

# Lead<sup>1</sup>

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## GENERAL SUMMARY

**T**HE LEAD INDUSTRY in 1951 was characterized by a marked decrease in imports, lessened mine output, and the greatest recovery of secondary lead on record. Although consumption was 4 percent less than in 1950, new supplies were inadequate, and lead was withdrawn from the stocks of consumers, producers, and Government to meet the demand. A ceiling price of 17.00 cents per pound, New York, was established January 26 on domestic lead, and selling prices were generally quoted at the ceiling until October 2 when the Office of Price Stabilization authorized an increase of 2 cents a pound. The increase became effective immediately and remained to the end of the year. Before October 2 domestic consumers could buy lead abroad at any price, but after that date regulations prevented the purchase of foreign lead at prices over the domestic ceiling price plus duty. Unable to sell all of the lead they produced outside of the United States, certain foreign producers were forced to lower their prices, and there was every indication that by early 1952 additional foreign supplies would be available at the ceiling price.

The total supply of 1,155,000 short tons of lead was composed of 388,000 tons of recoverable mine production, 518,000 tons of secondary lead, and imports (excluding scrap) equal to 249,000 tons, lead content. Consumption of lead, including that in pigments and chemicals, totaled 1,185,000 tons. Producers' stocks of refined primary lead declined from 28,894 tons at the beginning of the year to 18,518 tons on December 31, 1951, but antimonial lead stocks remained about the same. Consumers' stocks decreased 37,124 tons during the year to 102,760 tons.

The drop in mine output from 431,000 tons in 1950 to 388,000 tons in 1951 was attributed partly to shutdowns at most lead mines and mills in the Western States from August 23 to September 6. The decrease in producers' stocks was due partly to strikes at the Selby, Omaha, Perth Amboy, Herculanum, and Bunker Hill plants and to a fire at the Tooele smelter which curtailed production. The decline in imports was attributed almost wholly to the higher prices paid in foreign markets and to the existence of a domestic tariff that added to the cost of foreign metal.

## GOVERNMENT REGULATIONS

In 1951 the Government exercised limited controls over the lead industry owing to concern over possible shortages for defense requirements. Lead was brought under inventory control on February 16 through National Production Authority Order M-38. This order was

<sup>1</sup> This report deals primarily with the smelting, refining, and consuming phases of the industry. For details of mining operations, see various State chapters of this volume.

**TABLE 1.—Salient statistics of the lead industry in the United States, 1942-46 (average) and 1947-51, in short tons**

	1942-46 (average)	1947	1948	1949	1950	1951
Production of refined primary lead:						
From domestic ores and base bullion	383,640	381,109	339,413	404,449	418,809	342,644
From foreign ores and base bullion	72,959	59,901	67,281	72,889	89,505	75,049
Total	456,599	441,010	406,694	477,338	508,314	417,693
Recovery of secondary lead	350,467	511,970	500,071	412,183	482,275	518,110
Imports (general):						
Lead in pigs, bars, and old	237,638	175,538	276,013	289,889	<sup>2</sup> 461,827	187,989*
Lead in base bullion	9,726	1,580	7,186	2,373	3,488	2,281
Lead in ores and matte	71,434	50,752	63,907	107,279	<sup>2</sup> 76,520	67,651
Exports of refined pig lead	4,294	1,523	411	969	2,735	1,281
Consumption of primary and secondary lead	1,056,544	1,172,000	1,133,895	957,674	1,237,981	1,184,793
Prices (cents per pound):						
New York:						
Average for period	6.82	14.67	18.04	15.36	13.30	17.49
Quotation at end of period	7.71	15.00	21.50	12.00	17.00	19.00
London average for period	5.42	15.27	17.16	16.95	13.29	20.25
Mine production of recoverable lead <sup>1</sup>	418,544	384,221	390,476	409,908	430,827	388,164
World smelter production of lead	1,461,800	1,455,000	<sup>2</sup> 1,505,000	<sup>2</sup> 1,709,000	<sup>2</sup> 1,870,000	1,821,000

<sup>1</sup> Includes Alaska.

<sup>2</sup> Revised figure.

amended on May 28 to set forth certain limitations on the acceptance of rated orders so as to provide for creation of a set-aside reserve of pig lead to meet emergency conditions and to establish limitations on the use of lead and lead products. Beginning June 1 the amended order restricted the use of lead to not more than 100 percent of the average monthly quantity used during the first 6 months of 1950 and prohibited its use for any new purposes. Order M-76, issued on July 26, placed the supply of soft pig lead produced by primary refiners under allocation control as of September 1 to assure equitable distribution. Effective November 1, imported pig lead was also placed under allocation control by Order M-76 as amended.

## DOMESTIC PRODUCTION

Statistics on lead output may be prepared on a mine or smelter and refinery basis. Mine-production data, compiled on the basis of lead content in ores and concentrates, adjusted to account for average losses in smelting, are a better measure of domestic output from year to year and are most accurate for showing the geographic distribution of production. Pig-lead output, as reported by smelters and refiners, presents a more precise figure of actual lead recovery but indicates only in a general way the source of crude material treated. Smelter and refinery output generally differs from the mine figure owing to the lag between mine shipments and smelter treatment of ores and concentrates.

## MINE PRODUCTION

Domestic mine output of recoverable lead declined 10 percent in 1951 compared with 1950 and was the lowest annual output since 1947. Production during the first half of the year was at a rate well above the 1,063-ton average daily output for the entire year. In July, August, and September production was considerably below the daily average

for the year, while output during the last quarter approximately equaled the average output per day for the year.

Production in 9 of the 16 States producing over 1,000 tons of recoverable lead in 1951 decreased from the 1950 output. Virginia's output was the lowest since the State's production was first recorded separately in 1939. In Arizona, Nevada, and Idaho mine production was the smallest since 1944, 1945, and 1946, respectively. On the other hand, Colorado produced more lead in 1951 than in any year since 1927, and Montana's output was the largest since 1940.

- Of the total lead produced in the United States in 1951, 68 percent came from 25 properties. Missouri continued to rank first among the States in the production of lead, and the Southeastern Missouri district continued to be the largest producer of lead, supplying nearly 32 percent of the total domestic output. As in previous years, the St. Joseph Lead Co. produced the bulk of the district's output from its Bonne Terre, Desloge, Federal, and Leadwood mine groups in St. Francois County and, as a joint venture with the National Lead Co., the Mine La Motte property in Madison County. Each mine is equipped with a mill; the 5 have a combined daily capacity of about 28,800 tons of ore. In Madison County the National Lead Co. St. Louis Smelting & Refining Division, operated its Madison lead-copper mine and 1,200-ton flotation mill at Fredericktown throughout the year, except for a 7-week period in April and May when operations were stopped owing to a strike. The St. Joseph Lead Co. began construction of 2 new mills during the year, 1 at Hayden Creek and the other at Indian Creek. The Midwest Mining & Milling Co. acquired the Catherine and Fleming mine, formerly held by the Fredericktown Lead Co., and continued exploration and development work on the property.

Lead production in the Tri-State district declined 14 percent in 1951, chiefly because of the lower grade of ore mined. This decrease occurred despite substantially higher concentrate prices than in 1950 and a 14-percent increase in zinc production. The Eagle-Picher Co., Mining & Smelting Division, was by far the largest producer in the district and was followed by the American Zinc, Lead & Smelting Co., Nellie B. Division. Other large producers were the National Lead Co. St. Louis Smelting & Refining Division, Federal Mining & Smelting Co., and Bilharz Mining Co. In December 1951, 19 mine mills and 3 tailings mills were operating in the district compared to 16 mine mills and 4 tailings mills in 1950.

Mine production of recoverable lead in the combined Western States decreased 10 percent in 1951. During the year mines in these States accounted for nearly 60 percent of the total domestic output or about the same as in 1950.

Idaho continued to be the largest producer of lead in the Western States and second only to Missouri in the United States despite a 23-percent reduction in output in 1951. The decline resulted principally from a shortage of underground miners in late summer and early fall and a 2-week strike of mine, mill, and smelter workers in August and September. In 1951, 92 percent of Idaho's total lead came from the Coeur d'Alene region and most of the remainder from the Warm Springs and Bayhorse districts. The Bunker Hill & Sullivan mine at Kellogg was by far the largest producer. The 5 leading producing

mines—the Bunker Hill & Sullivan, Page, Star, Morning, and Triumph—contributed over 59 percent of the State total lead. Other important producers were the Sidney group, Dayrock, Tamarack, Constitution, Sunshine, and the Frisco group properties. Zinc-lead ore and old tailings from the Coeur d'Alene region yielded 78 percent of State output.

Utah increased its output of lead 13 percent in 1951, although the leading properties were idle for about 2 weeks because of strikes. The United States & Lark mine at Bingham was again the principal producer. Other important lead-producing mines were the Chief No. 1, Park Utah Consolidated, Silver King Coalition, New Park, Calumet, Butterfield, Chief Consolidated Tailings, Ophir, and Hidden Treasure. These 10 properties supplied about 96 percent of the State lead. Of the total output nearly 88 percent was recovered from zinc-lead ore and 6 percent from lead ore.

Lead production in Colorado in 1951 increased for the fifth consecutive year and was the largest since 1927. The larger producing mines, in order of rank, were the Resurrection group, Treasury Tunnel-Black Bear (Idarado) group, Eagle, Smuggler Union group, and Shenandoah-Dives group. Zinc-lead ore and zinc-lead-copper ores yielded 69 percent of State total lead, zinc ore 14 percent, gold and silver ores 9 percent, and lead ore 7 percent.

Montana lead production in 1951 increased 9 percent over the 1950 output and was the highest since 1940. Most of this gain was due to an increased tonnage of zinc-lead ore produced from the Butte Hill mines and dumps of the Anaconda Copper Mining Co. and to a substantial rise in production from the Mike Horse mine, which was operated all of 1951 in contrast to 6 months' operation in 1950. Other large producers were the Jack Waite mine and the Blacktail property. Anaconda company-owned and leased operations accounted for 78 percent of the State lead in 1951. Of the total lead output 89 percent was recovered from zinc-lead ore and 7 percent from lead ore.

Arizona's output of lead in 1951 dropped 34 percent below the 1950 total owing chiefly to a marked decrease in the production of zinc-lead ore from the Copper Queen mine at Bisbee, where zinc-lead ore reserves were nearly depleted. The St. Anthony property at Tiger was the leading lead producer in the State during the year; it was followed by the Iron King mine at Humboldt, San Xavier mine near Sahuarita, Flux group near Patagonia, Copper Queen mine at Bisbee, and Aravaipa group near Klondike. About 92 percent of the State total lead was obtained from zinc-lead ore and 5 percent from lead ore.

Mine production of lead in California in 1951 decreased 12 percent from the record output established in 1950. The Anaconda Copper Mining Co. Inyo County properties, the Darwin group, Coso district, and the Shoshone group, Resting Springs district again furnished the bulk of the State lead. Moderate quantities of lead were recovered from ore from the Coronado Copper & Zinc Co. Afterthought mine and from flue dust accumulated at the site of the abandoned Kennett Copper smelter, both in Shasta County. About 58 percent of the total output was derived from lead ore and 35 percent from zinc-lead ore.

Lead output in Washington in 1951 decreased nearly 23 percent from the record quantity produced in 1950, chiefly because of reduced output at the Grandview and Bonanza mines. The 4 largest mines—Pend Oreille, Grandview, Bonanza, and Deep Creek—supplied 98 percent of the State total lead during the year. Over 77 percent of the output was from zinc-lead ore and most of the remainder from lead ore.

Nevada lead output dropped 24 percent in 1951 compared with 1950. Of the State total, 66 percent was mined in the Pioche district, Lincoln County. The leading producers in order of output were the Pioche group and Ely Valley mine, Pioche district; San Rafael mine, Quartz Mountain district; Copper Canyon mine, Battle Mountain district; and Bristol mine, Jack Rabbit district. About 77 percent of the total lead output was recovered from zinc-lead and zinc-lead-copper ores and most of the remainder from lead ore.

Production of lead in New Mexico increased 41 percent in 1951. Such a large percentage gain was to be expected as output in 1950 was unusually low, because most of the mines that shut down when metal prices declined in 1949 remained idle several months in 1950. The largest producers were the Ground Hog and Bayard groups in the Central district and the Lynchburg mine in the Magdalena district. Zinc and zinc-lead ore yielded 80 percent of the State total lead and lead ore 18 percent in 1951.

TABLE 2.—Mine production of recoverable lead in the United States, 1942-46 (average) and 1947-51, by States, in short tons

State	1942-46 (average)	1947	1948	1949	1950	1951
<b>Western States and Alaska:</b>						
Alaska.....	157	264	329	51	149	21
Arizona.....	18,401	28,566	29,899	33,568	26,383	17,394
California.....	6,760	10,080	9,110	10,318	15,831	13,967
Colorado.....	16,988	18,696	25,143	26,853	27,007	30,336
Idaho.....	84,466	78,944	88,544	79,299	100,025	76,713
Montana.....	13,552	16,108	18,411	17,996	19,617	21,802
Nevada.....	6,044	7,161	9,777	10,626	9,408	7,148
New Mexico.....	6,031	6,383	7,653	4,652	4,150	5,846
Oregon.....	7	12	7	12	17	2
South Dakota.....	32	8	16	4	-----	2
Texas.....	48	78	170	132	129	43
Utah.....	52,247	49,698	55,950	53,072	44,753	50,451
Washington.....	4,497	5,359	7,147	6,417	10,334	8,002
Wyoming.....	1	-----	-----	-----	-----	-----
Total.....	209,241	221,357	252,156	243,000	257,803	231,227
<b>West Central States:</b>						
Arkansas.....	1	18	22	1	9	33
Kansas.....	8,368	7,285	8,356	9,772	9,487	8,947
Missouri.....	174,966	132,246	102,288	127,522	134,626	123,702
Oklahoma.....	16,569	14,289	16,918	19,858	20,724	16,575
Total.....	199,904	153,838	127,614	157,153	164,846	149,257
<b>States east of the Mississippi River:</b>						
Illinois.....	2,646	2,325	3,695	3,824	2,729	3,160
Kentucky.....	194	214	216	187	66	107
New York.....	1,674	1,496	1,231	1,317	1,484	1,500
Tennessee.....	123	22	-----	257	113	14
Virginia.....	3,467	3,803	4,703	3,313	3,254	1,508
Wisconsin.....	1,295	1,166	861	857	532	1,391
Total.....	9,399	9,026	10,706	9,755	8,178	7,680
Grand total.....	418,544	384,221	390,476	409,908	430,827	388,164

Mines in States east of the Mississippi River produced 6 percent less lead in 1951 than in 1950. Decreased output was attributed to a 54-percent drop in production from Virginia, where the Austinville mine of the New Jersey Zinc Co. was idle from April to October 1 because of a strike. Lead is produced chiefly as a byproduct or co-product of zinc and fluorspar mining in these States.

Small quantities of lead were also recovered in 1951 from ores mined in Alaska, Oregon, South Dakota, Texas, and Arkansas.

TABLE 3.—Mine production of recoverable lead in the United States, by districts that produced 1,000 tons or more during any year, 1942-46 (average) and 1947-51, in short tons

District	State	1942-46 (average)	1947	1948	1949	1950	1951
Southeastern Missouri region.	Missouri	170,945	129,516	100,654	126,269	133,680	122,318
Coeur d'Alene region.	Idaho	78,616	73,060	82,587	74,152	94,697	70,570
West Mountain (Bingham).	Utah	28,334	26,163	30,672	32,600	27,472	29,120
Tri-State (Joplin region)	Kansas, Southwestern Missouri, Oklahoma.	28,808	24,239	26,901	30,883	31,157	26,906
Summit Valley (Butte)	Montana	3,795	10,630	13,217	11,490	15,679	16,630
Park City region	Utah	12,050	10,987	12,670	8,583	7,538	11,719
Upper San Miguel	Colorado	1,919	2,559	3,804	5,285	7,780	8,008
Coso (Darwin)	California	3,747	6,551	6,078	4,928	8,479	7,191
California (Leadville)	Colorado	4,701	4,296	4,745	5,080	6,392	5,996
Tintic	Utah	6,585	6,156	5,970	6,676	6,520	5,553
Metaline	Washington	4,028	3,460	4,297	4,030	7,445	5,234
Pioche	Nevada	3,248	3,487	5,613	6,630	6,761	4,751
Red Cliff	Colorado	1,341	924	1,120	1,600	2,110	4,274
Old Hat	Arizona	3,822	4,603	5,406	6,788	5,980	4,238
Big Bug	do	1,496	2,323	2,676	3,530	4,357	4,035
Animas	Colorado	2,567	2,241	1,886	2,935	3,069	3,963
Central	New Mexico	3,957	3,450	3,740	2,479	2,315	3,133
Warm Springs	Idaho	2,949	1,879	1,304	2,339	2,648	3,086
Pima (Sierritas, Papago, Twin Buttes).	Arizona	1,479	2,909	3,917	4,232	2,996	2,834
Rush Valley and Smelter (Tooele County).	Utah	3,483	3,829	4,185	2,953	1,393	2,674
Kentucky-Southern Illinois.	Kentucky, Southern Illinois.	2,626	1,889	2,965	2,822	1,526	2,516
Pioneer (Rico)	Colorado	2,458	2,042	2,430	1,388	1,138	2,231
Upper Mississippi Valley.	Iowa, Northern Illinois, Wisconsin.	1,508	1,816	1,807	2,046	1,801	1,923
Bossburg	Washington	133	1,010	1,394	2,011	2,640	1,768
Bayhorse	Idaho	1,410	2,039	1,880	1,073	1,679	1,732
Harshaw	Arizona	2,720	1,393	1,999	1,546	1,931	1,668
Warren (Bisbee)	do	5,062	13,422	11,253	13,865	7,790	1,606
Austinville	Virginia	3,252	3,803	4,703	3,813	3,254	1,508
St. Lawrence County	New York	1,674	1,496	1,231	1,817	1,484	1,497
Heddlerton	Montana	2,580	2,087	1,946	2,335	980	1,398
Aravaipa	Arizona	226	794	1,142	1,271	1,498	1,284
Creede	Colorado	426	329	451	1,162	1,422	1,167
Sneffels	do	321	( <sup>1</sup> )	756	1,064	866	1,094
Magdalena	New Mexico	1,264	1,987	2,826	1,162	926	1,004
Northport (Aladdin)	Washington	134	508	1,426	842	237	837
Tomichi	Colorado	281	1,458	1,788	1,221	645	761
Ophir	Utah	780	790	791	1,089	948	712
Eureka	Colorado	93	630	1,107	578	323	569
Modoc	California	247	139	1,061	729	87	317
Smelter (Lewis and Clark County).	Montana	1,285	60	396	166	201	209
Alder Creek	Idaho	54	1,103	776	442	62	115
Ten Mile	Colorado	490	1,167	4,177	3,671	910	6
Eagle <sup>2</sup>	Montana	1,155	693	600	1,024	1,013	( <sup>1</sup> )
Battle Mountain	Nevada	65	39	234	1,290	504	( <sup>1</sup> )
Resting Springs <sup>2</sup>	California	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )

<sup>1</sup> Figure not shown in order to avoid disclosure of individual company operations.

<sup>2</sup> This district is not listed in order of 1951 output.

TABLE 4—Twenty-five leading lead-producing mines in the United States in 1951, in order of output

Rank	Mine	District	State	Operator	Type of ore
1	Federal	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
2	United States and Lark	West Mountain (Bingham)	Utah	U. S. Smelting, Refining & Mining Co.	Zinc-lead.
3	Bunker Hill & Sullivan	Yreka	Idaho	Bunker Hill & Sullivan Mining & Concentrating Co.	Do.
4	Leadwood	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
5	Butte Hill mines and dumps	Summit Valley (Butte)	Montana	Anaconda Copper Mining Co.	Zinc-lead.
6	Mine La Motte	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
7	Bonne Terre	do	do	do	Do.
8	Page	Yreka	Idaho	Federal Mining & Smelting Co.	Zinc-lead.
9	Star	Hunter	do	Sullivan Mining Co.	Do.
10	Darwin group	Coso	California	Anaconda Copper Mining Co.	Lead.
11	Madison	Southeastern Missouri	Missouri	St. Louis Smelting & Refining Co.	Lead-copper.
12	Shoshone group	Resting Springs	California	Anaconda Copper Mining Co.	Lead.
13	Resurrection	Leadville	Colorado	Resurrection Mining Co.	Zinc-lead.
14	Morning	Hunter	Idaho	Federal Mining & Smelting Co.	Do.
15	Treasury Tunnel-Black Bear	Upper San Miguel	Colorado	Idarado Mining Co.	Do.
16	Combined Metals group	Pioche	Nevada	Combined Metals Reduction Co.	Do.
17	Chief and Eureka Hill	Tintic	Utah	Chief Consolidated Mining Co.	Do.
18	Eagle	Red Cliff	Colorado	New Jersey Zinc Co.	Zinc.
19	Park Utah Consolidated	Park City	Utah	Park Utah Consolidated Mines Co.	Zinc-lead.
20	Mammoth-Collins	Old Hat	Arizona	St. Anthony Mining & Development Co.	Do.
21	Desloge	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
22	Iron King	Big Bug	Arizona	Shattuck-Denn Mining Co.	Zinc-lead.
23	Silver King	Park City	Utah	Silver King Coalition Mines Co.	Do.
24	Smuggler Union	Upper San Miguel	Colorado	Telluride Mines, Inc.	Do.
25	Park Galena and Mayflower	Park City	Utah	New Park Mining Co.	Do.

The 25 leading lead-producing mines in the United States in 1951, listed in table 4, yielded 68 percent of the total domestic output; the 10 leading mines produced 51 percent and the 4 leading mines 36 percent.

Detailed information on the production of mines and mining districts in the United States may be found in the chapters of this volume dealing with the mine production of gold, silver, copper, lead, and zinc in the various States.

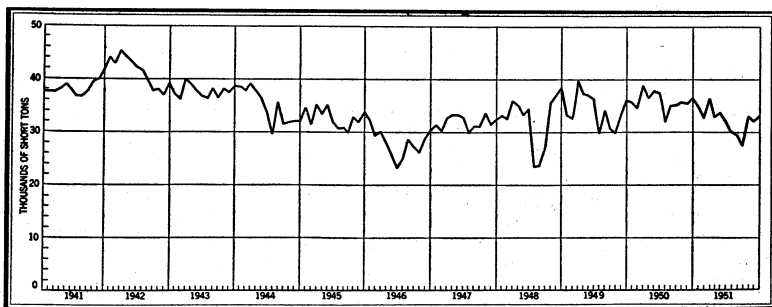


FIGURE 1.—Mine production of recoverable lead in the United States, 1941–51, by months.

TABLE 5.—Mine production of recoverable lead in the United States, 1950–51, by months, in short tons

Month	1950	1951	Month	1950	1951
January.....	35,684	35,102	August.....	35,020	29,487
February.....	34,716	32,864	September.....	35,087	27,494
March.....	38,960	36,474	October.....	35,730	33,058
April.....	36,432	32,972	November.....	35,419	32,060
May.....	37,906	33,537	December.....	36,397	32,928
June.....	37,439	32,148	Total.....	430,827	388,164
July.....	32,037	30,040			

### SMELTER AND REFINERY PRODUCTION

Pig (refined) lead produced in the United States is derived from three principal sources—domestic mine production, imports of foreign ores and base bullion, and scrap materials (treated largely at secondary smelters)—and is recovered at primary refineries that treat ore, base bullion, and small quantities of scrap and at secondary plants that process scrap exclusively. Of the 13 primary lead plants in the United States, 6 combine smelting and refining operations, 5 produce only base bullion (containing approximately 98 percent lead plus gold and silver, and small quantities of other impurities recovered from the ores smelted), and 2 confine their activities to refining. Refined lead and antimonial or “hard” lead may be 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 is essentially antimonial lead. Statistics on the production of refined lead and alloys at secondary plants are given in the Secondary Lead section of this chapter.



Of the 13 primary smelters in operation in 1951, all but 2 consumed substantial quantities of primary materials in the form of ores and concentrates. During the year these 11 plants consumed 435,894 short tons (lead content) of this type of material, of which 18 percent was of foreign origin. In 1950, 511,433 tons (lead content) of ores and concentrates were consumed, 17 percent of which was foreign.

**Active Lead Smelters and Refineries.**—Primary lead smelters and refineries operating in the United States in 1951 were as follows:

California: Selby—Selby plant, American Smelting & Refining Co. (smelter and refinery).

Colorado: Leadville—Arkansas Valley plant, American Smelting & Refining Co. (smelter).

Idaho: Bradley—Bunker Hill Smelter, Bunker Hill & Sullivan Mining & Concentrating Co. (smelter and refinery).

Illinois: Alton—Federal plant, American Smelting & Refining Co. (smelter and refinery).

Indiana: East Chicago—U. S. S. Lead Refinery, Inc. (refinery).

Kansas: Galena—Galena plant, Eagle-Picher Co. (smelter and refinery).

Missouri: Herculaneum—Herculaneum plant, St. Joseph Lead Co. (smelter and refinery).

Montana: East Helena—East Helena plant, American Smelting & Refining Co. (smelter).

Nebraska: Omaha—Omaha plant, American Smelting & Refining Co. (refinery).

New Jersey: Barber—Perth Amboy plant, American Smelting & Refining Co. (smelter and refinery).

Texas: El Paso—El Paso plant, American Smelting & Refining Co. (smelter).

Utah:

Midvale—Midvale plant, United States Smelting, Refining & Mining Co. (smelter).

Tooele—Tooele plant, International Smelting & Refining Co. (smelter).

### REFINED LEAD

Primary refineries in the United States produced 422,000 short tons of refined lead in 1951 or 18 percent less than the 1950 output of 514,000 tons.

Of the 418,000 of refined lead produced from primary sources during the year, domestic ores and base bullion were the source of 82 percent and imported ores and base bullion of 18 percent, the same proportions for domestic and foreign materials as in 1950. Table 7 gives the production of refined lead by source material and country of origin. Details of the sources of lead from domestic ores are given in the Mine Production section of this chapter.

**TABLE 6.**—Refined lead produced at primary refineries in the United States, 1947–51, by source material, in short tons

Source	1947	1948	1949	1950	1951
Refined lead:					
From domestic ores and base bullion.....	381, 109	339, 413	404, 449	418, 809	342, 644
From foreign ores.....	59, 838	60, 829	71, 413	86, 241	71, 984
From foreign base bullion.....	63	6, 452	1, 476	3, 264	3, 065
Total from primary sources.....	441, 010	406, 694	477, 338	508, 314	417, 693
From scrap.....	15, 662	4, 952	23, 230	5, 455	3, 893
Total refined lead.....	456, 672	411, 646	500, 568	513, 769	421, 586
Average sales price per pound.....	\$0. 143	\$0. 179	\$0. 158	\$0. 135	\$0. 173
Total calculated value of primary refined lead <sup>1</sup> .....	\$126, 130, 000	\$145, 600, 000	\$150, 840, 000	\$137, 245, 000	\$144, 522, 000

<sup>1</sup> Excludes value of refined lead produced from scrap at primary refineries.

TABLE 7.—Refined primary lead produced in the United States, 1947-51, by source material and country of origin, in short tons

Source	1947	1948	1949	1950	1951
Domestic ore and base bullion.....	381, 109	339, 413	404, 449	418, 809	342, 644
Foreign ore:					
Australia.....	5, 952	6, 729	6, 465	6, 984	9, 056
Canada.....	3, 548	3, 608	3, 317	7, 892	7, 986
Europe.....		43	30		17
Mexico.....	5, 523	4, 427	8, 477	5, 992	3, 620
South America.....	17, 096	24, 589	29, 163	38, 770	36, 849
Other foreign.....	27, 719	21, 433	23, 961	26, 603	14, 456
Total.....	59, 838	60, 829	71, 413	86, 241	71, 984
Foreign base bullion:					
Australia.....		466	1, 382	2, 427	2, 815
Mexico.....	30	5, 637	36	435	27
South America.....	33	52	58	402	75
Other foreign.....		297			148
Total.....	63	6, 452	1, 476	3, 264	3, 065
Total foreign.....	59, 901	67, 281	72, 889	89, 505	75, 049
Grand total.....	441, 010	406, 694	477, 338	508, 314	417, 693

### ANTIMONIAL LEAD

Antimonial lead output at primary refineries in 1951 rose 14 percent above the 1950 level but was well below the record high established in 1948. Production increased at 3 of the 5 primary plants producing the alloy. Distribution of antimonial lead production at primary refineries in 1947-51 by source material is shown in table 8, as is also the average antimony content.

Although antimonial lead is an important byproduct of the refining of base bullion, the quantity derived from this source is only a small part of total domestic output. The major production is recovered from the smelting of antimonial lead scrap at secondary smelters. Production data from lead-smelting plants treating scrap materials exclusively are summarized in the following section.

TABLE 8.—Antimonial lead produced at primary lead refineries in the United States, 1947-51

Year	Production (short tons)	Antimony content		Lead content by difference (short tons)			
		Short tons	Percent	From domestic ore	From foreign ore	From scrap	Total
1947.....	86, 075	4, 933	5.7	14, 836	9, 350	56, 456	81, 142
1948.....	100, 764	5, 760	5.7	29, 561	15, 918	49, 525	95, 004
1949.....	41, 402	3, 385	8.2	692	4, 620	32, 705	38, 017
1950.....	57, 959	4, 504	7.8	10, 728	4, 344	38, 383	53, 455
1951.....	65, 309	4, 416	6.7	17, 372	9, 218	34, 303	60, 893

### SECONDARY LEAD

Some scrap lead is treated at primary smelters, but the greater part is processed at a large number of plants that specialize in the treatment of secondary materials. Secondary lead is recovered in the form of refined lead, antimonial lead, and other alloys.

Secondary lead recovery in 1951 was the highest on record—7 percent above the 1950 figure—and exceeded the domestic mine output of recoverable lead for the sixth consecutive year. Data on recovery, by type of plant, in 1947-51 are shown in table 9. Detailed information on secondary lead appears in the Secondary Metals—Nonferrous chapter of this volume.

TABLE 9.—Secondary lead recovered in the United States, 1947-51, in short tons

	1947	1948	1949	1950	1951
As refined metal:					
At primary plants.....	15,662	4,952	23,230	5,455	3,893
At other plants.....	95,843	126,951	129,396	123,858	165,023
Total.....	111,505	131,903	152,626	129,313	168,916
In antimonial lead:					
At primary plants.....	56,456	49,525	32,705	38,383	34,303
At other plants.....	209,479	194,027	140,037	187,257	195,660
Total.....	265,935	243,552	172,742	225,640	229,963
In other alloys.....	134,530	124,616	86,815	127,322	119,231
Grand total:					
Short tons.....	511,970	500,071	412,183	482,275	518,110
Value.....	\$146,423,420	\$179,025,418	\$130,249,828	\$130,214,250	\$179,266,060

### LEAD PIGMENTS

The principal lead pigments are litharge, white lead, red lead, sublimed lead, leaded zinc oxide, and orange mineral. These products are manufactured for the most part from metal, but some ore and concentrates are converted directly into pigments. Details of the production of lead pigments are given in the Lead and Zinc Pigments and Zinc Salts chapter of this volume.

### CONSUMPTION AND USES

Domestic lead consumption (including lead in lead ore consumed directly in the manufacture of lead pigments and salts) totaled 1,184,793 short tons in 1951. Of the total consumed, 749,590 tons was refined soft lead and 296,555 tons was contained in antimonial lead, 26,205 tons in unmelted white scrap, 45,784 tons in "percentage metals" (the alloy pig metals derived from the secondary lead industry), 24,303 tons in copper-base scrap, 29,538 tons in drosses and residues, and 12,818 tons recovered from ores in leaded zinc oxide. In 1951, 42 percent of all lead consumed was used in the manufacture of metal products (excluding storage batteries). Production of the 3 largest lead-consuming items—batteries, cable coverings, and tetraethyl fluid—took 54 percent of all lead consumed during the year. Batteries took 32 percent and cable covering and tetraethyl fluid each 11 percent.

TABLE 10.—Consumption of lead in the United States in 1950 and 1951, by product, in short tons

	1950	1951		1950	1951
<b>Metal products:</b>			<b>Pigments:</b>		
Ammunition.....	38,438	40,242	White lead.....	36,181	25,578
Bearing metals.....	38,241	35,410	Red lead and litharge.....	101,974	88,031
Brass and bronze.....	21,461	29,858	Pigment colors.....	13,464	12,796
Cable covering.....	131,989	131,863	Other <sup>2</sup> .....	14,768	13,099
Calking lead.....	53,450	46,544	Total pigments.....	166,387	139,504
Casting metals.....	19,295	22,497	<b>Chemicals:</b>		
Collapsible tubes.....	13,386	13,657	Tetraethyl lead.....	113,846	128,407
Foil.....	3,941	2,881	Miscellaneous chemicals.....	11,680	6,949
Pipes, traps, and bends.....	41,361	33,095	Total chemicals.....	125,526	135,356
Sheet lead.....	30,778	31,210	<b>Miscellaneous uses:</b>		
Solder.....	94,606	82,465	Annealing.....	6,456	6,656
Terne metal.....	3,805	2,051	Galvanizing.....	2,426	2,173
Type metal.....	24,776	28,236	Lead plating.....	1,521	1,444
Total metal products.....	515,527	500,009	Weights and ballast.....	6,870	7,913
<b>Storage batteries:<sup>1</sup></b>			Total miscellaneous uses.....	17,273	18,186
Antimonial lead.....	212,464	199,838	Other, unclassified uses.....	14,859	16,354
Lead oxides.....	185,945	175,546	Grand total.....	1,237,981	1,184,793
Total storage batteries.....	398,409	375,384			

<sup>1</sup> Classified under "metal products" before 1950.

<sup>2</sup> Includes lead content of leaded zinc oxide production.

TABLE 11.—Consumption of lead in the United States 1950-51, by months, in short tons<sup>1</sup>

Month	1950	1951	Month	1950	1951
January.....	83,671	126,022	August.....	127,317	97,622
February.....	78,491	101,603	September.....	121,782	78,999
March.....	88,939	120,826	October.....	126,589	88,527
April.....	84,673	118,372	November.....	116,304	88,106
May.....	100,620	102,524	December.....	110,456	86,307
June.....	103,443	94,453	Total.....	1,237,981	1,184,793
July.....	95,686	81,427			

<sup>1</sup> Includes lead content of leaded zinc oxide production.

TABLE 12.—Consumption of lead in the United States in 1951, by class of product and type of material, in short tons

	Soft and antimonial lead	Scrap, percentage metal, drosses, etc.	Total
Metal products.....	383,108	116,901	500,009
Storage batteries <sup>1</sup> .....	368,361	7,023	375,384
Pigments.....	126,603	83	126,686
Chemicals.....	135,356		135,356
Miscellaneous.....	17,547	639	18,186
Unclassified.....	15,170	1,184	16,354
Total.....	1,046,145	125,830	1,171,975

<sup>1</sup> Formerly classified under metal products.

<sup>2</sup> Excludes 12,818 tons of lead contained in leaded zinc oxide.

## STOCKS

**Producers' Stocks.**—Lead stocks, as reported by the American Bureau of Metal Statistics, are shown in table 13. Stocks of refined and antimonial lead include metal held by all primary refiners and by some of the refiners of secondary metal who produce soft lead. According to reports released by the American Bureau of Metal Statistics, monthly stocks of refined lead and antimonial lead in 1951 were, on the average, less than half of the tonnage held in comparable periods of 1950. Inventories totaled 25,339 tons on December 31, 1951, compared with year-end stocks of 35,619 tons in 1950.

**TABLE 13.**—Stocks of lead at smelters and refineries in the United States at end of year, 1947–51, in short tons

[American Bureau of Metal Statistics]

	1947	1948	1949	1950	1951
Refined pig lead.....	13, 634	29, 050	61, 329	28, 894	18, 518
Antimonial lead.....	7, 694	9, 594	9, 095	6, 725	6, 821
Total.....	21, 328	38, 644	70, 424	35, 619	25, 339
Lead in base bullion—					
At smelters and refineries.....	7, 652	9, 697	16, 364	11, 993	11, 315
In transit to refineries.....	5, 447	4, 101	3, 696	4, 959	3, 909
In process at refineries.....	16, 328	17, 939	15, 561	15, 341	15, 700
Total.....	29, 427	31, 737	35, 621	32, 293	30, 924
Lead in ore and matte and in process at smelters.....	77, 199	76, 373	95, 481	69, 757	67, 817
Grand total.....	127, 954	146, 754	201, 526	137, 669	124, 080

The Bureau of Mines annual survey of primary smelters and refiners indicated stocks of 28,894 tons (lead content) of refined soft lead at plants on January 1, 1951, and 18,517 tons on December 31, 1951. Primary antimonial lead stocks at these same plants totaled 6,152 tons (lead content) at the beginning of 1951 and 6,367 tons at the end of the year. In terms of lead content, stocks of ore and concentrates at the operating primary smelters and refineries increased from 42,346 tons to 44,378 during the same period. The inventory of base bullion at refineries that receive base bullion as a raw material and at smelters that produce base bullion for shipment to refineries was 11,658 tons at the beginning of the year and 12,731 tons on December 31, 1951. Stocks of in-process base bullion or work lead at four combination smelter-refinery plants are not included in reports to the Bureau of Mines. No direct comparison can be made between these data and the figures of the American Bureau of Metal Statistics. Figures reported to the Bureau of Mines represent physical inventory at the plants, irrespective of ownership, and do not include material in process or in transit.

**Consumers' Stocks.**—Consumers' stocks of lead decreased 27 percent during 1951. The decline was consistent through the first 6 months, was reversed in July, and then continued the downward trend through the remainder of the year, dropping from 139,884 tons on January 1 to 102,760 on December 31. Stocks of antimonial lead gained 2 percent and percentage metals 9 percent, but stocks of refined soft lead dropped 35 percent, white-metal scrap 42 percent, copper-base scrap 8 percent, and drosses 46 percent.

TABLE 14.—Consumers' stocks of lead in the United States at end of year, 1948-51, by type of material, in short tons, lead content

Year	Refined soft lead	Antimonial lead	Unmelted white scrap	Percentage metals	Copper-base scrap	Drosses, residues, etc.	Total
1948.....	62,077	35,088	4,828	7,932	2,301	6,972	119,198
1949.....	64,542	16,837	2,957	5,405	2,087	5,439	97,267
1950 <sup>1</sup> .....	87,285	27,737	5,406	6,446	1,558	11,452	139,884
1951.....	56,731	28,221	3,140	7,054	1,429	6,185	102,760

<sup>1</sup> Revised figures.

## PRICES

The two major markets for lead in the United States are New York and St. Louis. Much of the lead produced domestically is sold at prices normally based upon quotations in these markets. Since suspension of trading on the London Metal Exchange in September 1939 the London market has had no direct influence on New York quotations, and the differential between St. Louis and New York prices has remained 0.2 cent a pound, an amount approximating the freight charges between the two cities.

The price of lead was controlled by the Office of Price Stabilization during 1951. Ceiling prices were established for lead on January 26, 1951, at the highest price (for each seller) at which sales were made between December 19, 1950, and January 25, 1951. Thus a number of ceiling prices were established. The bulk of lead sales, however, were at 17.00 cents per pound, common lead, New York. The 17.00-cent price remained in effect until October 2, when the Office of Price Stabilization permitted a rise of 2 cents a pound. No further change in price occurred in 1951.

TABLE 15.—Average monthly and yearly quoted prices of lead at St. Louis, New York, and London, 1949-51, in cents per pound<sup>1</sup>

Month	1949			1950			1951		
	St. Louis	New York	London <sup>2</sup>	St. Louis	New York	London <sup>2</sup>	St. Louis	New York	London <sup>2</sup>
January.....	21.32	21.50	22.10	11.80	12.00	12.11	16.80	17.00	17.00
February.....	21.32	21.50	22.10	11.80	12.00	12.11	16.80	17.00	17.00
March.....	18.73	18.91	22.10	10.76	10.96	11.06	16.80	17.00	17.00
April.....	14.99	15.16	19.28	10.43	10.63	10.57	16.80	17.00	20.00
May.....	13.57	13.72	17.98	11.52	11.72	11.61	16.80	17.00	20.00
June.....	11.85	12.00	15.45	11.61	11.81	11.84	16.80	17.00	20.00
July.....	13.39	13.56	14.59	11.46	11.66	11.58	16.80	17.00	21.45
August.....	14.80	15.01	15.56	12.73	12.93	12.84	16.80	17.00	22.49
September.....	14.85	15.05	15.51	15.60	15.80	15.70	16.80	17.00	22.49
October.....	13.23	13.42	13.79	15.84	16.04	16.00	18.72	18.92	21.87
November.....	12.33	12.52	12.79	16.80	17.00	17.00	18.80	19.00	21.88
December.....	11.80	12.00	12.12	16.80	17.00	17.00	18.80	19.00	21.84
Average.....	15.18	15.36	16.95	13.10	13.30	13.29	17.29	17.49	20.25

<sup>1</sup> St. Louis: Metal Statistics, 1952, p. 531. New York: Metal Statistics, 1952, p. 525. London: E&MJ Metal and Mineral Markets.

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

The official London price of £136 per long ton of lead (equivalent to 17.00 cents per pound computed on the 280.00-cent per pound base), fixed by the Ministry of Supply on November 1, 1950, remained in effect until April 1, 1951, when the Ministry raised the price to £160 (20.00 cents). The price was increased again on July 14 to £180 (22.50 cents). On October 1 the official price was reduced to £175 (21.88 cents), at which level it remained for the balance of the year. (During the latter half of 1951 sterling exchange rates varied between 278.63 and 280.00 cents per pound, hence actual dollar prices were at times slightly less than the 21.88-cent equivalent shown).

## FOREIGN TRADE <sup>2</sup>

**Tariff.**—There has been a tariff on lead for well over a century, ranging from a low of 15 percent ad valorem to a high of 3 cents a pound. The import duty set by the Tariff Act of 1930 on lead-bearing ores, flue dust, and mattes (lead content) was 1½ cents per pound and on lead bullion, pigs, bars, scrap lead, antimonial lead, type metal, babbitt metal, solder, and alloys not specifically provided for, 2½ cents per pound. In accordance with the Mexican Trade Agreement of January 30, 1943, these rates were reduced to ¾ cent and 1¼ cents per pound, respectively. In June 1948 these duties were suspended for 1 year by act of Congress. As the Congress took no action on a bill to extend the suspension beyond June 30, 1949, the expiration date of the original legislation, the import duties provided for in the Mexican Trade Agreement were reinstated automatically on July 1, 1949, and continued at those levels throughout 1950. Abrogation of the agreement, effective January 1, 1951, restored the full duties established by the Tariff Act of 1930. The Mexican Agreement was reaffirmed on June 6, 1951, reestablishing the 1¼-cent and ¾-cent duties on pig lead and lead in ores and concentrates, respectively.

**Imports.**—Total imports of lead declined to 258,000 tons in 1951 or less than half the record quantity of 542,000 tons imported in 1950. The drastic decline resulted from the reluctance of foreign producers to export lead to the United States, when the Free World market price for lead was considerably higher than the United States ceiling price. However, since foreign demand could not absorb the available foreign lead, stocks in the hands of producers accumulated until producers were compelled to reduce prices. By the end of the year Free World prices were essentially at the United States level.

Of total imports, 178,900 tons (69 percent) was as pigs and bars, 67,700 tons (26 percent) in ore and matte, 9,100 tons (4 percent) as reclaimed, scrap, etc., and 2,300 tons (1 percent) in base bullion. Canada supplied 32 percent of the pigs and bars, Mexico 21 percent, Yugoslavia 20 percent, Peru 18 percent, Australia 8 percent, and other countries 1 percent. Imports of ore and matte came principally from Peru, Bolivia, Africa, Canada, and Australia.

<sup>2</sup> Figures on imports and exports compiled by M. B. Price and E. D. Page, of the Bureau of Mines, from records of the U. S. Department of Commerce.

**TABLE 16.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, 1947-51, by countries, in short tons <sup>1</sup>**

[U. S. Department of Commerce]

Country	1947	1948	1949	1950	1951 <sup>2</sup>
<b>Ore and matte:</b>					
Africa.....	5,616	10,142	31,373	19,713	10,673
Australia.....	7,054	9,017	8,983	<sup>3</sup> 9,792	7,423
Bolivia.....	6,234	20,369	24,098	<sup>3</sup> 13,336	15,989
Canada.....	14,833	8,288	10,326	<sup>3</sup> 9,452	7,427
Chile.....	3,048	3,430	3,395	<sup>3</sup> 2,605	1,945
El Salvador.....	1	250	333	417	286
Guatemala.....		23	2,827	325	3,169
Honduras.....		61	465	412	381
Mexico.....	3,065	2,702	8,388	2,846	2,517
Peru.....	10,477	8,548	14,970	16,010	16,946
Other countries.....	424	1,077	2,121	<sup>3</sup> 1,612	895
<b>Total ore and matte.....</b>	<b>50,752</b>	<b>63,907</b>	<b>107,279</b>	<b><sup>3</sup> 76,520</b>	<b>67,651</b>
<b>Base bullion:</b>					
Australia.....			2,246	2,263	2,234
Guatemala.....				232	
Japan.....				921	
Korea.....	285	82			
Mexico.....	1,255	6,455	25		
Peru.....	40	619	102	72	47
Other countries.....		30			
<b>Total base bullion.....</b>	<b>1,580</b>	<b>7,186</b>	<b>2,373</b>	<b>3,488</b>	<b>2,281</b>
<b>Pigs and bars:</b>					
Africa.....	78	507	280		2,279
Australia.....	10,639	30,469	17,192	22,009	13,598
Belgium-Luxembourg.....		8,911	212	166	331
Burma.....		2,343	1,414		
Canada.....	59,079	53,978	56,432	107,673	56,959
Germany.....			8,333	8,643	738
Italy.....		21,349	3,419		
Japan.....		2,108		<sup>3</sup> 5,712	
Korea.....	1,659	39	51		
Mexico.....	85,783	98,460	126,398	220,767	36,863
Netherlands.....		1,826	219	484	
Peru.....	1,151	23,559	34,626	31,988	31,528
Spain.....		1,653		440	
Yugoslavia.....	1,120	2,889	23,436	43,855	36,310
Other countries.....	4	1,133	1,120	51	301
<b>Total pigs and bars.....</b>	<b>159,513</b>	<b>247,116</b>	<b>275,240</b>	<b><sup>3</sup> 441,788</b>	<b>178,907</b>
<b>Reclaimed, scrap, etc.:</b>					
Africa.....	478	344	479		
Australia.....	1,111	3,690	2,971	1,061	2,175
Belgium-Luxembourg.....		986	329	13	
Canada.....	8,070	11,687	1,856	1,317	1,698
Canal Zone.....	202	447	384	319	228
Chile.....	62				84
France.....		( <sup>4</sup> )	289		88
Germany.....			663	290	
Italy.....	69	2,304	346		
Jamaica.....	31	1	89	51	252
Japan.....	5,336		2,765	<sup>3</sup> 14,769	441
Malta, Gozo, Cyprus.....	78	155			
Mexico.....		1,644	845	934	2,089
Netherlands.....		2,460	599	4	18
Panama.....	41	223	92	80	234
Philippines.....	433	2,341	1,144	99	114
Yugoslavia.....		652			
Venezuela.....		2	8	106	668
Other countries.....	114	1,961	1,790	996	993
<b>Total reclaimed, scrap, etc.....</b>	<b>16,025</b>	<b>28,897</b>	<b>14,649</b>	<b><sup>3</sup> 20,039</b>	<b>9,082</b>
<b>Grand total.....</b>	<b>227,870</b>	<b>347,106</b>	<b>399,541</b>	<b><sup>3</sup> 541,835</b>	<b>257,921</b>

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

<sup>2</sup> In addition to data shown "fine dust or fume containing lead and zinc, and other minerals or metals" (lead content), imported as follows—11 tons.

<sup>3</sup> Revised figure.

<sup>4</sup> Less than 0.5 ton.



TABLE 17.—Lead imported for consumption in the United States, 1947-51, by classes<sup>1</sup>

[U. S. Department of Commerce]

Year	Lead in ores, flue dust, and mattes, n.s.p.f.		Lead in base bullion		Pigs and bars		Sheets, pipe, and shot		Not otherwise specified (value)	Total value
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value		
1947.....	44,442	\$8,561,174	1,758	\$416,643	158,705	\$38,008,443	67	\$42,434	\$10,453	\$50,111,298
1948.....	33,932	8,350,507	10,922	3,239,135	244,692	80,922,779	181	100,519	35,554	100,968,922
1949.....	121,848	34,397,026	1,133	374,954	272,437	80,148,110	178	101,084	29,830	119,054,978
1950.....	95,068	21,045,414	1,148	193,356	434,410	104,340,645	207	78,111	78,690	129,613,215
1951.....	31,470	8,310,145	-----	-----	178,896	63,641,204	255	123,377	174,265	74,426,044

<sup>1</sup> In addition to quantities shown (value included in total values), "reclaimed, scrap, etc." imported as follows—1947: 15,963 tons, \$3,072,151; 1948: 28,897 tons, \$8,320,428; 1949: 14,076 tons, \$4,003,974; 1950: Revised figures, 22,524 tons, \$3,876,999; 1951: 7,890 tons, \$2,100,389, and flue dust or fume containing lead and zinc and other minerals or metals, (lead content) imported as follows—1951: 11 tons, \$76,664. Figures include lead received by the Government and held in stockpiles, but exclude imports for manufacture in bond and export, which are classified as "imports for consumption" by the U. S. Department of Commerce.

<sup>2</sup> Revised figure.

TABLE 18.—Miscellaneous products containing lead, imported for consumption in the United States, 1947-51

[U. S. Department of Commerce]

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	Gross weight (short tons)	Lead content (short tons)	Value
1947.....	264	171	\$208,185	2,406	2,219	\$753,664
1948.....	257	184	213,614	14,732	13,163	5,279,080
1949.....	281	127	459,236	5,861	5,207	2,255,909
1950 <sup>1</sup> .....	4,345	2,744	2,814,264	12,518	10,582	3,431,650
1951.....	1,533	988	1,494,792	9,336	8,660	3,845,671

<sup>1</sup> Revised figures.

**Exports.**—Total exports of pig lead in 1951 were 1,281 tons compared with 2,735 tons in 1950. Export restrictions imposed under the Export Control Act of 1940 remained in force throughout 1951.

TABLE 19.—Lead pigs, bars, and anodes exported from the United States, 1947-51, by country of destination, in short tons <sup>1</sup>

[U. S. Department of Commerce]

Destination	1947	1948	1949	1950	1951
<b>Country:</b>					
Argentina.....	894	2	7	-----	55
Belgium-Luxembourg.....	-----	-----	76	-----	37
Brazil.....	63	1	126	47	62
Canada.....	10	8	14	306	138
Canal Zone.....	52	-----	15	19	24
Chile.....	52	42	40	35	107
China.....	10	21	-----	-----	-----
Colombia.....	12	16	60	123	42
Cuba.....	38	40	68	61	48
Denmark.....	-----	-----	131	-----	-----
El Salvador.....	9	1	34	96	35
Honduras.....	7	1	29	6	14
Hong Kong.....	23	2	-----	4	-----
India.....	19	121	4	-----	11
Israel.....	-----	-----	1	174	112
Madagascar.....	44	-----	-----	-----	-----
Mexico.....	16	14	3	3	4
Netherlands.....	100	1	-----	-----	-----
Pakistan.....	-----	-----	-----	569	-----
Panama.....	( <sup>2</sup> )	1	( <sup>2</sup> )	3	2
Philippines.....	24	1	53	306	17
Portugal.....	-----	-----	3	2	-----
Saudi Arabia.....	3	24	7	1	3
Turkey.....	50	11	7	-----	-----
United Kingdom.....	-----	-----	-----	67	-----
Uruguay.....	27	-----	69	734	424
Venezuela.....	30	71	148	95	62
Other countries.....	40	33	74	84	84
<b>Total.....</b>	<b>1,523</b>	<b>411</b>	<b>969</b>	<b>2,735</b>	<b>1,281</b>
<b>Continent:</b>					
North America.....	144	75	179	525	288
South America.....	1,079	133	475	1,052	756
Europe.....	119	10	215	75	40
Asia.....	134	189	85	1,068	197
Africa and Oceania.....	47	4	15	15	( <sup>2</sup> )
<b>Total: Short tons.....</b>	<b>1,523</b>	<b>411</b>	<b>969</b>	<b>2,735</b>	<b>1,281</b>
<b>Value.....</b>	<b>\$388,599</b>	<b>\$169,075</b>	<b>\$356,819</b>	<b>\$790,480</b>	<b>\$513,671</b>

<sup>1</sup> In addition 102 tons of foreign lead was reexported in 1947, none in 1948, 86 tons in 1949, 53 tons in 1950, and none in 1951.

<sup>2</sup> Less than 0.5 ton.

## WORLD REVIEW

Lead is produced in many countries, but four—United States, Mexico, Australia, and Canada—have accounted for about three-fifths of the world output in recent years, as is apparent from tables 20 and 21, which show world mine and smelter production by countries 1945-51, insofar as statistics are available.

**Algeria.**—See French Morocco.

**Argentina.**—The chief lead-producing district in Argentina is the Aguilar, where the Compania Minera Aguilar, S. A., a subsidiary of the St. Joseph Lead Co., operates the Aguilar group of mines. Production in 1951 was 70 percent of the mill capacity, because of exchange difficulties which made it difficult to get adequate supplies and equipment. During the year, 199,904 metric tons of ore was milled, from which 26,219 tons of lead concentrate was produced. This represents an increase over the previous year, when 174,398 tons was milled to produce 23,777 metric tons of concentrate. The lead con-

centrate was smelted at the National Lead Co., S. A., smelter at Barranqueras, Chaco Territory.

**Australia.**—Both mine and smelter output of lead increased slightly above the 1950 level despite continued shortages of labor and supplies and the requirement that producers supply domestic needs at a price approximately one-third of that received for export lead. Mine output in 1951 was 228,000 metric tons or approximately 14 percent of the world total.

The most important districts are Broken Hill, New South Wales, and Mount Isa, Queensland. Other large deposits occur at Captain's Flat (Lake George Mines) New South Wales and the Read-Roseberry mine in Tasmania.

TABLE 20.—World mine production of lead, 1946–51, by countries, in metric tons <sup>1</sup>

[Compiled by Pauline Roberts]

Country <sup>1</sup>	1946	1947	1948	1949	1950	1951
Algeria.....	1,015	1,295	1,047	1,222	1,408	2,838
Argentina.....	18,100	21,200	21,800	16,000	<sup>2</sup> 20,000	<sup>2</sup> 20,000
Australia.....	186,786	199,779	220,437	216,918	<sup>2</sup> 222,694	228,407
Austria.....	981	1,971	3,482	4,297	4,440	4,522
Belgian Congo.....	870	670	400	180	—	—
Bolivia (exports) <sup>4</sup> .....	8,434	11,310	25,610	26,351	31,203	30,032
Burma.....	—	22	<sup>5</sup> 36	( <sup>5</sup> )	78	<sup>2</sup> 2,000
Canada.....	160,559	146,662	151,727	144,945	<sup>2</sup> 150,317	143,193
Newfoundland.....	25,213	21,121	—	—	318	—
Chile.....	86	3,507	<sup>5</sup> 6,223	2,859	3,318	<sup>2</sup> 4,000
Czechoslovakia.....	2,200	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )
Ecuador.....	<sup>2</sup> 307	<sup>2</sup> 172	<sup>2</sup> 269	380	<sup>2</sup> 229	30
Finland.....	149	182	72	130	142	136
France.....	8,296	7,495	7,645	9,936	<sup>2</sup> 11,459	10,605
French Equatorial Africa.....	2,807	2,336	2,603	731	1,814	2,504
French Morocco.....	11,202	21,200	28,600	<sup>2</sup> 37,200	<sup>2</sup> 48,759	68,134
Germany: West Germany.....	15,378	14,756	22,344	40,944	44,830	50,368
Greece.....	475	936	1,280	2,051	<sup>2</sup> 2,307	4,852
Guatemala.....	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	3,154	3,000	3,300
Honduras.....	—	—	143	449	<sup>2</sup> 279	454
Hungary.....	100	200	—	( <sup>5</sup> )	300	( <sup>5</sup> )
Italy.....	13,900	24,000	30,400	34,600	<sup>2</sup> 38,300	38,738
Japan.....	<sup>2</sup> 4,344	<sup>2</sup> 5,208	<sup>2</sup> 6,672	<sup>2</sup> 9,132	<sup>2</sup> 10,896	12,672
Korea: Korea, Republic of.....	—	900	300	<sup>2</sup> 143	136	136
Mexico.....	140,144	223,133	193,317	220,763	238,078	225,468
Nigeria.....	—	93	273	<sup>2</sup> 29	<sup>2</sup> 12	<sup>5</sup> 56
Northern Rhodesia <sup>7</sup> .....	8,371	<sup>2</sup> 15,891	13,229	14,169	13,905	14,194
Norway.....	26	141	265	<sup>2</sup> 301	<sup>2</sup> 360	<sup>2</sup> 360
Peru.....	44,518	54,814	48,538	65,357	<sup>2</sup> 62,118	82,350
Philippines.....	—	—	( <sup>5</sup> )	550	879	571
Poland <sup>7</sup> .....	10,915	12,761	16,874	17,850	18,000	18,000
Portugal.....	375	398	635	746	845	<sup>2</sup> 900
Rumania.....	3,224	3,495	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )	( <sup>5</sup> )
Salvador <sup>2</sup> .....	—	—	203	530	530	470
Southern Rhodesia.....	—	—	—	83	—	—
South-West Africa.....	—	<sup>2</sup> 13,100	33,600	<sup>2</sup> 38,400	<sup>2</sup> 33,680	39,230
Spain.....	38,662	30,382	29,792	31,550	<sup>2</sup> 32,257	55,745
Spanish Morocco.....	240	65	215	159	<sup>2</sup> 178	<sup>2</sup> 300
Sweden.....	21,290	20,858	23,579	23,900	22,673	15,059
Tunisia.....	8,655	12,340	13,219	14,860	<sup>2</sup> 19,260	21,250
Turkey.....	—	—	2,756	<sup>2</sup> 200	260	600
Union of South Africa.....	152	133	156	166	<sup>2</sup> 600	900
U. S. S. R. <sup>2,7</sup> .....	43,000	63,000	75,000	90,000	<sup>2</sup> 111,600	128,400
United Kingdom.....	<sup>2</sup> 2,807	<sup>2</sup> 3,228	<sup>2</sup> 2,432	<sup>2</sup> 2,505	<sup>2</sup> 3,338	4,158
United States <sup>4</sup> .....	304,336	348,558	354,232	371,860	<sup>2</sup> 390,838	352,135
Yugoslavia.....	<sup>2</sup> 45,523	<sup>2</sup> 54,786	<sup>2</sup> 62,861	<sup>2</sup> 72,144	<sup>2</sup> 86,039	78,750
Total (estimate).....	<sup>2</sup> 1,150,000	<sup>2</sup> 1,359,000	<sup>2</sup> 1,424,000	<sup>2</sup> 1,535,000	<sup>2</sup> 1,643,000	1,679,000

<sup>1</sup> Lead may be produced in Brazil, China, Cuba, East Germany, India, and North Korea, but accurate data on production are not available and estimates by the senior author of chapter have been included in the world total.

<sup>2</sup> Estimate.

<sup>3</sup> Revised figure.

<sup>4</sup> Tonnage recoverable from ore.

<sup>5</sup> Data not available; estimate by the senior author of the chapter included in the total.

<sup>6</sup> Exports.

<sup>7</sup> Smelter production.

TABLE 21.—World smelter production of lead, 1946–51, by countries, in metric tons<sup>1</sup>

[Compiled by Pauline Roberts]

Country	1946	1947	1948	1949	1950	1951
Argentina.....	16,190	17,800	17,830	<sup>1</sup> 18,037	<sup>1</sup> 18,960	24,000
Australia.....	139,665	161,093	162,057	<sup>2</sup> 152,464	<sup>2</sup> 163,102	173,767
Austria.....	4,476	3,795	9,350	9,841	10,910	11,147
Belgium <sup>3</sup> .....	23,762	40,520	66,035	79,304	62,094	70,646
Brazil.....	420	402	( <sup>4</sup> )	1,172	<sup>2</sup> 4,200	<sup>2</sup> 3,000
Burma.....			7,570	<sup>1</sup> 230	<sup>1</sup> 11	4,968
Canada.....	150,360	147,104	145,246	132,608	154,551	147,609
China.....	14	771	834	2,062	<sup>2</sup> 4,000	<sup>2</sup> 5,000
Czechoslovakia.....	2,800	4,460	5,770	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )
France.....	32,010	29,218	33,288	54,450	61,236	47,970
French Morocco.....			2,818	7,073	12,097	23,322
Germany:						
East Germany.....		( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )
West Germany.....	<sup>2</sup> 27,659	<sup>2</sup> 24,356	<sup>2</sup> 49,382	<sup>2</sup> 99,372	118,140	121,524
Greece.....	1,127	948	1,166	<sup>2</sup> 2,389	2,125	3,890
Guatemala.....	131	110	( <sup>4</sup> )	( <sup>4</sup> ) 68	271	60
Hungary.....	10	60	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> ) 639	( <sup>4</sup> ) 878
India.....	14,269	17,701	<sup>2</sup> 26,734	<sup>2</sup> 26,346	37,469	36,000
Italy.....	4,032	6,168	6,972	7,596	9,984	10,740
Korea:						
Korea, Republic of.....		250	299	100	( <sup>4</sup> )	( <sup>4</sup> )
North Korea.....	<sup>2</sup> 2,000	<sup>2</sup> 2,000	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )
Mexico.....	137,742	217,827	187,067	212,004	230,831	219,107
Northern Rhodesia.....	8,371	15,891	13,229	14,169	13,905	14,194
Peru.....	36,478	32,810	34,297	<sup>2</sup> 36,017	<sup>2</sup> 31,693	44,247
Poland.....	10,915	12,761	16,874	17,850	18,000	18,000
Portugal.....	260	321	233	304	591	( <sup>4</sup> )
Rumania.....	3,225	3,316	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )	( <sup>4</sup> )
South-West Africa.....		64	82			
Spain.....	32,346	34,382	25,813	33,021	<sup>2</sup> 40,568	41,240
Sweden.....	11,223	9,229	6,228	10,757	<sup>2</sup> 16,681	9,435
Tunisia.....	7,498	9,891	<sup>2</sup> 17,957	19,498	23,536	22,906
U. S. S. R. <sup>5</sup> .....	48,000	63,000	75,000	90,000	<sup>2</sup> 111,600	128,400
United Kingdom <sup>6</sup> .....	2,540	<sup>2</sup> 2,845	2,312	<sup>2</sup> 2,134	<sup>2</sup> 3,048	4,158
United States (refined) <sup>7</sup> .....	306,717	400,018	363,092	431,695	453,171	376,142
Yugoslavia.....	<sup>2</sup> 32,600	40,400	<sup>2</sup> 49,200	56,800	<sup>2</sup> 57,200	60,100
Total (estimate).....	1,057,000	1,320,000	<sup>2</sup> 1,365,000	<sup>2</sup> 1,550,000	<sup>2</sup> 1,696,000	1,652,000

<sup>1</sup> Data derived in part from Monthly Bulletin of the United Nations, Statistical Summary of the Mineral Industry (Imperial Institute, London), and the Yearbook of the American Bureau of Metal Statistics.

<sup>2</sup> Revised figure.

<sup>3</sup> Includes scrap.

<sup>4</sup> Data not yet available; estimate by senior author of chapter included in total.

<sup>5</sup> Estimate.

<sup>6</sup> American and British zones only.

<sup>7</sup> Figures cover lead refined from domestic and foreign ores; refined lead produced from foreign base bullion not included.

Four companies—the North Broken Hill, Ltd., the Broken Hill South, Ltd., the New Broken Hill Consolidated, Ltd., and the Consolidated Zinc Corp., Ltd.—mine and mill the Broken Hill ores. During 1951 the Consolidated Zinc Corp., Ltd., continued its program of developing and equipping its mine for increased output. In the course of the year the company mined and milled 440,302 tons of ore containing 58,981 tons of recoverable lead. In addition, it hoisted and milled 211,608 tons of ore (16,706 tons recoverable lead content) for the account of New Broken Hill Consolidated, Ltd. The latter company made excellent progress during the year with development of the No. 19 level and construction of new mine shafts, concentrator, and power plant, which were expected to be placed in service in late 1952. Broken Hill South, Ltd., reported mining 279,319 long tons of ore which assayed 12.0 percent lead, 12.1 percent zinc, and 7.8 ounces of silver per ton. The tonnage mined by North Broken Hill, Ltd., increased slightly, but recoveries of both lead and zinc declined because

the ores treated from the British, Junction, and Block 14 areas were partly oxidized.

The Electrolytic Zinc Co. of Australasia operated the Hercules and Roseberry mines in the Read-Roseberry district of Tasmania, increasing both reserves and output of lead during the year. Output of ore for the year ended June 30, 1951, was 159,429 long tons, which yielded 10,084 long tons of lead concentrate, 46,153 of zinc concentrate, and 3,781 of copper concentrate.

Mount Isa Mines, Ltd., which owns and operates the great Mount Isa deposits in Queensland, continued its operations at a normal rate. During the year the company became interested in working the Protheroe lead mine at Northampton, Western Australia, which produced about 500 tons of lead concentrate monthly.

**Bolivia.**—In 1951 Bolivia exported 30,000 metric tons of recoverable lead in ore. Small miners continued to dominate the lead industry and provided 63 percent of the total lead exported, with the Aramayo and Hochschild groups furnishing 15 percent each. Although official figures were not available on the amount of lead smelted in Bolivia, it was known that the 3 smelters at La Paz, Cochabamba, and Tupiza had a bullion capacity of about 500 tons per month. A fourth smelter under construction at Oruru was expected to increase total capacity to an estimated 700 tons of bullion per month.

**Canada.**—Although the value of recoverable lead from Canadian mines was 17 percent greater than in 1950, the output (143,000 metric tons) was the least since 1933. The Sullivan mine of the Consolidated Mining & Smelting Co., Kimberley, British Columbia, continued to be the principal source of Canadian lead. Ore production in 1951 at this mine totaled 2,533,212 short tons compared to 2,680,962 tons in 1950. As in 1950 the grade decreased somewhat because of the mining of lower grade ores and the dilution consequent to mining pillars. The company milled about 10,000 tons of ore daily, using a combination of sink-float and flotation equipment. The waste from the sink-float plant, which amounted to about 25 percent of the feed, was used for backfill in the mine. Lead concentrate was treated at the company smelter, Trail, B. C., with ores and concentrate from other properties. Production of refined pig lead at the Trail plant totaled 162,712 tons in 1951 compared with 170,364 in 1950. Work progressed on construction of new lead-smelting facilities that would both improve metallurgical efficiency and increase capacity. Accumulated and current lead-bearing residues from the Trail zinc smelter were to be smelted.

The Big Bull and Tulsequah Chief mines in northwest British Columbia came into production during the year, jointly producing 250 tons of complex ore per day. The Yale Lead and Zinc Mine, 30 miles northeast of Nelson, B. C., began producing at the rate of 190 tons of ore daily in April. Other mines were being developed in British Columbia and Nova Scotia, and exploration of the Pine Point mine on the south shore of Great Slave Lake was continued.

**French Morocco and Algeria.**—Perhaps the outstanding development in the lead industry abroad in 1951 was the increased production of the mines of French Morocco. Mine output of 68,100 metric tons of lead was 40 percent above that of 1950. It was unofficially reported that Société des Mines Zellidja milled 835,889 tons of ore to recover

38,885 tons of 74-percent lead concentrate and 29,820 tons of 54-percent zinc concentrate. The company No. 2 mill had a daily ore-treatment capacity of 3,300; it was scheduled to treat all Zellidja ore after August 1, 1952. Total Zellidja reserves were estimated to be 27,000,000 tons, of which 10,000,000 tons may be marginal. Other important producers of lead in French Morocco were the Société des Mines d'Aouli and the Compagnie Royale Astusienne des Mines.

The lead-zinc district extends into adjacent Algeria, where the Société Nord Africaine du Plomb was developing an ore deposit containing 16 percent zinc and 2 percent lead. The operations were directed from Zellidja, and plans provided for milling 600 tons of ore daily at Zellidja's No. 1 mill beginning about August 1952.

The lead smelter of the Société des Mines de Zellidja at Qued-el-Heimer produced 18,400 tons of refined lead in 1951. Capacity of the smelter was said to be 4,000 tons of concentrate monthly.

**Guatemala.**—Output of the Caquipec mine in the Department of Alta Verapaz more than tripled that of 1950 and would have been greater except for transportation difficulties. The lead ores, which ranged from 20 to 42 percent lead, were shipped to the United States and Canada for smelting. Small producers in the Department of Huehuetenango continued to mine and smelt pig lead for the domestic market by primitive methods.

**Mexico.**—Mine production of lead declined somewhat in 1951 as higher prices permitted lower grade ores to be profitably treated. According to the annual report to the stockholders of the San Francisco Mines of Mexico, Ltd., shortage of electrical power forced some curtailment of production. The company milled 597,400 metric tons of ore compared to 623,000 tons in 1950 and produced 45,756 tons of 64.34-percent lead concentrate, 68,452 tons of 55.18-percent zinc concentrate, and 6,148 tons of 26.24-percent copper concentrate. Ore reserves at the end of September 1951 were 4,208,000 tons, containing 6.50 percent lead, 9.35 percent zinc, and 0.65 percent copper.

**South-West Africa.**—The Tsumeb Corp., Ltd. operated the very rich and important Tsumeb mine near the north boundary of the territory. In spite of transportation difficulties with the narrow-gauge railway between Tsumeb and Vsajos, progress continued in expansion of facilities and production. In the year ended June 30, 1951, the concentrator treated 392,780 short tons of ore, from which 32,637 tons of lead, 11,231 tons of copper, and 12,847 tons of zinc were recovered. Sinking of the new vertical 7-compartment De Wet shaft progressed to a depth of 2,460 feet by the end of 1951. The shaft was to be sunk to 4,150 feet and equipped with a hoist and skips capable of handling 2,000 tons of ore daily. During the year the Tsumeb Corp. investigated a lead-zinc deposit near Windhoek. The South-West Africa Co. expanded milling capacity at the Abenab-West lead-vanadium property near Grootfontein.

**Tunisia.**—During 1951, 12 mines in Tunisia produced 33,915 tons of lead concentrate containing 21,250 metric tons of lead. In the same period the Megrine, Djebel Hallouf, and Bizerte lead smelters smelted 39,350 tons of ore and concentrate to produce 22,906 metric tons of pig lead.