

MINER YEARB

METALS AND

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Lead

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TOTAL SUPPLIES well in excess of demand, increased production, increased consumption, and consumption were salient features of the domestic lead industry in 1953. Supply in 1953 totaled 1,377,000 tons compared with 1,202,000 tons in 1952; supply totaled 1,202,000 tons; in 1952 supply totaled 1,131,000 tons, respectively. Production was attributed largely to record mine and smelter output outside of the United States which stimulated the United States and accentuated the market problems of the mining industry. United States imports of recovered lead were the second highest on record, whereas domestic production declined 12 percent and (with the exception of 1951) since the depression year 1935. The price of lead was high of 14.75 cents a pound in early January to a low of 13.48 cents in late April; various fluctuations brought the price up to 17.49 cents on September 16, where it remained for the remainder of the year. The average price for the year was 13.48 cents a pound. Consumption in 1952 and 1951.

Lead supply in 1953 consisted of 343,000 tons from mine production, 487,000 tons of secondary lead from scrap, and 547,000 tons of imports (exclusive of scrap which normally goes to secondary smelting plants in the scrap total). The total of 1,377,000 tons was 17 percent above the 1952 supply. Consumption of lead, including pig lead and chemicals, totaled 1,202,000 tons compared with 1,131,000 tons in the preceding year. Producers' stocks of pig lead increased from 31,000 to 65,000 tons during the year. Antimonial lead stocks increased from 11,000 to 123,000 tons, whereas consumers' stocks of pig lead decreased substantially, whereas consumers' stocks of antimonial lead decreased from 123,000 tons to 114,000.

Domestic mine production of recoverable lead increased from 390,000 tons in 1952 to 343,000 tons in 1953. Production in the Western and West Central States curtailed production as a result of low lead and zinc prices. Production in the Eastern half of the year was at a rate of about 30,400 tons a month, or 36 percent below the 1952 annual rate, while output in the Western half was at a rate of 26,600 tons a month, or 25 percent below the 1952 annual rate. Production in the principal producing States was lower than in 1952. Decreases, on a tonnage basis, were in Utah

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Oklahoma, New Mexico, and Missouri. The only States in which lead production increased were Idaho, New York, and Wisconsin.

The total lead content of imports exclusive of scrap declined 11 percent from the alltime high of 1952; the tonnage (547,000), nevertheless, was the second highest on record and created an excess supply that exerted a depressing influence upon domestic mine production.

Because of widespread mine closings and reduced employment in the lead- (and zinc-) mining industry much thought was given to tariff revision through either new legislation or the invoking of the "escape clause" of the Reciprocal Trade Agreements Act; various other proposals were made to restrict imports or provide means of direct or indirect relief to the domestic industry. In July the Tariff Commission, in response to resolutions of the United States Senate Committee on Finance and the House of Representatives Committee on Ways and Means, instituted a general investigation of the lead and zinc industries to determine relevant facts of production, trade, consumption, and competitive position, "including the effect of imports of lead and zinc on the livelihood of American workers." A report of the investigation was published April 20, 1954.³

GOVERNMENT REGULATIONS

Although all controls governing the use and distribution of lead had been revoked in May 1952 and lead was removed from the list of scarce materials in June, producers and consumers were required to continue reporting stocks, production, and consumption of lead through June 30, 1953, in order that the National Production Authority could continue its "surveillance of lead supplies and consumption." The Office of Price Stabilization price ceilings on lead and zinc were revoked February 13, 1953.

GOVERNMENT PROGRAMS UNDER DEFENSE PRODUCTION ACT OF 1950

Provisions of the Defense Production Act of 1950 with respect to exploration were carried out by the Defense Minerals Exploration Administration (DMEA) and those with respect to procurement by the Defense Materials Procurement Agency (DMPA).

DEFENSE MINERALS EXPLORATION ADMINISTRATION

Exploration contracts and amendments to existing contracts continued to be made by the DMEA during 1953, but in conformance to a directive issued by the Office of Defense Mobilization no applications were accepted for lead- and zinc-exploration projects after May 15, 1953. The turnabout in lead supplies from scarcity to plenty in the second half of 1952 and the continued accumulation of stocks in the United States as well as abroad in 1953 were considered determining factors in the decision reached by the Office of Defense Mobilization (ODM).

³ U. S. Tariff Commission, Lead and Zinc—Report on Investigation Conducted Under Section 332 of the Tariff Act of 1930 Pursuant to a Resolution by the Committee on Finance of the United States Senate, dated July 27, 1953, and a resolution by the Committee on Ways and Means, House of Representatives, dated July 29, 1953, April 1954, Parts I, II, III, IV, and V.

The objective of the DMEA—to encourage reserves of strategic and critical minerals and zinc—was achieved through projects for ore sources. The Government financed cost of approved exploration projects for calendar year 1953 entered into 30 contracts with Government participation of \$2,068,303.⁴ Through lead- and zinc-exploration contracts had been authorized a maximum Government participation of 50 percent in lead-zinc-copper exploration contracts. Fifty percent of all DMEA contracts executed and obligated and through 1953, 32 percent of the funds obligated. A list of DMEA exploration in 1953 is given in the Zinc section.

DEFENSE MATERIALS PROCUREMENT

The Defense Materials Procurement Agency reduced in early 1953 with respect to lead requirement ratio increased and production in force in 1951 and 1952 were coming in 1953, the remaining function of DMPA was completing those in negotiation—within the agency Procurement Service (EPS) of General Services Administration (GSA).

The only contract providing for lead exploration approved in 1953 was that executed on July 1, 1953, by Consolidated Mining Co., Salt Lake City, Utah. The Government advanced Chief Consolidation of proposed expenditures for developing lead mines in the Tintic district, Juab County, Utah, on a percentage royalty agreement of 3 years and a loan to be made on the basis of 5 percent of the ores developed under terms of the contract.

United States assistance in developing lead exploration was negligible in 1953. Mutual Security Administration counterpart funds, were executed with the Government but only a few hundred tons of lead was produced.

DOMESTIC PRODUCTION

Statistics on lead output may be prepared on a refinery basis. Mine-production data, on the basis of content in ores and concentrates, adjusted for losses in smelting, are a better measure of production. Pig-lead output, as reported, presents a more precise figure of actual lead production. Only a general way the source of crude metal from refinery output usually differs from the source of concentrates to the lag between mine shipments and refinery output.

⁴ Includes funds provided through amendments to contracts for participation in exploration contracts that were submitted for completion.

TABLE 1.—Salient statistics of the lead industry in the United States, 1944–48 (average) and 1949–53, in short tons

	1944–48 (average)	1949	1950	1951	1952	1953
Production of refined primary lead:						
From domestic ores and base bullion...	352,962	404,449	418,809	342,644	383,358	328,012
From foreign ores and base bullion....	65,888	72,880	89,505	75,040	89,494	139,879
Total.....	418,850	477,338	508,314	417,683	472,852	467,891
Recovery of secondary lead.....	419,857	412,183	482,275	518,110	471,294	480,737
Imports (general):						
Lead in pigs, bars, and old.....	205,196	289,889	401,827	188,175	523,059	300,510
Lead in base bullion.....	1,791	2,373	3,488	2,281	380	869
Lead in ores and matte.....	64,504	107,270	75,520	67,471	104,621	160,929
Exports of refined pig lead.....	3,890	909	2,735	1,281	1,762	803
Consumption of primary and secondary lead.....	1,080,523	957,674	1,237,981	1,184,703	1,130,795	1,201,604
Prices (cents per pound):						
New York:						
Average for period.....	10.76	15.36	13.30	17.49	16.47	13.48
Quotation at end of period.....	12.41	12.00	17.00	19.00	14.12	13.50
London average for period.....	10.11	16.95	13.29	20.25	16.82	11.48
Mine production of recoverable lead ¹	383,573	409,908	430,827	388,164	390,162	342,644
World smelter production of lead.....	1,361,000	1,648,000	1,808,000	1,764,000	1,973,000	1,905,000

¹ Includes Alaska.² Revised figure.

The competitive position of the domestic lead and zinc industry with reference to foreign producers in 1952 and part of 1953 was reported⁵ April 20, 1954, by the United States Tariff Commission. The report, which was based on all available information including industry hearings and a canvass of domestic lead and zinc mining, milling, smelting and refining companies, revealed that many important changes had taken place in the domestic industry since 1939, when the last Mineral Census was made. One tabulation showed that in 1939 the lead-zinc mines of the United States produced 16,317,000 tons of crude ore with a recoverable metal content of 2.2 percent lead, 2.8 percent zinc, 0.71 and 0.004 ounce per ton of silver and gold, respectively, utilizing 32,283,000 man-hours of labor at \$0.62 per hour. The total value of mine or mill products for that year was \$62,652,000. A similar tabulation for 1952, covering 89 percent of the national output of recoverable lead and 90 percent of the recoverable zinc, showed striking differences. Reports from 211 firms indicated that in 1952 they produced 22,919,000 tons of crude ore with a recoverable metal content of 1.4 percent lead, 2.5 percent zinc, 0.1 percent copper, and 0.73 and 0.006 ounce of silver and gold, respectively. Man-hours worked by production and related workers in mining and milling this tonnage totaled 43,791,000, paid at an average hourly rate of \$1.95. The total mine or mill value of all products was \$225,384,000. These figures indicate that wages increased 215 percent in the period 1939 to 1952, tons of ore mined and milled per man-hour increased from 0.51 to 0.52, the recovery of zinc and lead per ton of ore declined 11 and 36 percent, respectively, and the value of products sold per ton of crude ore increased from \$3.84 to \$9.83, or 156 percent.

Tables from the Tariff Commission report showing the quantity and value of products, principal expenses, hourly earnings, and man-hours worked in lead and zinc mining and milling in the United States

⁵ Work cited in footnote 3.

by State or principal region, and the crude metal content by 1952, are given in the Zinc chapter of this yearbook. The activity per unit of labor, and grade of ore, were the same as in 1952, but the average value of lead was estimated by the Bureau of Mines to have increased to approximately \$6.75 per ton.

On the basis of reports to the Tariff Commission, employees engaged in mining and milling in 1952 supplied 92 percent of the mine output of lead, declined from 23,800 in January 1953, or 32 percent for the period. Employees in smelters and refineries (exclusive of copper) produced from an average of nearly 3,600 in 1952 to 1,100 in the first 10 months of 1953.

In studying the competitive position of the domestic mining industry, the Tariff Commission reported that producers which in 1952 supplied 80 percent of the lead and zinc mined in Canada, 28 percent in Mexico, and 68 percent of the combined output of Australia. From these confidential reports it follows with relation to Canada, the

*** that total principal operating expenses for mining and salaries, are lower per ton of crude ore mined in Canada and Mexico. This appears to be the case because earnings of workers are much lower for operations in either Canada or the United States, and are slightly higher in the United States. The data also indicate that the per ton of crude ore mined in Mexico were much higher than in the United States.

However, when allowance is made for the difference in the ores mined in the three countries, as affected by the metals obtained from them, the situation with respect to parison of costs is quite different. Notwithstanding the higher expenses for salaries and wages in Canada and Mexico than in the United States, the unit of recoverable metal in Mexico and Canada

MINE PRODUCTION

Domestic mine production of recoverable lead increased from 383,573 tons in 1952 to 342,644 tons in 1953, with the production was 335,000 tons, was the lowest in the Western and West Central States. The decline was down as a result of low lead and zinc prices. The first half of the year was at a rate of about 10 percent below the 1952 annual rate—within 6 months was at a rate of 26,600 tons a month (average monthly yield in 1952. Missouri produced 10 percent of the total), was again the largest lead producer, and Utah produced 75,000 tons (22 percent) of recoverable lead, respectively, and ranking States. Production in 13 of the States was lower than in 1952. The largest producers, on a basis, were in Utah, Colorado, Arizona, California, Missouri. Idaho, New York, and Wisconsin, in which lead production increased.

TABLE 2.—Mine production of recoverable lead in the United States, 1944-48 (average) and 1949-53, by States, in short tons

State	1944-48 (average)	1949	1950	1951	1952	1953
Western States and Alaska:						
Alaska.....	153	51	140	21	1	9
Arizona.....	24,304	33,568	20,383	17,394	16,520	9,428
California.....	8,404	10,318	15,831	13,007	11,100	8,004
Colorado.....	19,123	20,853	27,007	30,330	30,066	21,764
Idaho.....	75,890	79,299	100,025	76,713	73,710	74,610
Montana.....	13,180	17,990	19,617	21,302	21,279	19,949
Nevada.....	7,399	10,020	9,408	7,148	6,790	4,371
New Mexico.....	6,772	4,652	4,150	5,846	7,021	2,943
Oregon.....	5	12	17	2	1	5
South Dakota.....	12	4	.....	2	2	10
Texas.....	50	132	129	43	56	.....
Utah.....	45,930	53,072	44,753	50,451	50,210	41,522
Washington.....	5,024	6,417	10,334	8,602	11,744	11,004
Wyoming.....	1	.....	.....	.....	.....	.....
Total.....	200,355	243,000	257,803	231,227	228,008	194,320
West Central States:						
Arkansas.....	9	1	9	33	4	.....
Kansas.....	7,770	9,772	9,487	8,947	5,016	3,347
Missouri.....	144,081	127,522	134,020	121,702	120,245	126,895
Oklahoma.....	14,302	19,858	20,724	16,575	15,137	9,304
Total.....	167,068	157,153	164,840	149,257	150,302	138,546
States east of the Mississippi River:						
Illinois.....	2,972	3,824	2,729	3,160	4,282	3,391
Kentucky.....	165	187	66	107	60	52
New York.....	1,261	1,317	1,484	1,500	1,120	1,435
Tennessee.....	40	257	113	14	18	9
Virginia.....	4,351	3,313	3,254	1,508	3,792	2,788
Wisconsin.....	1,361	857	532	1,391	2,000	2,094
Total.....	10,150	9,755	8,178	7,680	11,252	9,769
Grand total.....	383,573	409,008	430,827	388,164	390,162	342,044

The West Central States produced 138,500 tons of recoverable lead in 1953 (8 percent less than in 1952) from the mines of southeastern Missouri and those of the Tri-State district, comprised of southwestern Missouri, north-eastern Oklahoma, and southeastern Kansas.

As in the previous 45 years, the southeastern Missouri lead belt was the major lead-producing district in the United States, furnishing 37 percent of the Nation's total lead production. Although crude-ore production was down about 7 percent, output of lead approximated that in 1952. The chief producer was the St. Joseph Lead Co., operating the company-owned Bonne Terre, Desloge, Federal, and Leadwood mine-mill units in St. Francois County. Ore from the company Doe Run operation was milled at the Federal mill, and a sink-float plant concentrate from the new Hayden Creek mine was concentrated further at the Leadwood mill. The company also operated the Mine La Motte mine-mill unit in Madison County and continued development and construction at its new Indian Creek mine-mill unit in Washington County. The second largest producer was the National Lead Co., operating its Madison County mine-mill unit at Fredricktown.

The Tri-State district produced 13,300 tons of lead in 1953 compared with 27,400 tons in 1952. Crude zinc-lead ore production was 3,480,000 tons or 43 percent less than the 6,140,000 tons mined in 1952. Much of the decline in mine output of lead and zinc in the

Tri-State was attributed to the closure of East Central mill as a result of a strike beginning through the remainder of the year. This was the total ore treated more than 1,500,000 tons of lead production at the National Lead Co. Ballard closure in mid-November was another factor. At the year end approximately 30 mines are in the district compared with about 150 mines in 1952. The recoverable zinc and lead in the ore (recovery) was 2.87 and 0.50 percent, respectively, of 1952 with 2.75 and 0.56 percent in 1952. This limited potentiality of upgrading Tri-State ore values. The Western States had a combined 194,300 tons of recoverable lead in 1953 compared with 194,320 tons in 1952. The decline, as elsewhere in the district, was chiefly from low lead-zinc prices that forced closures as mining of submarginal ores was no longer profitable.

Idaho was the second largest producer of lead in 1953 with 74,600 tons (73,700 tons in 1952). As a result of the d'Alene region produced over 90 percent of the lead with the Bunker Hill, Star, Page, and Morrison producers. The Nabob mine (Nabob Silver) was closed early in 1953 owing to low metal prices, and the company operation of the Sherman and Tamarack mine on a block-leasing system. On October 4 the Tamarack Smelting & Refining Co. was closed after 10 years of operation. A considerable quantity of ore remained before complete abandonment of the mine. Numerous exploration and development projects are in the Coeur d'Alene region in 1953. Bunker Hill Concentrating Co. started a \$1 million sink-float exploration project at its Crescent mine during 1953. The mine in Blaine County was the only major lead mine outside the Coeur d'Alene region.

Utah ranked third among lead-producing States with 41,500 tons—almost 9,000 tons less than in 1952. The principal producing mines, in addition to the United States & Lark property (United States & Mining Co.), Chief No. 1 and Eureka Hill (United States & Mining Co.), and Blue Ledge district mine (United States & Mining Co.), West Calumet mine (Combined Metals Refining Co.), Ophir mine (United States Smelting, Refining & Park Utah Consolidated and Silver King Co.), and Silver King Co. in 1952, remained inoperative throughout 1953. November at the United States & Lark output.

Lead output from Colorado mines totaled 16,520 tons, a 28-percent decline from 1952. The greatest decline was at the San Juan County, where the Shenandoah-District mill were closed March 14, and in Lake County where the Zinc-Lead Co. Akron-Erie mine in Gunnison Co.

1952, remained inoperative throughout 1953. The Eagle mine, Colorado's foremost zinc and fourth most important lead producer in 1953, was closed by a strike from September 1 to November 2.

Lead production in Montana declined 6 percent to 19,900 tons in 1953. The chief production was from Anaconda Copper Mining Co. owned or leased properties in the Butte area and the East Helena slag dump. The Blacktail mine, an open-pit mine in Missoula County, operated by Linton Mines, Inc., was closed in the fall of 1953 because of the low lead price. Begun in 1949, the mine had produced about 500 tons of lead annually. The Jack Waite mine (American Smelting & Refining Co.) in Sanders County maintained a high production level, but the Iron Mountain mine of the Mineral Leasing Co. in Mineral County was closed in July.

Mine output of lead in Washington in 1953 was 11,100 tons, or about 700 tons less than in 1952. The lead was produced chiefly by the Pend Oreille mine of Pend Oreille Mines & Metals Co., the Grandview mine of American Zinc, Lead & Smelting Co., and the Deep Creek mine of Goldfield Consolidated Mines Co. Other lead-producing mines included the Bonanza, the Lead King, Oriole, Johnsburg, Advance, Electric Point, Gladstone, King Tut, Lead Trust, Long Shot, Old Dominion, Red Top, Santiago, United Treasure, Young America, Leo Ray, and Queen mines, all in either Pend Oreille or Stevens County. In late 1953 the Grandview and Pend Oreille mine output was curtailed by reducing the workweek, and beginning in October the Deep Creek activity was limited to development.

Lead output in Arizona in 1953 decreased 43 percent to 9,400 tons, the lowest since 1935. Low lead and zinc prices throughout the year resulted in continued idleness of the San Xavier mine and in suspension of mining lead-zinc ores at the Copper Queen, and a general decline in activity at small-scale mining operations. The chief lead producers of the State in 1953 were the Iron King mine (Shattuck Denn Mining Corp.); Trench unit (American Smelting & Refining Co.); Aravaipa mine (Athletic Mining Co.); Hilltop mine (American Zinc, Lead & Smelting Co.); and Copper Queen mine (Phelps Dodge Corp.).

Lead production from California mines declined 23 percent in 1953 to 8,700 tons. The Darwin group operated by Anaconda Copper Mining Co. in Inyo County was the only large producing unit operating throughout the year, but in early 1953 the New Penn mines produced both zinc and copper concentrates containing recoverable lead. Other producing mines included the Silver Reid, Christmas Gift, Lane, Defense, Modoc, Mimetta Reward, Le Moine, and Lippincott mines in Inyo County; the Alexander mine in Mono County; the Umerci mine in San Bernardino County; the Black Eagle mine in Riverside County; the Green Dragon mine in Siskiyou County; and the Hazel Creek mine in El Dorado County.

The recoverable lead content of Nevada-mined ores in 1953 was 4,400 tons, a 36-percent drop from the 1952 output. The decrease was brought about by low lead-zinc prices, which caused Combined Metals Reduction Co. to divert more of its Casleton mill capacity to manganese-lead-zinc ores at the expense of lead-zinc ores. Other producers of lead included the Bristol mine (Bristol Silver Mines Co.), Lincoln County; and the Ward mine (Walker Corp.), White Pine County.

Output of lead in New Mexico declined during 1953 owing to closure of all zinc mines closed in 1952. Zinc-lead mines closing were the Kearney mine of New Mexico Consolidated Mines Co. (September 23); the Ground Hog group of American Smelting & Refining Co. (September 23); the Bayard group of the United Mining Co. (September 30); and the Lynx mine (April). The principal lead-producing mines were the zinc-lead group in the Central district, the Hansonburg district, and the Ground Central district.

Mine production of lead in States east of the Mississippi declined 13 percent to 10,000 tons in 1953, a 13-percent decline from 11,500 tons in 1952. The principal producing areas were the Valley district of northwestern Illinois (3,688 tons); Wythe County, Va. (2,780 tons); and County, N. Y. (1,435 tons). The remainder was produced by the byproduct of the southern Illinois-western mining district (1,849 tons) and of the Tennessee (9 tons).

Northern Illinois and southwestern Wisconsin produced 4 percent and was chiefly from the mines of the Inc., Vinegar Hill Zinc Co., Inc., Eagle Lead Co., operating in Lafayette and Adams counties and mines of Tri-State Zinc, Inc., and the mines in Jo Daviess County, Ill. The Eagle-Pine mine was brought to a halt March 31 when the company Graham Central mill near Galena was repaired; but the mines, which include the Graham and the Mifflin, which were in Wisconsin and the Graham and Snyder mines, which were in Wisconsin, reopened. The Mifflin Mining Co. ceased operations in March resumed operations for 4 months in March, Iowa County, Wis.

Lead output of the Illinois-Kentucky district declined 34 percent owing to smaller output of the Co. plant at Rosiclare, Ill., and to smaller output of ores being treated. The Hutson zinc mine, which also produced lead, was closed January 1953.

Lead output in New York, chiefly from the Joseph Lead Co., was 28 percent greater than in 1952. Production in Virginia declined 26 percent owing to the ore from the Austinville mine of the New Jersey Zinc Co. announced in 1953 the New Jersey Zinc Co. announced the zinc-lead mine, Louisa County, Va. The mine had been productive since 1911. The lead output was 10,000 tons, a byproduct recovered in smelting the zinc.

The 25 leading lead-producing mines in the United States listed in table 4, yielded 78 percent of the total lead produced. The 10 leading mines produced 61 percent of the total.

More detailed information on the production of lead in the districts in the United States appears in

TABLE 3.—Mine production of recoverable lead in the United States, 1944-48 (average) and 1949-53, by districts that produced 1,000 tons or more during any year, 1949-53, in short tons

District	State	1944-48 (average)	1949	1950	1951	1952	1953
Southeastern Missouri region.	Missouri.....	141,719	126,269	133,680	122,318	122,042	125,273
Coeur d'Alene region.....	Idaho.....	70,488	74,152	94,697	70,570	67,330	69,885
West Mountain (Bingham).	Utah.....	24,614	32,600	27,472	29,120	34,328	20,311
Summit Valley (Butte).....	Montana.....	6,465	11,490	15,679	16,630	16,153	16,767
Tri-State (Joplin region)...	Kansas, southwestern Missouri, Oklahoma.	25,224	30,883	31,167	26,906	27,366	13,273
Metaline.....	Washington.....	3,751	4,030	7,445	5,234	(1)	8,694
Coso (Darwin).....	California.....	5,032	4,928	8,479	7,191	(1)	8,260
Upper San Miguel.....	Colorado.....	2,433	5,285	7,780	8,008	7,657	7,440
Park City region.....	Utah.....	10,621	8,583	7,638	11,719	7,494	4,735
Big Bug.....	Arizona.....	2,070	3,330	4,357	4,035	4,135	4,339
Upper Mississippi Valley...	Iowa, northern Illinois, Wisconsin.	1,851	2,046	1,801	1,923	3,532	3,688
Tintic.....	Utah.....	5,325	6,070	6,520	5,553	4,279	3,590
Pioche.....	Nevada.....	3,927	6,630	6,761	4,751	4,632	3,306
California (Leadville).....	Colorado.....	4,850	5,080	6,392	5,906	5,624	3,072
Austinville.....	Virginia.....	4,269	3,313	3,254	1,498	3,792	2,788
Rush Valley & Smelter (Tooele County).....	Utah.....	3,687	2,063	1,393	2,074	2,506	2,753
Warm Springs.....	Idaho.....	2,102	2,339	2,648	3,086	3,455	2,583
Red Cliff.....	Colorado.....	950	1,600	2,110	4,274	3,980	2,500
Northport (Aladdin).....	Washington.....	447	342	237	937	(1)	2,165
Harshaw.....	Arizona.....	1,472	1,546	1,031	1,658	1,921	2,104
Pioneer (Rico).....	Colorado.....	2,383	1,388	1,138	2,231	2,230	1,871
Kentucky-Southern Illinois.	Kentucky, southern Illinois.	2,648	2,822	1,520	2,516	2,790	1,849
Creede.....	Colorado.....	362	1,162	1,422	1,167	1,513	1,696
Bayhorse.....	Idaho.....	1,569	1,073	1,679	1,732	1,091	1,484
Central.....	New Mexico.....	4,036	2,479	2,315	3,133	4,486	1,460
St. Lawrence County.....	New York.....	1,201	1,317	1,484	1,497	1,120	1,435
Sniffels.....	Colorado.....	(1)	1,064	866	1,004	1,044	1,307
Animas.....	do.....	2,437	2,935	3,069	3,963	3,464	1,212
Eagle.....	Montana.....	638	1,024	1,013	(1)	733	1,179
Ophir.....	Utah.....	479	1,089	948	712	990	1,157
Breckenridge.....	Colorado.....	101	308	347	246	490	1,056
Hansonberg.....	New Mexico.....	24	131	461	753	847	1,031
Bossburg.....	Washington.....	509	2,011	2,640	1,788	(1)	168
Battle Mountain.....	Nevada.....	92	1,290	564	1,351	907	1
Old Hat.....	Arizona.....	4,835	6,788	5,960	4,241	3,913	1
Pima (Sierritas, Papago, Twin Buttes).....	do.....	2,726	4,232	2,966	2,834	1,864	1
Hedleston.....	Montana.....	2,458	2,335	930	1,398	1,251	1
Warren (Blisbee).....	Arizona.....	9,692	13,865	7,700	1,606	1,828	1
Magdalena.....	New Mexico.....	1,790	1,162	926	1,004	1,046	1
Aravalpa.....	Arizona.....	576	1,271	1,498	1,294	865	1
Tomichi.....	Colorado.....	863	1,221	945	701	739	1
Ten Mile.....	do.....	1,415	3,671	910	6	8	1
Resting Springs.....	California.....	(1)	(1)	(1)	(1)	(1)	1

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

TABLE 4.—Twenty-five leading lead-producing mines in the United States in 1953, 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 & Lark.....	West Mountain (Bingham).....	Utah.....	U. S. Smelting, Refining & Mining Co.	Lead-zinc.
3	Bunker Hill.....	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.	Lead-zinc.
6	Mine La Motte.....	Southeastern Missouri.....	Missouri.....	St. Joseph Lead Co.	Lead.
7	Desloge.....	do.....	do.....	do.	Do.
8	Bonnie Terra.....	do.....	do.....	do.	Do.
9	Pago.....	Yreka.....	Idaho.....	American Smelting & Refining Co.	Lead-zinc.
10	Darwin group.....	Coso.....	California.....	Anaconda Copper Mining Co.	Do.
11	Star.....	Hunter.....	Idaho.....	Sullivan Mining Co.	Do.
12	Pend Oreille.....	Metaline.....	Washington.....	Pend Oreille Mines & Metals Co.	Do.
13	Morning.....	Hunter.....	Idaho.....	American Smelting & Refining Co.	Do.
14	Treasury Tunnel-Black Bear.....	Upper San Miguel.....	Colorado.....	Idaado Mining Co.	Do.
15	Iron King.....	Big Bug.....	Arizona.....	Battuck-Denn Mining Co.	Do.
16	Payson.....	Flint Center.....	Utah.....	Payson Mines, Inc.	Lead.
17	Chino.....	Park City region.....	Utah.....	Nader Park Mining Co.	Lead-zinc.
18	Park Gilman-Mayflower.....	Pioche.....	Nevada.....	Combined Metals Reduction Co.	Do.
19	Grandview.....	Metaline.....	Washington.....	American Zinc-Lead Smelting Co.	Do.
20	Reurrection.....	Leadville.....	Colorado.....	Reurrection Mining Co.	Do.
21	Smuggler Union.....	Upper San Miguel.....	Idaho.....	Telluride Mines, Inc.	Do.
22	Frisco.....	Leland.....	Idaho.....	American Smelting & Refining Co.	Do.

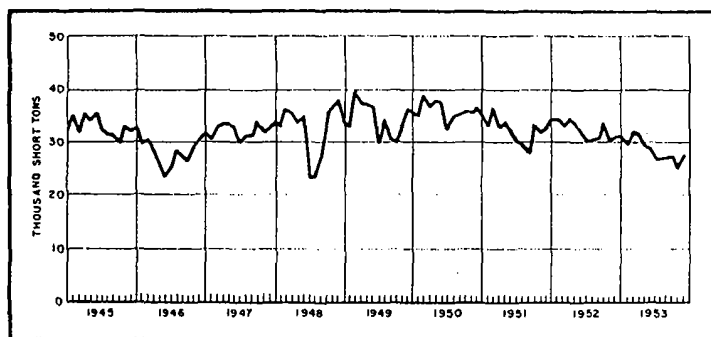


FIGURE 1.—Mine production of recoverable lead in the United States, 1945–1953, by months.

TABLE 5.—Mine production of recoverable lead in the United States,¹ 1952–53, by months, in short tons

Month	1952	1953	Month	1952	1953
January.....	34,551	31,073	August.....	30,454	28,631
February.....	34,601	29,861	September.....	30,633	29,934
March.....	33,437	31,780	October.....	33,863	27,226
April.....	34,724	31,490	November.....	30,152	25,154
May.....	34,087	29,507	December.....	31,178	27,456
June.....	32,202	28,797	Total.....	390,162	342,614
July.....	30,090	26,837			

¹ Includes Alaska.

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 principally antimonial lead. Statistics on the production of refined lead and alloys at secondary plants are given in the Secondary Lead section of this chapter.

The 11 primary smelters in operation in 1953 consumed 475,000 short tons (lead content) of primary materials in the form of ores and concentrates, of which 69 percent was of domestic and 31 percent of foreign origin. Total consumption was 5 percent less than in 1952 but 9 percent above consumption in 1951.

ACTIVE LEAD SMELTERS AND REFINERIES

Primary lead smelters and refineries in operation in 1953 were as follows:

California: Selby—Selby plant, American Smelting & Refining Co. (refinery).
 Colorado: Leadville—Arkansas Valley plant, American Smelting & Refining Co. (smelter).
 Idaho: Bradley—Bunker Hill Smelter, Bunker Hill Mining & Refining Co. (smelter and refinery).
 Illinois: Alton—Federal plant, American Smelting & Refining Co. (refinery).
 Indiana: East Chicago—U. S. S. Lead Refinery, U. S. Steel Corp. (refinery).
 Kansas: Galena—Galena plant, Eagle-Picher Corp. (smelter and refinery).
 Missouri: Herculaneum—Herculaneum plant, American Smelting & Refining Co. (refinery).
 Montana: East Helena—East Helena plant, American Smelting & Refining Co. (smelter).
 Nebraska: Omaha—Omaha plant, American Smelting & Refining Co. (smelter and refinery).
 New Jersey: Barber—Perth Amboy plant, American Smelting & Refining Co. (smelter and refinery).
 Texas: El Paso—El Paso plant, American Smelting & Refining Co. (refinery).
 Utah:

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

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

Bunker Hill & Sullivan Mining & Refining Co. is operating a \$3 million modernization program at its Selby plant. The program includes a crushing and fine-grinding plant and pelletizing plant, and a 202-foot-diameter slag-fuming plant. Four companies operated five slag-fuming plants in 1953, producing 1,000 tons of zinc and some lead from lead slags.

A list of the companies and plant locations follows:

California: Selby—American Smelting & Refining Co.
 Idaho: Kellogg—Bunker Hill & Sullivan Mining & Refining Co.
 Montana: East Helena—Anaconda Copper Mining Co.
 Texas: El Paso—American Smelting & Refining Co.
 Utah: Tooele—International Smelting & Refining Co.

The new slag-fuming plant⁶ at the Selby plant was described in the preceding section. The plant has capacity to recover 10,000 tons of lead from lead slags.

REFINED LEAD

Primary refineries in the United States produced 1,000 tons of refined lead in 1953, a 1-percent decrease from 1,010 tons produced in 1952.

Of the 467,900 tons of refined lead produced in 1953, 70 percent came from domestic ores and concentrates and 30 percent from imported ores and bullion (81 percent in 1952). Table 7 gives the production of refined lead by country of origin. Details of the production of refined lead are given in the Mine Production section of this chapter.

⁶ Engineering and Mining Journal, Slag-Fuming at Selby.

TABLE 6.—Refined lead produced at primary refineries in the United States, 1944-48 (average) and 1949-53, by source material, in short tons

Source	1944-48 (average)	1949	1950	1951	1952	1953
Refined lead:						
From domestic ores and base bullion.....	352,062	404,440	418,800	342,644	383,368	328,012
From foreign ores.....	64,523	71,413	80,241	71,984	89,092	139,711
From foreign base bullion.....	1,365	1,476	3,264	3,065	402	168
Total from primary sources.....	418,850	477,338	508,314	417,693	472,852	467,891
From scrap.....	11,704	23,230	5,456	3,893	3,070	4,211
Total refined lead.....	430,554	500,568	513,769	421,586	475,922	472,102
Average sales price per pound.....	\$0.107	\$0.158	\$0.135	\$0.173	\$0.161	\$0.131
Total calculated value of primary refined lead ¹	\$88,964,000	\$150,840,000	\$137,245,000	\$144,522,000	\$153,247,000	\$123,601,000

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

TABLE 7.—Refined primary lead produced in the United States, 1944-48 (average) and 1949-53, by source material and country of origin, in short tons

Source	1944-48 (average)	1949	1950	1951	1952	1953
Domestic ore and base bullion.....	352,062	404,440	418,800	342,644	383,368	328,012
Foreign ore:						
Australia.....	12,002	6,465	0,984	0,050	5,888	10,886
Canada.....	6,159	3,317	7,892	7,986	7,113	26,673
Europe.....	8	30	.....	17	454	190
Mexico.....	4,071	8,477	5,902	3,020	2,344	5,876
South America.....	18,433	20,163	38,770	36,840	48,025	50,828
Other foreign.....	22,950	23,961	26,003	14,456	24,668	36,249
Total.....	64,523	71,413	80,241	71,984	89,092	139,711
Foreign base bullion:						
Australia.....	93	1,382	2,427	2,815	.....	42
Mexico.....	1,160	36	436	27	70	.....
South America.....	53	58	402	75	177	126
Other foreign.....	59	.....	.....	148	155	.....
Total.....	1,365	1,476	3,264	3,065	402	168
Total foreign.....	65,888	72,889	80,505	75,049	89,494	139,879
Grand total.....	418,850	477,338	508,314	417,693	472,852	467,891

ANTIMONIAL LEAD

Production of 62,400 tons of antimonial lead at primary refineries in 1953 was 7 percent above 1952 production, with all 5 plants contributing to the increase. Distribution of antimonial lead production at primary refineries in 1949-53 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 smelting antimonial lead scrap at secondary smelters. Production data from lead-smelting plants treating scrap materials exclusively are summarized in the following section.

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TABLE 8.—Antimonial lead produced at primary refineries in the United States, 1944-48 (average)

Year	Production (short tons)	Antimony content	
		Short tons	Percent
1944-48 (average).....	70,343	4,559	6.7
1949.....	41,402	3,385	8.2
1950.....	57,959	4,504	7.8
1951.....	65,309	4,416	6.7
1952.....	68,203	4,362	7.5
1953.....	62,373	4,537	7.3

SECONDARY LEAD

Some scrap lead is treated at primary refineries. Part is processed at a large number of plants producing secondary materials. Secondary lead is produced from refined lead, antimonial lead, and other materials.

Recovery of secondary lead in 1953 totaled 17,742 tons, an increase over the 471,300 tons recovered in 1952. Secondary metal and in alloys again exceeded domestic production in the preceding 7 years. Data on secondary lead by type of plant, are shown in table 9. Secondary lead appears in the Secondary section of this volume.

TABLE 9.—Secondary lead recovered in the United States, 1944-48 (average) and 1949-53, in short tons

	1944-48 (average)	1949	1950
As refined metal:			
At primary plants.....	11,704	23,230	17,742
At other plants.....	74,952	129,396	139,711
Total.....	86,656	152,626	157,453
In antimonial lead:			
At primary plants.....	43,335	32,705	36,840
At other plants.....	172,279	140,037	148,025
Total.....	215,614	172,742	184,865
In other alloys.....	117,587	86,815	100,000
Grand total:			
Short tons.....	419,857	412,183	442,318
Value.....	\$96,065,459	\$130,249,828	\$130,249,828

LEAD PIGMENTS

The principal lead pigments are litharge, red lead, and sublimed lead, leaded zinc oxide, and orange lead. They are manufactured for the most part from lead concentrates are converted directly into pigments. Production of lead pigments are given in the Lead 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 1,202,000 tons in 1953, an increase of 6 percent over consumption in 1952. Of the total consumed, 795,000 tons was refined soft lead (including both primary and secondary refined lead), 278,000 tons was contained in antimonial lead (the greater part of which was secondary), 26,000 tons in white-metal scrap, 43,000 tons in percentage metals, 27,000 tons in copper-base scrap, and 24,000 tons in drosses and residues; and 9,000 tons was recovered from ore in leaded zinc oxide. About 42 percent of all lead consumed was used in metal products, 30 percent in storage batteries, 11 percent in pigments, 14 percent in chemicals (including tetraethyl lead), and 3 percent in miscellaneous uses. Production of the 3 largest lead-consuming items—batteries, tetraethyl fluid, and cable covering—took 30.5, 13.5, and 12 percent, respectively, or 56 percent of all lead consumed in 1953. Although aluminum, polyethylene, and neoprene have replaced lead cable sheathing in some uses, lead continues to be favored because of high corrosion resistance, flexibility, the ease with which it may be jointed, and its very considerable salvage value. Lead consumed for cable covering increased 3 percent to 147,000 short tons, the largest quantity so consumed since 1948. Lead consumed in manufacturing tetraethyl lead was 10 percent above 1952 and 93 percent greater than in 1948.

TABLE 10.—Consumption of lead in the United States, 1952–53, by products, in short tons

	1952	1953		1952	1953
Metal products:			Pigments:		
Ammunition.....	36,182	45,147	White lead.....	22,043	17,775
Bearing metals.....	38,545	38,591	Red lead and litharge.....	76,742	88,649
Brass and bronze.....	25,807	26,203	Pigment colors.....	12,839	12,859
Cable covering.....	142,571	148,565	Other ¹	9,775	10,307
Calking lead.....	46,150	48,236	Total pigments.....	122,200	120,590
Casting metals.....	18,017	12,908	Chemicals:		
Collapse tubes.....	10,095	11,583	Tetraethyl lead.....	146,723	162,443
Foil.....	2,124	4,410	Miscellaneous chemicals.....	3,006	6,976
Pipes, traps, and bends.....	29,465	28,693	Total chemicals.....	150,719	169,419
Sheet lead.....	28,697	30,476	Miscellaneous uses:		
Solder.....	72,664	78,743	Annealing.....	5,084	5,280
Terne metal.....	1,812	3,200	Galvanizing.....	2,002	2,020
Type metal.....	27,413	26,729	Lead plating.....	1,037	987
Total metal products.....	476,542	501,482	Weights and ballast.....	7,660	8,244
Storage batteries:			Total miscellaneous uses.....	15,783	18,540
Antimonial lead.....	187,506	191,753	Other, unclassified uses.....	14,522	10,908
Lead oxides.....	163,424	175,822	Grand total.....	1,130,795	1,201,604
Total storage batteries.....	350,930	367,575			

¹ Includes lead content of leaded zinc oxide production.

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TABLE 11.—Consumption of lead in the United States, by month, in short tons¹

Month	1952	1953	
January.....	97,603	96,377	August.....
February.....	92,527	92,121	September.....
March.....	88,664	103,336	October.....
April.....	83,719	104,816	November.....
May.....	82,714	101,282	December.....
June.....	87,679	108,534	
July.....	85,568	99,496	

¹ Includes lead content of leaded zinc oxide production.

TABLE 12.—Consumption of lead in the United States, by product and types of material

Metal products.....	
Storage batteries.....	
Pigments.....	
Chemicals.....	
Miscellaneous.....	
Unclassified.....	
Total.....	

¹ Excludes 9,563 tons of lead contained in leaded zinc oxide.

STOCKS

Producers' Stocks.—Lead stocks, as reported by the Bureau of Metal Statistics, are shown in thousands of short tons. Lead and antimonial lead include metal held by producers and some of the refiners of secondary metal. Despite decreased supply and increased consumption with 1952, supply continued to outstrip consumers' requirements by 173,000 tons in 1949. Lead in raw material, in process, and in finished product totaled 196,000 tons, approximately 1949.

TABLE 13.—Stocks of lead at smelters and refiners, end of year, 1944–48 (average) and 1949 (American Bureau of Metal Statistics)

	1944–48 (average)	1949
Refined pig lead.....	27,348	61,900
Antimonial lead.....	7,044	9,000
Total.....	34,392	70,900
Lead in base bullion—		
At smelters and refineries.....	8,351	16,000
In transit to refineries.....	4,536	3,000
In process at refineries.....	16,976	18,000
Total.....	28,863	35,000
Lead in ore and matte and in process at smelters.....	87,066	95,000
Grand total.....	150,321	201,000

Figures reported to the Bureau of Mines in its annual survey of smelters and refiners represent physical inventory at the plants, irrespective of ownership, and do not include material in process or in transit. Bureau reports indicated stocks of 65,000 tons of refined lead at these plants on December 31, 1953, compared with 31,400 tons on January 1. Stocks of antimonial lead at primary plants increased from 11,000 tons to 14,400 during the year. Stocks of ore and concentrates (lead content) also increased, rising from 34,000 tons to 44,000; inventories of base bullion at refineries that receive bullion and smelters that produce bullion for shipment to refineries, increased from 13,500 tons to 18,200.

Consumers' Stocks.—Consumers' stocks of lead decreased 7 percent in 1953. Stocks on January 1 totaled 123,000 tons, changed very little through the first 4 months of the year, increased to 139,000 tons by the end of June, and thereafter declined gradually to 114,000 tons on December 31. Consumers' stocks of refined lead, antimonial lead, unmelted white-metal scrap, and lead in copper-base scrap decreased 6, 27, 7, and 9 percent, respectively, increases being reported in percentage metals and drosses.

TABLE 14.—Consumers' stocks of lead in the United States at end of year, 1949–53, 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
1949.....	64,542	16,837	2,957	5,405	2,087	5,439	97,267
1950.....	87,285	27,737	5,406	0,446	1,558	11,452	139,884
1951.....	56,731	28,221	3,140	7,054	1,429	6,185	102,760
1952.....	80,888	20,309	3,877	6,191	2,282	8,983	122,530
1953.....	75,801	14,867	3,607	7,921	2,083	9,484	113,763

PRICES

The market price for common lead, New York, was 14.75 cents a pound for the first few days of the year, the highest quotation of the year. On January 7 the price dropped to 14.50 cents a pound, and subsequent decreases brought it to 12.00 cents, the low point of the year, on April 20. On April 29 it advanced again to 12.50 cents and then six ¼-cent advances raised the quotation to 14.00 cents on July 23. On September 16 there was a ½-cent decrease to 13.50 cents, and the price remained there through December 31.

The London free lead market was in operation throughout the year. Quotations ranged from a high of £105 per long ton (equivalent to 13.11 cents per pound computed on the base of 279.75 cents per pound) on January 5 to a low of £73 per long ton (9.12 cents per pound) on April 22. The average monthly quoted price of common lead is given in table 15. Comparison of the New York and London prices shows that for the year the New York price was 2 cents a pound higher.

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TABLE 15.—Average monthly and yearly quotations for lead, New York, and London, 1951–53, in cents per pound

Month	1951			1952
	St. Louis	New York	London ¹	
January.....	16.80	17.00	17.00	16.80
February.....	16.80	17.00	17.00	16.80
March.....	16.80	17.00	17.00	16.80
April.....	16.80	17.00	20.00	16.80
May.....	16.80	17.00	20.00	16.80
June.....	16.80	17.00	20.00	16.80
July.....	16.80	17.00	21.45	16.80
August.....	16.80	17.00	22.49	16.80
September.....	16.80	17.00	22.49	16.80
October.....	18.72	18.92	21.87	18.72
November.....	18.80	19.00	21.88	18.80
December.....	18.80	19.00	21.84	18.80
Average.....	17.29	17.49	20.25	17.29

¹ St. Louis: Metal Statistics, 1954, p. 525. New York: Metal and Mineral Markets and Quin's Metal Handbook.
² Conversion of English quotations into American money.
³ Federal Reserve Board.
⁴ Revised.

⁵ Average of daily mean of bid-and-asked quotations, at close of business.

FOREIGN TRADE

Imports.—General imports of lead in 1952 total to 552,000 tons; nevertheless, the highest on record. The large surplus in 1952 and 1953 was brought about primarily by the fact that lead imported in 1952 was in the form of pigs and bars, and lead contained in ores, flue dust, and anodes, 18 percent, Australia 18 percent, Peru 13 percent, Canada 13 percent of the pigs and bars, 13 percent of the ores, flue dust, and matte 24 percent from Peru, 19 percent from the Union of Soviet Republics, 12 percent from Australia, and 12 percent from Bolivia.

TABLE 16.—Total lead imported into the United States in 1948–53, by country of origin, in short tons¹

Country		1944–48 ² (average)	1953
Ore and matte:			
Africa.....		4,391	3,121
Australia.....		13,876	13,876
Bolivia.....		6,296	2,002
Canada (including Newfoundland and Labrador).....		22,992	1,002
Chile.....		2,902	1,002
El Salvador.....		61	1,002
Guatemala.....		6	1,002
Honduras.....		13	1,002

See footnotes at end of table.

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

TABLE 16.—Total lead imported into the United States in ore, matte, base bullion, pigs, bars, and reclaimed, by countries, 1944-48 (average) and 1949-53, in short tons¹—Continued

Country	1944-48 ² (average)	1949	1950	1951 ³	1952 ⁴	1953
Ore and matte—Continued						
Mexico.....	2,101	8,388	2,846	2,525	⁵ 2,497	3,443
Peru.....	10,007	14,970	16,010	10,946	⁵ 28,213	32,842
Philippines.....	8	279	949	789	2,446	2,980
Other countries.....	1,842	1,842	663	106	735	437
Total ore and matte.....	64,504	107,279	76,520	67,471	⁵ 104,621	160,929
Base bullion:						
Australia.....		2,246	2,263	2,234		
Guatemala.....			232		266	736
Japan.....			921			
Mexico.....	1,546	25				
Peru.....	160	102	72	47	123	133
Other countries.....	79				(¹)	
Total base bullion.....	1,791	2,373	3,488	2,281	389	869
Pigs and bars:						
Africa.....	117	280		2,279	6,670	9,706
Australia.....	12,725	17,192	22,000	13,598	82,800	70,348
Belgium-Luxembourg.....	1,782	212	100	331	1,785	2,017
Bolivia.....					635	220
Burma.....	469	1,414				
Canada (including Newfoundland and Labrador).....	31,007	56,432	107,673	56,959	104,531	49,000
Germany.....		8,333	8,643	738	⁵ 6,662	⁵ 4,006
Italy.....	4,270	3,419				
Japan.....	3,032	2,108	5,712			
Mexico.....	113,132	126,398	220,767	30,987	198,872	140,751
Netherlands.....	365	219	484		2,747	1,981
Peru.....	25,783	34,626	31,988	31,528	42,160	62,216
Spain.....	331		440		6,509	
United Kingdom.....	85	341	49	206	4,216	1,148
Yugoslavia.....	802	23,436	43,855	36,311	53,907	51,820
Other countries.....	482	830	2	2	737	1,852
Total pigs and bars.....	194,472	275,240	441,788	179,032	510,720	385,071
Reclaimed, scrap, etc.:						
Africa.....	164	479				17
Australia.....	2,084	2,971	1,001	2,175	924	2,666
Belgium-Luxembourg.....	197	329	13			202
Burma.....		205			203	
Canada (including Newfoundland and Labrador).....	4,548	1,856	1,317	1,730	6,047	371
Canal Zone.....	132	384	319	228	858	205
Chile.....	15			84		
France.....	(¹)	289		88		
Germany.....		603	290			
Italy.....	475	346				
Jamaica.....	9	89	51	252	101	28
Japan.....	1,067	2,765	14,769	476	345	21
Mexico.....	337	845	934	2,089	872	98
Netherlands.....	492	599	4	18	454	502
Panama.....	55	92	80	234	300	138
Peru.....				159	297	50
Philippines.....	555	1,144	99	114	90	
Venezuela.....	(¹)	8	106	668	196	
Western Pacific Islands.....			6	81	282	43
Yugoslavia.....	130				345	103
Other countries.....	464	1,585	990	753	1,019	986
Total reclaimed, scrap, etc.....	10,724	14,649	20,039	9,143	12,339	5,439
Grand total.....	271,401	399,541	541,835	257,927	⁵ 628,060	562,308

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

² In addition to data shown "fine dust or fume containing lead and zinc, and other minerals or metals (lead content)," imported as follows—1944-48 (average): 100 tons; 1951: 13 tons; 1952: 40 tons.

³ Revised figure.

⁴ Less than 1 ton.

⁵ West Germany.

TABLE 17.—Lead imported for consumption (average) and 1949-53

[U. S. Department of Commerce]

Year	Lead in ores, fine dust, and matos, n. s. p. f.		Lead in base bullion		Pigs and bars, short tons
	Short tons	Value	Short tons	Value	
1944-48 (average)	56,620	\$8,426,912	2,559	\$733,473	191,634
1949.....	121,848	34,397,026	1,133	374,954	272,437
1950.....	95,068	21,046,414	1,148	193,356	434,410
1951.....	31,359	8,278,266			179,021
1952.....	107,881	32,765,497	2,951	1,137,813	510,718
1953.....	67,030	16,214,084	742	294,058	379,119

¹ In addition to quantities shown (value included in total) as follows—1944-48 (average): 10,712 tons, \$2,424,653; 1949: 1951: 8,020 tons, \$2,183,240; 1952: Revised figures, 11,358 tons, \$3,446,000; 1953: 13 tons, \$3,446,000. "fine dust or fume containing lead and zinc and other minerals"—1944-48 (average): 100 tons, \$86,970; 1951: 13 tons, \$3,446,000. Figures include lead received by the Government and held in inventory in bond and export, which are classified as "Imports of Commerce."

² Revised figure.

TABLE 18.—Miscellaneous products containing lead in the United States, 1944-48

[U. S. Department of Commerce]

Year	Babbitt metal, solder, white metal, and other combinations containing lead	
	Gross weight (short tons)	Lead content (short tons)
1944-48 (average)	174	111
1949.....	281	127
1950.....	4,345	2,744
1951.....	1,533	988
1952.....	1,640	990
1953.....	2,375	1,343

¹ Revised figure.

Exports.—Exports of pigs and bars in 1953. Export restrictions imposed in 1940 remained in effect throughout 1953.

TABLE 19.—Total lead exported from the United States in ores, matte, base bullion, pigs, bars, anodes, and scrap, by destinations, 1944-48 (average) and 1949-53, in short tons¹

[U. S. Department of Commerce]

Destination	1944-48 (average)	1949	1950	1951	1952	1953
Ore, matte, base bullion:						
Belgium-Luxembourg.....	20		132			
Canada.....	2	1,616	1	557	836	1,038
Total ore, matte, base bullion.....	22	1,616	133	557	836	1,038
Pigs, bars, and anodes:						
Belgium-Luxembourg.....		76		37		
Brazil.....	240	126	47	62	433	76
Canada.....	14	14	306	138	40	32
Canal Zone.....	12	15	19	24	18	1
Chile.....	67	40	35	107	193	18
Colombia.....	27	60	123	42	10	21
Cuba.....	62	68	61	48	52	28
Denmark.....		131				
Ecuador.....	2	15			84	
El Salvador.....	3	34	90	35	23	2
Honduras.....	5	29	6	14	10	3
India.....	28	4		11	4	
Pakistan.....			569			
Philippines.....	8	53	306	17	78	405
Turkey.....	17	7			280	
United Kingdom.....			67			
Uruguay.....	0	69	734	424	231	
Venezuela.....	45	148	95	62	67	41
Other countries.....	3,364	80	250	200	230	170
Total pigs, bars, and anodes.....	3,893	969	2,735	1,281	1,702	803
Scrap:						
Belgium-Luxembourg.....	(?)	302		31		27
Canada.....	(?)	95	41	203	20	39
Germany.....	(?)		204	145		640
Japan.....	(?)			105		
Lebanon.....	(?)	11				
United Kingdom.....	(?)	270	1,271	20	55	2,000
Total scrap.....	(?)	747	1,576	594	75	2,706
Grand total.....	3,915	3,332	4,444	2,432	2,673	4,547

¹ In addition, foreign lead in pigs and bars was reexported as follows: 1944-48 (average) 117 tons; 1949-53 86 tons; 1950-53 tons; 1951—none; 1952—2 tons; 1953—700 tons.

² Not separately classified.

³ West Germany.

Tariff.—The duties on pig lead and lead in ores and concentrates remained at 1½ cents and ¼ cent per pound, respectively, in 1953.

Because of widespread mine closures and reduced employment in the lead- (and zinc-) mining industry much thought was given to tariff revision through either new legislation or the invoking of the "escape clause" of the Reciprocal Trade Agreements Act, and various other proposals were made to restrict imports or provide other means of direct or indirect aid to the domestic industry. On July 29, 1953, the Tariff Commission, in response to resolutions of the United States Senate Committee on Finance and the House of Representatives Committee on Ways and Means, instituted a general investigation of the lead and zinc industries to determine all relevant facts of production, trade, consumption, and competitive position including the effect of imports of lead and zinc on the livelihood of American workers. A report of the investigation was submitted April 20, 1954.⁸

⁸ Work cited in footnote 3.

TABLE 20.—Lead articles: United States rates of duty imposed under Tariff Act of 1930, in specified years, 1930-54

Item	Tariff rate in—				
	1930	1945	1948	1951	1954
Lead pigments:					
Litharge.....	2½ cents	2½ cents	2½ cents	1½ cents ¹	1½ cents.
Orange mineral.....	3 cents	2½ cents	2 cents	2 cents	2 cents.
Red lead.....	2½ cents	2½ cents	2½ cents	1½ cents	1½ cents.
White lead.....	2½ cents	2½ cents	2½ cents	1½ cents	1½ cents.
All pigments containing lead, dry or in pulp, or ground in or mixed with oil or water, n. s.	30 percent.	3 cents, 15 percent min., 30 percent max. ²	3 cents, 15 percent min., 30 percent max. ²	3 cents, 15 percent min., 30 percent max.	3 cents, 15 percent min., 30 percent max.
In chief value of suboxide of lead.	30 percent.	20 percent ¹	20 percent ¹	20 percent.	20 percent.
Other.....					
Lead-bearing ores, fine dust, and mattes of all kinds.	1½ cents	¾ cent ¹	¾ cent ¹	1½ cents ¹	¾ cents. ^{1a}
Lead bullion or base bullion, lead pigs and bars.	2½ cents.	1½ cents ¹	1½ cents ¹	2½ cents ¹	1½ cents. ^{1a}
Lead dross, reclaimed lead, scrap lead, type metal, etc.					

Par. 72:

Lead pigments:

Litharge.

Orange mineral.

Red lead.

White lead.

All pigments containing lead, dry or in pulp, or ground in or mixed with oil or water, n. s.

In chief value of suboxide of lead.

Other.

Lead-bearing ores, fine dust, and mattes of all kinds.

Lead bullion or base bullion, lead pigs and bars.

Lead dross, reclaimed lead, scrap lead, type metal, etc.

TECHNOLOGY

During 1953 the Bureau of Mines published the following reports of investigation relating to lead:

4945. Browning, James S., and Clevenger, Clinton B., Process for Beneficiating Great Gossan Lead Ores, Carroll County, Va.; 14 pp.
 4953. Townsend, James W., Investigation of Lead-Zinc Deposits at the Harrington-Hickory Mine, Beaver County, Utah; 2 pp.
 5014. Popoff, C. C., Lead-Zinc Deposits of the Dunkelberg District, Granite County, Mont.; 41 pp.

Geological Survey publications relating to lead and issued in 1953 are:

- Circular 213. Harrison, J. E., and Leonard, B. F., Preliminary Report on the Jo Reynolds Area, Lawson-Dumont District, Clear Creek County, Colo.; 9 pp.
 Circular 231. Agnew, A. F., Flint, A. E., and Allingham, J. W., Exploratory Drilling Program of the United States Geological Survey for Evidences of Zinc-Lead Mineralization in Iowa and Wisconsin; 37 pp.
 Circular 242. Luttrell, G. W., Bibliography of United States Geological Survey Publications on Lead and Zinc; 18 pp.
 Circular 271. Stieff, L. R., Stern, T. W., and Milkey, R. G., A Preliminary Determination of the Age of Some Uranium Ores of the Colorado Plateaus by the Lead-Uranium Method; 19 pp.
 Professional Paper 235. Behre, Charles H., Jr., Geology and Ore Deposits of the West Slope of the Mosquito Range; 176 pp.
 Bulletin 998-B. Gault, H. R., Rossman, D. L., Flint, G. M., Jr., and Ray, R. G., Some Zinc-Lead Deposits of the Wrangell District, Alaska; 43 pp.
 Bulletin 998-C. Robinson, G. D., and Twenhofel, W. S., Some Lead-Zinc and Zinc-Copper Deposits of the Ketchikan and Wales Districts, Alaska; pp. 59-83.

Articles on new methods and techniques in mining and milling published during the year were:

- Tomkinson, E. R., Sinking Iron King's No. 7 Shaft: Min. Cong. Jour., vol. 39, No. 10, October, pp. 36, 37.
 Mining World, Iron King Uses Close Control: Vol. 15, No. 2, February, pp. 26-29.
 How Bunker Hill Stair Step Block Caves Low-Dip Lead-Zinc Ore Body in Quartzite: Vol. 15, No. 8, July, pp. 57-59. National Lead Company Driving 16- by 14-Foot Crosscut, 2,250 Feet to Velie Swalley: Vol. 15, No. 6, May, pp. 38, 39. Eureka Corporation Found It—A Way to Adapt Oil-Well Methods to Mine Exploration: Vol. 15, No. 9, August, pp. 40-43.
 Doyle, W. R., Steel Rail Sets at Resurrection: Min. Cong. Jour., vol. 39, No. 10, October, pp. 49-52, 65.
 Kinney, L. M., Trackless Mining at Pend Oreille: Vol. 29, No. 11, November, pp. 28, 29, 105.
 Huttli, J. B., New Oxide Lead Unit for Darwin: Eng. and Min. Jour., vol. 154, No. 3, March, pp. 81-83.
 Stockett, Norman A., Developments in Mining Practice in Southeast Missouri: Min. Cong. Jour., vol. 39, No. 4, April, pp. 84-87.
 Bain, C. K., St. Joseph Lead's Indian Creek Development: Min. Eng., vol. 5, No. 9, September, pp. 899-904.
 Allen, V. C., Mechanization at an Upper Mississippi Valley Zinc-Lead Mine: Bull. Inst. Min. and Met., vol. 63, No. 556, March, pp. 261-269.

A number of articles relating to secondary lead production appeared in the technical press during 1953. One of the new plants⁹ of the George Sall Metals Co. features pneumatic conveying, automatic casting, and use of seasonal gas. The plant produces lead, aluminum, brass, and zinc scrap. The design and operation of the Pennsylvania Secondary Lead Plant,¹⁰ Philadelphia, Pa.

Some other articles concerning metallurgical development published in 1953 were:

- Schumacher, E. E., Ultra-Pure Metals Production: Jour. Met., vol. 5, No. 11, November, pp. 49-51.
 Chemical Engineering and Mining Review: Deposition of Lead on Steel, by the Brooklyn Institute of Technology: Vol. 46, No. 2, November 10, pp. 49-51.
 Metal Industry (London), Antimonial Lead Alloys: Vol. 46, No. 2, November 10, p. 268. Antimonial Lead Alloys-II: Vol. 46, No. 2, November 10, p. 269.
 American Institute of Electrical Engineers, Transactions: Power Cable: Tech. Paper 54-7, October, pp. 1-10.

WORLD REVIEW

World mine production of lead in 1953 was 1,900,000 metric tons, a gain of about 100,000 metric tons over the record set in 1952. Lead ores are mined in 53 countries (25 in 1952), but 5—United States, Canada, Mexico, Australia, and U. S. S. R.—have furnished about 90% of the total in recent years. World smelter production in 1953—1,810,000 metric tons—was approximately 33% greater than in 1952. The principal producers on a mine basis supplied 55% of the total world smelter output. The percentage of the total world smelter output produced by countries for 1949-53, insofar as is given in table 21; world smelter production for 1949-53, insofar as is given in table 22.

World smelting and refining facilities are listed in table 23.

⁹ Fadden, W. J. Jr., New Plant for Secondary Smelting: ENR, 1953, pp. 72-77.

¹⁰ Wakosborg, S. B., Orderliness Is the Keynote at This Lead Plant: ENR, No. 3, April 10, 1954, pp. 44, 45.

Lead and Zinc Pigments

By Robert L. Menich¹ and



NOTEWORTHY features of the lead and zinc pigment industry in 1953 were the increased volume of shipments of zinc oxide, and leaded zinc oxide and white lead. Shipments of lithopone and white lead. Shipments of zinc oxide each increased 5 percent, while white lead declined 15 and 2 percent, respectively.

Shipments of red lead, zinc chloride, and zinc sulfide increased 11, and 13 percent, respectively.

The increased shipments of pigments are due to increases in the volume of business in the paint and pigment consumers of these products. In 1953 the value of sales of automobiles was 42 percent above the 1952 rate, while buses decreased 1 percent, however, and synthetic rubber increased 6 percent. The value of public and private construction in 1952, and the value of sales of paint, was 7 percent higher than in 1952.

Decreased shipments of white lead—the largest tonnage paint pigment—and the growing use of other pigments, notably zinc oxide and lithopone.

Supplies of lead and zinc, the chief raw materials of the pigment industry, were abundant throughout the year. Prices declined further during the year (the prices in 1952) brought ending prices to a low of 14.75 cents a pound, reached a low of 12.5 cents in spring and summer of 1950. Common lead prices reached a low of 13.5 cents in September, where it remained for the year. The quotation for Prime Western lead, St. Louis, fell from a high of 13 cents a pound in September, where it remained for the year.

Lead- and zinc-pigment price quotations for slab-zinc prices closely throughout the year. Prices of pigments fell as lead- and zinc-metal prices fell. Prices of pigments ranged from 1 to 11 percent lower than in 1952.

Shipments of white lead (dry) in 1953 were the smallest since the beginning of the present century, reflecting a marked increase in utilization of other pigments.

¹ Commodity-industry analyst.
² Statistical assistant.

Litharge shipments increased 14,000 tons or 10 percent in 1953, the largest percentage and tonnage gain among the pigments covered by this report. Shipments of red lead increased 1 percent during the year but were well below the yearly average for the preceding 10 years. Figure 1 shows trends in shipments of lead pigments for 1910-53.

Zinc oxide (lead-free) shipments increased 5 percent in 1953 and were the highest since 1950. Leaded zinc oxide shipments also increased 5 percent above the 1952 rate of deliveries to consumers. The use of lithopone has declined substantially in the post World War II period; in 1953 shipments were 15 percent lower than in 1952 and considerably below those for all years from 1917-52.

Shipments of zinc salts increased moderately in 1953; zinc chloride gained 11 percent and zinc sulfate 13 percent.

TABLE 1.—Salient statistics of the lead¹ and zinc pigments industry of the United States, 1944-48 (average) and 1949-53

	1944-48 (average)	1949	1950	1951	1952	1953
Production (shipments)² of principal pigments:						
White lead (dry and in oil), short tons...	62,644	27,355	45,176	35,416	26,663	26,217
Red lead.....do.....	40,146	24,866	35,072	35,352	30,926	31,333
Litharge.....do.....	146,525	121,052	177,658	154,753	140,708	154,618
Zinc oxide.....do.....	147,642	110,132	160,820	147,716	142,210	148,627
Leaded zinc oxide short tons.....	68,773	36,722	63,973	44,341	37,892	39,712
Lithopone.....do.....	140,225	78,335	105,660	102,837	61,832	52,439
Value of products:						
All lead pigments....	\$61,916,000	\$58,564,000	\$79,858,000	\$89,273,000	\$72,230,000	\$64,303,000
All zinc pigments....	49,913,000	43,162,000	71,322,000	74,599,000	63,050,000	56,475,000
Total.....	111,829,000	101,716,000	151,180,000	163,872,000	136,180,000	120,778,000
Value per ton received by producers:						
White lead (dry).....	\$229	\$351	\$335	\$426	\$403	\$378
Red lead.....	236	333	314	397	376	312
Litharge.....	241	324	292	383	348	285
Zinc oxide.....	166	230	258	311	307	264
Leaded zinc oxide.....	174	242	262	320	313	289
Lithopone.....	92	116	124	141	137	132
Foreign trade:						
Lead pigments:						
Value of exports....	\$1,135,000	\$1,167,000	\$950,000	\$984,000	\$933,000	\$709,000
Value of imports....	162,000	143,000	344,000	1,797,000	451,000	16,000
Zinc pigments:						
Value of exports....	3,798,000	3,426,000	2,124,000	6,855,000	4,352,000	1,468,000
Value of imports....	9,800	52,000	1,275,000	930,000	90,000	287,000
Export balance.....	4,701,200	4,388,000	1,455,000	5,112,000	4,744,000	1,964,000

¹ Excludes basic lead sulfate, data for which are withheld to avoid disclosure of individual company operations.

² Reported as sales before 1945.

The distribution pattern for shipments of pigments to consumers in 1953 remained virtually the same as in previous years. The paint industry continued to be the largest user by far of white lead, leaded zinc oxide, and lithopone, receiving approximately 90, 99, and 71 percent, respectively, of shipments. The paint industry also became the largest user of red lead in 1953, taking 47 percent of the total shipments and displacing storage-battery makers as the chief user,

LEAD AND ZINC PIGMENTS

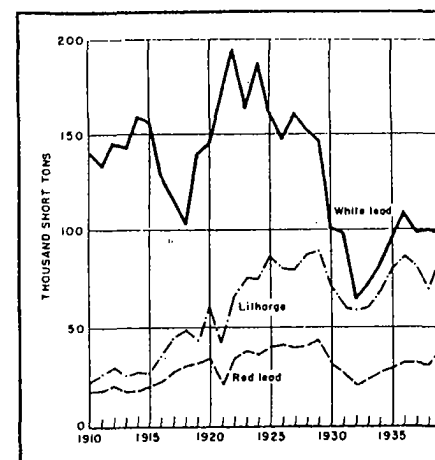


FIGURE 1.—Trends in shipments of

In addition, 21 percent of zinc oxide (lead-free) shipments went into paint. Battery manufacturers were the chief users of red lead, receiving 67 percent of producers' deliveries. The rubber industry was the chief consumer of zinc oxide, receiving 53 percent of shipments. Relatively small quantities of litharge, leaded zinc oxide were also used in manufacturing rubber. The paint industry ranks fourth in consumption of zinc pigments, being surpassed only by the paint, storage-

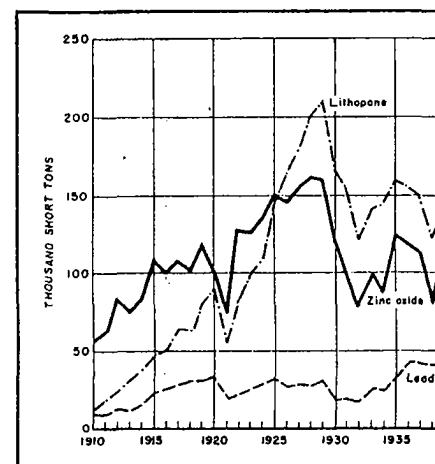


FIGURE 2.—Trends in shipments of

dustries. In 1953, 14 percent of litharge shipments, 6 percent of lead-free zinc oxide shipments, 4 percent of red lead shipments, and 3 percent of white lead shipments were used in making ceramics.

Titanium pigments continued to furnish the chief competition to lead and zinc pigments in paintmaking. Production and shipments of titanium pigments increased 5 and 13 percent, respectively, in 1953 and were slightly higher than the former records established in 1951. In 1953 production and shipments of titanium pigments were 93 and 99 percent higher than in 1945, an indication of the inroads that titanium pigments have made in the pigment field since the end of World War II. At present the Bureau of Mines is not at liberty to publish statistics for titanium pigments. Producers and details of the distribution of shipments are given in the Titanium chapter of Minerals Yearbook Volume I, 1953.

PRODUCERS AND PLANTS

A list of companies producing lead and zinc pigments and zinc salts, plants, and the products manufactured in 1953 follows:

White lead:

The Eagle-Picher Co.	East Chicago, Ind.
Euston Lead Co.	Seranton, Pa.
W. P. Fuller & Co.	South San Francisco, Calif.
John R. MacGregor Lead Co.	Chicago, Ill.
National Lead Co.	Do.
Do.	Oakland, Calif.
Do.	Perth Amboy, N. J.
Do.	Philadelphia, Pa.
Do.	St. Louis, Mo.

Red lead and litharge:

Associated Lead & Zinc Co.	Seattle, Wash.
The Eagle-Picher Co.	East Chicago, Ind. ¹
Do.	Galena, Kans.
Do.	Joplin, Mo.
Do.	Newark, N. J.
W. P. Fuller & Co.	South San Francisco, Calif.
Hammond Lead Products, Inc.	Hammond, Ind.
Linklater Co.	Montebello, Calif.
John R. MacGregor Lead Co. ¹	Chicago, Ill.
National Lead Co.	Atlanta, Ga.
Do.	Charleston, W. Va.
Do.	Chicago, Ill.
Do.	Dallas, Tex.
Do.	Philadelphia, Pa.
National Lead Co. (Morris P. Kirk & Son, Inc.)	Los Angeles, Calif.
National Lead Co.	Oakland, Calif.
Do.	St. Louis, Mo.
Western Lead Products Co.	Los Angeles, Calif.

Zinc chloride:

American Cyanamid Corp. (Calco Chemical Division).	Bound Brook, N. J.
American Smelting & Refining Co.	Alton, Ill.
Do.	Omaha, Nebr.
Do.	Perth Amboy, N. J.
Do.	Selby, Calif.
Chemicals, Inc.	Chicago, Ill.
Jordan Co.	Do.

¹ Litharge only.

LEAD AND ZINC PIGMENTS

E. I. du Pont de Nemours & Co.	Do.
Mallinckrodt Chemical Works	Do.
Marathon Battery Co.	Do.
National Lead Co. (Morris P. Kirk & Son, Inc.)	Do.
Rohm & Haas Co.	Do.
The Ruby Chemical Co.	Do.
Zinc sulfate:	
The Chemical & Pigment Co. (Division Glidden Co.)	Do.
E. I. du Pont de Nemours & Co.	Do.
Mallinckrodt Chemical Works	Do.
The Sherwin-Williams Co. (Ozark Smelting Division)	Do.
Sullivan Mining Co.	Do.
Tennessee Corp.	Do.
Virginia Smelting Co.	Do.
Zinc oxide and leaded zinc oxide:	
American Chemet Corp. ²	Do.
American Zinc Co. of Illinois	Do.
American Zinc Oxide Co. ²	Do.
The Eagle-Picher Co.	Do.
Do.	Do.
Harshaw Chemical Co. ²	Do.
Monsanto Chemical Co. ²	Do.
The New Jersey Zinc Co. of Pa.	Do.
Rohm & Haas Co. ²	Do.
Royce Chemical Co. ²	Do.
St. Joseph Lead Co. ²	Do.
The Sherwin-Williams Co. (Ozark Smelting Division) ²	Do.
Superior Zinc Corp. ²	Do.
United Industrial & Chemical Corp. ²	Do.
Lithopone:	
The Chemical & Pigment Co. (Division Glidden Co.)	Do.
Do.	Do.
E. I. du Pont de Nemours & Co.	Do.
The New Jersey Zinc Co. (Mineral Point Division)	Do.
The Sherwin-Williams Co. (Ozark Smelting Division)	Do.

² Leaded zinc oxide only.

² Zinc oxide only.

In addition, the Auto-Lite Battery Co., Willard Storage Battery Co. produced a substitute product (black oxide) for use in the manufacture of storage batteries. E. I. du Pont de Nemours & Co. shut its lithopone plant permanently in December 1952, and moved its lithopone facilities to the same site.

PRODUCTION

The value of shipments of lead and zinc pigments in 1953 was \$120,778,000, an 11-percent decrease from 1952. Lead pigments comprised 53 percent of the total, the same proportions as in 1952.

For many years figures on "sales" were used in this series of reports as a better guide to activity in the pigments industry than production. Beginning with 1945 the base was changed to "shipments" to conform with data compiled on Bureau of Mines lead and zinc schedules. Available information for 1945 (the year of change) indicates little difference between sales and shipments in that year. In reporting tonnages of pigments, an attempt is made to avoid all duplication, one of the chief problems being that finished pigments frequently are blended to make another product. Basic lead sulfate and zinc oxide, for example, are blended to make leaded zinc oxide, and in this instance the pigment weights appear in the total for the last-named class only. Pigments consumed by producing companies to make products beyond those covered by this report—that is, paints, storage batteries, and other articles—are considered shipments.

LEAD PIGMENTS

Combined shipments of lead pigments increased 7 percent in quantity in 1953 but decreased 11 percent in value. Substantial reductions in average prices received by producers explained the marked decrease in value.

Average values of lead pigments reported by producers dropped for the second successive year and were well below the record selling prices of 1951. The average price received for white lead (dry) in 1953 was \$378 per ton—6 percent less than that in 1952; red lead sold at an average of \$312 per ton—a decrease of 17 percent; and litharge brought \$285 per ton—18 percent less than the 1952 average.

White Lead.—The downward trend in the use of white lead, first evident in the late 1920's, continued as competitive pigments supplanted both the dry and "in oil" varieties in many paint formulations. Total shipments in 1953 declined slightly from 1952 and were the lowest by far since long before the beginning of the 20th century. Statistics show the extent of the decline forcefully; in 1953 shipments were equivalent to only 18 percent of average yearly shipments for 1910-14 and to 32 percent of average yearly shipments for 1941-45.

Basic Lead Sulfate.—The Bureau of Mines is not at liberty to publish figures on basic lead sulfate for 1946-53.

Red Lead.—Shipments of red lead increased 1 percent in 1953 but were 42 percent below shipments in 1944, the peak year.

Orange Mineral.—No shipments of orange mineral were reported in 1947-53.

Litharge.—Shipments of litharge increased 10 percent above the 1952 total and were exceeded only in 4 earlier years—1947, 1948, 1950 and 1951.

Battery manufacturers produced 82,000 tons of black or gray suboxide of lead in 1953 for their own use in place of litharge. This quantity compares with 76,000 tons in 1952 and 77,000 tons in 1951. This suboxide production required 78,000 tons of pig lead in 1953, 72,000 tons in 1952, and 73,000 tons in 1951.

LEAD AND ZINC PIGMENTS

TABLE 2.—Production and shipments of lead pigments, 1952-53

Pigment	1952			
	Production (short tons)	Shipments		
		Short tons	Value ¹	
			Total	Average
White lead:				
Dry.....	16,405	15,779	\$6,353,285	\$403
In oil ²	11,454	10,884	5,177,314	476
Red lead.....	32,620	30,926	11,634,900	376
Litharge.....	144,564	140,798	49,064,874	348

¹ Except for basic lead sulfate, figure for which is withheld for operations.

² At plant, exclusive of container.

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

TABLE 3.—Lead pigments ¹ shipped by major class, 1944-48 (average) and 1949-53

Year	White lead	
	Dry	In oil
1944-48 (average).....	35,267	27,314
1949.....	15,719	11,454
1950.....	28,606	16,405
1951.....	23,369	12,620
1952.....	15,779	10,884
1953.....	16,784	9,454

¹ Excludes basic lead sulfate, data for which are withheld for operations.

ZINC PIGMENTS AND

Total shipments of zinc pigments in 1953 were 11 percent below those from 1952, but the value of shipments was 15 percent above the 1952 value because of substantial price reductions. Shipments of the most important of the zinc pigments in 1953 were 5 percent below those of 1952, but lithopone shipments declined 15 percent among the products covered by this report.

Average values of zinc pigments reported by producers dropped for the second year in succession and were well below the record selling prices of 1951. The average value of zinc oxide (lead-free) in 1953 declined 14 percent from 1952; zinc oxide dropped to \$259 per ton, or 17 percent below the 1952 average; and lithopone sold at \$132 per ton, or 15 percent below the 1952 average.

Shipments of the zinc salts, zinc chloride and zinc sulfate, declined 11 and 13 percent, respectively, above the 1952 value of zinc chloride (50° B. solution) was \$163 per ton—whereas the average value received for zinc chloride from 1952 to \$143 per ton.

TABLE 4.—Production and shipments of zinc pigments and salts in the United States, 1952-53

Pigment or salt	1952				1953			
	Pro- duction (short tons)	Shipments			Pro- duction (short tons)	Shipments		
		Short tons	Value ¹			Short tons	Value ¹	
			Total	Average			Total	Average
Zinc oxide ²	137,957	142,210	\$43,614,180	\$307	155,645	148,627	\$39,266,282	\$264
Leaded zinc oxide ²	37,869	37,892	11,860,168	313	39,819	39,712	10,284,801	259
Lithopone.....	60,220	61,832	8,475,200	137	64,593	62,480	6,923,487	132
Zinc chloride, 60° B.....	50,590	61,966	4,822,966	93	60,234	67,537	5,323,019	93
Zinc sulfate.....	19,349	19,587	3,189,611	163	22,449	22,220	3,181,411	143

¹ Value at plant, exclusive of container.² Zinc oxide containing 5 percent or more lead is classed as leaded zinc oxide. In this table data for leaded zinc oxide include a small quantity containing less than 5 percent lead.TABLE 5.—Zinc pigments and salts shipped ¹ by manufacturers in the United States, 1944-48 (average) and 1949-53, in short tons

Year	Zinc oxide	Leaded zinc oxide	Lithopone	Zinc chloride (60° B.)	Zinc sulfate
1944-48 (average).....	147,642	68,773	146,225	61,063	21,200
1949.....	110,132	36,722	78,335	55,208	20,065
1950.....	160,820	63,073	105,650	64,564	23,912
1951.....	147,710	44,341	102,837	60,730	23,524
1952.....	142,210	37,892	61,832	51,966	19,587
1953.....	148,627	39,712	52,439	57,537	22,220

¹ Reported as sales before 1945.

Zinc Oxide.—Lead-free zinc oxide shipments increased 5 percent above 1952 and were the highest since 1950.

TABLE 6.—Production of zinc oxide (lead-free) by processes, 1944-48 (average) and 1949-53, as percent of total

Process	1944-48 (average)	1949	1950	1951	1952	1953
American process (ore and primary residues).....	75	71	72	75	74	74
French process (metal and scrap).....	10	17	18	18	20	20
Other.....	9	12	10	7	6	6
Total.....	100	100	100	100	100	100

Leaded Zinc Oxide.—Shipments of leaded zinc oxide increased 5 percent in 1953 but were considerably below average yearly shipments in the preceding 10 years.

Four grades of leaded zinc oxide, classified according to lead content, are produced in the United States. The bulk of the output, however, is the 5- to 35-percent grade; only relatively small quantities of the other grades—less than 5 percent lead, over 35 to 50 percent lead, and over 50 percent lead—are produced. For publication

LEAD AND ZINC PIGMENTS

purposes, the 2 top and 2 lower grades of 1953 (comparison with 1952 in parenthesis) (32,401) tons of 35 percent lead and under over 35 percent lead.

Lithopone.—Lithopone shipments for deliveries and were the lowest since 1916.

The lithopone statistics in this report ordinary lithopone sold as such plus the the high-strength product.

Consumption of ordinary lithopone in lithopone has diminished to very small been downward almost continuously since used in making the titanated variety. this purpose in 1953 was 60 percent below smallest on record. The lithopone figure the totals for ordinary lithopone in other

Zinc Sulfide.—In 1953 only one company the Bureau of Mines is not at liberty to ment.

Zinc Chloride.—Shipments of zinc chloride increased 11 percent in 1953.

Zinc Sulfate.—Zinc sulfate shipments 1953 were 11 percent higher than in 1952.

TABLE 7.—Titanated lithopone produced in lithopone used in its manufacture, 1944-48 (average) and 1949-53, in short tons

Year	Titanated lithopone produced	Ordinary lithopone used	
1944-48 (average).....	6,240	5,270	1951.....
1949.....	2,000	1,700	1952.....
1950.....	3,400	2,900	1953.....

RAW MATERIALS

Figures covering the raw materials used in salts in 1953 and 1952 are shown in the

Lead pigments and zinc pigments and a variety of materials, including ore, refined materials as scrap, residues, ashes, dross, approximately 95 percent of the lead in pig lead and the remainder from ore; in of contained lead from metal was 95 and in ore used to make leaded zinc oxide, was from foreign sources. The proportion was as follows: 74 percent (76 in 1952) (11) percent from slab zinc, and 12 materials; about 33 (26) percent of the ore

Tables 8 and 9 give the source of the each pigment and salt. Pig lead is directly or indirectly, in manufacturing

TABLE 11.—Distribution of red-lead shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (average)	1949	1950	1951	1952	1953
Paints.....	13,211	9,034	14,103	14,740	13,149	14,570
Storage batteries.....	22,358	12,103	17,478	16,722	13,796	13,975
Ceramics.....	907	603	981	834	388	1,188
Other.....	3,080	2,460	2,510	3,050	3,693	1,000
Total.....	40,146	24,806	35,072	35,352	30,926	31,333

¹ Reported as sales before 1945.

Orange Mineral.—No shipments of orange mineral have been reported since 1946, when 123 tons went to various industries.

Litharge.—The use of litharge for storage batteries regularly is roughly two-thirds of total shipments; in 1953 the proportion was 67 percent compared with 69 percent in 1952. The ceramics industry is the second largest consumer of litharge; shipments for this purpose increased 32 percent above 1952 and comprised 14 percent of the total in 1953. Shipments for chrome pigments, oil refining, and rubber increased 5, 6, and 6 percent, respectively, while shipments for varnish, insecticides, and floor coverings declined 30, 15, and 24 percent, respectively.

TABLE 12.—Distribution of litharge shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (average)	1949	1950	1951	1952	1953
Storage batteries.....	89,129	77,163	105,558	94,064	97,656	103,849
Ceramics.....	15,079	13,299	27,771	22,815	15,006	20,924
Chrome pigments.....	9,437	8,557	10,017	11,117	8,376	8,821
Oil refining.....	6,729	5,720	6,488	6,068	4,080	4,342
Varnish.....	3,545	4,286	4,347	5,584	5,572	3,915
Insecticides.....	14,320	5,353	10,651	5,691	2,724	2,305
Rubber.....	2,412	1,398	3,047	2,641	2,100	2,230
Floor coverings.....	126	62	220	1,772	701	603
Other.....	6,748	5,214	9,559	5,001	3,684	7,520
Total.....	146,525	121,052	177,658	154,763	140,798	154,518

¹ Reported as sales before 1945.

ZINC PIGMENTS AND SALTS

Zinc Oxide.—Shipments of lead-free zinc oxide to consuming industries followed the same distribution pattern in 1953 as in previous years. The rubber industry and paint manufacturers remained by far the leading consumers, accounting for 53 (51 in 1952) and 21 percent (22), respectively, of total shipments. Shipments for ceramics and coated fabrics and textiles each comprised 6 percent of the total (5 and 4 in 1952). Shipments to all consuming industries except floor coverings increased in 1953.

LEAD AND ZINC PIGMENTS

TABLE 13.—Distribution of zinc oxide shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (average)	1949	1950
Rubber.....	74,377	58,496	58,496
Paints.....	20,480	26,205	26,205
Ceramics.....	8,294	0,982	0,982
Coated fabrics and textiles ²	12,571	5,200	5,200
Floor coverings.....	5,948	2,005	2,005
Chemical warfare.....	16,963	10,684	10,684
Other.....			
Total.....	147,042	110,132	110,132

¹ Reported as sales before 1945.² Includes the following tonnages for rayon: 1949-4,470; 1950-4,470.

Leaded Zinc Oxide.—Leaded zinc oxide is used exclusively as a pigment in paint manufacture. Of total shipments was for this purpose. 1 percent of shipments) are used by the

TABLE 14.—Distribution of leaded zinc oxide shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (average)	1949	1950
Paints.....	65,759	35,038	35,038
Rubber.....	167	124	124
Other.....	2,847	600	600
Total.....	68,773	36,722	36,722

¹ Reported as sales before 1945.

Lithopone.—The chief use of lithopone is in paints, varnish, and lacquers; approximately 90 percent of total shipments goes to these industries. Shipments for use in paints, etc., declined 17 percent and comprised 17 percent of the total. Shipments for use in coated fabrics and textiles increased 2, 13, and 9 percent, respectively, while shipments for paper and floor coverings declined 2, 13, and 9 percent, respectively.

TABLE 15.—Distribution of lithopone shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (average)	1949	1950
Paint, varnish, and lacquers ²	116,150	56,146	56,146
Coated fabrics and textiles.....	6,950	6,602	6,602
Paper.....	4,204	2,375	2,375
Floor coverings.....	9,852	6,380	6,380
Rubber.....	2,117	3,245	3,245
Printing ink.....	(³)	(³)	(³)
Other.....	6,862	3,587	3,587
Total.....	146,225	78,336	78,336

¹ Reported as sales before 1945.² Includes a small quantity, not separable, used for printing lacquers.³ Included in "Other" before 1950, except for those quantities used in printing lacquers.

Zinc Chloride.—Statistics on the end-use distribution of zinc chloride shipments are not available. The principal uses of the salt are in wood preserving, battery manufacturing, vulcanized fiber, oil refining, and as a soldering flux.

Zinc Sulfate.—The textile (rayon) industry has ranked first in consumption of zinc sulfate since 1946, when the agricultural use (fertilizers and fungicides) led; in 1953 shipments for rayon increased 10 percent from 1952 and comprised 41 percent of the total. Agriculture continued to be the second largest use; shipments for this purpose increased 33 percent and composed 30 percent of total shipments. Among the smaller uses, shipments for chemicals and glue increased, whereas shipments for flotation reagents, electrogalvanizing, textile dyeing and printing, and paint and varnish processing decreased.

TABLE 16.—Distribution of zinc sulfate shipments,¹ by industries, 1944-48 (average) and 1949-53, in short tons

Industry	1944-48 (aver- age), gross weight	1949		1950		1951		1952		1953	
		Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis	Gross weight	Dry basis
Rayon.....	7,685	10,591	7,957	11,217	8,322	10,073	7,925	8,181	6,812	9,008	7,612
Agriculture.....	7,094	4,429	3,595	5,841	4,880	5,588	4,847	5,111	4,446	6,773	5,894
Chemicals.....	2,037	1,197	851	1,879	1,377	2,871	2,243	1,675	1,489	2,539	2,105
Flotation reagents.....	1,238	921	757	952	727	858	736	1,070	950	736	648
Glue.....	450	453	370	579	464	396	337	391	329	601	501
Textile dyeing and printing.....	250	30	21	145	129	1,400	1,163	350	301	155	138
Electrogalvanizing.....	315	217	154	324	203	190	129	342	243	337	225
Paint and varnish processing.....	465	663	585	189	119	32	20	172	130	106	70
Other.....	1,676	1,564	979	2,786	1,820	2,116	1,274	2,295	1,422	1,965	1,219
Total.....	21,200	20,065	15,209	23,912	18,041	23,524	18,674	19,587	16,122	22,220	18,412

¹ Reported as sales before 1945.

PRICES

Total and average values received by producers for lead and zinc pigments and zinc salts are given in the tables in the first part of this report. Average values of litharge, red lead, and white lead declined \$63, \$64, and \$25 per ton in 1953 and were the lowest for white lead since 1950 and for red lead and litharge since 1946. The price of pig lead fluctuated from a high of 14.75 cents a pound to a low of 12 cents a pound in 1953 in contrast with the wide variation in 1952 (13.5-19 cents), hence the range in pigment quotations was not as pronounced in 1953 as in 1952.

Average values received for the zinc pigments, zinc oxide, leaded zinc oxide, and lithopone in 1953 were \$43, \$54, and \$5 less than values in 1952 but remained at a relatively high level compared with other years. Quotations for Prime Western grade slab zinc, East St. Louis, in 1953 ranged from a high of 13 cents a pound to a low of 10 cents a pound compared with a fluctuation of 7 cents (19.5-12.5) in 1952.

The average value of zinc chloride in 1953 remained unchanged from the record established in 1952 while zinc sulfate declined \$20 a ton or 12 percent from 1952.

LEAD AND ZINC PIGMENTS

TABLE 17.—Range of quotations on lead pigments at New York (or delivered in the East)

Product	1952
White lead (basic lead carbonate), dry, carlots, barrels.....	14.00
Basic lead sulfate (sublimed lead), less than carlots, barrels.....	13.25
Red lead, dry, 95 percent or less, less than carlots, barrels.....	14.25
Orange mineral, American, less than carlots, barrels.....	10.00
Litharge, commercial, powdered, less than carlots, barrels.....	13.25
Zinc oxide:	
American process, lead free, bags, carlots.....	11.00
American process, 5 to 35 percent lead, barrels, carlots.....	11.25
French process, red seal, bags, carlots.....	12.25
French process, green seal, bags, carlots.....	12.75
French process, white seal, barrels, carlots.....	13.50
Lithopone, ordinary, less than carlots, bags.....	6.50
Zinc sulfide, less than carlots, bags, barrels.....	13.50
Zinc chloride, works:	
Solution, tanks.....	3.25
Fused, drums.....	7.00
Zinc sulfate, crystals, less than carlots, barrels.....	4.95

¹ Includes granulated.

FOREIGN

Foreign trade in lead and zinc pigments has of minor importance in relation to domestic commodities. In 1953 these products were on a greatly reduced scale from 1952; the value was \$2,267,000 compared with \$5,500,000 in 1952, imports declined from \$541,000 to \$300,000.

Imports of lead pigments were chiefly of litharge, which totaled 1,000 tons, and zinc oxide—the only item of significant value—and salts—increased nearly sevenfold.

The United States exported small quantities of red lead, and lead arsenate in 1953, but only a small portion of shipments by value.

Zinc oxide and lithopone are the only zinc pigments (by this report) exported in greatest quantities. Exports of these pigments each declined in 1953 compared with 1952, exported in 1952 and comprised 2 and 3 percent of domestic shipments.

¹ Figures on imports and exports compiled by Mao B. Sheng, Bureau of Mines, from records of the U. S. Department of Commerce.

TABLE 18.—Value of foreign trade of the United States in lead and zinc pigments and salts, 1951-53

[U. S. Department of Commerce]

	Imports for consumption			Exports		
	1951	1952	1953	1951	1952	1953
Lead pigments:						
White lead.....	\$386,973	\$139,829	\$44	\$272,605	\$222,092	\$219,514
Red lead.....	89,351	623	47	266,098	183,649	163,830
Litharge.....	788,004	273,719	15,281	445,201	527,450	425,848
Other lead pigments.....	32,373	36,386	678	(¹)	(¹)	(¹)
Total.....	1,796,761	450,657	16,050	(¹)	(¹)	(¹)
Zinc pigments:						
Zinc oxide.....	779,209	88,066	275,122	3,235,685	2,720,203	883,821
Zinc sulfide.....			6,460	(¹)	(¹)	(¹)
Lithopone.....	161,105	2,308	5,058	3,615,915	1,632,106	584,279
Total.....	930,484	90,364	287,240	6,854,600	4,352,309	1,468,100
Lead and zinc salts:						
Lead arsenate.....	2,664	36,879		165,215	62,498	83,139
Other lead compounds.....	68,009	12,560	6,457	(¹)	(¹)	(¹)
Zinc arsenate.....		22	27	(¹)	(¹)	(¹)
Zinc chloride.....	194,595	79,645	25,379	(¹)	(¹)	(¹)
Zinc sulfate.....	15,565	10,767	3,958	(¹)	(¹)	(¹)
Total.....	281,433	139,863	35,821	(¹)	(¹)	(¹)
Grand total.....	3,008,658	680,784	339,111	(¹)	(¹)	(¹)

¹ Data not available.

TABLE 19.—Lead pigments and salts imported for consumption in the United States, 1944-48 (average) and 1949-53

[U. S. Department of Commerce]

Year	Short tons							Total value
	White lead (basic carbonate)	Red lead	Litharge	Lead sub-oxide	Lead pigments n. s. p. f.	Lead arsenate	Other lead compounds	
1944-48 (average).....	41	65	301	19	6	12	(¹)	\$166,327
1949.....	101	23	96	23	6		(¹)	142,607
1950.....	944	70	12	57	27		2	344,555
1951.....	2,675	215	1,855	53		7	180	1,838,034
1952.....	390	2	621	53	(¹)	81	32	499,986
1953.....	(¹)	(¹)	50	1	4		18	22,507

¹ Less than 1 ton.

LEAD AND ZINC PIGMENTS

TABLE 20.—Zinc pigments and salts imported in the United States, 1944-48 (average) and 1949-53

[U. S. Department of Commerce]

Year	Short tons			
	Zinc oxide		Lithopone	Zinc sulfide
	Dry	In oil		
1944-48 (average).....	37	1	(¹)	(¹)
1949.....	239	(¹)	12	
1950.....	5,063	2	1,201	
1951.....	1,772	10	794	
1952.....	173	(¹)	11	
1953.....	1,157	29	30	

¹ Less than 1 ton.

TABLE 21.—Lead pigments and salts exported in the United States, 1944-48 (average) and 1949-53

[U. S. Department of Commerce]

Year	Short tons	
	White lead	Red lead
1944-48 (average).....	1,940	
1949.....	699	
1950.....	815	
1951.....	767	
1952.....	675	
1953.....	818	

TABLE 22.—Zinc pigments and salts exported in the United States, 1944-48 (average) and 1949-53

[U. S. Department of Commerce]

Year	Short tons		Total value	
	Zinc oxide	Lithopone		
1944-48 (average).....	10,258	13,510	\$3,798,061	1951.....
1949.....	5,040	14,460	3,420,118	1952.....
1950.....	3,094	9,357	2,124,367	1953.....