber, and unsaturated resins.

Orange Mineral.—No production of orange mineral was reported in 1959.

Litharge.—Battery makers continued to claim most of the litharge shipped to industry. Ceramics received about 15 percent, chrome pigments 4 percent, oil refining 3 percent, rubber 2 percent, varnish 4 percent, and the remaining 72 percent was classified as "Other," which consisted of chemicals, driers, floor covering, friction material, ink, insecticides, storage batteries, and unspecified uses.

Battery makers produced 152,000 tons of leaded litharge, commonly called black or gray suboxide, for making the paste used in filling the interstices of battery plates.

Prices.—The quoted price of white lead ranged from 17 to 18 cents a pound or \$340 to \$360 a ton in carlots in 1959. The average value of shipments of dry white lead was \$382 a ton, down \$6 from 1958; the in-oil variety was up \$1 to \$468. The quoted price of red lead ranged from 14.25 to 17.75 cents a pound or \$285 to \$355 a ton in less than carlots; average value of shipments rose \$21 to \$310 a ton. The quoted price of litharge ranged from 13.75 to 15.75 cents a pound or \$275 to \$315 a ton in less than carlots; average value of shipments decreased \$2 a ton to \$275.

Foreign Trade.—Imports of lead pigments and salts increased 52 percent in value and 55 percent in quantity compared with 1958. Imports of white lead, red lead, litharge, and other lead compounds rose 48, 631, 48, and 409 percent, respectively, over 1958; other lead pigments increased 28 tons.

TABLE 21.—Distribution of red-lead shipments, by industries, in short tons

Industry	1950-54 (average)	1955	1956	1957	1958	1959
Paints.....	13,820	14,308	14,331	15,993	13,726	12,098
Storage batteries.....	14,806	11,998	9,853	(1)	(1)	(1)
Ceramics.....	920	667	1,483	(1)	(1)	(1)
Other.....	2,417	2,209	2,208	11,005	6,260	0,807
Total.....	31,969	29,272	27,975	26,998	21,992	21,906

¹ Included with "Other."

TABLE 22.—Distribution of litharge shipments, by industries, in short tons

Industry	1950-54 (average)	1955	1956	1957	1958	1959
Storage batteries.....	99,157	90,200	82,041	(1)	(1)	(1)
Ceramics.....	20,907	24,173	19,802	18,071	(1)	15,340
Chrome pigments.....	8,633	6,025	3,558	3,055	3,731	4,682
Varnish.....	4,716	5,206	3,571	3,227	3,223	4,725
Insecticides.....	4,774	3,521	(1)	(1)	(1)	(1)
Oil refining.....	4,951	3,533	3,523	3,360	2,508	3,006
Rubber.....	2,350	1,447	2,208	1,298	1,247	1,808
Floor coverings.....	700	803	(1)	(1)	(1)	(1)
Other.....	7,328	12,783	16,764	76,878	81,360	76,362
Total.....	153,521	148,611	131,525	106,788	92,165	106,013

¹ Included with "Other."

² Revised figure.

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TABLE 23.—Value of lead pigments and salts imported into the United States

[Bureau of the Census]

	Imports for consumption		
	1957	1958	1959
Lead pigments:			
White lead.....	\$25,508	\$235,725	\$33,000
Red lead.....	60,040	13,243	0
Litharge.....	1,704,078	1,509,185	2,210,000
Other lead pigments.....	10,961	694	0
Total.....	1,800,587	1,758,827	2,243,000
Lead salts:			
Lead arsenate.....	0	0	0
Other lead compounds.....	15,003	10,770	0
Total.....	15,003	10,770	0
Grand total.....	1,911,590	1,769,597	2,243,000

¹ Beginning Jan. 1, 1958, exports not separately classified.

² Data not available.

TABLE 24.—Lead pigments and salts imported into the United States

[Bureau of the Census]

Year	Short tons			
	White lead (basic carbonate)	Red lead	Litharge	Lead suboxide
1950-54 (average).....	782	58	629	38
1955.....	3	3	751	34
1956.....	20	113	6,371	78
1957.....	92	258	8,118	33
1958.....	724	64	7,712	0
1959.....	1,073	468	11,382	0

¹ Data known to be not comparable with other years.

TABLE 25.—Lead pigments and salts exported from the United States

[Bureau of the Census]

Year	Short tons		
	White lead	Red lead	Litharge
1950-54 (average).....	805	464	0
1955.....	957	325	0
1956.....	654	362	0
1957.....	812	622	0
1958.....	0	0	3,440
1959.....	0	0	3,178

¹ Beginning Jan. 1, 1958, white lead, red lead, and litharge not separately classified.

² Data not available.

18 percent. The remaining 12 percent was supplied collectively by many other countries.

The principal suppliers of imported pigs and bars, and also ores and concentrates, were the same as in 1958, but several of the major suppliers changed places in order of importance. The changes were believed to reflect to some extent the size of the allotments assigned to the various countries under the quota system.

Exports.—Exports of lead, although slightly larger than in 1958, totaled only 2,756 tons.

Tariff.—The duties on pig lead and lead content of ores and concentrates remained $1\frac{1}{10}$ cents and $\frac{3}{4}$ cent a pound, respectively.

TABLE 29.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, in short tons, in terms of lead content¹

(Bureau of the Census)

Country	1950-54 (average)	1955	1956	1957	1958	1959
Ore, fluo dust and matte:						
North America:						
Canada-Newfoundland and Labrador	21,717	33,000	30,092	25,193	* 22,270	32,426
Greenland					5,276	
Guatemala	3,288	5,209	6,004	8,985	5,019	146
Honduras	823	2,757	2,063	2,955	3,681	3,630
Mexico	2,090	2,201	3,860	3,835	1,790	480
Peru	185	3	8	113	45	195
Other North America						
Total	28,679	43,269	44,430	41,061	* 37,077	36,895
South America:						
Bolivia	16,346	13,812	17,177	18,319	14,715	11,205
Chile	2,252	409	118	36	367	113
Colombia	131	540	1,440	* 1	861	622
Peru	26,540	44,223	55,174	55,766	* 70,757	36,906
Other South America	147	82	184	* 1,078	145	63
Total	45,425	59,072	74,003	75,189	* 86,835	48,989
Europe:	243		24	264	240	221
Asia:						
Philippines	1,865	2,635	2,222	783	1,169	315
Other Asia	70		422	240	317	25
Total	1,944	2,635	2,644	1,029	1,486	340
Africa:						
Union of South Africa	23,641	41,575	44,208	43,916	49,215	27,879
Other Africa	668			25	1	
Total	24,200	41,575	44,208	43,941	49,216	27,879
Oceania: Australia	13,665	30,038	31,044	30,995	* 26,839	24,854
Total ore, fluo dust and matte	114,105	177,470	190,452	198,470	* 201,509	139,178
Base bullion:						
North America	247		31		8	34
South America	83			84	452	46
Europe	(²)					
Asia	184			(³)		
Oceania	900					
Total base bullion	1,414		31	84	460	80
North America:						
Canada-Newfoundland and Labrador	75,610	34,453	16,230	28,607	40,928	41,533
Mexico	133,214	93,309	77,641	102,604	122,864	86,827
Other North America	60			(⁴)		324
Total	208,874	127,822	93,781	131,111	163,790	128,684

See footnotes at end of table.

TABLE 29.—Total lead imported into the pigs, bars, and reclaimed, by countries, in short tons, in terms of lead content¹—Continued

Country	1950-54 (average)
Pigs and bars:	
South America:	
Peru	35,690
Other South America	173
Total	35,703
Europe:	
Belgium-Luxembourg	928
Germany	4,047
Spain	2,306
United Kingdom	1,620
Yugoslavia	44,891
Other Europe	2,296
Total	56,088
Asia:	1,172
Africa: Morocco	* 7,242
Oceania: Australia	49,440
Total pigs and bars	358,579
Reclaimed, scrap, etc.:	
North America:	
Canada-Newfoundland and Labrador	2,498
Mexico	1,068
Other North America	1,124
Total	4,690
South America:	
Peru	138
Venezuela	104
Other South America	44
Total	376
Europe:	
Belgium-Luxembourg	43
Denmark	12
Germany	69
Netherlands	196
Other Europe	301
Total	621
Asia:	
Japan (including Nansai and Nanpo Islands)	3,124
Other Asia	248
Total	3,372
Africa:	3
Oceania:	
Australia	1,365
Other Oceania	106
Total	1,471
Total reclaimed, scrap, etc.	10,523
Grand total	484,681

¹ Data are "general imports," that is, they include lead entering the country under bond.

² Revised figure.

³ Less than 1 ton.

⁴ West Germany, effective Jan. 1, 1952.

⁵ French Morocco prior to Jan. 1, 1957.

⁶ Includes 90 tons from Northern Rhodesia in 1950-Rhodesia and Nyasaland in 1959.

⁷ Includes material classified by Bureau of the Census to be from French Morocco.

TABLE 30.—Total lead imported for consumption in the United States, in ore, matte, base bullion, pigs, bars, reclaimed and sheets, pipe, and shot, by countries, in short tons, in terms of lead content¹

[Bureau of the Census]

Country	1950-54 (average)	1955	1956	1957	1958	1959
Ore, fine dust and matte:						
North America:						
Canada-Newfoundland and Labrador	18,502	41,164	20,733	30,302	31,394	28,644
Greenland					5,270	
Guatemala	3,438	2,916	5,613	12,120	4,044	157
Honduras	496	699	3,018	6,108	* 3,577	3,649
Mexico	2,584	1,502	2,829	6,602	3,167	627
Other North America	209	1	1	16	12	8
Total	25,229	46,372	38,104	55,157	* 48,370	33,085
South America:						
Bolivia	12,701	9,131	19,771	14,874	22,501	10,820
Chile	3,935	5,054	2,057	1,758	88	113
Colombia	50	409	852	1,000	850	422
Peru	21,485	42,280	58,363	50,506	* 92,027	38,979
Other South America	360	121	182	676	465	50
Total	38,527	57,595	82,065	68,814	* 115,931	50,390
Europe:	225		24		21	107
Asia:						
Philippines	1,865	2,635	2,227	816	1,169	203
Other Asia	70		187	308	311	25
Total	1,944	2,635	2,414	1,124	1,480	318
Africa:						
Union of South Africa	20,055	28,008	35,417	65,289	* 37,093	28,930
Other Africa	1,397	7		25	1	1,821
Total	22,352	28,015	35,417	65,314	* 37,094	30,750
Oceania:						
Australia	11,162	21,816	32,999	44,207	33,829	22,036
Other Oceania			159			
Total	11,162	21,816	33,158	44,207	33,829	22,036
Total ore, fine dust, and matte	90,420	158,433	191,302	234,016	* 237,626	130,606
Base bullion:						
North America	220		31		8	34
South America	38			25	408	
Europe	(¹)					
Asia	184					
Oceania	534					
Total base bullion	970		31	25	416	34
Pigs and bars:						
North America:						
Canada-Newfoundland and Labrador	75,610	34,453	16,220	28,607	40,026	41,478
Mexico	130,123	93,313	76,242	99,208	117,938	82,762
Other North America	96					201
Total	205,829	127,766	92,462	127,815	158,864	124,501
South America:						
Peru	35,546	24,393	33,540	34,009	42,533	20,311
Other South America	173			1,601	146	
Total	35,719	24,393	33,540	36,000	42,679	20,311
Europe:						
Belgium-Luxembourg	928	231	1,208	1,852	4,604	1,669
Denmark	1,068	2,296	1,389	1,910	1,462	187
Germany	4,047	496	1,688	1,850	3,008	2,613
Spain	2,306	10,649	6,700	3,119	9,605	11,270
United Kingdom	1,620	47	116	2,666	8,566	1,035
Yugoslavia	44,891	35,659	38,001	40,282	36,789	32,370
Other Europe	1,227	55	773	607	507	2,984
Total	60,084	40,433	49,252	52,032	64,421	52,034

See footnotes at end of table.

TABLE 30.—Total lead imported for consumption in the United States, in ore, matte, base bullion, pigs, bars, reclaimed and sheets, pipe, and shot, by countries, in short tons, in terms of lead content¹—Continued

Country	1950-54 (average)	1955
Pigs and bars—Continued		
Asia	1,178	55
Africa:		
Morocco	7,152	7,800
Other Africa	110	
Total	7,262	7,800
Oceania: Australia	49,439	54,530
Total pigs and bars	355,511	283,977
Reclaimed, scrap, etc.:		
North America:		
Canada-Newfoundland and Labrador	2,528	7,598
Mexico	1,058	6,120
Other North America	1,131	1,412
Total	4,717	15,130
South America:		
Peru	157	166
Venezuela	194	1,653
Other South America	148	
Total	499	1,819
Europe:		
Belgium-Luxembourg	43	576
Denmark	12	282
Germany	60	3
Netherlands	196	112
Other Europe	290	567
Total	619	1,640
Asia	3,507	26
Africa	3	
Oceania:		
Australia	1,117	375
Other Oceania	94	54
Total	1,211	429
Total reclaimed, scrap, etc.	10,556	18,944
Sheets, pipe, and shot:		
North America:		
Canada	90	321
Central Zone		
Mexico	13	1,296
Total	103	1,616
South America:		
Europe	14	432
Asia	89	
Total sheets, pipe, and shot	210	2,048
Grand total	466,582	441,402

¹ Excludes imports for manufacture in bond and export, which are by the Bureau of the Census.² Revised figure.³ Less than 1 ton.⁴ West Germany, effective Jan. 1, 1952.⁵ French Morocco prior to Jan. 1, 1957.⁶ Includes material classified by the Bureau of the Census as Bureau of Mines to be from French Morocco.

TABLE 31.—Lead imported for consumption in the United States, by classes¹

[Bureau of the Census]

Year	Lead in ores, flue dust or fume, and mattes, n.s.p.f.		Lead in base bullion		Pigs and bars		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)		
1950-54 (average).....	99,429	\$25,072	976	\$327	355,611	\$99,349	210	\$79	\$173	\$127,307
1955.....	156,433	\$38,145	.....	.....	263,977	\$73,032	2,048	\$56	\$164	\$118,805
1956.....	191,302	\$60,621	31	11	282,204	\$77,719	7,054	\$2,017	\$184	\$135,820
1957.....	234,616	\$62,284	25	8	321,708	\$85,146	5,917	\$1,377	\$300	\$150,816
1958.....	237,625	\$60,772	416	130	351,759	\$71,404	2,625	\$606	\$440	\$124,795
1959.....	136,690	\$26,921	34	19	282,632	\$64,667	3,608	\$850	\$680	\$84,347

¹ Excludes imports for manufacture in bond and export, which are classified as "imports for consumption" by Bureau of the Census.² In addition to quantities shown (value included in total value), "reclaimed, scrap, etc.," imported as follows—1950-54 (average): 10,558 tons, \$2,300,823; 1955: 18,944 tons, \$3,930,958; 1956: 20,464 tons, \$5,208,423; 1957: 7,576 tons, \$1,040,902; 1958: 8,019 tons, \$1,440,639; 1959: 7,897 tons, \$1,304,107.³ Data known to be not comparable with other years.⁴ Revised figure.

TABLE 32.—Miscellaneous products containing lead, imported for consumption in the United States

[Bureau of the Census]

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)
1950-54 (average).....	2,420	1,529	\$1,891	8,612	7,400	\$2,921
1955.....	2,285	1,283	\$1,911	14,570	13,213	\$4,370
1956.....	4,108	2,526	\$3,381	9,544	8,500	\$2,763
1957.....	3,502	2,100	\$3,049	5,275	4,858	\$1,627
1958.....	4,244	2,040	\$4,677	5,170	4,525	\$1,100
1959.....	11,840	3,761	\$16,820	5,012	5,020	\$1,204

¹ Data known to be not comparable with other years.WORLD REVIEW⁵

World mine and smelter production declined about 3 percent below 1958. The reduced output was attributed largely to voluntary limitations on production by the major free-world producing countries and U.S. import quotas. Most of the lead entering international trade was mined in Australia, Canada, Mexico, Morocco (Northern and Southern Zones), Peru, South-West Africa, and Yugoslavia. The U.S.S.R. and Bulgaria of the Sino-Soviet bloc also were large producers. Most of the lead recovered in Australia, Canada, Mexico, and Yugoslavia was refined within those countries, but the bulk of that mined in Morocco, Peru, and South-West Africa was exported in the form of ores and concentrates.

⁶ When zinc or copper were coproducts with lead, additional information on mines and countries may be found in the Zinc and Copper chapters of the Minerals Yearbook 1959.

NORTH AMERICA

Canada.—Lead was recovered from copper ores at 19 mines.⁶ Mine product refinery output 141,000 tons, compared in 1958. Exports of lead in ores and tons and exports of pig lead, 92,252 tons.

TABLE 33.—Total lead exported from the United States, by destination

[Bureau of the Census]

Destination	1950-54 (average)	1955
Ore, matte, base bullion (lead content):		
North America:		
Canada.....	516	1,320
Mexico.....	.....	.....
Total.....	516	1,320
Europe.....	(?)	17
Asia.....	.....	.....
Total ore, matte, base bullion.....	533	1,337
Pigs, bars, anodes:		
North America:		
Canada.....	107	1,070
Cuba.....	42	1,070
Mexico.....	11	1,070
Other North America.....	112	1,070
Total.....	272	1,070
South America.....	640	1,070
Europe.....	27	1,070
Asia:		
Japan.....	7	1,070
Nansel and Nanpo.....	.....	.....
Philippines.....	200	1,070
Taiwan.....	18	1,070
Other Asia.....	268	1,070
Total.....	491	1,070
Africa.....	(?)	5
Oceania.....	.....	.....
Total pigs, bars, anodes.....	1,435	4,070
Scrap:		
North America.....	132	4,070
South America.....	.....	.....
Europe:		
Belgium-Luxembourg.....	27	7,070
Germany.....	95	4,070
Netherlands.....	.....	1,070
United Kingdom.....	881	8,070
Other Europe.....	64	2,070
Total.....	1,067	2,400
Asia:		
Japan.....	570	4,070
Other Asia.....	.....	.....
Total.....	570	4,070
Total scrap.....	1,709	2,900
Grand total.....	3,737	4,770

¹ In addition foreign lead was reexported as follows: Ore, matte, base bullion: 1950-54: 3 tons; 1955: 6 tons; 1956: 4 tons; 1957-59: none. Pigs, bars, anodes: 1956: 60 tons; 1957: 300 tons; 1958: 25 tons; 1959: 83 tons. Scrap: 11 tons.

² Less than 1 ton.³ West Germany, effective Jan. 1, 1952.

⁴ Buck, W. K., Review of Lead, Zinc, and Copper, pp. 7, 9, 18.

duction has increased. Consumption of titanium mill products, using shipments as a gage, increased nearly 24 percent to 3,200 tons.

One large semifabricator reported that manned military aircraft continued to be the major market for titanium mill products; however, 15 percent of the metal shipped by the company was earmarked for use in missiles and an equal quantity for civilian application, chiefly in aircraft.²

Use of titanium in missiles stems chiefly from its combination of lightness and high strength. The use of titanium instead of steel for the fourth-stage motor casing of the Juno II rocket that placed Pioneer IV in orbit around the sun reportedly permitted an additional 2 pounds of payload, an increase of 20 percent.³ Welded titanium rings, 74 inches in diameter, 2 $\frac{7}{8}$ inches thick, and weighing 70.6 pounds, have been fabricated for use in the man-carrying space capsule scheduled for launching as part of the National Aeronautics and Space Administration's Project Mercury.⁴ Another important use of titanium in missiles was for gas pressure vessels.

Although aircraft and missiles remained titanium's major markets, uses were developed in other fields. Chemical, petroleum, and food processing firms began to use titanium for heat exchangers, impellers, filters, condensers, coils, pressure vessels, valves, pumps, nozzles, reactors, and other equipment. Electronic uses in tubes, rectifiers, and computers were proposed.

The recently completed nickel-cobalt extraction facilities of Freeport Nickel Co. represent the largest application of titanium in the processing industries. The leaching plant at Moa Bay, Cuba, used approximately 37,000 pounds of titanium in heat exchangers, process piping, valves, and reactor internals.⁵ The purification plant at Port Nickel, La., used 8,000 pounds in processing equipment. The process, design problems, and material problems associated with the plants were discussed.⁶

Pigments.—Consumption of titanium pigments, using shipments as a gage, increased 10 percent over 1958. Consumption of pigments not separately classified in table 5 included use in ceramics, roofing, siding, gems, for titanium chemicals, and plastics.

STOCKS

Stocks of rutile, which have been increasing since 1955, continued to increase and at the end of 1959 represented over 3 years' supply at the 1959 rate of consumption. Titanium-slag stocks also increased but stocks of ilmenite decreased. Yearend stocks of titanium sponge held by producers, melters, and semifabricators totaled 1,000 tons, about the same as stocks at the end of 1958, and were enough for a 3 months' supply at the 1959 consumption rate. An additional 22,474 tons was held in the revolving sponge stockpile.

² Annual Report of the Allegheny Ludlum Steel Corporation, 1959, Titanium Metals Corporation of America, p. 14.

³ Missiles and Rockets, Titanium, Plastic Rocket Cases Gain: Vol. 5, No. 42, Oct. 12, 1959, pp. 29-30, 32-33.

⁴ Materials in Design Engineering, Largest Titanium Ring Used in Space Capsule: Vol. 50, No. 6, November 1959, pp. 209-210.

⁵ Crucible Titanium Review, Titanium in Chemical and Marine Applications: Vol. 7, No. 4, November 1959, p. 2.

⁶ Simons, S. C., Materials Selection and Design Problems in a Nickel-Cobalt Extraction Plant: Corrosion, vol. 15, No. 4, April 1959, pp. 55-59.

TITANIUM

TABLE 5.—Distribution of titanium-pigment shipments by industry, 1950-54 (average)

Industry	1950-54 (average)
Distribution by gross weight:	
Paints, varnishes, and lacquers.....	70.0
Paper.....	7.8
Floor coverings (linoleum and felt base).....	4.6
Rubber.....	3.0
Coated fabrics and textiles (oilcloth, shade cloth, artificial leather, etc.).....	1.0
Printing ink.....	1.1
Other.....	11.6
Total.....	100.0
Distribution by titanium dioxide content:	
Paints, varnishes, and lacquers.....	61.8
Paper.....	11.3
Floor coverings (linoleum and felt base).....	5.4
Rubber.....	3.9
Coated fabrics and textiles (oilcloth, shade cloth, artificial leather, etc.).....	2.0
Printing ink.....	1.6
Other.....	13.4
Total.....	100.0

Titanium sponge metal scrap held by melters decreased from 4,100 tons at the beginning of the year to 1,000 tons at the end of the year.

TABLE 6.—Stocks of titanium concentrates in the United States, 1958 and 1959, in short tons

	Ilmenite		Titanium dioxide
	Gross weight	Estimated TiO ₂ content	Gross weight
1958 ¹			
Mine.....	35,938	10,622	
Distributors.....	236	140	
Consumers.....	758,370	388,605	153,494
Total stocks.....	794,544	405,467	153,494
1959			
Mine.....	33,561	15,580	
Distributors.....	114	68	
Consumers.....	679,527	351,784	155,011
Total stocks.....	713,202	367,412	155,011

¹ Revised figures.

PRICES

Concentrates.—The price quoted for ilmenite concentrates by Mineral Markets remained unchanged in 1959 at \$95 per short ton (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) at the beginning of the year was \$95 per short ton. At the end of the year, a nominal price of \$85 per short ton was quoted.

Zinc

By H. J. Schroeder¹ and Esther



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THE DOMESTIC zinc industry in 1959 consumption and continuation of imports to a reduction of producers' stocks by 1 moderate increase in slab-zinc production was for the Government account were small.

This strengthening of zinc's position was vance from 11.5 cents a pound, East St. Louis year to 12.5 cents at yearend. Production of registered a small gain despite lost output year because of labor strikes.

A United Nations-sponsored conference April and early May resulted in specific volume production by various countries. These results increase in world consumption brought supply demand by yearend. Another result of the an International Lead-Zinc Study Group on

¹ Commodity specialist.

² Statistical assistant.

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

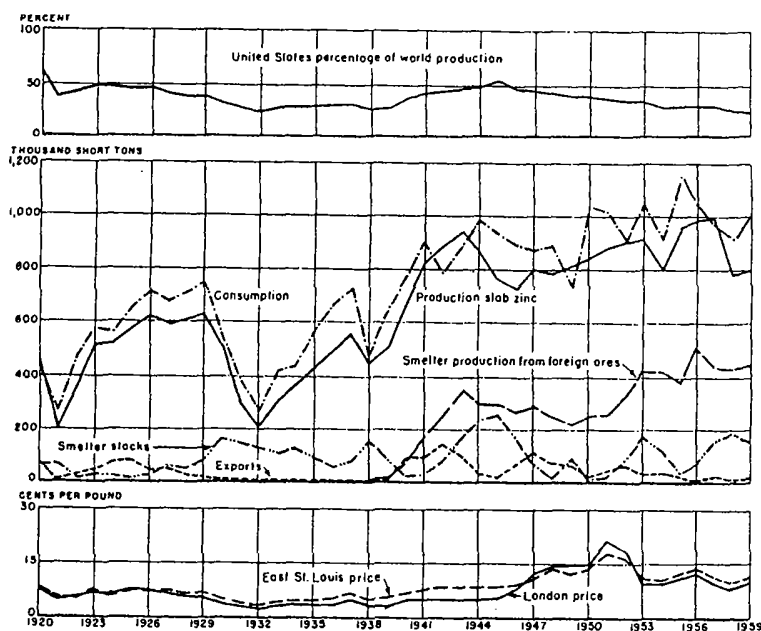


FIGURE 1.—Trends in the zinc industry in the United States, 1920-59. Consumption figures represent primary slab zinc plus zinc contained in pigments made directly from ore.

LEGISLATION AND GOVERNMENT PROGRAMS

A third United Nations conference on lead and zinc, with the aim of attaining greater stability in the industry, was held in New York in late April and early May. One result was specific voluntary commitments by various countries to restrict output to bring supply and demand into better balance. The meeting also provided for creating a continuing body designated as the International Lead-Zinc Study Group. Membership consisted of 25 nations with substantial interests in production, consumption, or trade of lead or zinc.

Import quotas on zinc metal and ore imposed by President Eisenhower, effective October 1, 1958, were in effect throughout 1959. The quotas were set at 80 percent of the U.S. average annual competitive import rate from 1953 through 1957—379,840 tons of zinc in ore and 141,120 tons of zinc in pigs, slabs, and certain other forms.

On August 22 the U.S. Senate formally ordered the Tariff Commission to conduct an investigation of the lead-zinc situation and report findings by March 31, 1960, on the adequacy of existing import restrictions. The Tariff Commission announced on September 2 that public hearings would be held in Washington January 12-15, 1960, to allow all interested parties the opportunity to express their views.

The Office of Minerals Exploration (OME), authorized in 1958

ZINC

TABLE 1.—Salient zinc statistics

	1950-54 (average)	1955	1956
United States:			
Production:			
Domestic ores, recoverable content.....short tons..	598,293	514,671	541,671
Value.....thousands..	\$175,696	\$126,609	\$141,609
Slab zinc:			
From domestic ores.....short tons..	532,339	582,913	478,044
From foreign ores.....do....	337,283	380,691	380,691
Total slab zinc.....do....	869,622	963,604	858,735
From scrap (redistilled slab).....short tons..	58,325	60,042	60,042
Total.....do....	927,947	1,023,646	918,777
Secondary zinc.....do....	246,122	230,298	230,298
Imports (general):			
Ores (zinc content).....do....	400,027	478,044	478,044
Slab zinc.....do....	150,231	195,095	195,095
Exports of slab zinc.....do....	30,021	18,069	18,069
Stocks:			
At producers' plants.....do....	83,855	30,264	30,264
At consumers' plants.....do....	70,293	123,644	123,644
Consumption:			
Slab zinc.....do....	924,823	1,119,812	1,119,812
Ores (recoverable zinc content).....short tons..	119,009	118,135	118,135
Secondary (recoverable zinc content).....do....	238,431	231,133	231,133
Total consumption.....do....	1,282,263	1,469,080	1,469,080
Price, Prime Western grade, East St. Louis			
cents a pound..	13.03	12.30	12.30
World:			
Mine production.....short tons..	2,775,000	2,300,000	2,300,000
Smelter production.....do....	2,480,000	2,930,000	2,930,000
Price, Prime Western, London			
cents a pound..	14.83	11.30	11.30

¹ Includes production of zinc used directly in alloying operations.

² Excludes redistilled slab zinc.

³ Revised figure.

⁴ Excludes remelt zinc.

⁵ Includes ore used directly in galvanizing.

⁶ Excludes redistilled slab and remelt zinc.

as the successor to the Defense Minerals Exploration (OME), continued to encourage exploration of zinc and metals. Exploration assistance for zinc advanced 50 percent of the approved projects. During 1959, OME awarded five contracts for zinc and other metals for a total of \$88,935. Also, five applications were and three were being considered at the end of the year.

Under authority of Public Law 480 (1955) Mobilization (ODM) authorization of the Office of Defense Mobilization, through its agent, the Commodity Credit Corporation (CCC), continued to trade perishable surplus for zinc and other commodities of foreign origin. It contracted for 29,041 tons of zinc metal (38,861 tons) to the Government supplemental stockpile.

The General Services Administration is responsible for stockpile procurement and

ment under foreign-aid programs as agent of the International Cooperation Administration (ICA), and administration of Defense Production Act (DPA) programs, including domestic purchase programs. Purchases of zinc produced from domestic ores were made against the maximum stockpile objective for this metal in mid-1959. These purchases are included in the 3,000 tons reported by the American Zinc Institute as being shipped by domestic producers.

Foreign zinc received at GSA warehouses under barter agreements during the year totaled 27,787 tons (40,216 tons in 1958). Such zinc was placed in the supplemental stockpile and could not be removed except by act of Congress.

TABLE 2.—DMEA contracts involving lead and zinc executed in 1959, by States

State and contractor	Property	County	Date approved	Total amount ¹
COLORADO				
Clear Creek Mining Co.	Lake Central project	Clear Creek	Oct. 1	\$84,500
IDAHO				
Abot Mining Co.	Pilot group	Shoshone	June 23	43,550
MONTANA				
Baltimore Syndicate	Baltimore mine	Jefferson	July 27	22,930
Howard C. Banks	Hidden Hand	Powell	June 23	13,900
VIRGINIA				
Roland F. Beers, Inc.	Myers	Smyth	June 16	12,900
UTAH				
Olen Larsen	Iron Blossom No. 1	Juab	June 16	43,920
Total				221,790

¹ Government participation was 50 percent in exploration projects for lead and zinc in 1959.

DOMESTIC PRODUCTION

MINE PRODUCTION

Mines in the United States produced 425,300 tons of recoverable zinc in 1959. This quantity was an increase of 3 percent over that of 1958 but was the second smallest annual zinc production since 1933. Continued reduction in output from the West Central States and increased output of States east of the Mississippi River were notable developments. Production in the first half of 1959 was 224,100 tons; the reduced output of 201,200 tons in the second half of the year was largely attributable to labor strikes.

Idaho retained its leadership among the western zinc-mining States and was the second largest producer in the Nation. The Star mine of the Bunker Hill Co. was the largest zinc mine in the State. Other principal producers were the Page mine of American Smelting & Refining Co. and the Bunker Hill mine of the Bunker Hill Co.

ZINC

TABLE 3.—Mine production of recoverable zinc in short tons

State	1950-54 (average)	1959
Western States and Alaska:		
Alaska	1	22,000
Arizona	41,923	41,923
California	6,069	6,069
Colorado	46,530	46,530
Idaho	74,802	74,802
Montana	75,328	75,328
Nevada	12,281	12,281
New Mexico	27,807	27,807
Oregon	8	8
South Dakota	5	5
Texas	32,431	32,431
Utah	21,638	21,638
Washington	338,390	338,390
Total	338,390	338,390
West Central States:		
Arkansas	17	17
Kansas	23,237	23,237
Missouri	9,708	9,708
Oklahoma	46,338	46,338
Total	79,360	79,360
States east of the Mississippi River:		
Illinois	19,311	19,311
Kentucky	1,683	1,683
New Jersey	52,051	52,051
New York	43,147	43,147
North Carolina	38,155	38,155
Pennsylvania	13,310	13,310
Tennessee	14,836	14,836
Virginia	180,543	180,543
Wisconsin	508,293	508,293
Total	508,293	508,293
Grand total	508,293	508,293

The Iron King mine of Shattuck D. is the largest producer in Arizona. Cyprus is the largest producer in January at the Old Dick mine. The San Xavier mine closed.

Colorado remained the third largest producer in the West Central States. Major producing mines in New Jersey Zinc Co., the Idarado Mine Co., and the Emperius mine of Emperius Mining Co. of Rico Mining Co.

Mine output in Utah dropped 22 percent in 1959 at the International Smelting & Refining Co. during the latter part of the year. The mine of United States Smelting, Refining & Chemical Co. was the largest zinc producer in the State.

Mines in Montana produced 16 percent of the total zinc production in 1959. The Anaconda Co. mines at Butte, continuing throughout the year, was the largest producer.

The two principal producing mines in Idaho are the Oreille Mines and the American Zinc, Lead & Smelting Co. The Oreille mine, operating on a curtailed basis, produced 619 tons of zinc in 1959.

10,800 tons of zinc and 7,800 tons of lead in concentrates. Total operating costs per ton were held to \$3.116, compared with \$3.037 for 1958, despite an increase of \$0.212 per ton for development expenditures.⁴ The Federal Bureau of Mines released a publication⁵ on mine production in Pend Oreille and Stevens Counties for the years 1902-56.

Mine output in New Mexico dropped sharply. The United States Smelting, Refining, & Mining Co. Bayard-mine group remained closed throughout the year. Empire Zinc Division of The New Jersey Zinc Co. reopened its Hanover operation early in August after it had been closed since May 1958. By yearend, operations were normal.

TABLE 4.—Mine production of recoverable zinc in the United States, by months, in short tons

Month	1958	1959	Month	1958	1959
January.....	39,020	35,830	August.....	29,856	31,728
February.....	34,693	35,441	September.....	30,694	30,025
March.....	36,602	37,428	October.....	32,738	31,608
April.....	40,232	38,700	November.....	33,290	36,025
May.....	36,208	38,742	December.....	35,785	39,538
June.....	33,690	36,921			
July.....	29,197	32,308	Total.....	412,005	425,303

Mines in the West Central States of Kansas, Oklahoma, and Missouri produced only 2,200 tons of zinc, compared with 10,100 tons in 1958. All producing mines in the Tri-State district had ceased operating in 1958, and they remained closed throughout 1959. Production resulted from cleanup and mill-tailing operations. There was no recovery of zinc from southeastern Missouri lead ores.

Mine output in Tennessee again set a new record, expanding 52 percent above 1958 to 89,900 tons, and firmly establishing the State as the largest zinc producer in the country. American Zinc Co. completed initial development at its Coy mine and began stoping operations in January. The Young mine increased its annual production rate to 2,500 tons by midyear and planned to attain a 4,000-ton annual rate. New Jersey Zinc Co. brought the Jefferson City mine to planned production, enabling the mill to operate at capacity. At the Flat Gap mine, initial production began in January. By yearend the production rate had increased, and stope preparation had advanced so that mine production was expected to reach mill capacity in 1960.⁶

New York dropped from second to third largest zinc-producing State in the Nation. All production was from Balmat and Edwards mines of St. Joseph Lead Co. The company reported an increase in the workweek from 5 to 6 days in January. This continued until the entire operation was closed by a strike on July 1. Settlement was reached November 2, and work was resumed on the 6-day basis.

In the Northern Illinois and Wisconsin districts, the Eagle-Picher Co. and Tri-State Zinc, Inc., mines operated throughout the year.

⁴ Pend Oreille Mines & Metals Co., Annual Report, 1959, pp. 2-3.
⁵ Fulkerson, Frank B., and Kingston, Gary B., Mine Production of Gold, Copper, Lead, and Zinc in Pend Oreille and Stevens Counties, Washington, 1902-56: Bureau of Mines Inf. Circ. 7872, 1959, 51 pp.
⁶ New Jersey Zinc Co., Annual Report, 1959, pp. 7-8.

ZINC

American Zinc, Lead and Smelting Co. resume year at both its Vinegar Hill Division mines and

Zinc output in Virginia increased 10 percent. Zinc Co. reopened its Timberville mine in February, closed for about a year. New Jersey Zinc Co. operated its Mineville mine throughout the year and reopened its Mineville mine in September after a shutdown of 13 months. Austinville concentrating mill was operating with ore from both mines.

In Pennsylvania the New Jersey Zinc Co. production rate at the Friedensville mine, but anticipated. The mine-water problem remained inoperative to control. Development of the lower mine by yearend the main haulage incline was completed, level and stoping was initiated on the 800-foot level.

In the Southern Illinois and Kentucky districts, a byproduct of fluorspar mining increased slightly the zinc content of the ore.

The Sterling mine of New Jersey Zinc Co. was maintained on a standby basis; the company studies directed toward improved extractive operations is reopened.⁷

The 25 leading zinc-producing mines in the United States listed in table 5, yielded 82 percent of the total zinc. The four leading mines supplied 25 percent, contributed 45 percent.

SMELTER AND REFINERY PRODUCTION

The zinc smelting and refining industry operated 10 primary plants and 10 secondary plants producing zinc pigments, zinc dust, and zinc alloys. Some of the products were zinc calcs, pigments, diecasting alloys, rolled zinc, and secondary zinc.

Primary Smelters and Electrolytic Plants.—The 10 primary plants processed zinc ore and concentrate, zinc slag-fuming plants; other primary zinc-bearing plants produced half of all zinc-base scrap.

Production at primary zinc plants totaled 4,072,000 tons, of which 28,500 tons was redistilled. Beside the primary plants also produced zinc oxide, zinc dust, and zinc alloys.

Primary-plant capacity for slab zinc at yearend was 1,166,800 tons. The five electrolytic plants had 4,072 electrolytic cells in use at yearend and a total capacity of 479,500 tons (59 percent of their 479,500 tons of capacity). The four remaining primary smelters reported 35,364 of their 44,444 tons of capacity. The four remaining primary smelters distilling vertical-retort plants at Meadowbrook, Pa.; and Josephstown, Pa. The New Jersey Zinc Co. externally gas-fired vertical

⁷ New Jersey Zinc Co., Annual Report, 1959, p. 7.

TABLE 5.—Twenty-five leading zinc-producing mines¹ in the United States in 1959 in order of output

Rank	Mines	District	State	Operator	Type of ore
1	Balmat.....	St. Lawrence County	New York	St. Joseph Lead Co.	Lead-zinc.
2	Eagle.....	Red Cliff (Battle Mountain)	Colorado	The New Jersey Zinc Co.	Do.
3	Jefferson City.....	Eastern Tennessee	Tennessee	do.	Zinc.
4	Butte mines.....	Summit Valley	Montana	The Anaconda Co.	Do.
5	United States & Lark.	West Mountain (Bingham)	Utah	United States Smelting, Refining & Mining Co.	Lead-zinc.
6	Star.....	Coeur d' Alene	Idaho	The Bunker Hill Co.	Do.
7	Iron King.....	Big Bug	Arizona	Shattuck Donn Mining Corp.	Do.
8	Young.....	Eastern Tennessee	Tennessee	American Zinc Co. of Tennessee	Zinc.
9	Friedensville.....	Lehigh County	Pennsylvania	The New Jersey Zinc Co.	Do.
10	Austinville.....	Austinville	Virginia	do.	Lead-zinc.
11	Mascot No. 2.....	Eastern Tennessee	Tennessee	American Zinc Co. of Tennessee	Zinc.
12	Flat Gap.....	do.	do.	The New Jersey Zinc Co.	Do.
13	Davis-Bible Group.	do.	do.	United States Steel Corp., Tennessee Coal & Iron Div.	Do.
14	Treasury Tunnel-Black Bear Smuggler Group.	Upper San Miguel	Colorado	Idarado Mining Co.	Copper-lead-zinc.
15	Pend Oreille.....	Metalline	Washington	Pend Oreille Mines & Metals Co.	Lead-zinc.
16	E. P. Shullsburg.....	Upper Mississippi Valley	Wisconsin	The Eagle-Picher Co.	Zinc.
17	Graham-Snyder-Spillane-Feehan.	do.	Illinois	do.	Lead-zinc.
18	Old Dick.....	Eureka	Arizona	Cyprus Mines Corp.	Copper-zinc.
19	Edwards.....	St. Lawrence County	New York	St. Joseph Lead Co.	Zinc.
20	Gray.....	Upper Mississippi Valley	Illinois	Tri-State Zinc, Inc.	Lead-zinc.
21	United Park City.....	Parker City Region	Utah	United Park City Mines Co.	Do.
22	Burra-Boyd.....	Polk County	Tennessee	Tennessee Copper Co.	Copper-zinc.
23	Grandview.....	Metalline	Washington	American Zinc, Lead & Smelting Co.	Lead-zinc.
24	Bowers-Campbell.....	Rockingham County	Virginia	Tri-State Zinc, Inc.	Zinc.
25	Mahoning Group.....	Kentucky-Southern Illinois	Illinois	Ozark Mahoning Co.	Fluorspar-lead-zinc.

¹ Excludes old slag dump of the Bunker Hill Co., Kellogg, Idaho.

Josephstown used electrothermic distillation retorts. Combined horizontal and vertical-retort production of 517,900 tons was only 75 percent of the reported 1959 capacity of 687,300 tons.

The list of primary smelters published in the Zinc chapter of the 1957 Minerals Yearbook was unchanged. Athletic Mining and Smelting Co. at Fort Smith, Ark., shut down operations on December 31 reportedly because of an insufficient supply of zinc concentrate.

Slag-Fuming Plants.—Many lead smelters recover a zinc fume product containing 7.5 to 12.5 percent zinc from lead blast-furnace slags.

Five such plants in the United States treated 616,400 tons of hot and cold lead slag (including some crude ore at the Tooele plant), which yielded 111,300 tons of oxide fume containing 73,300 tons of recoverable zinc. Corresponding figures for 1958 were 790,700; 148,600; and 98,000 tons, respectively.

Secondary Zinc Smelters.—Zinc-base scrap (a mix of clippings and drosses, die-cast alloys, old zinc clippings, and chemical residues) was smelted in secondary smelters, although about a third usually smelters, and most sal ammoniac skimmings plants. Secondary smelters depend on the dealers for their supply of scrap materials.

Chicago, Ill., was a new addition in 1959 to zinc smelters given in the Zinc chapter of the Minerals Yearbook. Primary and secondary smelting plants produced 57,800 tons of redistilled zinc, 4,32,800 tons of zinc dust. The zinc content was 94,100 tons.

Additional details on 127,400 tons of zinc-base copper-base scrap (table 8) may be obtained from the Copper chapter of this volume.

TABLE 6.—Stocks and consumption of new and old zinc in 1959, gross weight in short tons

Class of consumer and type of scrap	Stocks, beginning of year ¹	Receipts	Consumption
Smelters and distillers:			
New clippings.....	279	1,798	
Old zinc.....	524	4,237	
Engravers' plates.....	518	3,630	
Skimmings and ashes.....	7,155	20,205	
Sal skimmings.....	801	445	
Die-cast skimmings.....	3,385	11,024	
Galvanizers' dross.....	5,502	55,366	
Die castings.....	5,698	34,972	
Rod and die scrap.....	2,533	3,064	
Flue dust.....	123	6,199	
Chemical residues.....	440	8,195	
Total.....	27,968	149,035	
Chemical plants, foundries and other manufacturers:			
New clippings.....		20	
Old zinc.....			
Engravers' plates.....	1,236	5,432	
Skimmings and ashes.....	12,059	20,910	
Sal skimmings.....			
Die-cast skimmings.....	14	29	
Die castings.....		40	
Rod and die scrap.....	104	514	
Flue dust.....	1,016	20,330	
Chemical residues.....			
Total.....	14,433	47,275	
Grand total:			
New clippings.....	279	1,818	
Old zinc.....	524	4,237	
Engravers' plates.....	518	3,630	
Skimmings and ashes.....	8,401	25,637	
Sal skimmings.....	12,860	21,356	
Die-cast skimmings.....	3,385	11,024	
Galvanizers' dross.....	5,515	55,395	
Die castings.....	5,698	34,972	
Rod and die scrap.....	2,537	3,104	
Flue dust.....	227	6,713	
Chemical residues.....	1,456	28,528	
Total.....	42,401	190,310	

¹ Figures partly revised.

TABLE 7.—Production of secondary zinc and zinc-alloy products in the United States, gross weight in short tons

Products	1950-54 (average)	1955	1956	1957	1958	1959
Redistilled slab zinc.....	58,325	166,042	172,127	172,481	46,605	157,818
Zinc dust ¹	27,548	30,118	28,048	26,715	28,512	32,768
Remelt spelter.....	4,458	8,019	7,900	6,404	8,230	4,718
Remelt die-cast slab.....	8,091	12,729	12,900	10,328	12,980	13,150
Zinc die and die-casting alloys.....	4,200	6,377	4,306	6,440	6,082	6,884
Galvanizing stocks.....	210	325	369	240	249	245
Rolled zinc.....	3,160	2,915	2,179	185	10	14
Secondary zinc in chemical products.....	35,283	28,917	30,675	33,361	32,482	40,204

¹ Includes redistilled slab made from remelt die-cast slab.² Includes zinc dust produced from other than scrap.

TABLE 8.—Zinc recovered from scrap processed in the United States, by kind of scrap and form of recovery, in short tons

Kind of scrap	1958	1959	Form of recovery	1958	1959
New scrap:			As metal:		
Zinc-base.....	87,566	104,420	By distillation:		
Copper-base.....	71,312	93,909	Slab zinc ¹	48,160	57,227
Aluminum-base.....	1,490	2,024	Zinc dust ²	26,010	32,119
Magnesium-base.....	38	63	By remelting.....	5,282	4,776
Total.....	160,406	202,406	Total.....	77,442	94,122
Old scrap:			In zinc-base alloys.....	17,683	17,611
Zinc-base.....	38,643	38,532	In brass and bronze.....	99,641	120,190
Copper-base.....	29,764	33,487	In aluminum-base alloys.....	2,941	3,948
Aluminum-base.....	1,436	1,734	In magnesium-base alloys.....	143	179
Magnesium-base.....	93	95	In chemical products:		
Total.....	60,926	73,848	Zinc oxide (lead-free).....	16,016	19,362
Grand total.....	230,332	276,254	Zinc sulfate.....	(1)	(1)
			Zinc chloride.....	10,748	13,625
			Miscellaneous.....	5,718	7,217
			Total.....	162,890	182,132
			Grand total.....	230,332	276,254

¹ Includes zinc content of redistilled slab made from remelt die-cast slab.² Includes zinc content of dust made from other than scrap.³ Included under "Miscellaneous."

SLAB ZINC

Domestic smelter output of slab zinc increased 3 percent over 1958. Included in the 856,500 tons of slab zinc produced is molten zinc used directly in alloying operations. Of the output, 798,700 tons was primary metal and 57,800 redistilled secondary zinc. Primary production was 44 percent from domestic ores and 56 percent from foreign ores; 35 percent was electrolytic and 65 percent distilled slab zinc. Primary smelters produced 49 percent of the redistilled secondary slab zinc; the remainder was obtained from secondary smelters. Prime Western-grade zinc, which accounted for 42 percent of the total (41 percent in 1958) was the principal grade produced. Special high grade constituted 39 percent (36 percent in 1958), High grade 11 percent (11 percent), Brass Special 9 percent (10 percent), Intermediate 2 percent (2 percent), and Select a small fraction of 1 percent in both 1958 and 1959.

TABLE 9.—Distribution of 1958 zinc scrap consumption and recovery therefrom, by type of product, gross weight in short tons¹

Scrap items	Products						Total scrap consumed	Total metal recovered	Number of plants using each item ²
	Redistilled slab	Remelt spelter	Remelt die-cast slab	Zinc die castings	Zinc dust	Zinc oxide (lead-free)			
New clippings.....	176	1,652	145				2,339	2,219	33
Old zinc.....	1,704	1,066	1,376				4,100	4,100	53
Engravers' plates.....	575	1,466	1,000				2,657	2,657	42
Skimming and ashes.....	10,553	3,230			4,891		18,774	2,832	20
Sal skimmings.....	223				16,039		16,262	2,577	12
Die-cast skimmings.....	4,682				24,737	28	29,419	44,458	26
Galvanizers' dross.....	24,874				1,467	3,453	26,341	26,341	78
Die-cast and die scrap.....	13,901	191	896		2,193	429	16,000	20,725	8
Fine dust.....	3,432						6,074	2,800	6
Chemical residues.....						7,969	22,157	12,067	

TABLE 10.—Primary and redistilled secondary slab zinc produced in the United States, in short tons

Year	Primary			Redistilled secondary	Total (excludes zinc recovered by remelting)
	From domestic ores	From foreign ores	Total		
1950-54 (average).....	582,339	137,283	869,622	58,325	927,947
1955.....	582,913	138,591	963,504	66,042	1,029,546
1956.....	470,093	151,517	983,610	72,127	1,055,737
1957.....	539,692	445,104	985,796	72,481	1,058,277
1958.....	346,240	435,006	781,246	46,605	827,851
1959.....	348,443	450,225	798,668	57,818	856,484

¹ Includes a small tonnage of slab zinc further refined into high-grade metal.
² Includes production of zinc used directly in alloying operations.

TABLE 11.—Distilled and electrolytic zinc, primary and secondary, produced in the United States, in short tons

CLASSIFIED ACCORDING TO METHOD OF REDUCTION

Year	Electrolytic primary	Distilled	Redistilled secondary		Total
			At primary smelters	At secondary smelters	
1950-54 (average).....	342,277	527,345	22,565	35,760	927,947
1955.....	389,891	573,613	24,747	41,295	1,029,546
1956.....	410,417	573,193	30,221	41,906	1,055,737
1957.....	409,483	576,313	35,215	37,296	1,058,277
1958.....	328,449	464,797	24,297	22,308	827,851
1959.....	280,813	517,853	28,451	29,367	856,484

CLASSIFIED ACCORDING TO GRADE

Year	Grade A		Grade B (Intermediate)	Grades C and D		Grade E (Prime Western)	Total
	Special High Grade (99.99% Zn)	High Grade (Ordinary)		Brass Special	Select		
1950-54 (average).....	286,404	172,573	18,842	52,988	6,857	390,283	927,947
1955.....	378,215	135,597	23,792	80,209	3,904	404,829	1,029,546
1956.....	356,756	162,457	37,691	96,291	2,400	400,132	1,055,737
1957.....	354,042	182,317	32,262	84,291	1,180	434,215	1,058,277
1958.....	298,442	86,859	19,388	81,841	1,300	340,021	827,851
1959.....	331,312	71,792	17,493	75,305	1,414	359,168	856,484

¹ Includes production of zinc used directly in alloying operations.

Pennsylvania again ranked first in production of slab zinc, Texas second, and Oklahoma third. The slab-zinc output of Pennsylvania, West Virginia, Oklahoma, and Arkansas was distilled; that of Montana and Idaho was electrolytic. Part of the Illinois and Texas slab output was distilled, and part was electrolytic.

TABLE 12.—Primary slab zinc produced in the United States, in short tons

Year	Arkansas	Idaho	Illinois	Montana	Oklahoma	Pennsylvania
1950-54 (average).....	18,613	52,834	110,868	203,189	151,274	183,218
1955.....	21,481	56,625	102,808	207,306	160,961	218,218
1956.....	27,651	57,799	101,826	214,755	156,178	198,218
1957.....	23,080	65,881	107,294	198,036	157,638	197,218
1958.....	17,952	55,454	82,844	148,921	122,133	157,218
1959.....	15,964	61,191	102,708	86,620	162,072	121,218

¹ Includes Missouri, 1950-53, 1955, 1956.

² Includes Missouri.

³ Includes West Virginia.

⁴ Texas only.

⁵ Includes production of zinc used directly in alloying operations.

BYPRODUCT SULFURIC ACID

Sulfuric acid was made from sulfur dioxide in the production of zinc sulfide concentrate at some primary zinc plants. Elemental sulfur was burned to increase production. In 1959 acid production at zinc-roasting plants was 803,600 short tons valued at \$13.1 million, and 100,100 tons valued at \$1.6 million.

ZINC DUST

Zinc dust included in data in tables 8, 9, and 10 consists of commercial grades that comply with close specifications of unoxidized metal, evenness of grading, and does not include blue powder. The zinc dust produced ranged from 95.0 to 99.8 percent and was valued at \$1.6 million. Total shipments of zinc dust were 33,000 tons shipped abroad. Producers' stocks of zinc dust were 10,000 tons at the end of the year.

Most of the zinc dust was made from zinc scrap, but some was recovered from refined metal.

TABLE 13.—Zinc dust¹ produced in the United States, in short tons

Year	Short tons	Value		Year
		Total	Average per pound	
1950-54 (average).....	27,548	\$9,366,013	\$0.170	1957.....
1955.....	30,118	9,216,108	.163	1958.....
1956.....	28,048	9,368,032	.167	1959.....

¹ All produced by distillation.

² Corrected figure.

CONSUMPTION AND RESERVE

Zinc consumed as refined metal in slab or pipe form was 868,300 tons in 1958; as ore and concentrates, 108,000 tons; and used directly in galvanizing, 108,000 tons.

as scrap to make alloys, zinc dust, pigments and salts, 214,300 tons (178,900). Totaled, these uses accounted for 1,278,500 tons of primary and secondary zinc, an increase of 12 percent over the 1,142,100 tons in 1958. The quantity of zinc consumed directly in making pigments and salts is reported in table 21. Zinc consumed in scrap form and the manufactured products other than remelt and redistilled are reported in tables 6, 7, and 8.

Slab-zinc consumption, as reported by 700 plants, increased 10 percent and was only 15 percent below the record 1,119,800 tons used in 1955. Zinc-base alloys consumed the most—41 percent of the 956,200 tons used by all industries. Slab zinc used by the brass industry rose 28 percent over 1958 and was 13 percent of the total. Zinc used in galvanizing steel products decreased 5 percent to 361,000 tons and represented 38 percent of total use. The remaining 8 percent went into rolled products, zinc oxide, light-metal alloys, desilverizing lead, and miscellaneous uses.

Rolling mills used 42,900 tons of slab zinc and remelted and rerolled 14,700 tons of metallic scrap produced in fabricating plants operated

TABLE 14.—Consumption of slab zinc in the United States, by industries, in short tons¹

Industry and product	1950-54 (average)	1955	1956	1957	1958	1959
Galvanizing: ²						
Sheet and strip.....	164,054	200,403	203,713	168,221	194,190	175,691
Wire and wire rope.....	47,347	48,171	42,937	36,468	35,638	35,602
Tubes and pipe.....	83,692	98,206	86,277	70,463	67,318	59,530
Fittings.....	13,669	10,586	10,652	9,966	8,904	10,239
Other.....	96,359	93,775	³ 95,567	⁴ 82,640	⁵ 75,173	⁶ 79,665
Total galvanizing.....	400,021	451,141	439,146	367,757	381,220	381,027
Brass products:						
Sheet, strip, and plate.....	71,074	67,550	56,207	52,873	46,967	61,234
Rod and wire.....	43,602	46,830	39,413	33,711	32,568	40,386
Tube.....	16,120	15,363	13,666	11,015	9,645	11,805
Castings and billets.....	0,435	7,518	6,337	5,818	4,423	4,967
Copper-base ingots.....	0,400	8,062	7,107	7,286	7,094	10,276
Other copper-base products.....	1,354	920	1,184	787	678	707
Total brass products.....	144,045	146,243	124,004	112,390	101,375	129,276
Zinc-base alloy:						
Die castings.....	274,133	417,333	340,200	363,830	309,408	283,356
Alloy dies and rod.....	7,869	11,754	9,322	10,149	5,400	3,745
Blush and sand castings.....	2,196	1,720	1,085	2,060	2,022	2,225
Total zinc-base alloy.....	284,198	430,807	360,507	376,039	316,830	289,327
Rolled zinc.....	57,196	61,689	47,350	41,260	40,610	42,919
Zinc oxide.....	18,608	22,433	19,160	20,428	13,331	16,345
Other uses:						
Wet batteries.....	1,471	1,420	1,345	1,336	846	1,344
Desilverizing lead.....	2,534	2,676	2,939	2,808	2,621	1,948
Light-metal alloys.....	3,444	3,484	5,630	4,858	3,657	3,325
Other ⁴	6,426	10,019	8,500	8,635	7,922	8,091
Total other uses.....	13,876	17,599	18,614	17,737	14,946	15,366
Total consumption⁵.....	924,823	1,119,812	1,008,790	935,620	868,327	956,199

¹ Excludes some small consumers.

² Includes zinc used in electrogalvanizing and electroplating, but excludes sherardizing.

³ Includes 27,760 tons used in job galvanizing in 1956, 28,280 tons in 1957, 28,602 tons in 1958, and 31,521 tons in 1959.

⁴ Includes zinc used in making zinc dust, bronze powder, alloys, chemicals, castings, and miscellaneous uses not elsewhere mentioned.

⁵ Includes 3,589 tons of remelt zinc in 1954, 2,997 tons in 1955, 5,230 tons in 1956, 6,805 tons in 1957, 8,073 tons in 1958, and 5,209 tons in 1959.

ZINC

in connection with the rolling mills. An additional 14,700 tons of purchased scrap (new clippings and old zinc) were rolled.

Output of rolled zinc increased 5 percent over 1958. The quantity of rolled zinc at the mills was 3,000 tons at the end of 1959, with 2,200 tons on hand at the beginning of the year. The quantity of rolled zinc, the rolling mills produced 19,700 tons of rolled zinc in manufacturing 19,700 tons of finished products.

TABLE 15.—Rolled zinc produced and quantity available in the United States

	Short tons	1958	
		Total	Average per pound
Production:			
Sheet zinc not over 0.1 inch thick.....	12,388	\$7,308,801	\$0.295
Roller plate and sheets over 0.1 inch thick.....	419	174,769	.208
Strip and ribbon zinc.....	24,608	9,749,501	.198
Foil, rod, and wire.....	1,498	763,332	.255
Total rolled zinc.....	38,899	17,996,403	.231
Imports.....	901	288,271	.168
Exports.....	3,818	2,637,346	.345
Available for consumption.....	36,101		
Value of slab zinc (all grades).....			.102
Value added by rolling.....			.129

Figures represent net production. In addition 12,769 tons of strip and 14,700 tons of purchased scrap were rolled from scrap originating in fabricating plants operated by rolling mills.

Of the commercial grades of slab zinc used, 47 percent of the total, Prime Western 33 percent, Brass Special 9 percent, Intermediate 9 percent, Remelt together 1 percent. All grades of slab zinc were used in making brass products, and all except Select grade were used in galvanizing. More than 98 percent of the slab zinc used in brass-base alloys was Special High grade.

TABLE 16.—Consumption of slab zinc in the United States by industries, in short tons

Industry	Special High grade	High grade	Intermediate	Brass Special	Select
Galvanizers.....	14,505	9,628	3,185	84,423	2,087
Brass mills¹.....	29,222	60,868	837	8,611	2,087
Die casters².....	381,833	223	79		
Zinc rolling mills.....	15,063	8,340	8,166	11,170	
Oxide plants.....	1,648				
Other.....	4,535	1,206	454	73	
Total.....	446,796	86,183	12,731	84,277	2,087

¹ Includes brass mills, brass ingot makers, and brass foundries.

² Includes producers of zinc-base die castings, zinc-alloy dies, and zinc-base

CONSUMPTION OF SLAB ZINC BY GEOGRAPHIC AREAS

Among 36 States consuming slab zinc for galvanizing, Ohio, Illinois, Pennsylvania, and Indiana continued to lead, using 58 percent of the total. The iron and steel industry used zinc to galvanize steel sheets, wire, tube, pipe, cable, chain, bolts, railway-signal equipment, building and pole-line hardware, and many other items.

Connecticut, with 32 percent of the total, again ranked first in use of slab in brassmaking. Of 22 States using zinc to make zinc-base alloys, Michigan ranked first, then Illinois and Ohio.

Slab zinc used by rolling mills to make sheet, strip, ribbon, foil, plate, rod and wire totaled 42,900 tons, compared with 40,600 tons used in 1958. The major American use was for dry-cell battery cases and similar extruded cases for radio condensers and tube shields.

TABLE 17.—Consumption of slab zinc in the United States in 1958, by industries and States, in short tons

State	Galvanizers	Brass mills ¹	Die casters ²	Other ³	Total
Alabama.....	(9)	(9)	(9)	(9)	27,006
Arizona.....	(9)	(9)	(9)	(9)	(9)
Arkansas.....	(9)	(9)	(9)	(9)	(9)
California.....	19,217	(9)	16,748	(9)	35,965
Colorado.....	(9)	(9)	(9)	(9)	(9)
Connecticut.....	8,190	40,636	(9)	(9)	48,826
Delaware.....	(9)	(9)	(9)	(9)	(9)
District of Columbia.....	(9)	(9)	(9)	(9)	(9)
Florida.....	(9)	(9)	(9)	(9)	(9)
Georgia.....	(9)	(9)	(9)	(9)	(9)
Hawaii.....	(9)	(9)	(9)	(9)	(9)
Idaho.....	(9)	(9)	(9)	(9)	(9)
Illinois.....	53,821	20,705	82,550	16,306	173,382
Indiana.....	30,433	(9)	22,068	(9)	52,501
Iowa.....	(9)	(9)	(9)	(9)	(9)
Kansas.....	(9)	(9)	(9)	(9)	(9)
Kentucky.....	(9)	(9)	(9)	(9)	(9)
Louisiana.....	(9)	(9)	(9)	(9)	(9)
Maine.....	(9)	(9)	(9)	(9)	(9)
Maryland.....	30,320	(9)	(9)	(9)	30,320
Massachusetts.....	8,625	(9)	(9)	(9)	8,625
Michigan.....	4,553	13,170	35,731	108	53,562
Minnesota.....	(9)	(9)	(9)	(9)	(9)
Mississippi.....	(9)	(9)	(9)	(9)	(9)
Missouri.....	3,016	(9)	3,480	(9)	6,496
Nebraska.....	(9)	(9)	(9)	(9)	(9)
New Hampshire.....	(9)	(9)	(9)	(9)	(9)
New Jersey.....	7,613	6,769	(9)	(9)	14,382
New York.....	4,430	(9)	33,211	(9)	37,641
North Carolina.....	(9)	(9)	(9)	(9)	(9)
Ohio.....	67,361	(9)	50,486	(9)	117,847
Oklahoma.....	(9)	(9)	(9)	(9)	(9)
Oregon.....	338	(9)	(9)	(9)	338
Pennsylvania.....	52,363	7,802	20,335	(9)	80,500
Rhode Island.....	(9)	(9)	(9)	(9)	(9)
South Carolina.....	(9)	(9)	(9)	(9)	(9)
Tennessee.....	(9)	(9)	(9)	(9)	(9)
Texas.....	10,794	(9)	(9)	(9)	10,794
Utah.....	(9)	(9)	(9)	(9)	(9)
Virginia.....	(9)	(9)	(9)	(9)	(9)
Washington.....	(9)	(9)	(9)	(9)	(9)
West Virginia.....	(9)	(9)	(9)	(9)	(9)
Wisconsin.....	2,224	(9)	(9)	(9)	2,224
Total.....	359,055	128,850	389,071	76,012	953,088

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.

Weather-stripping, roof flashing, photoengraving, and hold electric fuses were other uses. States consuming zinc products, in descending order of use, were Illinois, Pennsylvania, New York, Iowa, Massachusetts, and Connecticut.

Other slab zinc uses included slush castings, zincizing lead, light-metal alloys, zinc dust, zinc chloride, zinc oxide, and part of the zinc used for zinc pigments and salts.

ZINC PIGMENTS AND SALTS

Production and Shipments.—Production of zinc pigments and salts was enough for all requirements in 1958.

Outputs of lead-free and leaded zinc oxide increased 20 percent, above 1958. The value of paint increased 20 percent. Output of zinc chloride increased 20 percent over 1958. The values of public use increased 6 and 13 percent, respectively.

Pigments and salts were made from various sources, including ore, slab zinc, scrap, and residues. Zinc salts produced directly from ore exceeded 90,000 tons. Zinc oxide and zinc chloride produced from slab zinc and zinc in pigments and salts derived from zinc ore exceeded 41,300 tons.

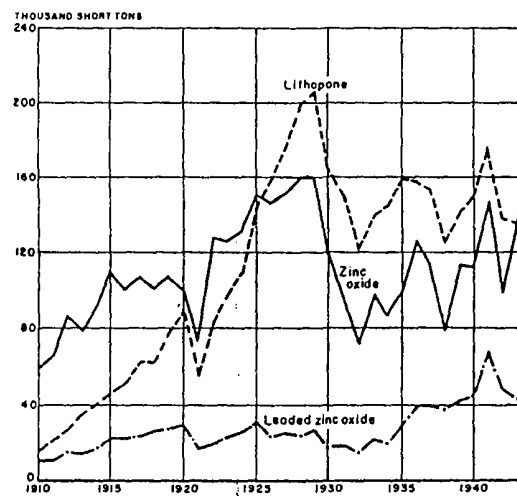


FIGURE 2.—Trends in shipments of zinc pigments and salts

¹ Prepared by Arnold M. Lansche, commodity specialist and assistant.

TABLE 18.—Salient statistics of the zinc pigments¹ industry of the United States

	1950-54 (average)	1955	1956	1957	1958	1959
Shipments:						
Zinc oxide.... short tons...	147,933	168,541	154,955	151,267	135,991	154,234
Leaded zinc oxide.... do....	43,978	32,661	27,164	24,203	23,288	22,626
Value of pigments.....	\$63,357,000	\$58,031,000	\$55,245,000	\$47,036,000	\$42,797,000	\$47,521,000
Value per ton received by producers:						
Zinc oxide.....	270	258	271	271	270	269
Leaded zinc oxide.....	281	259	282	249	203	267
Foreign trade:						
Value of imports.....	540,000	685,186	770,156	1,043,629	2,203,805	3,301,089
Value of exports.....	1,723,000	771,021	846,883	985,325	789,995	764,760
Export balance.....	1,183,000	85,435	76,727	-58,304	-1,473,870	-2,536,829

¹ Excludes lithopone; figure withheld to avoid disclosing individual company confidential data.

Lead-free zinc oxide was made by several processes: 65 percent from ores and residues by the American process, 24 percent from metal by the French process, and 11 percent by "Other" processes 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.

Three grades of leaded zinc oxide classified according to lead content were produced. There was no production of 5 percent or less of leaded zinc oxide reported; the more-than-5-through 35-percent grade constituted the bulk of production; smaller quantities were produced in the more-than-35-through 50-percent and over-50-percent grades.

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

TABLE 19.—Production and shipments of zinc pigments and salts¹ in the United States

Pigment or salt	1958				1959			
	Production (short tons)	Shipments			Production (short tons)	Shipments		
		Short tons	Value ¹			Short tons	Value ²	
			Total	Average			Total	Average
Zinc oxide ³	132,664	135,991	\$36,671,762	\$270	161,606	154,234	\$41,483,742	\$269
Leaded zinc oxide ³	22,844	23,288	6,125,033	263	23,550	22,626	6,037,604	267
Zinc chloride, 50° B	63,593	65,761	8,754,543	133	76,196	72,864	7,335,175	141
Zinc sulfate	34,513	33,737	4,927,162	146	41,353	40,670	6,322,882	156

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.

ZINC

TABLE 20.—Zinc pigments and salts¹ shipped by manufacturing States, in short tons

Year	Zinc oxide	Leaded zinc oxide
1950-54 (average).....	147,933	43,978
1955.....	168,541	32,661
1956.....	154,955	27,164
1957.....	151,267	24,203
1958.....	135,991	23,288
1959.....	154,234	22,626

¹ Excludes zinc sulfide and lithopone, figures withheld to avoid disclosing individual company confidential data.TABLE 21.—Zinc content of zinc pigments¹ and salts² manufactured, by sources, in short tons

Pigment or salt	1958					Zinc in p
	Zinc in pigments and salts produced from—				Total zinc in pig- ments and salts	
	Ore		Slab zinc	Second- ary ma- terial ¹		
	Do- mestic	For- eign				Ore
Zinc oxide.....	60,096	8,767	13,077	24,049	105,089	71,126
Leaded zinc oxide..	9,164	4,901			14,065	4,820
Total pigments.....	69,260	13,668	13,077	24,049	120,084	75,946
Zinc chloride.....			(1)	11,700	11,700	
Zinc sulfate.....	(1)	(1)		(1)	11,809	(1)

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 Materials because they include zinc recovered from byproduct sludges, residues, etc., not classified as waste.³ Figure withheld to avoid disclosing individual company confidential data.

Consumption.—Total lead-free zinc oxide shipments increased 17 percent, ceramics industry 15 percent, coated fabrics and textiles industries declined.

TABLE 22.—Distribution of zinc oxide shipments, by industry

Industry	1950-54 (average)	1955	1956
Rubber.....	75,344	88,677	80,459
Paints.....	33,427	33,932	32,485
Ceramics.....	8,723	10,617	10,160
Coated fabrics and textiles.....	6,974	11,263	8,447
Floor coverings.....	2,836	2,281	1,436
Other.....	19,829	23,771	21,968
Total.....	147,933	168,541	154,955

¹ Includes the following tonnages for rayon: 1955—5,769; 1956—7,721; 1957—10,160; for 1959 withheld to avoid disclosing individual company confidential data.

Paintmaking accounted for 92 percent of the leaded zinc oxide consumption. Rubber and other uses consumed the remainder.

TABLE 23.—Distribution of leaded zinc oxide shipments, by industries, in short tons

Industry	1950-54 (average)	1955	1956	1957	1958	1959
Paints.....	43,451	32,178	25,825	23,904	23,021	20,745
Rubber.....	76	483	339	209	267	1,578
Other.....	451					
Total.....	43,978	32,661	27,164	24,203	23,288	22,323

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

Statistics on end-use distribution of zinc chloride 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 64 and 13 percent, respectively, of the total shipments; the "Other" category (chemical, flotation reagents, glue manufacturing, medicinal, mineral, and rubber industries) received 23 percent. Zinc sulfate consumed by rayon manufacturers increased 32 percent, and that for other uses 287 percent; agricultural uses declined 54 percent, compared with 1958.

TABLE 24.—Distribution of zinc sulfate shipments by industries, in short tons

Year	Rayon		Agriculture		Other		Total	
	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis
1950-54 (average)....	9,019	7,282	6,076	5,241	6,559	4,958	21,654	17,481
1955.....	10,732	9,537	8,187	7,089	4,946	3,722	23,864	20,348
1956.....	21,083	18,825	7,051	6,291	4,066	3,190	32,200	28,308
1957.....	19,903	17,785	9,818	8,261	3,899	3,465	33,620	29,311
1958.....	19,796	17,747	11,525	9,819	2,416	2,191	33,737	29,757
1959.....	26,062	23,854	5,262	4,696	9,346	7,428	40,670	35,479

Prices.—American process lead-free zinc oxide was quoted at 14.5 cents a pound in carlots during 1959. The 5- to 35-percent leaded product made by this process was quoted in 15.125 cents a pound in carlots until October 12, when it was quoted at 15.375 cents, where it remained through December 31. Green-seal and white-seal French-process zinc oxides remained at 16.25 and 16.75 cents a pound in carlots, respectively, throughout the year; red seal opened the year at 15.25 cents and advanced 0.5 cent in May to 15.75, where it remained through December 31. Lithopone was at 9.125 cents a pound in less than carlots throughout 1959. Zinc chloride (50-percent solution), zinc sulfate (in less than carlots), and zinc sulfide (in carlots) were quoted at 5.15, 9.75, and 25.30 cents a pound, respectively, all year.

Foreign Trade.—Imports of zinc pigments and salts increased 46 per-

cent in value and 45 percent in quantity of imported totaled about 19,100 tons. Zinc oxide accounted for 85 percent of these imports.

TABLE 25.—Value of zinc pigments and salts imported into the United States

[Bureau of the Census]

	Imports for consumption		
	1957	1958	1959
Zinc pigments:			
Zinc oxide.....	\$1,043,629	\$2,263,865	\$3,301,089
Zinc sulfide.....	104,930	91,273	72,280
Lithopone.....	8,124	9,307	8,762
Total.....	1,156,683	2,364,445	3,382,121
Zinc salts:			
Zinc arsenate.....		3,776	
Zinc chloride.....	104,498	92,046	127,405
Zinc sulfate.....	74,710	60,171	168,817
Total.....	179,208	155,993	296,222
Grand total.....	1,335,891	2,520,438	3,678,343

¹ Data not available.

TABLE 26.—Zinc pigments and salts imported for consumption

[Bureau of the Census]

Year	Short tons				
	Zinc oxide		Lithopone	Zinc sulfide	Zinc chloride
	Dry	In oil			
1950-54 (average)....	2,109	8	420	32	3
1955.....	3,320		30	265	5
1956.....	3,667		143	510	6
1957.....	5,245		57	342	6
1958.....	11,729		69	295	5
1959.....	16,510		73	235	7

¹ Less than 1 ton.

² Data known to be not comparable to other years.

Exports of zinc oxide and lithopone together totaled about 19,100 tons. Zinc oxide was down 1 percent, and quantity exported.

TABLE 27.—Zinc pigments exported from the United States

[Bureau of the Census]

Year	Short tons		Total value	Year
	Zinc oxide	Lithopone		
1950-54 (average)....	5,137	9,351	\$3,230,180	1957.....
1955.....	2,549	1,892	1,072,551	1958.....
1956.....	2,748	1,337	1,084,775	1959.....

STOCKS

National Stockpile.—Inventories in the National Stockpile at the end of 1959 approximately equaled or exceeded the basic and maximum objectives. During 1959, 3,000 tons of domestically produced zinc was reported by industry^a 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 also acquired 27,787 tons of foreign zinc in 1959, under surplus agricultural-product barter contracts authorized under the Agricultural Trade Development and Assistance Act of 1954 and amendments. The 322,094 tons acquired from 1956 through 1959 under this program was placed in the supplemental stockpile.

Producers' Stocks.—Smelters' stocks of slab zinc began the year at 184,000 tons, rose to 206,000 tons by the end of March. They declined to 169,000 tons at the end of June, rose to 193,000 tons at the end of September, and then followed a downward trend to a yearend low of 156,500 tons.

TABLE 28.—Stocks of zinc at zinc-reduction plants in the United States at end of year, in short tons

	1955	1956	1957	1958	1959
At primary reduction plants.....	37,322	64,794	153,338	182,111	152,657
At secondary distilling plants.....	1,942	2,081	2,495	1,909	3,800
Total.....	39,264	66,875	155,833	184,020	156,457

¹ Revised figure.

Consumer Stocks.—Stocks of slab zinc at consumers' plants were 93,600 tons at the beginning of the year and declined during the next 4 months to the year's low of about 75,000 tons at the end of April. A general upward trend occurred for the remainder of the year, and stocks reached a high of 102,200 tons at yearend. An additional 7,000 tons of slab zinc was in transit to consumer plants. At the average monthly rate of consumption, total consumer stocks plus metal in transit represented about 6 weeks' supply.

TABLE 29.—Consumers' stocks of slab zinc at plants at the beginning and end of 1958, by industries, in short tons

	Galva- nizers	Brass mills ¹	Zinc die casters ²	Zinc rolling mills	Oxide plants	Other	Total
Dec. 31, 1958.....	48,260	12,226	20,783	5,019	178	1,153	93,609
Dec. 31, 1959.....	50,773	13,412	25,201	4,930	303	1,396	102,195

¹ Includes brass mills, brass ingot makers, and foundries.

² Includes producers of zinc-base die castings, zinc-alloy dies, and zinc-alloy rods.

³ Revised figures.

⁴ Stocks on Dec. 31, 1958 and 1959, exclude 747 tons and 696 tons, respectively, of remelt spelter.

^a Kimberly, J. L., A review of the Zinc Industry in the United States During 1959, Am. Zinc Inst., New York 17, N.Y., 16 pp.

ZINC

PRICES

The quoted price for Prime Western zinc at 12 cents per pound at the beginning of 1959. On decreased 0.5 cent to 11 cents, where it remained when an increase of 1 cent raised the price to 12 cents. The price was again raised 1 cent to 13 cents by 0.5 cent to 12.5 cents by other smelters. This until November 2, when the price was established it remained the balance of the year, averaging for the year.

The average monthly zinc quotation on the L was 82.127 a long ton (equivalent to 10.27 cents at the exchange rate recorded by the Federal price for January was 74.884 (9.36 cents a pound) a low of 71.125 (8.96 cents per pound) in early March (12.17 cents per pound) in November; the price 95.190 (11.9 cents per pound) was the highest represented a considerable gain during the year.

TABLE 30.—Price of zinc concentrate

	1955	1956
Joplin 60-percent zinc concentrate: ¹ Price per short ton.....	77.50	83.8
Average price common zinc at—		
St. Louis (spot) ¹.....cents per pound..	12.30	13.4
New York ¹.....do.....	12.80	13.9
London ².....do.....	11.30	12.1
Price indexes (1947-49 average=100): ³		
Zinc (New York).....	101	111
Lead (New York).....	94	100
Copper (New York).....	177	199
Straits tin (New York).....	103	117
Nonferrous metals.....	143	155
All commodities.....	111	111

¹ Metal Statistics, 1960.

² E&MJ Metal and Mineral Markets English quotations converted average rates of exchange recorded by Federal Reserve Board.

³ Based upon price indexes of U.S. Department of Labor.

Prices of new and old scrap zinc varied with slab zinc. Sales of clean new zinc clippings, gravers' or lithographers' plates averaged 5 cents where they remained through August. In September and December the average price increased 0.19 cents, respectively, to a 6.69 cents per pound; the price ranged from 4.75 to 7 cents per pound; the price ranged from 4.75 to 7 cents per pound, averaging 3.67 cents.

TABLE 31.—Average monthly quoted prices of 60-percent zinc concentrate at Joplin, and of common zinc (prompt delivery or spot), St. Louis and London¹

Month	1958			1959		
	60-percent zinc concentrates in the Joplin region (dollars per ton)	Metallic zinc (cents per pound)		60-percent zinc concentrates in the Joplin region (dollars per ton)	Metallic zinc (cents per pound)	
		St. Louis	London **		St. Louis	London **
January.....	56.00	10.00	7.88	68.00	11.50	9.26
February.....	56.00	10.00	8.05	67.50	11.42	9.21
March.....	56.00	10.00	8.00	64.00	11.00	9.47
April.....	56.00	10.00	7.86	64.00	11.00	9.16
May.....	56.00	10.00	7.79	64.00	11.00	9.73
June.....	56.00	10.00	8.02	64.00	11.00	9.28
July.....	56.00	10.00	7.95	64.00	11.00	10.18
August.....	56.00	10.00	7.98	64.00	11.00	10.28
September.....	56.00	10.00	8.13	65.56	11.38	10.76
October.....	62.50	10.87	8.81	72.30	12.28	11.42
November.....	66.80	11.40	9.41	76.00	12.50	11.87
December.....	68.00	11.50	9.29	76.00	12.50	11.90
Average for year.....	60.55	10.31	8.24	60.36	11.46	10.27

¹ Joplin: Metal Statistics, 1960, p. 592. St. Louis: Metal Statistics, 1960, p. 559. London: E&MJ Metal and Mineral Markets.

² Conversion of English quotations into American money based on average rates of exchange recorded by Federal Reserve Board.

³ Average of daily mean of bid and asked quotations at morning session of London Metal Exchange.

TABLE 32.—Average price received by producers of zinc, by grades, in cents a pound

Grade	1955	1956	1957	1958	1959
Grade A:					
Special High Grade.....	12.79	14.26	12.13	10.45	11.73
High Grade.....	12.59	13.98	11.70	10.13	11.43
Grade B: Intermediate.....	12.30	14.06	11.69	10.81	11.44
Grades C and D:					
Brass Special.....	12.21	13.71	11.31	10.38	11.30
Select.....	11.13	13.41	10.56	10.48	10.93
Grade E: Prime Western.....	11.74	13.13	11.24	9.98	11.18
All grades.....	12.29	13.73	11.64	10.22	11.47
Prime Western; spot quotation at St. Louis ¹	12.80	13.49	11.40	10.31	11.46

¹ Metal Statistics, 1960, p. 559.

FOREIGN TRADE

Imports.—Import quotas imposed October 1, 1958, by Presidential Proclamation 3257, dated September 22, 1958, were in effect throughout 1959. The quotas limited annual competitive imports of unmanufactured zinc (not including zinc in fume) to 379,840 tons in ores and concentrates and 141,120 tons as metal. The quotas established were 80 percent of the average dutiable imports into the United States during 1953-57. Specific quotas were assigned to major importing countries and an "all other" quota was established to cover the needs of the remaining small importers.

Imports for consumption (imports for immediate consumption plus withdrawals for consumption from bonded warehouses) given in table 35 give a close approximation of dutiable imports of unmanufactured zinc entering the United States and reflect the effect of the quotas.

Comparison of competitive imports in 1959 and 1957 (the last full year before establishing a quota of 36 percent for zinc ores and concentrates as metal. Zinc fume was excluded from quota). Imports increased from 36,000 tons in 1958 to 1959.¹⁰

General imports (imports for immediate consumption into bonded warehouses) presented in table 36 show that imports of unmanufactured zinc into the United States increased 8 percent to 499,500 tons for 1959 and decreased 20 percent to 157,000 tons for 1958.

Exports.—Exports of slab zinc increased from 11,600 tons in 1958 to 11,600 tons in 1959. Significant increases were reported for the United Kingdom, Sweden, India, Chile, Mexico, and Oceania.

TABLE 33.—Zinc imported into the United States, by countries, in short tons

[Bureau of the Census]			
Country	1950-54 (average)	1955	1956
Ores (zinc content):			
North America:			
Canada.....	129,267	173,157	177,111
Cuba.....	36	3,704	1,111
Guatemala.....	5,303	8,353	11,111
Honduras.....	401	1,433	2,111
Mexico.....	168,903	196,461	193,111
Other North America.....	11		
Total.....	303,921	373,108	384,111
South America:			
Argentina.....	1,231		
Bolivia.....	12,046	1,833	7,111
Chile.....	1,241	4,838	
Peru.....	63,600	83,915	98,111
Other South America.....	279	142	
Total.....	68,397	90,748	106,111
Europe:			
Germany, West.....			
Italy.....	1,748		
Spain.....	9,479	3,043	1,111
Other Europe.....	4,597		
Total.....	15,824	3,043	1,111
Asia:			
Philippines.....	863	465	
Other Asia.....	481		
Total.....	1,349	465	
Africa:			
Union of South Africa.....	5,781	5,050	13,111
Other Africa.....	601	5,630	17,111
Total.....	6,382	5,050	13,111
Oceania: Australia.....	4,154	5,630	17,111
Grand total.....	400,027	478,044	525,111

See footnotes at end of table.

¹⁰ U.S. Tariff Commission Report to the Congress on Imports and Exports of Metals, March 1960, table 18.

TABLE 33.—Zinc imported into the United States, in ores, blocks, pigs, or slabs, by countries, in short tons—Continued

[Bureau of the Census]

Country	1950-54 (average)	1955	1956	1957	1958	1959
Blocks, pigs, or slabs:						
North America:						
Canada.....	95,371	113,402	110,875	103,964	93,475	88,414
Mexico.....	17,809	19,480	17,163	23,536	23,266	9,338
Total.....	113,240	132,882	134,028	127,500	116,731	97,752
South America: Peru.....	3,699	9,707	6,690	22,947	9,736	12,377
Europe:						
Austria.....			2,296	1,020	110	220
Belgium-Luxembourg.....	8,034	17,748	32,353	34,103	21,707	7,606
Germany ¹	5,264	6,642	15,285	8,772	2,673	55
Italy.....	7,200	6,190	13,486	10,010	6,166	7,438
Netherlands.....	2,407	1,079	5,906	2,504	2,520	—
Norway.....	3,194	804	—	—	2,769	168
United Kingdom.....	1,379	79	611	1,791	672	841
Yugoslavia.....	1,035	—	600	10,909	5,781	3,643
Other Europe.....	160	—	110	—	—	—
Total.....	28,603	32,242	70,000	60,160	42,398	20,052
Asia:						
Japan.....	44	—	4,883	2,887	2,039	—
Other Asia.....	(²)	—	—	—	—	—
Total.....	44	—	4,883	2,887	2,039	—
Africa:						
Belgian Congo.....	2,950	15,228	17,782	33,007	20,991	12,790
Rhodesia and Nyasaland, Federation of.....	* 213	280	3,808	3,074	1,064	4,667
Other Africa.....	110	1,264	—	—	—	—
Total.....	3,279	16,772	21,590	36,981	22,055	17,457
Oceania: Australia.....	1,400	4,033	7,281	9,823	2,240	9,366
Grand total: Blocks, pigs, or slabs.....	160,231	195,696	244,978	269,007	195,199	150,963

¹ Data include zinc imported for immediate consumption plus material entering country under bond.² Revised figure.³ Less than 1 ton.⁴ Includes 52 tons imported from French Pacific Islands.⁵ West Germany, 1952-59.⁶ Northern Rhodesia.

ZINC

TABLE 34.—Zinc imported for consumption in the thousand dollars

[Bureau of the Census]

Year	Ore (zinc content)		Blocks, pigs, slabs		Slabs
	Short tons	Value	Short tons	Value	
1950-54 (average).....	381,704	* \$51,437	148,844	\$38,017	—
1955.....	384,648	36,811	195,069	40,452	—
1956.....	402,379	49,231	244,726	66,034	—
1957.....	679,416	88,516	268,824	* 64,129	—
1958.....	* 637,699	* 61,121	185,093	* 35,511	—
1959.....	436,009	38,568	104,462	33,906	—

Year	Dross and skimmings	
	Short tons	Value
1950-54 (average).....	2,789	\$221
1955.....	108	8
1956.....	417	61
1957.....	353	67
1958.....	737	77
1959.....	955	110

¹ Excludes imports for manufacture in bond and export, which are reported by Bureau of the Census.² Data known to be not comparable with other years.³ Revised figure.⁴ In addition manufactures of zinc were imported as follows: * 1950-

* 1956—\$287,361; * 1957—\$204,348; 1958—\$389,803; 1959—\$811,916.

TABLE 35.—Zinc imported for consumption in the United States, in ores, blocks, pigs, or slabs, by countries, in short tons

[Bureau of the Census]

Country	1950-54 (average)	1955	1956	1957	1958	1959
Ores (Zinc content):						
North America:						
Canada.....	132,502	162,307	146,110	146,110	146,110	146,110
Cuba.....	148	428	—	—	—	—
Guatemala.....	5,021	8,137	—	—	—	—
Honduras.....	258	78	—	—	—	—
Mexico.....	154,129	155,647	187,110	187,110	187,110	187,110
Other North America.....	13	—	—	—	—	—
Total.....	292,071	316,597	343,220	343,220	343,220	343,220
South America:						
Argentina.....	882	—	—	—	—	—
Bolivia.....	10,147	170	—	—	—	—
Chile.....	1,130	4,686	—	—	—	—
Peru.....	48,417	57,454	91,110	91,110	91,110	91,110
Other South America.....	281	83	—	—	—	—
Total.....	60,857	62,393	97,220	97,220	97,220	97,220
Europe:						
Germany, West.....	(¹)	—	—	—	—	—
Italy.....	2,539	—	—	—	—	—
Spain.....	9,972	—	—	—	—	—
Other Europe.....	4,477	3,043	—	—	—	—
Total.....	16,988	3,043	—	—	—	—

See footnotes at end of table.

TABLE 35.—Zinc imported for consumption in the United States, in ores, blocks, pigs, or slabs, by countries, in short tons—Continued

[Bureau of the Census]						
Country	1950-54 (average)	1955	1956	1957	1958	1959
Ores (Zinc content)—Continued						
Asia:						
Philippines.....	888	465	816	942	92	29
Other Asia.....	446			9	211	
Total.....	1,314	465	816	951	303	29
Africa:						
Union of South Africa.....	6,605	7	407	19,751	* 27,100	4,963
Other Africa.....	689			(¹)	524	1,376
Total.....	7,104	7	407	19,751	* 27,714	6,338
Oceania: Australia.....	3,280	2,143	14,995	6,710	* 6,100	24,809
Grand total: Ores.....	381,704	384,648	462,379	678,416	* 537,699	436,009
Blocks, pigs, or slabs:						
North America:						
Canada.....	95,380	113,402	116,875	103,064	93,327	88,414
Mexico.....	10,528	18,730	16,929	23,690	22,804	9,718
Total.....	111,908	132,132	133,804	127,654	116,131	98,132
South America: Peru.....	3,696	9,767	6,690	22,047	9,736	12,537
Europe:						
Austria.....			2,290	1,020	55	805
Belgium-Luxembourg.....	8,034	17,748	32,353	34,163	17,969	11,648
Germany.....	5,254	6,642	15,257	8,772	2,035	662
Italy.....	7,140	6,303	13,486	10,010	5,816	7,173
Netherlands.....	2,407	1,079	5,955	2,504	730	1,705
Norway.....	3,194	604			2,601	525
United Kingdom.....	1,379	79	611	1,791	112	1,389
Yugoslavia.....	1,035		600	10,572	5,009	3,584
Other Europe.....	160		110			
Total.....	28,612	32,355	70,678	68,832	34,327	26,560
Asia:						
Japan.....	44		4,883	2,887	1,708	855
Other Asia.....	(¹)					
Total.....	44		4,883	2,887	1,708	855
Africa:						
Belgian Congo.....	2,956	16,228	17,782	33,007	20,991	12,790
Rhodesia and Nyasaland, Federation of.....	* 213	280	3,808	3,974	560	4,840
Other Africa.....	110	1,264				298
Total.....	3,279	16,772	21,590	36,981	21,551	17,928
Oceania: Australia.....	1,406	4,033	7,281	9,823	2,240	9,141
Grand total: Blocks, pigs, or slabs.....	148,844	195,059	244,726	268,824	186,603	164,462

* Excludes imports for manufacture in bond and export, classified as "Imports for consumption" by Bureau of the Census.

¹ Revised figure.

² Less than 1 ton.

³ Includes 52 tons imported from French Pacific Islands.

⁴ West Germany, 1952-59.

⁵ Northern Rhodesia.

TABLE 36.—Slab and sheet zinc exported from the United States, in short tons

[Bureau of the Census]				
Destination	Slabs, pigs, and blocks			
	1956	1957	1958	1959
North America:				
Canada.....	8	13	6	
Cuba.....	86	31	31	
Mexico.....	839	613	* 646	1,000
Other North America.....	21	58	46	
Total.....	954	615	* 928	1,000
South America:				
Argentina.....		6		
Brazil.....	49	17		
Chile.....	96	40	36	
Colombia.....		55	14	
Venezuela.....	1		8	
Other South America.....	7	3		
Total.....	153	121	58	
Europe:				
Belgium-Luxembourg.....	1,428	1,064		1,000
Denmark.....				
Germany, West.....	279	336		
Italy.....				
Netherlands.....	44	478		2,000
Sweden.....				
Switzerland.....	448			
United Kingdom.....	5,040	6,504	672	4,000
Other Europe.....	25	(¹)		
Total.....	7,264	8,380	672	8,000
Asia:				
India.....	2	672		6,000
Japan.....	1	4	1	
Korea, Republic of.....	433	912		
Philippines.....		8	5	
Other Asia.....	6	73	405	
Total.....	442	1,669	411	6,000
Africa:				
Union of South Africa.....				
Other Africa.....			4	
Total.....			4	
Oceania:				
Australia.....				2,000
Grand total.....	8,813	10,785	* 2,073	11,000

* Due to changes in classification by Bureau of the Census data for earlier years.

¹ Revised figure.

² Less than 1 ton.

TABLE 37.—Zinc ore and manufactures of zinc exported from the United States, in thousand dollars

[Bureau of the Census]

Year	Zinc ore, concentrates (zinc content)		Slabs, pigs, or blocks		Sheets, plates, strips, or other forms, n.e.s.		Zinc scrap and dross (zinc content)		Zinc dust	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1950-54 (average) ¹	2, 111	\$543	30, 021	\$10, 817	4, 859	\$2, 893	5, 897	\$804	(²)	(²)
1955	854	162	18, 009	4, 175	3, 037	2, 193	21, 612	2, 250	445	\$162
1956	7	(³)	8, 813	2, 465	4, 444	3, 031	14, 921	1, 540	372	136
1957	7	(³)	10, 785	2, 853	4, 056	2, 950	8, 469	822	695	198
1958	1	(³)	2, 673	4704	3, 818	2, 437	6, 344	361	619	170
1959	1	(³)	11, 620	2, 673	3, 629	2, 708	11, 332	1, 053	621	162

¹ Effective Jan. 1, 1952, zinc and zinc-alloy semifabricated forms, n.e.c., were exported as follows: 1952—\$101,740 (quantity not available); 1953—286 tons (\$151,406); 1954—543 tons (\$257,316); 1955—651 tons (\$295,686); 1956—582 tons (\$301,230); 1957—485 tons (\$246,527); ² 1958—1,168 tons (\$542,000); 1959—1,071 tons (\$612,388).

³ Not included in 1950-54 averages; 1950—606 tons (\$186,557); 1951—723 tons (\$400,066); 1952 included with "scrap"; 1953—802 tons (\$181,056); 1954—609 tons (\$160,760).

⁴ Less than \$1,000.

⁵ Revised figure.

⁶ Due to changes in classification by the Bureau of the Census, data not strictly comparable to earlier years.

Tariff.—The duty on slab zinc remained at 0.7 cent a pound, that on zinc contained in ore and concentrate at 0.6 cent a pound, and that on zinc scrap at 0.75 cent a pound throughout 1959. The duties on zinc articles under the Tariff Act of 1930 were unchanged, remaining as shown on page 1290, Volume I, 1953 Minerals Yearbook.

WORLD REVIEW

NORTH AMERICA

Canada.—Consolidated Mining & Smelting Co. continued to lead Canadian zinc production. According to the annual company report, the Sullivan silver-lead-zinc mine at Kimberly, British Columbia, produced 2,440,000 tons of crude ore. Rock excavation was nearly completed on the 500-foot extension to the main shaft to open two new levels for production. The Bluebell lead-zinc mine at Riondel, British Columbia, produced 251,400 tons of ore. Shaft sinking to lower levels was in progress, but some difficulty was encountered from water. The H. B. zinc-lead mine near Salmo, British Columbia, produced 463,500 tons of ore. An exploration program consisting of a 900-foot adit and 1,200 feet of drifting in the main ore zone was conducted at the Duncan lead-zinc property in the Lardeau area of British Columbia. Production of slab zinc at the company electrolytic plant at Trail, British Columbia, was 194,499 tons, 76 percent of total Canadian output. Approximately 78 percent was produced from concentrates of company-owned mines, 11 percent from retreatment of stockpiles of zinc-plant residues and lead-blast furnace slag, and 11 percent from purchased ores and concentrates.

ZINC

TABLE 38.—World mine production of zinc (content short tons) ¹

[Compiled by Augusta W. Jann and Beronice B.]

Country ²	1950-54 (average)	1955	1956
North America:			
Canada ⁴	360, 879	433, 357	422, 633
Cuba		1, 134	1, 638
Greenland ⁵			0, 060
Guatemala ⁶	5, 540	10, 400	12, 000
Honduras ⁶	400	1, 433	2, 288
Mexico	238, 338	296, 061	274, 351
United States ⁴	698, 293	514, 071	542, 340
Total	1, 203, 448	1, 267, 955	1, 201, 300
South America:			
Argentina	17, 319	23, 260	26, 350
Bolivia (exports)	28, 064	23, 500	18, 818
Chile	1, 909	3, 200	2, 969
Peru	136, 137	183, 074	193, 037
Total	183, 029	233, 043	241, 174
Europe:			
Austria	4, 480	5, 787	5, 868
Bulgaria ⁷	22, 900	35, 200	39, 400
Finland	4, 365	23, 300	43, 000
France	14, 100	12, 100	13, 870
Germany:			
East ⁸	5, 300	7, 700	7, 700
West	91, 347	101, 558	101, 898
Greece ⁷	6, 941	13, 500	22, 300
Ireland	1, 453	2, 709	1, 798
Italy	115, 649	132, 057	137, 531
Norway	9, 011	7, 411	7, 007
Poland ⁹	137, 500	139, 000	138, 000
Spain	87, 150	101, 800	96, 100
Sweden	47, 925	64, 810	72, 797
U. S. S. R. ¹⁰	207, 000	260, 000	310, 000
United Kingdom	1, 811	3, 167	1, 563
Yugoslavia	53, 455	65, 834	63, 426
Total ¹¹	815, 000	985, 000	1, 071, 000
Asia:			
Burma	2, 623	9, 100	8, 100
China ¹²	11, 000	31, 000	39, 000
India	1, 929	2, 900	4, 200
Iran ¹³	7, 700	6, 300	5, 200
Japan	90, 399	119, 787	135, 585
Korea:			
North ¹⁴	10, 600	39, 000	55, 000
Republic of	115		440
Philippines	1, 089		1, 050
Thailand	1, 270	3, 200	2, 400
Turkey ¹⁵	2, 403	770	1, 090
Total ¹⁶	134, 600	213, 000	253, 000
Africa:			
Algeria	10, 791	35, 982	35, 703
Belgian Congo	104, 179	74, 700	129, 561
Egypt	704		602
Morocco: Southern zone	28, 416	47, 686	46, 649
Rhodesia and Nyasaland, Federation of:			
Northern Rhodesia	26, 897	38, 070	38, 134
South-West Africa ¹⁷	17, 082	23, 728	18, 612
Tunisia	4, 155	6, 311	5, 200
Total	198, 224	222, 118	270, 557
Oceania:			
Australia	240, 978	287, 352	311, 452
World total (estimate) ¹⁸	2, 776, 000	3, 200, 000	3, 420, 000

¹ Data derived in part from Yearbook of American Bureau of Metal Statistics, Yearbook, and Statistical Summary of Mineral Industry (Overseas Section).

² In addition to countries listed, Czechoslovakia and Rumania also are not available; estimates for these countries are included in totals.

³ This table incorporates some revisions. Data do not add exactly to where estimated figures are included in detail.

⁴ Recoverable.

⁵ Estimate.

⁶ U. S. imports.

⁷ Includes zinc content of mixed ores, except 1959 figure, which represents smelter production.

⁸ Year ended March 21 of year after that stated.

⁹ 1 year only, as 1954 was first year of commercial production.

¹⁰ 1954 figure for 1955-56.

TABLE 39.—World smelter production of zinc by countries,¹ in short tons²

[Compiled by Augusta W. Jann and Doronice B. Mitchell]

Country	1950-54 (average)	1955	1956	1957	1958	1959
North America:						
Canada.....	229,804	256,542	255,604	247,310	252,093	255,342
Mexico.....	59,645	61,878	62,136	62,353	63,329	61,882
United States.....	869,622	903,504	983,610	985,706	781,246	798,668
Total.....	1,159,101	1,281,924	1,301,310	1,295,465	1,096,668	1,115,870
South America:						
Argentina.....	11,191	14,881	16,200	16,150	17,400	³ 17,600
Peru.....	6,971	18,801	10,419	32,483	32,034	29,598
Total.....	18,162	33,682	26,619	48,633	49,434	47,198
Europe:						
Austria.....		1,493	7,932	10,291	11,698	12,508
Belgium.....	214,187	233,625	264,289	259,765	236,730	247,250
Bulgaria.....		1,497	6,435	8,282	9,000	9,900
France.....	92,152	123,624	124,108	143,905	165,190	162,200
Germany, West.....	180,180	197,020	204,964	202,648	146,818	182,046
Italy.....	58,576	76,201	79,817	82,107	78,050	83,499
Netherlands.....	26,345	31,347	31,980	33,085	29,285	35,445
Norway.....	45,523	60,176	53,762	53,290	50,180	53,218
Poland.....	137,500	172,200	109,000	175,013	179,252	185,263
Spain.....	24,331	26,291	25,381	24,138	27,239	26,309
U.S.S.R. ⁴	207,000	260,000	310,000	330,000	360,000	420,000
United Kingdom.....	81,246	91,108	91,247	86,111	83,537	81,722
Yugoslavia.....	15,034	15,176	21,890	32,473	34,445	35,220
Total.....	1,009,000	1,284,000	1,388,000	1,447,000	1,418,000	1,510,000
Asia:						
China (refined).....	11,000	29,000	38,000	41,000	45,000	66,000
Japan.....	78,676	124,075	150,159	152,182	155,401	176,642
Total.....	89,676	153,075	188,159	193,182	200,401	242,642
Africa:						
Belgian Congo.....	⁵ 21,936	37,443	46,390	54,227	58,905	60,418
Rhodesia and Nyasaland, Fed. of Northern Rhodesia.....	26,897	31,248	32,390	33,040	33,880	33,488
Total.....	48,833	68,691	78,780	87,267	92,785	93,906
Oceania: Australia.....	90,188	113,220	117,592	123,589	128,547	130,436
World Total (estimate).....	2,480,000	2,930,000	3,100,000	3,100,000	2,900,000	3,140,000

¹ In addition to countries listed Czechoslovakia and Rumania also produce zinc, but production data are not available; estimates are included in total.

² Data derived in part from Yearbook of American Bureau of Metal Statistics, United Nations Monthly Bulletin and Statistical Yearbook, and Statistical Summary of Mineral Industry (Overseas Geol. Surveys, London).

³ This table incorporates some revisions. Data do not add exactly to totals shown because of rounding where estimated figures are included in detail.

⁴ In addition other zinc-bearing materials totaling 30,288 tons in 1953; 18,545 in 1954; 37,442 in 1955; 39,564 in 1956; 30,504 in 1957; 19,572 in 1958; and 314 in 1959.

⁵ Estimate.

⁶ Includes production from reclaimed scrap.

⁷ Average for 1953-54.

The annual report of the Pend Oreille Mines & Metals Co. showed that the Reeves McDonald Mines, Ltd., produced 421,600 tons of ore at its Remac, British Columbia mine, yielding 32,376 tons of concentrates containing 14,267 tons of zinc and 4,408 tons of lead plus values in silver and cadmium. Shaft sinking was completed to an elevation of 1,045 feet above sea level. Other development work was accomplished to assure future production.

Sheep Creek Mines, Ltd., Windermere, British Columbia, reported

production for the year ending May 31, 1959, grading 2.36 percent lead and 5.45 percent zinc.

Hudson Bay Mining & Smelting Co. of Manitoba-Saskatchewan boundary and retained Canada's second largest producer of zinc. Tons of ore, an increase of 1,500 tons over 1958, 7.4 percent from the Flin Flon mine, 7.4 percent from the Schist Lake mine, and 5.9 percent from the Schist Lake development work at its Coronation mine, Flin Flon, at the Stall Lake mine, 4 miles and at Chisel Lake, 5 miles southwest of production at the company electrolytic zinc plant (toba) was 62,582 tons—25 percent of the total.

The Manitowadge (Ontario) mine of V. the third largest zinc producer in Canada for the year indicated mill feed to be 375,000 tons containing 32,500 tons of zinc, 2,750 tons of lead, and considerable quantities of silver and gold.

Geco Mines, Ltd., at Manitowadge, mill with a calculated grade of 2.10 percent copper, 1.30 ounces per ton of silver. The ore yields concentrates assaying 54.7 percent zinc. Flotation continued, and major improvements in ventilation system.

Sherbrooke Metallurgical Co., a subsidiary of Zinc Co., was erecting a zinc roasting and sintering plant at Maitland, Ontario. The two roasters (with 100 tons of concentrate) were expected to be operating in 1960. A long-term contract was made for the roasted zinc concentrate was to be sold to the company's two plants in the United States and Europe.

In Quebec, Quemont Mining Corp., Ltd. is producing ore containing 2.64 percent zinc plus values in silver and gold. Production was 32,071 tons of zinc concentrates. During the year, the shaft was providing four additional levels at 150-foot intervals. Producers of zinc concentrate included W. J. which treated 311,000 tons of ore containing 4.36 percent copper, and produced 16,630 tons of zinc concentrate assaying 51.3 percent zinc; and Normetal M. milled 376,400 tons of a copper-zinc-gold-silver concentrate assaying 52 percent zinc.

The Mattagami area of northwestern Quebec is the center of intense exploration by numerous companies. Over a dozen drills were active along the main line. General structural and stratigraphic control has been established as a guide to further exploration.

¹¹ Mining Magazine (London), vol. 101, No. 4, October 1959.

¹² Hudson Bay Mining & Smelting Co., Annual Report, 1959.

¹³ Northern Miner, vol. 45, No. 48, Jan. 14, 1960, p. 1.

¹⁴ Precambrian Mining in Canada, vol. 82, No. 11, Nov. 1959.

¹⁵ Northern Miner, vol. 65, No. 48, Feb. 18, 1960, p. 1.

In New Brunswick, Heath Steele Mines, Ltd. (subsidiary of American Metal Climax, Inc.) remained on a standby basis.¹⁶

In Newfoundland, Buchans Mining Co., Ltd., operated its lead-zinc-copper property near Red Indian Lake throughout the year. Production, as of June 1, was curtailed to 90 percent of the 1958 rate, conforming with the announcement made by the company at the United Nations-sponsored meeting on lead and zinc. The new concrete-lined McLean shaft was deepened 1,321 feet to reach 3,444 feet. Diamond drilling extended the R-4 ore body 740 feet to a depth of 3,265 feet. Shaft sinking was to be suspended at 3,521 feet, pending additional work to determine the extent of the ore body.¹⁷

In the Yukon Territory, United Keno Hill Mines, Ltd., operated its Mayo district silver-lead-zinc mine. Production for the year consisted of 16,074 tons of lead concentrate and 13,767 tons of zinc concentrate containing 8,859 tons of zinc plus values of silver, lead, and cadmium. Ore reserves at yearend were estimated to be 550,000 tons assaying 38.21 ounces of silver per ton, with 6.60 percent lead and 4.89 percent zinc.¹⁸

Greenland.—The lead-zinc mine at Mestersvig probably would be depleted in about 3 years, because the reserve in the mine and surrounding area was not increased despite vigorous prospecting.¹⁹

Mexico.—The Mexican Government previously had decided to proceed with construction of a Government-owned zinc refining plant to be organized under the corporate name of Zincamex S.A. to process zinc concentrates of producers not handled by private smelters. The process to be used had not been decided upon nor had the plant location been selected.

American Smelting & Refining Co. continued operating its extensive zinc-producing units in Mexico but at a somewhat reduced rate.

American Metal Climax, Inc., through its Mexican subsidiary, Cia. Minera de Penoles, S.A. mined 242,000 tons of ore. This was a 30-percent reduction from 1958, partly reflecting the announcement of the company at the United Nations meeting of its intent to reduce production voluntarily. The 3½-mile haulage tunnel at the Avalos mine, begun in 1957, was nearly complete at the end of 1959 and was expected to be in operation by April 1960.

San Francisco Mines of Mexico, Ltd., at the San Francisco and Clarines mines, Chihuahua, during the year ended September 30, 1959, milled 823,000 tons of crude ore yielding 55,000 tons of 65.58 percent lead concentrate, 94,000 tons of 57.50 percent zinc concentrate, and 8,300 tons of 27.67 percent copper concentrate.

Fresnillo Co. continued to operate its lead-zinc mines at Fresnillo in Zacatecas and at Naica in Chihuahua. In the year ending June 30, 1959, the company milled 581,600 tons of ore at the Fresnillo mill and 353,900 tons of ore at the Naica mill, yielding respectively 36,247 and 30,977 tons of 51.8 and 52.4 percent zinc concentrate.

El Potosi Mining Co. (subsidiary of Howe Sound Co.) operated its

ZINC

El Potosi mine in the Santa Eulalia district. The company's annual report disclosed several ore bodies of average size. Minas de Iquala, S.A., subsidiary of The Potosi Mining Co., operated its zinc-lead-copper mine and mill near

SOUTH AMERICA

Argentina.—Compania Minera Aguilar, Joseph Lead Co., operated its lead-zinc-silver mine at Jujuy. The mill treated a record tonnage of 67,500 tons of zinc concentrate, compared with 50,000 tons in 1958. The zinc concentrate was roasted at the Borghi. The sinter was reduced to slab zinc in a smelter owned by Cia. Metalúrgica Austral. Production of slab zinc by Austral smelter was curtailed by power shortages and dropped from 9,800 tons in 1959.²⁰

Production at National Lead Co. operated in 1959 was to be 15,100 tons of concentrate containing 9,000 tons of zinc.

Bolivia.—The Pulacayo and Animas mines were the principal Bolivian zinc producers. Total reported production for 1958 was 3,700 tons in 1959.

Peru.—Production of slab zinc at La Oroya, Pasco Corp. was 29,595 tons, smelted entirely at company-owned mines.²¹ Compagnie Minière du Pérou, S.A., experienced its most profitable year in 6 years before. Minas de Venturosa, S.A., its mine and contracting mill were shut down in 1959. The future of the company was uncertain. The Minerales Santander, Inc., initially placed in liquidation in 1958, produced 21,865 tons of zinc concentrate. Other important zinc producers in Peru were Volcan, Atacocha, Cia. des Mines de Huaran, and M.

EUROPE

Austria.—The lead-zinc mines of Austria produced 100,000 tons of crude zinc ore. Concentrates from this ore were treated at the Bleiberg Bergbau AG plant at Gailitz, yielding Austria's production of 20,000 tons of zinc.

Bulgaria.—A large increase in flotation production was planned to provide for rapid expansion in the new Rhodope mountains near the Greek border. The first stage, completed in two stages—the first to provide for 20,000 tons, and the second an additional 2,000 tons—of the ore was expected to be over 20 percent lead.²²

Finland.—The principal zinc producer was the Oyj Zinc Concentrate containing 60,500 tons.

¹⁶ American Metal Climax, Inc., Annual Report 1959, p. 22.

¹⁷ American Smelting & Refining Co., 61st Annual Report, 1959, p. 13.

¹⁸ Mining Magazine (London), vol. 102, No. 2, February 1960, p. 107.

¹⁹ Mining World Annual Review, Apr. 25, 1960, p. 139.

²⁰ St. Joseph Lead Co., Annual Report, 1959, p. 11.

²¹ Cerro de Pasco Corp., Annual Report, 1959, p. 10.

²² Mining Journal (London), vol. 254, No. 6503, Apr. 8, 1960.

values in copper and lead from 453,000 tons of ore. A new copper-lead-zinc mine at Pyhasalmi in central Finland began shipping ore in late November. Completion of the mine was scheduled for 1962, when mining was expected to be at an annual rate of 335,000 tons containing 18,000 tons of zinc. The ore reserve was calculated to be adequate for 25 years at this rate.

Italy.—The Salafossa mine, near Belluno, reported increased production. Approximately 1.5 million tons of about 1-percent lead and 5- to 6-percent zinc ore had been developed. Mining was to be by room-and-pillar method, using systematic roof bolting.²³

Portugal.—An old established Spanish company, Companhia Real Asturiana de Minas, installed a factory for zinc rolling in the north of Portugal at Matosinhos. This was the first plant of its kind in Portugal.²⁴

Spain.—Plans were announced for two electrolytic zinc plants to be built in Spain. Sociedad Austruiana del Zinc, a new firm, which was 40-percent owned by Real Compania Austuriana, was to build a plant at Aviles to produce 20,000 tons a year. Minera Celdran, S. A., mining and exporting zinc ores from Cartagena province, planned production in 1959 from a new 12,000-ton-a-year plant.²⁵

Sweden.—Boliden Mining Co. announced that it had a 63-million-ton reserve of lead-zinc-copper sulfide ore. In the Skelleftea district, the Boliden, Langsele, Renstrom, Kristiveberg, Ravliden, Adak-Lindskold, Brannmyran, Rudtjebacken Ostra Hogkulla, and Langdal mines contained 26.4 million tons. The Loivall, Lovstrand, and Vassbo mines contained 31 million tons, and the central Swedish group of Garpenberg, Kalvbacken, Svardsjo, Saxberget, and Ljusnarsberg mines, contained about 5.6 million tons.²⁶

U.S.S.R.—Russia's output of zinc, estimated at 130,000 tons in 1950, was reported to have doubled by 1955 and to have reached 300,000 to 350,000 tons by 1958. In addition, about 100,000 tons a year had been imported. As fast as production increased, it was reported that consumption probably would increase at a faster rate and Russia might well become a bigger importer of zinc.²⁷

United Kingdom.—The British Government announced that all slab zinc remaining in its stockpile was to be sold during the next 4 years, considering prevailing conditions and any relevant reports of the International Lead and Zinc Study Group. The stockpile contained 53,000 tons consisting of about 35,000 tons of Regular High grade, 12,750 tons of Special High grade, and 5,250 tons of Good Ordinary Brand (Prime Western) zinc.²⁸

Production of lead and zinc declined. Operation at Greenside mine, at Glenridding near Lake Ullswater in the Lake district, ceased toward the end of the year, as the ore reserves had been exhausted.²⁹

Yugoslavia.—A lead-zinc ore body of about 2 million tons, containing 5 percent lead and 4 percent zinc, was developed at Zute Prlina,

Kopaonik mountain. An ore body at Blagovest was proved to contain 7 percent lead and 7 percent zinc was proved.

The Zletovo mines in Macedonia were started in 1958, producing zinc concentrate production. Further east, at Struga, over 1 million tons of 5-percent lead and 5-percent zinc have been found.

The smelter at Celje, Slovenia, produced 18,000 tons in 1958 and the electrolytic zinc plant produced 13,592 tons in 1958. The Celje smelter is a solid plant and a second sulfuric acid plant, being enlarged by 50 percent.

At Mojkovac, Montenegro, a large zinc deposit was discovered. The building of a zinc electrolytic plant in this area was discussed.³⁰

ASIA

Burma.—The Burma Corp., Ltd., continued production of lead-zinc-silver mine in the Shan States of northern Burma. Production was 21,300 tons of zinc concentrate. Exports to Belgium, 10,800 tons to United Kingdom, and 10,500 tons to United States.

India.—Output of lead-zinc ores, all from the Mysore mines, increased 38 percent to 178,500 tons. Milling of zinc concentrate, which was shipped to Japan, was 10,000 tons. The Government approved in principle the proposal of India to build a zinc smelter with an initial capacity of 16,500 tons of zinc. The project was based on the assumption of an increased output to 100,000 tons.

Iran.—All lead-zinc concentrate produced in Iran was shipped to the U.S.S.R. In the latter half of May, trade negotiations between Iran and the U.S.S.R. in Tehran, resulting in purchase contracts for 1959, agreed upon were about 12 to 15 percent below 1958 prices, which, according to Iranian mine owners, made operations very difficult.

Japan.—The production of 178,000 tons of zinc in 1958, of which 158,000 tons from domestic ore, 16,000 tons from foreign sources, represents a record high. Monthly capacity of zinc in 1959 was 15,300 tons, an increase of 8 percent over 1958. The increase was attributed mainly to expansion of the Kanto Zinc Co. There was a noticeable increase in output from the Kanto Zinc mines. The Kanniossa mine of Mitsui Bussan Kaisha, Ltd., with a daily milling capacity of 4,000 tons, increased its output more than 30 percent of the total output.

In northern Honshu the Dowa Mining Co. started production of lead-zinc ore 1 mile south of the old Koska mine. Ore was found below the surface. Two types of ore, one with a barite gangue, had been developed. The other was a mixed copper-lead-zinc sulfide with gold and silver. The ore contained copper.

²³ Work cited in footnote 20.

²⁴ Ministry of International Trade and Industry, Japan, 1959, pp. 47-48.

²⁵ Mining World Annual Review, Apr. 25, 1960, p. 121.

²⁶ Foreign Trade (Ottawa), vol. 113, No. 2, Jan. 16, 1960, p. 21.

²⁷ Engineering and Mining Journal, vol. 160, No. 4, April 1959, p. 138.

²⁸ Mining World, vol. 21, No. 8, July 1959, pp. 83-84.

²⁹ Address at American Zinc Institute, Annual Meeting Apr. 23, 1959, by R. Lewis Stubbs, Director, Zinc Development Association (London).

³⁰ Mining Record, vol. 71, No. 10, Mar. 10, 1960, p. 3.

³¹ Mining World Annual Review, Apr. 25, 1960, p. 125.

A reserve of more than 4 million tons had been indicated, and exploration continued. The company started a 2-year development plan entailing shaft sinking and lateral development, construction of a 22,000-ton-per-month mill, and enlargement of the smelter.²²

AFRICA

Algeria.—Société Algérienne du Zinc²³ reported its mine across the border from Bou Bekar, Morocco, produced 112,000 tons of ore containing 25.47 percent zinc and 3.68 percent lead during the year ending September 30, 1959. The decrease in tonnage from 169,000 for the previous year was attributed to strikes and difficulties associated with foreign exchange, because the Moroccan and French francs were devalued on different dates. Ore was treated in Morocco at the mill of Société Nord-Africaine du Plomb. The company's ore reserve was enough for 3 years of full-scale production. Diamond drilling completed during 1959 indicated zones of mineralization, to be explored further in 1960.

Belgian Congo.—The Prince Leopold copper-zinc mine of the Union Minière du Haut Katanga at Kipushi, near Elisabethville, was the only zinc producer in the Congo. According to the company's annual report 1,021,000 tons of ore milled at the concentrator produced 180,000 tons of zinc concentrate, containing 60.32 percent zinc. A subsidiary of the company roasted 146,000 tons of concentrate, producing sulfuric acid for ore treatment and 122,000 tons of sintered concentrate. During the year 95,500 tons of roasted concentrate was sold to Metalka (Société Métallurgique du Katanga) for electrolytic processing, and 78,600 tons of raw and sintered concentrate was shipped to Belgium. A study was being made of ways to recover the zinc contained in the slag of the spoil heap at the Lubumbashi copper plant.

Morocco.—Production of zinc concentrate in Morocco increased from 96,000 tons in 1958 to 113,000 tons containing about 65,000 tons of zinc in 1959.

Rhodesia and Nyasaland, Federation of.—At Broken Hill, the Rhodesia Broken Hill Development Co., Ltd.²⁴ mined 207,100 short tons of crude ore (164,300 in 1958). The leach plant treated 108,800 tons of material containing 37.9 percent zinc. The heavy-medium separation plant treated 149,300 tons of feed to recover 117,400 tons of product that was part of the 175,300 tons of feed to the sulfide flotation plant producing 50,700 tons of zinc concentrate assaying 67 percent zinc. Leach solution and calcined concentrate were processed in the company electrolytic plant to yield 33,400 tons of slab zinc. During the year, more zinc concentrate was produced than could be roasted. The surplus was stockpiled, pending completion of the new Imperial vertical furnace-type smelter.

South-West Africa.—The Tsumeb Corp., Ltd., mined and milled 625,000 tons of ore averaging 23.7 percent combined copper, lead, and zinc during the year ending June 30, 1959. The company sold

ZINC

concentrate containing 21,609 tons of zinc during the year. The assured ore reserve above the 30th level as of June 30, 1959, was 8,165,000 tons with an average zinc content of 1.9 percent. Diamond drilling below the 30th level had added 1,000 tons of ore with a zinc content of 1.9 percent.²⁵

Tunisia.—Production of zinc concentrate, at the mine-mill unit, totaled about 6,600 short tons during the year.

United Arab Republic (Egypt Region).—In accordance with an Egyptian agreement, press reports indicated resumption of mining, extraction, and additional exploration at Um Gheig near the Red Sea coast. Also under way was construction of a zinc plant in Suez with an annual capacity of 5,000 tons.

OCEANIA

Australia.—The Broken Hill district of New South Wales was the leading Australian zinc-producing area. Mined and milled were New Broken Hill Consolidated, Ltd., Broken Hill South, Ltd.; and North Broken Hill. Total output in the Broken Hill district was 2,130,000 short tons of ore yielding zinc concentrate containing about 1,100,000 short tons in addition to lead concentrate and silver.

During the fiscal year ending June 30, 1959, the Broken Hill district milled 1,030,000 short tons of silver-lead-zinc ore. The Broken Hill district in the Cloncurry district of Queensland. The Broken Hill district produced 16,154 tons of zinc concentrate, containing 16,154 tons of lead bullion (containing 5,023,218 ounces of lead) and development resulted in substantially increased production. During the year, the Commonwealth Government of Australia would lend the State of Queensland funds to develop the Townsville-Mount Isa Railway. The railway would make possible further expansion of the Mount Isa mine. Lake George Mines, Pty., Ltd., during the fiscal year ending June 30, 1959, milled 236,000 tons of ore to produce 36,800 tons of zinc concentrate, containing 20,800 tons of zinc as well as pyrites, and gold from ores mined in the Cape York district, New South Wales.²⁷ Development below the 30th level, pending awaiting results of the drilling program.

For the fiscal year ended June 30, 1959, the Mount Isa Zinc Co. of Australasia, Ltd. (in the Read-Road district) milled 222,000 short tons of ore yielding 84,000 tons of zinc concentrate. The zinc concentrates from this district were treated at the company's Broken Hill district where they were produced to produce 128,000 tons of slab zinc.²⁸ Construction and improvements was continued during the year.

²² Mining World Annual Review, Apr. 25, 1960, p. 120.

²³ Newmont Mining Corp., Annual Report, 1959, p. 14.

²⁴ The Rhodesia Broken Hill Development Co., Ltd., 50th Annual Report, 1959, p. 12.

²⁵ American Metal Climax, Inc., 1959 Annual Report, p. 29.

²⁶ American Smelting & Refining Co., Annual Report, 1959, p. 14.

²⁷ Lake George Mining Corp., Ltd., Annual Report, 1959, p. 16.

²⁸ E Z Industries, Ltd., Annual Report, 1959, p. 7.

TECHNOLOGY

The American Zinc Institute and Lead Industries Association reported that their cooperative research program was successful in those portions devoted to the plating of zinc diecastings and zinc lithographic plates and that progress was achieved in other research projects.

Several papers reported research by the Federal Bureau of Mines³⁹ and Geological Survey.⁴⁰

Zinc was extracted⁴¹ from zinc sulfide concentrate by an oxidation process in a sulfuric acid solution. In the process, the agitated acid mixture contained in an autoclave at 110° C. was reacted with oxygen under 20 p.s.i. pressure. About 99 percent of the zinc in the zinc sulfide was converted to zinc sulfate with finely divided free sulfur as a byproduct.

A series of zinc alloys⁴² (U.S. Patent 2,472,402) containing titanium and copper was said to be superior to other zinc alloys in strip and sheet form in low creep rate, low coefficient of linear expansion, and resistance to grain growth during annealing.

Patents issued included a solderable zinc-tin alloy;⁴³ a cyanide-type plating bath for depositing a zinc-tin alloy;⁴⁴ a process for making a buff-red zinc oxide;⁴⁵ a method of gasplating objects with zinc metal;⁴⁶ zinc-base alloys characterized by a high wear resistance provided by inclusion of iron-titanium-aluminum particles or iron-zirconium-aluminum particles;⁴⁷ a process for producing pigment-grade zinc ferrite;⁴⁸ and the use of zinc to remove certain fission product metals from a solution of uranium in liquid bismuth.⁴⁹

³⁹ Grosh, W. A., and Evans, T. A., Jr., Zinc-Ore Mining and Milling Methods, Piquette Mining and Milling Co., Tennyson, Wisc.: Bureau of Mines Inf. Circ. 7877, 1959, 16 pp.

⁴⁰ Chester, J. W., Application of Electrical-Resistivity Surveys to Explorations for Zinc-Lead Deposits, Racine-Spurgeon Area, Newton County, Mo.: Bureau of Mines Rept. of Investigations 5503, 1959, 67 pp.

⁴¹ Hild, John H., and Rose, C. K., Exploration of Lead-Zinc Deposits in the Ross Basin-Lake Como Area, San Juan County, Colo.: Bureau of Mines Rept. of Investigations 5518, 1959, 64 pp.

⁴² Harrison, J. E., Wells, J. D., Geology and Ore Deposits of the Chicago Creek Area, Clear Creek County, Colo.: Geol. Survey, Prof. Paper 320, 1959, 92 pp.

⁴³ Heyl, A. V., Jr., Agnew, A. F., Lyons, R. J., Behre, C. H., Jr., and Flint, A. E., The Geology of the Upper Mississippi Valley Zinc-Lead District: Geol. Survey, Prof. Paper 309, 1959 (1960), 810 pp.

⁴⁴ Forward, F. A., Veltman, H., Direct Leaching Zinc-Sulfide Concentrates by Sherritt Gordon: Jour. of Metals, Vol. 11, No. 12, December 1959, pp. 838-840.

⁴⁵ American Metal Market, New Jersey Zinc Reports Extensive Tests on New Ti-Cu Rolled Alloys: Vol. 66, No. 166, Aug. 26, 1959, p. 7.

⁴⁶ Saubestre, Edward B. (assigned to Sylvania Electric Products Inc.) Solderable Zinc Alloy Coating: U.S. Patent 2,884,350, Apr. 28, 1959.

⁴⁷ Saubestre, Edward B., and Arnant, Arnold D. (assigned to Sylvania Electric Products Inc.) Electroplating of Zinc-Tin Alloys: U.S. Patent 2,939,724, Aug. 4, 1959.

⁴⁸ Conn, John B., and Humphrey, William Karl (assigned to Merck & Co., Inc., Rahway, N.J.) Process for Preparing Zinc Oxide: U.S. Patent 2,898,191, Aug. 4, 1959.

⁴⁹ Drummond, Folsom E. (assigned to The Commonwealth Engineering Co., Dayton, Ohio) Zinc Gas Plating: U.S. Patent 2,898,227, Aug. 4, 1959.

⁴⁰ Holzwarth, James C., and Thomson, Robert F. (assigned to General Motors Corp., Detroit, Mich.) Highly Wear-Resistant Zinc Base Alloy: U.S. Patent 2,890,304, Aug. 11, 1959.

⁴¹ Highly Wear-Resistant Zinc Base Alloy and Method of Making Same: U.S. Patent 2,912,324, Nov. 10, 1959.

⁴² Downs, Charles Donald, and Martin, John (assigned to Columbian Carbon Co., New York, N.Y.) Method for Producing Zinc Ferrite Pigment: U.S. Patent 2,904,395, Sept. 16, 1959.

⁴³ Dwyer, Orrington E., Howe, Herbert E., and Avrutik, Edward R. (assigned to U.S.A. as represented by the Chairman of the Atomic Energy Commission). Removal of Certain Fission Product Metals From Liquid Bismuth Compositions: U.S. Patent 2,914,399, Nov. 24, 1959.

A silver-zinc primary battery⁵⁰ was developed. The battery had a power output of 31 watt per pound battery could be prepared to meet specifications in 3 seconds. In the dry condition, it was claimed to have a useful life of 8 hours.

⁵⁰ Journal of the Electrochemical Society, Silver-Zinc Manganese, November 1959, p. 205c.