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UNITED S

1931

O. E. KIESSL
Chief Economist, Division of

PART I—MET

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DOMESTIC PRODUCTION

Domestic production in 1931 was sharply reduced by the almost complete lack of demand. A few hundred pounds of columbite were shipped by Philip S. Hoyt from Las Tablas, N. Mex., and a smaller quantity was shipped by Dr. A. T. Roos from the Black Hills (near Rapid City) of South Dakota. At Spruce Pine, N. C., the Consolidated Feldspar Corporation sorted out, but did not sell, 200 or 300 pounds of columbite in 1931.

The following table shows the production of tantalum minerals in the United States during the past five years.

Columbite, mined in the United States, shipped in 1927–1931

Year	Pounds	Value	Year	Pounds	Value
1927	1,100	$378	1930	5,100	$3,350
1928	34,809	26,332	1931	700	490
1929	22,117	17,261			

IMPORTS

The bulk of the domestic supply of tantalum has been imported as ore. The following table shows imports for consumption since 1927.

Tantalum ores imported into the United States, 1927–1931 [1]

Year	Pounds	Value	Year	Pounds	Value
1927	[2] 15,119	$20,012	1930	[2] 8,474	$7,036
1929	[2] 15,250	19,418	1931	[3] 6,288	6,289

[1] No imports reported for 1928.
[2] Classified as "Ores of ferro-alloying metals (tantalum)."
[3] Classified as "Tantalum and columbium ores."

TITANIUM [1]

By P. M. Tyler and A. V

CONTENTS

GENERAL CONDITI

In 1931 noteworthy changes took place i titanium pigment industry in the United St are manufactured chiefly by two firms—th (a subsidiary of the National Lead Co.) a Color Corporation (formerly the Commercia

The Titanium Pigment Co. was the firs States to undertake the manufacture of tit to 1931 operated plants at Niagara Falls, N In 1931, however, the company transferred to St. Louis; and it was understood that la built at tidewater, probably in the vicin Titanium Pigment Co. manufactures titan and Titanox C pigments.

The titanium pigment business of the Co poration, a subsidiary of the Commercial S consolidated with the lithopone and dry co Pigment & Chemical Co. and the pigment the Grasselli Chemical Co. during 1931, as of a new company known as the Krebs Pigm of Newark, N. J. The company manufactu titanated lithopones (Ti Tone and Duolith product is marketed by the company sales Co., New York City) under the trade name "

Another titanium lithopone (Titanolith) Chemical & Pigment Co., San Francisco, Ca

Although the market for most white pigme by the general business depression, sales of rently continued to increase during 1931, a tionary throughout the year. In January, 19 of one-half cent a pound was made in th titanium pigments.

[1] Work on manuscript completed June, 1932.
[2] Statistics on domestic production prepared by H. W. Davis and by L. M. Jones, both of the Bureau of Mines. Figures on imports co of Mines, from records of the Bureau of Foreign and Domestic Com

DOMESTIC PRODUCTION

During 1931 the American Rutile Co. (a subsidiary of the Metal & Thermit Corporation) shipped ilmenite and rutile from its properties at Roseland, Nelson County, Va. The mill was operated steadily until cold weather. Particular attention was given to improving the recovery of fine material through better classification and the installation of a thickener for the classifier overflow. Development work in two tunnels has substantially enhanced the already large volume of proved ore reserves. The new plant of the Southern Mineral Products Corporation (described in the 1930 chapter of this series) at Piney River, Va., was operated throughout much of the year but not on a commercial basis.

The Titanium Corporation of America was incorporated in October, 1931, to develop rutile properties in Hot Spring County, Ark.

The output of titanium minerals during the past 10 years, so far as data are available to the Bureau of Mines for publication, is shown in the following table, which, however, gives shipments rather than production.

Titanium minerals produced in the United States, 1922–1931 [1]

Year	Rutile concentrates			Ilmenite concentrates		
	Short tons	Percentage of TiO_2	Value	Short tons	Percentage of TiO_2	Value
1922	310	95	(2)	5,181	52–54	(2)
1923	270	95	(2)	6,270	52	(2)
1924				4,769	52	[3] $76,300
1925	46	95	[3] $11,000	5,566	52	[3] 89,000
1926 [4]	30	95	[3] 7,500	4,813	52	[3] 77,000
1927	524	95	129,861	3,500	50	44,000
1928	176	93–96	[3] 37,700	918	50	[3] 21,000

[1] Both rutile and ilmenite concentrates produced in 1929, 1930, and 1931, but Bureau of Mines not at liberty to publish figures.
[2] Bureau of Mines not at liberty to publish figures.
[3] Arbitrary value.
[4] *Figures for Florida only.* Bureau of Mines not at liberty to publish figures for Virginia.

IMPORTS

The bulk of the ilmenite consumed in the United States is imported. In 1931 the imports registered a substantial increase, amounting to 29,857 long (33,440 short) tons, valued at $144,951, compared with only 22,297 long (24,973 short) tons, valued at $150,466, in 1930 and 22,386 long (25,072 short) tons, valued at $104,887, in 1929. It will be noted that the average declared value of the imports was $4.85 per long ton in 1931. Ocean freight from India is usually around $5 a long ton, and the trade journal quotations f. o. b. Atlantic seaboard are $10 to $12 a long ton. In 1931 all the shipments were credited to British India, whereas in former years substantial amounts have likewise been received from Senegal and occasionally from Brazil. According to Canadian official reports (see p. 86), however, 1,509 short tons of ilmenite were shipped to the United States in 1931 from the Baie St. Paul district, Quebec.

Imports of rutile in 1931 were reported as 2,000 pounds, valued at $189.

PRICES

During the past decade prices of titanium
steadily. The price of titanium dioxide ha
to 21 cents per pound in less than 5 yea
formerly quoted at 13 to 13½ cents per pou
cents per pound (for the barium-base pigme
7½ cents (for the calcium-base pigment, in
Early in 1932 a further cut of one-half cent
titanium-calcium pigment. At the end of 1
tanium was reduced from $150 per short to
for 15 to 18 per cent titanium and 6 to 8 per

Ilmenite containing 45 to 52 per cent Ti
out 1931 by the Engineering and Mining Jo
long ton, f. o. b. Atlantic seaboard, according
Low-grade domestic ilmenite, 32 to 35 per ce
$7 to $8 a ton. The quotation for rutile,
per cent concentrate, remained unchanged a

WORLD PRODUCTIO

The world production of titanium minera
gathered from Government reports and oth
shown in the following table.

World production of titanium minerals,

Mineral and country	1930		
	Ore produced	Content of TiO_2	Value [1]
Ilmenite:	*Metric tons*	*Per cent*	
Brazil [2]	80	53	$1,370
Canada (Quebec)	374	18–25	1,237
India (Travancore)	29,238	54	160,416
Norway	7,630	43	63,400
Portugal	834	50	3,746
Senegal [3]	5,322	48	7,377
United States	(4)	(4)	(4)
Rutile:			
Norway [5]	46	90–93	13,400
United States	(4)	(4)	(4)

[1] Values as officially reported, converted to United States currency a
as published by the Federal Reserve Board.
[2] Exports.
[3] Data not available.
[4] Bureau of Mines not at liberty to publish figures.
[5] Concentrates.

THE INDUSTRY IN FOREIGN

Australia.—The Radium & Rare Earths
which was formed a few years ago to exploit an
white from rutile found on its property at
decided to abandon the project as productio
and it was more economical to import ilm
India.[3] The Titanium Products Pty. (Ltd.)
bourne to manufacture titanium oxide pigm

[3] Peabody, S. R., Australian Firm Discontinues Plan to Manufactu
and Dom. Com., World Trade Notes on Chemicals, etc., vol. 5, No. 2

LEAD AND ZINC PIGMENTS

By E. W. Pehrson [2]

CONTENTS

SUMMARY

The total value of lead and zinc pigment
ducers amounted to approximately $56,267,0
with $69,253,000 in 1930, a decrease of 19
pigments decreased 20 per cent in value a
cent of the total value, whereas sales of zi
per cent and amounted to 48 per cent of the

The quantity of lead pigments sold by proc
to 197,079 short tons, a decrease of 22,463 to
pared with 1930 and 98,381 tons (33 per cen
Each of the lead pigments shared in this dec
(dry and in oil) decreased 5 per cent; litharg
22 per cent; basic lead sulphate, 16 per cent;
per cent.

The quantity of zinc pigments sold by proc
to 266,127 short tons, a decrease of 34,359 to
pared with 1930 and 127,948 tons (32 pe
1929. Sales of zinc oxide and lithopone fel
respectively, in 1931 as compared with 1930,
oxide increased 8 per cent.

Sales of zinc chloride increased 20 per cen
of zinc sulphate declined 15 per cent.

According to reports submitted to the Bu
and zinc pigment industry is not burdened
During 1931 production closely approximat
of all pigments except three exceeded the qu
8 per cent. The three exceptions were dry
lithopone, and in each case sales amounted t
of the total production.

The marked decline in the pigment indust
flected the sharp curtailment in the manuf
batteries, and rubber brought about by the
sion. In previous periods of unemployme
manufacturers actually enjoyed substantial

[1] Work on manuscript completed June, 1932.

[2] Statistics in this report prepared (unless otherwise indicated) by
and exports compiled from records of the Bureau of Foreign and Do
both of the Bureau of Mines.

many idle workers painted their homes while unemployed. In 1921 the sales of white lead in oil increased 28 per cent over those in 1920. At the beginning of 1930 a similar increase was expected, but the record now shows that in this respect 1930 and 1931 were exceptional years.

Market quotations for all lead pigments in 1931 suffered declines that ranged from ¼ cent to 2 cents per pound. Prices of the white pigments were maintained at the same level during the first 11 months, but in December price cuts amounting to about 10 per cent were announced. Prices of the red oxides responded to fluctuations in the pig-lead market. A net decline of 2 cents per pound was recorded for litharge and red lead. The average value per ton of lead pigments in 1931, as reported by producers to the Bureau of Mines, was only 11 per cent below the average in 1930, whereas the average quoted price of lead (New York) declined 23 per cent. Quotations on zinc oxide and leaded zinc oxide were maintained at the levels of the four preceding years, although the price of slab zinc (St. Louis) was 20 per cent lower in 1931 than in 1930. Lithopone prices were maintained at the quotations prevailing at the close of 1930.

Foreign trade in pigments fell off considerably during 1931. Imports of all lead and zinc pigments amounted to 7,278 tons, valued at $648,733, a decrease of 13 per cent in quantity and 19 per cent in value. Exports totaled 17,047 tons, valued at $2,005,638 (32 per cent below the amount and 40 per cent below the value of exports in 1930). Imports of lead pigments were negligible. Lithopone, the principal zinc pigment imported, and zinc sulphide showed declines, but incoming shipments of zinc oxide increased. Exports of all lead and zinc pigments except lithopone decreased.

An outstanding feature of the lead and zinc pigment industry during the last few years has been the severe competition between white lead and other pigments for the paint trade. The effect of this competition is indicated roughly in the comparative sales of the pigments concerned. Sales of white lead in oil decreased from 153,000 tons in 1922 to 70,000 tons in 1930. During the same period the combined sales of zinc oxide and lithopone increased from 212,000 to 283,000 tons. As three-fourths of the lithopone and about one-third of the zinc oxide produced in the United States are used in the manufacture of paints these figures indicate the marked degree to which the zinc pigments have invaded the paint industry at the expense of white lead. This trend, however, appears to have been reversed in 1931, as sales of white lead to the paint industry increased slightly, whereas the consumption of lithopone in paint decreased over 5 per cent and the total sales of zinc oxide decreased 20 per cent.

During the year two new plants for the production of lithopone and zinc oxide began operations. The producing organization of one large pigment manufacturer was completely reorganized to increase efficiency and effect economy. Many plants operated on a sharply curtailed basis, and others shut down completely. Some plants were permanently abandoned.

PRODUCTION

In this report sales of pigments and salts are considered as representing the production, no account being taken of the stocks on hand at the beginning and end of the year. The amounts used by producers at their own plants are included under sales.

The total value of lead and zinc pigments sold b
was approximately $56,267,000 in 1931 as compa
in 1930. The total value of all lead pigments s
and that of all zinc pigments sold was $27,138
pigments decreased 20 per cent in total value
quantity, whereas sales of zinc pigments decrease
value and 11 per cent in quantity. The average
pigments sold in 1931, as reported by producers,
cent, whereas the average New York quotation
23 per cent in 1931 as compared with 1930. Zin
only 6 per cent in value per ton, as compared
decrease in the St. Louis quotation for slab zinc.

Sales of zinc chloride increased 20 per cent in
cent in value in 1931, whereas sales of zinc su
per cent in quantity and 28 per cent in value.

The following tables show the sales of lead an
zinc salts from 1927 to 1931, as reported to the B

*Lead pigments sold by domestic manufacturers in the Uni
in short tons*

Year	White lead		Basic lead sulphate or sublimed lead	
	Dry	In oil	White	Blue
1927	38,609	119,026	13,482	1,061
1928	42,049	111,023	16,002	1,234
1929	42,159	104,872	15,580	1,234
1930	32,548	69,592	10,308	1,219
1931	30,922	66,446	8,790	896

Lead pigments sold by domestic manufacturers in the Unite

Pigment	1930		
	Short tons	Value (at plant, exclusive of container)	
		Total	Average
Basic lead sulphate or sublimed lead:			
White	10,308	$1,321,339	$129
Blue	1,219	130,017	107
Red lead	32,941	5,066,297	154
Orange mineral	356	76,055	215
Litharge	72,578	9,713,765	134
White lead:			
Dry	32,548	4,572,048	140
In oil	69,592	15,505,196	223

*Zinc pigments and salts sold by domestic manufacturers in th
1931, in short tons*

Year	Zinc oxide	Leaded zinc oxide	Lithopone	Zinc chloride (50° B.)	Zinc sulphate	Year	Zinc oxide	Lea zi ox
1927	161,246	20,064	170,004	40,141	6,418	1930	119,142	17,
1928	160,004	24,223	200,408	45,669	4,733	1931	95,700	18,
1929	160,011	27,149	206,315	43,189	7,484			

Zinc pigments and salts sold by domestic manufacturers in the United States, 1930 and 1931

Pigment or salt	1930			1931		
	Short tons	Value (at plant, exclusive of container)		Short tons	Value (at plant, exclusive of container)	
		Total	Average		Total	Average
Zinc oxide [1]	119,142	$14,896,883	$125	95,700	$11,997,096	$125
Leaded zinc oxide [1]	17,279	2,072,197	120	18,577	2,140,864	115
Lithopone	164,065	15,897,683	97	151,850	12,999,590	86
Zinc chloride, 50° B	29,043	1,247,385	43	34,885	1,417,010	41
Zinc sulphate	6,249	276,728	44	5,290	199,482	38

[1] Zinc oxide containing 5 per cent or more of lead is classed as leaded zinc oxide.

Statistics for lead arsenate, lead acetate, zinc stearate, and other lead and zinc salts and compounds are collected biennially by the Bureau of the Census for odd years. Details of production for several years were published in the 1930 chapter of this series. Data for 1931 were not available at the time this report was written.

SOURCE

Lead pigments and zinc pigments and salts are manufactured from a variety of materials, including ore, refined metal, and miscellaneous secondary materials, such as scrap and waste, from various industrial processes.

The following table gives the quantity and source of the metal contained in the lead pigments and in the zinc pigments and salts produced in the United States in 1930 and 1931. It shows that in 1931, 96.3 per cent of the lead in lead pigments was derived from pig lead, 3.3 per cent from ore, and 0.4 per cent from secondary material. For zinc pigments and salts the proportions were 60.3 per cent from ore, 21.2 per cent from slab zinc, and 18.5 per cent from secondary material.

Metal content of lead pigments and zinc pigments and salts produced by domestic manufacturers, 1930 and 1931, by sources, in short tons

Source	1930		1931	
	Lead in pigments [1]	Zinc in pigments and salts	Lead in pigments [1]	Zinc in pigments and salts
Domestic ore	6,686	104,561	5,722	74,532
Metal	100,182	27,090	166,328	26,223
Secondary material [2]	689	22,304	710	22,799
	107,557	153,955	172,760	123,554

[1] Includes also lead recovered in zinc oxide and leaded zinc oxide. The metal content of lead acetate and lead arsenate is not available, as no canvass of their production is made by the Bureau of Mines. Moreover, these salts are derived from pig lead, and their metal content has already been taken into statistical account in the figures covering lead production.
[2] Zinc ashes, skimmings, drosses, and old metal.

In the following tables the source of the metal used in the manufacture of each pigment and salt is given. Pig lead is used exclusively, either directly or indirectly, in the manufacture of white lead, litharge, red lead, and orange mineral and, to a large extent, in the manufacture

of basic lead sulphate. Zinc oxide is the on
slab zinc is used in considerable quantity. Ore
facture of zinc oxide, leaded zinc oxide, lithopo
basic lead sulphate. Some secondary lead is
ture of basic lead sulphate, and a substantial p
in lithopone and zinc chloride made in the Un
from secondary material.

Lead content of lead and zinc pigments produced by dom and 1931, by sources, in short ton

Pigment	1930				L
	Lead in pigments produced from—			Total lead in pigments	
	Domestic ore	Pig lead	Secondary material		Dom tic
White lead		87,329		87,329	
Red lead		30,403		30,403	
Litharge		67,510		67,510	
Orange mineral		222		222	
Basic lead sulphate	1,953	4,628	636	7,217	1,
Leaded zinc oxide	4,693		53	4,746	3,
Zinc oxide	40			40	
	6,686	190,182	689	197,557	5,

Zinc content of zinc pigments and salts produced by dom and 1931, by sources, in short ton

Pigment or salt	1930				Zinc
	Zinc in pigments and salts produced from—			Total zinc in pigments and salts	
	Domestic ore	Slab zinc	Secondary material		Dome ore
Zinc oxide	71,324	27,085	149	98,558	47,
Leaded zinc oxide	11,428		160	11,588	8,
Lithopone	[1] 20,646		14,679	[1] 35,225	[1] 17,
Zinc chloride		5	6,532	6,537	
Zinc sulphate	1,263		784	2,047	
	104,661	27,090	22,304	153,955	74,

[1] Includes zinc content of a small quantity of zinc sulphide produced.

PREPARATION AND USE

A general discussion of the properties, uses, lead and zinc pigments and zinc salts may be fou of this report. The following discussion summa developments and brings the statistical data up to

WHITE LEAD

A new process [3] for the preparation of white le been developed in Germany. Litharge is grou presence of carbon dioxide. Ammonia is add

[3] Oil, Paint and Drug Reporter, vol. 120, No. 23, Nov. 23, 1931, p. 16.

formation of ammonium carbonate and bicarbonate which in turn react with the litharge to produce basic lead carbonate. The white lead is said to be free from the normal carbonate. The ammonia is regenerated for reuse.

A mixture of white lead, oil, and graphite has been used successfully as a lubricant of open gears, and a mixture of white lead and mutton tallow is used to lubricate and protect control wires of airplanes.[4]

The United States usually exports about 6,000 tons of white lead annually, most of which is manufactured in bond from foreign lead.

The following table shows the sales of white lead (dry and in oil) to various industries in 1930 and 1931, as reported to the Bureau of Mines by the producers:

Distribution of white lead (dry and in oil) sales, 1930 and 1931, by industries

Industry	1930		1931	
	Short tons	Per cent of total	Short tons	Per cent of total
Paint	91,503	89.6	91,832	94.3
Ceramics	3,306	3.3	2,848	2.9
Other	7,211	7.1	2,688	2.8
	102,140	100.0	97,368	100.0

BASIC LEAD SULPHATE

The following table shows the sales of basic lead sulphate to various industries in 1930 and 1931, as reported to the Bureau of Mines by the producers:

Distribution of basic lead sulphate sales, 1930 and 1931, by industries

Industry	1930		1931	
	Short tons	Per cent of total	Short tons	Per cent of total
Paints	9,673	83.0	8,311	85.8
Storage batteries	1,104	9.6	697	7.2
Rubber	394	3.4	173	1.8
Other	456	4.0	505	5.2
	11,627	100.0	9,686	100.0

LITHARGE

Dr. John A. Schaeffer, director of research of the Eagle-Picher Lead Co., recently has called attention to the rapid advance made in storage-battery pigment technology during the past decade. After pointing out the improved performance of a battery in 1932 as compared with one in 1922 and the economy that has been effected in the use of lead oxides, he states:[5]

The question you will rightly ask * * * is a proper one: "Just how has this tremendous increase in capacity been obtained with a lowering of the weight of active material used in the plate?" Such a question brings us to the develop-

[4] Lead, vol. 2, No. 2, March, 1932, p. 3.
[5] Schaeffer, J. A., The Newer Developments in Lead Pigments and Their Uses: A paper presented before the Chicago chapter of the A. I. M. M. E., Mar. 16, 1932 (privately distributed), pp. 3–4.

ments which have been made in the manufacture
1922 it was the usual practice to produce oxides o
industry through the direct oxidation of metallic
over impact pulverizers. The result of this plan of
tion of a storage-battery oxide containing varying
dominance of rather large particles. It is a wel
battery oxide, either litharge or red lead, must hav
that a good bond can be obtained in the plate w
porosity; in other words, the maximum surface of
be exposed to the electrolyte with maximum physic
paratively large particles of oxide are present, the
but at the same time the total reactive surface of the
This statement holds true for both red lead and litl
only used in the positive plate and there only in a

The efforts of the oxide manufacturer have be
years toward producing an oxide of extreme finer
characteristics that proper bonding will be obtai
Our studies have led us to different methods of fu
improved methods of milling. * * *

Summing up these developments, we find that ir
the lead oxides have been improved through their n
an extent that we have been able to increase the
at 80° F. 40 per cent, with a corresponding decreas
of 27 per cent and a corresponding decrease in the
30 per cent, with no decrease in life.

If any of us who were devoting our attention to t
for use in the storage-battery industry 10 years ago
to-day be producing materials for use in a battery w
such increases in capacity with the corresponding
and reduction in quantity of active material, we wo
ble. Now, just what has this meant to the consumi
the cost of a storage battery has been tremendou
you can go on the market and buy a battery for a
to $8 which will perfectly service your automobil
time. At the same time it has also meant the pro
in trying to start our automobile on a cold morning

Doctor Schaeffer [6] also stated that the intr
sublimed litharge into the petroleum refining
more rapid and complete chemical reacti
operation.

The rapid increase in the use of neon ligh
the past few years has created a larger dem
a glass containing about 22 per cent of lea

The following table shows the sales of lith
in 1930 and 1931, as reported to the Bureau o

Distribution of litharge sales, 1930 and 1

Industry	1930		1931		Industr
	Short tons	Per cent of total	Short tons	Per cent of total	
Storage batteries	33,173	45.7	31,605	49.5	Rubber
Insecticides	6,000	8.3	7,508	11.8	Varnish
Oil refining	12,028	16.6	7,351	11.5	Linoleum
Ceramics	4,089	5.6	4,124	6.5	Other
Chrome pigments	3,286	4.5	3,582	5.6	

[6] Schaeffer, J. A., work cited, p. 7.

RED LEAD

A summary of recent developments in the use of red lead and litharge in the storage-battery industry is given in the discussion under litharge on page 216.

The following table shows the sales of red lead to various industries in 1930 and 1931, as reported to the Bureau of Mines by the producers:

Distribution of red-lead sales, 1930 and 1931, by industries

Industry	1930		1931	
	Short tons	Per cent of total	Short tons	Per cent of total
Storage batteries	18,908	57.7	13,700	53.0
Paints	10,900	33.1	9,256	35.8
Ceramics	835	2.5	811	3.1
Other	2,202	6.7	2,086	8.1
	32,941	100.0	25,853	100.0

ORANGE MINERAL

The following table shows the sales of orange mineral to various industries in 1930 and 1931, as reported to the Bureau of Mines by the producers:

Distribution of orange-mineral sales, 1930 and 1931, by industries

Industry	1930		1931	
	Short tons	Per cent of total	Short tons	Per cent of total
Ink manufacture	88	24.7	119	42.2
Color pigments	188	52.8	114	40.4
Other	80	22.5	49	17.4
	360	100.0	282	100.0

ZINC OXIDE AND LEADED ZINC OXIDE

The most recent source of data on the consumption of zinc oxide in the manufacture of rubber is the Census of Manufactures for 1929. According to this report 66,838 tons of zinc oxide were used in the manufacture of rubber goods in 1929; this was equivalent to 42 per cent of the total sales of zinc oxide reported by domestic producers in that year. Eighty-three per cent of the total was used in the manufacture of tires and inner tubes, 4 per cent in rubber boots and shoes, and 13 per cent in miscellaneous rubber goods. The data indicate that the average zinc oxide content of all rubber goods is about 6 per cent by weight.

According to the Census of Manufactures for 1929 the paint industry consumed 55,603 tons of zinc oxide in 1929. This quantity probably includes leaded zinc oxide also; thus the tonnage represents 30 per cent of the total sales of zinc oxide and leaded zinc oxide as reported to the Bureau of Mines for 1929.

Exports of zinc oxide in 1931 amounted to 5,131 short tons (5 per cent of the total production). Approximately 1,400 tons were imported.

LITHOPONE

A calcium-base lithopone has been develo
calcium sulphate is substituted for barium su
lower specific gravity of calcium sulphate, th
of the pigment can be increased and at the sa
values obtained. This type of pigment has
and is especially adaptable where flat finishes

Lithopone producers reported the use of ove
in the manufacture of titanated lithopone in 1

Imports of lithopone into the United State
5,674 short tons. Exports amounted to 3,8
import of 1,853 tons, the equivalent of 1.2 p
sales. Of the quantity imported 88 tons wer
containing 30 per cent or more of zinc sulphid

The following table shows the sales of litho
tries in 1930 and 1931, as reported to the Bu
ducers:

Distribution of lithopone sales, 1930 and 19

Industry	1
	Short ton
Paints, varnish, and lacquers	126,07
Floor coverings and textiles	23,65
Rubber	5,99
Other	8,33
	164,06

ZINC SULPHIDE

Zinc sulphide imparts to lithopone most
qualities, but only during the past decade h
separate pigment received general recognition
nized as one of the best white paint pigments
enamels, and lacquers is increasing, particular
paint products, where it is especially desirab
hiding power. It is also used in the manufac
linoleum, printing inks, and writing fluids. P
United States in 1924 with an output of onl
output had increased to 126,000 pounds during
1928.[7] Subsequent data on domestic produc
for publication. Domestic quotations for zi
from about 70 cents per pound in 1924 to 13 c
while, imports had increased from about 10,0
631,000 pounds in 1929, indicating a domestic
mating 1,000,000 pounds. Since 1929 imports
Effective June 18, 1930, the import duty on zinc
from 1½ to 3 cents per pound.

A unique use of zinc sulphide in luminous
oped in Germany.[8] Exceptionally pure zinc

[7] *Tariff Readjustment, 1929, Hearings Before the Committee on Wa*
sentatives: 70th Cong., 2d sess., vol. 1, Sch. 1, p. 822.
[8] Bureau of Foreign and Domestic Commerce, World Trade Notes:

sulphide possess marked phosphorescence, the period of luminosity varying with the color tones and composition of the pigment. The luminous paints are used in making signs, show cards, and various types of ornamentation. The dry pigment is used in printing, the powder being sprinkled over the text which is printed in gold size. An advantage of these luminous paints is that they contain no radium salts, phosphorus, or other poisonous substances.

ZINC SALTS

The quantity of zinc sulphate used as a depressing reagent in the flotation of complex lead and zinc ores amounted to 1,425 tons in 1929, 1,410 tons in 1928, and 1,010 tons in 1927.

Sales of zinc chloride increased during 1931, but the record shows that the production decreased, the excess sales having been made from stocks accumulated prior to 1931.

PRODUCERS AND PLANTS

The following companies reported having sold or used lead and zinc pigments and zinc salts of their own production in 1931:

White lead:	
Anaconda Lead Products Co. (electrolytic process)	East Chicago, Ind.
Carter White Lead Co	West Pullman, Chicago, Ill.
E. I. du Pont de Nemours & Co	Philadelphia, Pa.
Eagle-Picher Lead Co	East St. Louis, Ill.
Do	Cincinnati, Ohio.
Euston Lead Co	Scranton, Pa.
W. P. Fuller & Co	South San Francisco, Calif.
John T. Lewis & Bros. Co	Philadelphia, Pa.
National Lead Co	Chicago, Ill.
Do	St. Louis, Mo.
Do	Perth Amboy, N. J.
Do	Brooklyn, N. Y.
Do	Port Richmond, N. Y.
Do	Cincinnati, Ohio.
National Lead Co. of California	Melrose, Calif.
National Lead & Oil Co. of Pennsylvania	New Kensington, Pa.
Sherwin-Williams Co	Chicago, Ill.
Wetherill & Bro	Philadelphia, Pa.
Basic lead sulphate, or sublimed lead:	
Eagle-Picher Lead Co	Joplin, Mo.
Eagle-Picher Mining & Smelting Co	Galena, Kans.
St. Louis Smelting & Refining Works of National Lead Co	Collinsville, Ill.
Red lead, orange mineral, and litharge:	
Andrews Lead Co	Long Island City, N. Y.
Eagle-Picher Lead Co	East St. Louis, Ill.
Do	Joplin, Mo.
Do	Newark, N. J.
Do	Cincinnati, Ohio.
Evans Lead Co	Charleston, W. Va.
W. P. Fuller & Co	South San Francisco, Calif.
Morris P. Kirk & Son	Los Angeles, Calif.
John T. Lewis & Bros. Co	Philadelphia, Pa.
Metals Refining Co	Hammond, Ind.
National Lead Co	Chicago, Ill.
Do	St. Louis, Mo.
Do	Brooklyn, N. Y.
National Lead Co. of California	Melrose, Calif.
National Lead & Oil Co. of Pennsylvania	New Kensington, Pa.
Sherwin-Williams Co	Chicago, Ill.
Wetherill & Bro	Philadelphia, Pa.

Zinc oxide and leaded zinc oxide:	
American Zinc Co. of Illinois	Hillsboro,
American Zinc Oxide Co	Columbus,
Eagle-Picher Lead Co	Hillsboro,
Empire Zinc Co	Canon Cit
Grasselli Chemical Co	East Chica
International Lead Refining Co. (French process)	Do.
Do	Akron, Oh
Mineral Point Zinc Co	Mineral P
New Jersey Zinc Co. (of Pennsylvania)	Palmerton
Do. (French process)	Freemanst
Ozark Smelting & Mining Co	Coffeyville
St. Joseph Lead Co	Josephtow
Lithopone:	
Chemical & Pigment Co. (Inc.)	Oakland,
Do	Collinsville
Do	St. Helena
Eagle-Picher Lead Co	Argo, Ill.
Krebs Pigment & Color Corporation	Newport,
Do	Newark, N
Mineral Point Zinc Co	Depue, Ill.
New Jersey Zinc Co. (of Pennsylvania)	Palmerton
Ozark Smelting & Mining Co	Coffeyville
Sherwin-Williams Co	Chicago, Il
United Color & Pigment Co	Newark, N
Zinc salts:	
American Smelting & Refining Co	Selby, Cali
Do	Durango,
Do	Omaha, N
Do	Perth Amb
Charles Cooper & Co	Newark, N
General Chemical Co	Chicago, Il
Grasselli Chemical Co	East Chica
Do	Cleveland,
Do	Weirton, W
Great Western Electro-Chemical Co	Pittsburg,
Harshaw Chemical Co	Cleveland,
Charles Lennig & Co. (Inc.)	Philadelphi
Merrimac Chemical Co	Everett, M
Ozark Smelting & Mining Co	Coffeyville,

The Ozark Smelting & Mining Co., a subsidiary o Williams Co., began producing lithopone at its new p ville, Kans., during 1931.

The St. Joseph Lead Co. at Josephtown, Pa., begar zinc oxide in January, 1931. The plant, which has a of 120 tons of concentrate, was designed to treat zi from the company's mines in St. Lawrence County, electrothermic process. Sulphuric acid is manufacture product sulphur gases. The zinc oxide was sold ch manufacturers.

The Commercial Solvents Corporation, E. I. du Po & Co. (Inc.), and its affiliated company, the Grasselli have formed a new company known as the Krebs Pi Corporation, to consolidate the lithopone and dry-co the Krebs Pigment & Chemical Co. and the pigment division of Grasselli with the titanium pigment busine mercial Pigments Corporation, a subsidiary of Comme The now organization will combine the technical k research facilities of the companies interested.[9]

[9] Industrial and Engineering Chemistry, News Edition, vol. 9, No. 17, Sept. 10,

The new company has taken over the Newark (N. J.) plant of the Grasselli Chemical Co. and the Newport (Del.) plant of the Krebs Pigment & Chemical Co. The Grasselli Chemical Co. reported that pigment production has been permanently discontinued at its Grasselli (N. J.) and Philadelphia (Pa.) plants.

The Eagle-Picher Lead Co. discontinued the production of red lead and litharge at its Cincinnati plant in April, 1931, and white lead manufacture was suspended at the East St. Louis plant in June, 1931.

The New Jersey Zinc Co. was reported [10] as planning a $150,000 addition to its zinc sulphide plant at Palmerton, Pa.

TARIFF

No changes were made during 1931 in the import duties established by the tariff act of 1930, details of which were given in the 1930 chapter of this series.

IMPORTS AND EXPORTS

LEAD PIGMENTS

Imports of lead pigments into the United States are relatively unimportant. Exports of white lead pigments decreased 23 per cent in 1931 and amounted to 5 per cent of the total sales of domestic white lead; exports to the United Kingdom decreased 11 per cent and amounted to 85 per cent of the total. Combined exports of red lead, litharge, and orange mineral decreased 25 per cent in 1931 and amounted to over 3 per cent of the total sales by domestic manufacturers. The principal customers in 1931 and the percentage of the total taken by each follow: Canada 63 per cent, United Kingdom 8 per cent, Argentina and the Philippine Islands 3 per cent each, and Panama and Belgium 2 per cent each. Exports to Canada and Argentina increased 21 and 8 per cent, respectively, whereas those to the United Kingdom decreased 47 per cent. Netherland West Indies, which took 22 per cent of the total in 1930, took less than 1 per cent in 1931.

Basic carbonate white lead, red lead, litharge, and orange mineral imported for consumption in the United States, 1927–1931

Year	Basic carbonate white lead		Red lead		Litharge		Orange mineral	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
1927	330,421	$29,901	51,088	$4,403	1,182	$133	44,860	$3,816
1928	166,236	15,889	24,676	1,510	2,100	163	62,409	5,227
1929	106,478	19,086	10,197	745	3,763	270	52,122	3,889
1930	147,132	13,406	19,116	1,334	968	90	25,338	1,955
1931	135,922	12,114	652	44	204	48	23,714	1,937

[10] Chemical and Metallurgical Engineering, vol. 38, No. 7, July, 1931, p. 436.

White lead and red lead exported from the Uni

Year	White lead [1]		Red lead [2]		Year	
	Short tons	Value	Short tons	Value		
1927	6,047	$947,226	1,429	$271,376	1930	
1928	6,476	952,316	2,084	364,995	1931	
1929	5,908	921,509	2,890	503,243		

[1] Export figures for 1927–1931 may include an unknown quantity of
[2] Exports of red lead and litharge not classified separately for 19
unknown quantity of litharge; the figures for 1928–1931 include also an

White lead [1] exported from the United States, 1930

Destination	1930		1931		Destinatio
	Short tons	Value	Short tons	Value	
North America:					Europe:
Canada	66	$10,008	81	$11,191	Netherlands
Cuba	67	9,404	9	1,424	United King
Mexico	98	21,041	39	7,499	Other
Panama	101	16,809	1	153	
Other	56	11,879	22	4,449	
	388	69,141	152	24,716	Asia:
					Philippine Is
South America:					Other
Argentina	434	67,890	67	8,800	
Brazil	33	4,558	1	116	
Colombia	3	702	2	471	Africa
Uruguay	43	6,727	1	165	Oceania, incl
Venezuela	11	2,406	6	1,028	Australia
Other	51	7,565	6	738	
	575	89,848	83	11,318	

[1] Exports of white lead and basic lead sulphate or sublimed lead no
figures may include an unknown quantity of basic lead sulphate or su

ZINC PIGMENTS AND SA

Imports of lithopone, the principal zinc pig
United States, decreased 19 per cent in 1931 a
per cent of the domestic sales. Of the total
tons were classified as lithopone containing
zinc sulphide. Imports of the zinc oxides in
were equivalent to less than 2 per cent of the d
of zinc sulphide, which increased rapidly from
75 per cent in 1930 and 17 per cent in 193
pigments imported in 1931 came from Eur
supplied 91 per cent, Germany 7 per cent, an
the lithopone. All of the high-strength litho
the zinc sulphide came from Germany. Imp
nated as follows: Belgium, 52 per cent; Fran
Kingdom, 12 per cent; Germany, 11 per cen
3 per cent.

Exports of zinc oxide, the principal zinc pig
United States, decreased 52 per cent in 1931,
principal consuming countries showing decline
and the United Kingdom fell off 38 and 68
Canada took 55 per cent and the United King

1931 total. Exports of lithopone increased 4 per cent in 1931; Canada took 87 per cent of the total, the United Kingdom 6 per cent, and Cuba 3 per cent.

Zinc oxide, lithopone, zinc sulphide (white), zinc chloride, and zinc sulphate imported for consumption in the United States, 1927–1931

Year	Zinc oxide				Lithopone	
	Dry		In oil			
	Short tons	Value	Short tons	Value	Short tons	Value
1927	1,399	$220,427	77	$18,619	7,979	$056,166
1928	1,348	208,557	107	25,020	9,885	808,200
1929	1,267	203,080	110	27,145	8,409	725,554
1930	1,056	148,891	70	16,614	7,018	595,597
1931	1,352	170,169	105	19,308	5,674	428,523

Year	Zinc sulphide [1]		Zinc chloride		Zinc sulphate	
	Pounds [1]	Value	Short tons	Value	Short tons	Value
1927	132,223	$22,984	470	$40,069	205	$9,390
1928	338,030	47,235	563	47,185	683	28,866
1929	630,565	84,260	638	50,324	909	32,127
1930	169,533	23,552	351	28,811	510	17,819
1931	133,002	16,590	278	20,868	208	7,248

[1] Zinc sulphide is stated in pounds rather than tons because of its high value and smaller quantities.

Zinc oxide and lithopone exported from the United States, 1927–1931

Year	Zinc oxide		Lithopone		Year	Zinc oxide		Lithopone	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1927	14,494	$1,821,786	2,110	$222,585	1930	10,753	$1,446,904	3,605	$380,047
1928	14,799	1,849,889	3,326	337,565	1931	5,131	717,224	3,821	341,257
1929	17,638	2,301,643	4,556	463,235					

Zinc oxide exported from the United States, 1930 and 1931, by destinations

Destination	1930		1931		Destination	1930		1931	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
North America:					Europe:				
Canada	4,547	$628,178	2,818	$398,615	France	428	$52,375	1	$303
Cuba	91	13,960	58	9,489	Italy	115	10,651	55	3,535
Mexico	20	4,314	49	7,361	United Kingdom	4,719	578,820	1,523	191,896
Panama	101	18,037	68	10,988	Other	116	18,024	134	16,580
Other	53	8,016	5	841		5,378	665,879	1,713	217,322
	4,812	673,105	2,998	427,294	Asia:				
					Philippine Islands	69	8,729	22	3,608
South America:					Other	107	20,244	71	14,482
Argentina	68	12,060	171	24,113		176	28,973	93	18,090
Brazil	9	1,928	4	1,178	Africa	14	3,400	8	3,048
Other	28	6,381	42	7,378	Oceania, including Australia	268	55,166	102	18,801
	105	20,375	217	32,669		10,753	1,446,904	5,131	717,224

PRICES AND VALUE

The total value and the average price receiv
sales of lead and zinc pigments and salts are giv
of this chapter. The range of market quotatio
Oil, Paint and Drug Reporter is shown in the foll

*Range of quotations on lead pigments and zinc pigment
1929–1931, in cents per pound*

Product	192
Basic lead sulphate, or sublimed lead, dry, casks	7.75–
White lead, or basic lead carbonate:	
Dry, casks	8.25–
In oil, carload lots	10.73–1
Litharge, American, commercial, powdered, casks	8.75–1
Red lead, dry, casks	9.75–1
Orange mineral, American, casks	11.75–1
Lead acetate, brown, broken, barrels	12.00–1
Lead arsenate, powdered, drums	13.00–1
Zinc oxide:	
American process, lead-free, bags, car lots	
American process, leaded, barrels, car lots	
French process, red seal, bags, car lots	
French process, green seal, bags, car lots	1
French process, white seal, barrels, car lots	1
Lithopone, American, bags, car lots	
Zinc chloride:	
Solution,[1] tanks	2.75–
Fused	5.25–
Zinc sulphate, crystals, barrels	3.00–

[1] At works.

Quotations on dry white lead and basic lead
tained at levels prevailing at the close of 1930 f
of 1931; but in December, 1931, quotations
fourths of a cent per pound. The price of whit
in January, 1931, than in December, 1930, but
until December, 1931, when a reduction of 1 cent
These declines represented decreases of about 1
the red oxides fluctuated with the pig-lead ma
clined steadily during the first 5 months, then
June to levels that were maintained until Oct
decline began. The quotations for red lead an
cents per pound net during the year, and orange
cents per pound. Quotations on lead acetate a
declined in sympathy with the falling price of
York quotation for pig lead declined from 5.1
January 2 to 3.75 cents on December 31, or 26

Quotations in 1931 on the various grades of z
tained at the level of the four preceding years,
zinc (St. Louis) declined from 4.12½ cents at the
3.12½ cents at the end. The quotation for or
maintained at 4.5 cents per pound throughout 1
chloride and zinc sulphate responded to the dro
Quotations for zinc sulphide ranged from 16 to 3
1930 and from 13 to 16½ cents in 1931.

Rolled zinc available for consumption in the United States, 1930 and 1931

	1930			1931		
	Pounds	Value		Pounds	Value	
		Total	Average		Total	Average
Sheet zinc not over 0.1 inch thick	37,512,635	$3,376,194	$0.090	30,935,389	$2,581,635	$0.084
Boiler plate and sheets over 0.1 inch thick	1,771,412	148,606	.084	1,092,858	89,567	.082
Strip and ribbon zinc	63,485,948	5,146,606	.081	84,641,678	5,642,181	.067
Total zinc rolled	102,769,995	8,671,408	.084	116,669,925	8,313,383	.071
Sheet zinc imported for consumption	130,870	6,420	.098	39,352	2,283	.058
Rolled zinc exported	7,735,247	761,007		5,518,392	461,130	.084
Available for consumption	95,165,618			111,190,885		
Slab zinc, grades B, C, and D			.047			.037
Spread			.037			.034

A substantial quantity of zinc foil was produced in 1931, but as yet the market for this product is limited because of its dull finish and its effect on foods.

The quoted base price of sheet zinc, carload lots, f. o. b. rolling mills, ranged from 8.75 to 9 cents per pound during 1931. These quotations, however, are subject to discounts which may fluctuate, whereas the base quotations remain steady. The average price actually received by rolling mills reporting to the Bureau of Mines was 7.1 cents for all classes of rolled zinc compared with 8.4 cents in 1930, a drop of 15 per cent. The average price of the grades of slab zinc used in rolling mills decreased to 3.7 cents in 1931, so that the value added by rolling was 3.4 cents per pound in 1931 compared with 3.7 cents in 1930 and 2.4 cents in 1929.

The companies reporting production of rolled zinc in the United States in 1931 were the same as for the preceding year and are listed on page 438 of Zinc in 1930.

ZINC DUST

Commercial production of zinc dust in the United States began in 1910 and reached a maximum in 1920, when it was about 11,500 tons. From 1922 to 1927 the annual production averaged about 8,000 tons. In 1931, 10,611 tons were produced, 15 per cent more than in 1930.

Zinc dust [1] sold by producers in the United States, 1927–1931

Year	Short tons	Value		Primary zinc recovered as zinc dust (short tons) [2]	Year	Short tons	Value		Primary zinc recovered as zinc dust (short tons) [2]
		Total	Average per pound				Total	Average per pound	
1927	8,098	$1,346,105	$0.083	3,249	1930	9,237	$1,205,740	$0.065	2,559
1928	9,172	1,475,875	.080	2,668	1931	10,611	1,148,152	.054	[3] 2,820
1929	11,050	1,864,672	.084	[3] 3,263					

[1] In 1927 "blue powder" only was produced. From 1928 to 1931 some "atomized" dust also was produced, but the Bureau of Mines is not at liberty to publish the figures separately.
[2] The amount of secondary zinc recovered in zinc dust, 1928–1931, is shown in the table on secondary zinc, p. 272.
[3] Includes a small quantity of zinc in dust made from slab zinc

The following companies reported the pro
dust in 1931:

Producers of zinc dust in the United S

The Alloys Co
American Smelting & Refining Co
Do
Federated Metals Corporation
John Finn Metals Works
Grasselli Chemical Co
New Jersey Zinc Co
Superior Zinc Corporation

ZINC PIGMENTS AND SA

Zinc oxide, leaded zinc oxide, and lithopon
ments of zinc, and the chloride and sulphate
These products are manufactured from various
ores, metal, and secondary substances. In 193
of all zinc pigments and salts produced in
123,554 tons (20 per cent less than in 1930) ar
following sources:

Zinc content of zinc pigments and salts made in the
by sources, in short tons

Source	1927	1928
Domestic ore: [1]		
For pigments	121,899	123,964
For salts	867	806
	122,766	124,770
Metal	34,012	37,588
Secondary materials	[2] 24,986	[2] 26,861
	[2] 181,764	[2] 189,219

[1] Includes some zinc derived from primary drosses from zinc-reducti
[2] Revised figures.

The use of zinc ore and metallic zinc in the m
and salts decreased 29 and 3 per cent, respect
the use of secondary material increased 2 per
Ore was used in the manufacture of the follov
in 1931, the percentages representing the p
recoverable zinc content of the ore used in ea
process zinc oxide, 64 per cent; lithopone, 23
oxide, 12 per cent; and zinc salts, 1 per cent.
Practically all the metallic zinc was used i
French process zinc oxide.
The secondary zinc was distributed as follo
cent; zinc salts, 31 per cent; and zinc oxide
3 per cent.
Further details of the production of zinc p
given in the Mineral Resources chapter, Lead a
Salts.

SECONDARY ZINC

Secondary zinc production as reported by
includes zinc recovered from industrial scrap

zinc recovered in the same plant in which the industrial scrap is made is excluded. The accompanying table, compiled in large part by J. P. Dunlop of the Bureau of Mines, shows the quantity of secondary zinc recovered in the United States as metal and in zinc dust, zinc pigments, and zinc salts, 1928 to 1931.

Secondary zinc recovered in the United States, 1928–1931, in short tons

	1928	1929	1930	1931
Secondary zinc, redistilled	48,666	47,348	[1] 34,840	[1] 21,625
Secondary zinc, remelted	22,034	18,052	14,451	13,175
Total secondary zinc recovered unalloyed	70,700	65,400	49,300	34,800
Recovered zinc in alloys, excluding old brass remelted	12,500	11,000	7,700	7,400
Recovered zinc in remelted brass (estimated)	66,000	65,670	42,300	30,000
Total secondary zinc recovered as metal	149,200	142,070	99,300	72,200
Secondary zinc recovered in zinc dust	5,000	6,700	5,800	6,700
Secondary zinc recovered in pigments	14,900	16,000	15,000	16,000
Secondary zinc recovered in zinc salts	[2] 12,000	10,800	7,300	7,100
Total secondary zinc recovered	[3] 181,700	176,200	127,400	102,000

[1] Includes 22 tons of secondary electrolytic zinc.
[2] Includes 312 tons of secondary electrolytic zinc.
[3] Revised figures.

The recovery of secondary zinc decreased 20 per cent in 1931 and was the lowest output since 1921. Production of domestic primary zinc decreased 40 per cent.

Secondary zinc recovered in the form of metal decreased 27 per cent, due to decreases of 38 per cent in redistilled secondary zinc, 9 per cent in remelted zinc, 4 per cent in alloys other than old brass, and 29 per cent in remelted brass; that recovered in dust, pigments, and salts increased 6 per cent.

BY-PRODUCT SULPHURIC ACID

The following table gives the total quantity and value of sulphuric acid of different strengths produced and sold by plants associated with zinc-blende roasting operations.

By-product sulphuric acid produced at zinc-blende roasting plants in the United States, 1928–1931

	1928	1929	1930	1931
Number of establishments	21	21	21	21
Acid reported as 50°–60° B.:				
Produced (expressed as 60° B.) short tons	643,407	694,090	548,060	390,278
Consumed at works (expressed as 60° B.) do	32,680	33,474	29,205	16,375
Sold (expressed as 60° B.) do	618,010	657,785	518,665	373,254
Value of acid sold—				
Total	$6,109,450	$6,336,444	$4,996,275	$3,278,509
Average	$9.89	$9.63	$9.63	$8.78
Acid reported as 60° B. and stronger:				
Produced (expressed as 66° B.) short tons	384,445	482,507	385,038	347,904
Consumed at works (expressed as 66° B.) do	34,742	67,070	51,314	46,473
Sold (expressed as 66° B.) do	365,506	441,617	352,880	204,034
Value of acid sold—				
Total	$5,077,475	$6,381,556	$4,807,536	$3,884,404
Average	$13.89	$14.45	$13.79	$13.21
Total acid sold, equivalent in 60° B.:				
Quantity short tons	1,050,726	1,187,726	942,128	726,094
Value	$11,186,934	$12,718,000	$9,803,811	$7,102,913
Total acid consumed at works (60° B.) short tons	74,370	114,078	80,783	72,142

The total production of sulphuric acid (roasting plants in 1931 was 807,834 tons, 2(1930 and about 15 per cent of the total outp the United States.

The quantity of acid sold by zinc plants in 1 than in 1930. The average price received fo per ton lower than in 1930. The average sa stronger acids decreased 4 per cent. The t decreased 27 per cent. Sales of 60° B. acid de production 29 per cent. Sales of 66° B. acid de production 10 per cent. Statistics indicate th 60° B. acid remained constant and those of slightly in 1931.

The following statement shows the quantity used and the quantity and value of the acid m

Production and value of sulphuric acid made from blende roasting plants in the United States, 19

Number of establishments	
Blende used	short
Acid made, equivalent in 60° B	
Value at average of sales of 60° B	
Sulphur used	short
Acid made, equivalent in 60° B	
Value at average of sales of 60° B	
Total quantity of acid made (60° B.)	short t
Total value of acid made	

[1] Includes small quantity of pyrites.
[2] Includes acid made from small quantity of pyrites.

In 1931, as in 1930, 53 per cent of the acid m derived from blende and 47 per cent from sulp cent less blende was used, and 20 per cent les blende in 1931 than in 1930. Acid made fro 10 per cent of the total production of the Unit tity of sulphur used at zinc plants decreased 20 the acid produced therefrom decreased 20 per

A list of operators in 1931, with the locatio follows. Plants at zinc smelters are also indica reduction plants on page 276. The Americar Columbus, Ohio, has a zinc-roasting plant and c gases to the neighboring plant of the Farmer Hillsboro plant of the American Zinc Co. of Il 1931. The new plant of the St. Joseph Lead Co which began production in December, 1930, c per cent capacity during 1931; zinc concentrat company mines in New York.

Producers of by-product sulphuric acid at zinc-blende roa States in 1931

American Steel & Wire Co
American Zinc & Chemical Co
American Zinc Co. of Illinois
American Zinc Oxide Co

LEAD [1]

By E. W. Pehrson

CONTENTS

GENERAL SUMMA

Salient figures of the lead industry in the Un

Production of refined primary lead:	
From domestic ores	
From foreign ores and base bullion	
Recovery of secondary lead:	
As pig lead	
In alloys	
Total production of pig lead (primary and secondary)	
Imports (general):	
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Refined primary lead available for consumption	
Estimated consumption of primary and secondary lead	
Prices per pound of refined lead at New York:	
Highest monthly average	
Lowest monthly average	
Average for year	
Quotation at end of year	
Mine production of recoverable lead	
Southeastern Missouri district	
Utah	
Coeur d'Alene region	
Joplin (tri-State) region	
All other	
World smelter production of lead	
United States	
Mexico	
Australia	
Canada	
Spain	
All other	

[1] Work on manuscript completed October, 1932.

[2] Statistics prepared (unless otherwise indicated) by H. M. M
compiled from records of the Bureau of Foreign and Domestic C
Bureau of Mines.

The unfavorable condition of the lead industry in 1930 was intensified in 1931 by further decline in industrial activity. Again, as in 1930, producers failed to adjust production to steadily declining consumption; in consequence, stocks increased and prices fell.

In the United States the production of refined primary lead from domestic ores decreased 32 per cent and that from foreign ores and base bullion 24 per cent, making a decrease of 31 per cent in total primary output. Total production in 1931 was 45 per cent below that in 1926 (the year of peak production) and 1 per cent below the 1921 output. Production fell rapidly during the first six months of the year but during the latter half it was relatively stable.

The New York quotation declined from a high of 5.10 cents per pound at the beginning of the year to 3.75 cents at the end of May. Announcement of the debt moratorium during the latter part of June caused an upward movement which brought the quotation to 4.40 cents, where it remained throughout July, August, and September. In October the downward trend was resumed, and at the close of the year the price was again 3.75 cents. The average for the year was 4.24 cents, a decrease of 23 per cent from 1930 and the lowest yearly average since 1914; it was less than half the record average of 9.02 cents in 1925. From January to December, 1931, the average monthly price of lead decreased 21 per cent, whereas the general price level declined only 12 per cent.

The recovery of secondary lead in pig lead and alloys declined only 8 per cent in 1931 and was equivalent to 60 per cent of the domestic production of refined primary lead. This ratio exceeded the previous high of 49 per cent in 1928 and emphasizes the importance of secondary lead in our domestic lead supply.

The consumption of lead in the United States in 1931, as estimated by the American Bureau of Metal Statistics, declined 26 per cent from 1930 and 42 per cent from 1929, the year of record consumption. Among the principal consuming industries, cable covering and building showed the greatest declines, whereas storage batteries, white lead, and ammunition were fairly well maintained. Storage batteries, in which the use of lead declined only 4 per cent in 1931, again became the principal outlet for lead, replacing cable coverings which declined 44 per cent. White lead was third in importance with a decline of 8 per cent; building ranked fourth and ammunition fifth. Building and ammunition declined 40 and 11 per cent, respectively.

According to the American Bureau of Metal Statistics, stocks of refined pig lead and antimonial lead at smelters and refineries in the United States increased from about 103,000 tons on January 1 to about 151,000 tons on December 31, 1931. At the beginning of 1930 stocks amounted to 51,000 tons.

General imports of lead in base bullion decreased 16 per cent; imports from Mexico increased 58 per cent, but those from Peru decreased over 99 per cent. Receipts of lead in ore and matte declined 47 per cent. Very large decreases in shipments from Canada and Mexico were partly offset by increased imports from Newfoundland. Exports of refined pig lead declined 55 per cent and were the lowest since 1920.

Mine production of lead decreased
the lowest since 1910. Missouri, Idal
per cent of the total but decreased 20
tively. Oklahoma, which again ranked
and Colorado, which ranked fifth in 19
to a decline of 69 per cent in output.

World smelter production of lead
tons, 16 per cent less than in 1930 and
1924. The United States share of the
compared with 33 per cent in 1930 and
period 1925 to 1929. Smelter product
clined 32 per cent in 1931, whereas p
only 7 per cent. Mexico showed a s
whereas Australia, Canada, Spain, G
showed declines ranging from 6 to 11

The London price of lead in 1931 a
the lowest yearly average since 1910.
price was equivalent to 2.64 cents per
1930 average and the lowest since 19
1931, as in 1930, was 1.60 cents belov
1929 the differential was 1.79 cents per

According to press reports, effectiv
lead cartel agreed to a 15 per cent c
1930 production; on July 1 it was incre

During 1931 the decline in the foreig
Australian, and Spanish currencies aid
in those countries. In spite of low pric
began at Mount Isa in June. A new
refining 6,000 tons of Mount Isa lead
duction during the latter part of the
tional milling capacity was under way
mine, Newfoundland, and at the Stant

PRODUCTI

GENERAL

Pig lead produced in the United St
export is derived from three main s
ore and base bullion, and secondary m

The following table shows the quant
each of these sources from 1927 to 193

Pig lead produced in the United Stat

Year	F me a
1927	
1928	
1929	
1930	
1931	

The total production of pig lead in the United States in 1931 declined 26 per cent from that in 1930 and was 38 per cent below that in 1926 (the year of peak production), but exceeded the 1921 output by 15 per cent. Production from domestic ores and base bullion decreased 32 per cent and from foreign ores and base bullion 24 per cent, whereas that from secondary materials decreased less than 1 per cent.

PRIMARY LEAD

REFINERY PRODUCTION

Pig lead is classified by the Bureau of Mines as primary or secondary, according to whether it is derived directly from the smelting of ores and from base bullion or is reclaimed from junk and industrial lead scrap. Details of the Bureau of Mines classification of pig lead were given in the 1930 chapter of this series.

The following table summarizes the refined primary lead produced in the United States from 1720 to 1931.

Refined primary lead produced in the United States, 1720–1931

Year	Short tons				
	Desilverized lead [1] [2]	Desilverized soft lead	Soft lead [3]	Total production [1]	From domestic ores and base bullion
1720–1900	[2] 3,675,591	[2] 75,882	1,091,820	5,443,293	4,620,756
1901–1910	2,895,684	185,653	940,165	4,021,502	3,140,115
1911–1920	3,214,732	488,932	1,652,821	5,356,485	4,758,075
1921–1925	1,734,583	300,765	1,021,687	3,057,035	2,632,137
1926	484,669	55,707	258,565	798,941	680,685
1927	507,099	55,487	233,944	796,530	668,320
1928	500,603	49,405	226,003	781,071	620,202
1929	483,622	55,600	235,345	774,633	672,498
1930	396,094	45,578	201,361	643,033	573,740
1931	263,919	40,456	138,389	442,764	390,260
	14,162,596	1,353,591	6,599,100	[2] 22,115,287	18,762,788

Year	Short tons—Continued		Value		
	From foreign ores	From foreign base bullion	Average per pound	Domestic	Total
1720–1900	822,537		$0.043	$408,662,000	$471,998,000
1901–1910	881,387		.046	287,468,000	366,494,000
1911–1920	106,140	492,270	.059	563,002,000	632,432,000
1921–1925	138,715	280,183	.070	368,121,000	429,463,000
1926	48,210	70,046	.080	108,910,000	127,831,000
1927	32,369	95,841	.063	84,208,000	100,363,000
1928	26,632	128,237	.058	72,639,000	90,604,000
1929	29,675	72,460	.063	84,735,000	97,604,000
1930	34,348	34,945	.050	57,374,000	64,303,000
1931	22,254	30,250	.037	28,879,000	32,765,000
	3,352,499		.055	2,063,998,000	2,413,857,000

[1] The lead content of antimonial lead is excluded (see p. 357).
[2] Desilverized soft lead is excluded.
[3] Desilverized soft lead is included under "Desilverized lead" prior to 1894. Separate figures not available.

The total production of refined primary lead in the United States in 1931 was 31 per cent less than in 1930, 45 per cent below 1926

(the year of peak production), and the
1908. The total value of the output ir
from 1930 and 75 per cent from the re
the lowest since 1903. Curtailment wa
produced from domestic sources, which
the total primary lead in 1931, compare
The production of refined lead from dor
cent in 1931, amounted to only 57 per
output in 1926, and was the lowest since
2 per cent below the 1921 output. Lead
of foreign ores declined 35 per cent and
the total, whereas lead derived from th
bullion decreased only 13 per cent and w

GEOGRAPHICAL SOURCE OF LEAD RAW MATER
THE UNITED STA

The following table shows the source
bullion from which refined lead was pro
from 1929 to 1931. Much of the base bu
ern States is shipped to the Mississippi
for refining. In reporting the productio
refiners make the distribution on the ba
the total lead given in this table as from
base bullion and refined lead and thus c
antimonial lead produced from domestic
given here for 1931 exceeds by 3,339 to
refined lead from domestic ores shown i
1931 antimonial lead produced in the Un
tons of lead derived from domestic ores.

Primary lead smelted or refined in the United S
short tons

Source of ore	1929	1930	1931	Source
Domestic ore:				Domestic
Alaska	1,266	1,320	1,607	Undistr
Arizona	8,153	4,223	2,085	Zinc res
Arkansas [1]		41	21	
California	1,459	1,848	1,893	
Colorado	23,675	25,091	6,311	
Idaho	147,595	135,411	100,970	Foreign or
Illinois [1]	777	268	162	Australi
Kansas [1]	[2] 26,104	[2] 13,103	[2] 6,601	Canada
Kentucky [1]	303	87		Europe
Missouri [1]	211,345	201,056	151,359	Mexico
Montana	26,795	15,412	4,766	South A
Nevada	13,256	14,091	8,348	Other fo
New Mexico	12,249	11,250	11,045	Foreign b
New York [1]		[3]	[3]	lion:
Oklahoma [1]	[2] 45,653	[2] 23,398	[2] 12,312	Mexico
Oregon	15	7	3	South A
Texas	559	240	6	
Utah	157,085	122,311	75,207	
Virginia [1]	[3]	[3]	[3]	
Washington	447	577	1,314	Gra
Wisconsin [1]	1,729	1,832	740	

[1] The lead produced by these States is nonargentiferous or soft
duced from Colorado and New Mexico ores is also nonargentifero
[2] The smelter output of lead in Kansas and Oklahoma is separ
Bureau of Mines has been unable to obtain an accurate separatio
[3] Included under "Undistributed." Bureau of Mines not at lib

The foregoing table shows large decreases in lead production in 1931 in most of the important lead-producing States. Foreign ore smelted in the United States came largely from Newfoundland (included under "Other foreign"), Mexico, Canada, and South America (chiefly Bolivia); all but Newfoundland showed large decreases. Refined lead produced from Mexican base bullion increased 62 per cent, whereas that from South American base bullion decreased 99 per cent as a result of cessation of shipments from Peru.

SPECIFICATIONS FOR PIG LEAD

The American Society for Testing Materials classifies pig lead in three grades—corroding, chemical, and common. The requirements as to chemical composition of each of these grades were shown in the 1930 chapter of this series.

SOFT LEAD

Nonargentiferous lead ores of high purity, from which a soft lead can be produced without elaborate refining processes, are known as soft lead ores. Most of the soft lead ores produced in the United States are smelted into pig lead; but a substantial quantity is used each year in the manufacture of lead pigments, principally basic lead sulphate (white sublimed lead) and leaded zinc oxide. About one-fifth of the pig lead produced from soft lead ores is desilverized and used largely in the manufacture of white lead where high purity is required. Undesilverized soft lead containing relatively high copper is extremely resistant to corrosion by acids and is known to the trade as chemical lead; it is used chiefly in the manufacture of cable, pipe, and sheets.

The following table gives the production of soft lead during the past five years.

Soft lead produced in the United States from domestic ores, 1927–1931, in short tons

Year	Soft pig lead			Soft lead recovered in pigments	Total soft lead	Total domestic lead [1]	Soft lead percentage of domestic lead
	Undesilverized	Desilverized	Total				
1927	233,044	55,487	289,431	13,136	302,567	695,509	44
1928	225,903	49,465	274,468	10,465	284,933	652,402	44
1929	235,345	55,666	291,011	9,429	300,440	698,678	43
1930	201,361	45,578	246,939	6,686	253,625	588,042	43
1931	138,389	40,456	178,845	5,722	184,567	399,610	46

[1] Includes domestic refined lead, domestic lead in antimonial lead, and domestic lead in pigments. Domestic lead in antimonial lead computed on different basis in 1931. (See table on p. 357.)

ANTIMONIAL LEAD

Antimonial lead or hard lead is an important by-product of the refining of base bullion, but the amount derived from this source is only a small part of the country's yearly production. The principal uses of hard lead are in the manufacture of storage batteries, bearing metals, corrosion-resistant alloys, and type metal. A large percentage of the metal so used returns as scrap when

become worn out or obsolete. The smelting of s
the major part of the antimonial lead used, the
supplied by the refining of base bullion and by mi
mony with refined soft lead.

Several lead-smelting plants operate on scrap ma
Production data from such plants are summariz
Resources chapter on Secondary Metals. A large
lead scrap is also treated at primary smelters and
production of antimonial lead at these plants is s
that follows. Prior to 1931 the chapters of this
ported separately only primary antimonial lead,
domestic or foreign according to the origin of the
was derived. Owing to the increasing amounts o
being smelted at primary refineries and the fact t
lead ratios in the various materials charged to
from the ratio in the final product, the above metho
has become rather arbitrary. For this reason it
advisable to adopt a simpler method of present
with 1931 the total production of antimonial lead
eries is reported, and its lead content is classified ac
As the smelter has a complete record of the lea
various materials charged to the furnace, fairly ac
of primary and secondary lead can be obtained.

Antimonial lead produced at primary lead refineri

Year	Production (short tons)				Antimony content		Lead co
	From domestic ore	From foreign ore	From scrap	Total	Short tons	Percentage	From domestic ore
1927	16,040	8,307	9,592	33,939	3,775	11.1	(1)
1928	17,030	16,128	12,418	45,476	4,787	10.5	(1)
1929	17,092	8,607	17,575	43,244	4,935	11.4	(1)
1930	8,018	4,793	11,086	24,797	2,967	12.0	(1)
1931	(2)	(2)	(2)	21,842	2,438	11.2	3,628

[1] Not recorded. [2] Segregation discon

SECONDARY LEAD

Much of the lead consumed in the United Stat
manufacture of articles from which there is a lar
ondary metal. This applies particularly to the st
dustry, a leading consumer of lead and the sourc
rapid return of secondary metal. This industry i
much of the increase in the ratio of secondary le
domestic primary lead production. In 1914 the s
was equivalent to only 12 per cent of the primary
mestic ores; in 1931 the ratio was 60 per cent, an
per cent in 1930. Other important lead-consumi
which there is a large return of secondary metal inc
facture, building, bearing-metal manufacture, and t
facture.

The following table shows the recovery of secondary lead and its ratio to the refined primary lead produced in the United States from domestic ores. Further details of the secondary lead industry may be found in the Mineral Resources chapter on Secondary Metals.

Secondary lead recovered in the United States, 1927–1931 [1]

Year	Pig lead (short tons)	Lead in alloys (short tons)	Total recovered lead		
			Short tons	Value	Ratio to domestic refined primary lead (per cent)
1927	119,000	157,000	276,000	$34,776,000	41
1928	138,000	170,600	308,600	35,797,600	49
1929	138,500	172,500	311,000	39,186,000	46
1930	129,000	126,800	255,800	25,580,000	45
1931	128,800	105,900	234,700	17,367,800	60

[1] Compiled by J. P. Dunlop, of the Bureau of Mines.

PIGMENTS

Lead pigments manufactured in 1931 contained 172,760 tons of lead from the sources shown in the following table. Refined pig lead is used in the manufacture of white lead, litharge, red lead, sublimed lead, and orange mineral. In 1931 about 166,000 tons of the lead contained in lead pigments were derived from refined pig lead; white lead accounted for 47 per cent; litharge, 36 per cent; red lead, 14 per cent; and sublimed lead and orange mineral, 3 per cent. Sublimed lead and leaded zinc oxide are the principal pigments in which the lead content is derived from ores.

Further details of the production and value of lead pigments in the United States are given in the Mineral Resources chapter on Lead and Zinc Pigments and Salts.

Lead in pigments,[1] 1927–1931, by sources, in short tons

Year	Lead in pigments from—				Year	Lead in pigments from—			
	Domestic ore [2]	Metal	Scrap	Total		Domestic ore [2]	Metal	Scrap	Total
1927	13,136	242,713	1,246	257,095	1930	6,686	190,182	689	197,557
1928	10,465	242,914	654	254,033	1931	5,722	160,328	710	172,760
1929	9,429	248,657	2,427	260,513					

[1] Includes also lead recovered in zinc oxide and leaded zinc oxide.
[2] No pigments from foreign ore.

MINE PRODUCTION

Mine production of lead decreased 28 per cent in 1931. Eighty-four per cent of the total was produced in three States; Missouri contributed 40 per cent, Idaho 24 per cent, and Utah 20 per cent. In 1930 these three States produced 80 per cent of the total. Compared with 1930 outputs in 1931 decreased as follows: Missouri 20

per cent, Idaho 26 per cent, and Utah 31 pe
again ranked fourth, declined 43 per cen
ranked fifth in 1930, fell to eighth in 1931
cent decline in output. Production in Was
bled as the result of increased activity in th

Detailed information on the mining acti
tricts of the United States can be found i
chapters dealing with the mine production
lead, and zinc in the various States.

The following tables show the mine produ
by States and by districts from 1929 to 1931

Mine production of recoverable lead, 1929–1931

State	1929	1930	1931	State
Alaska	1,315	1,365	1,661	New York
Arizona	8,027	4,246	982	Oklahoma
Arkansas	61	53	78	Oregon
California	715	1,780	1,879	Tennessee
Colorado	24,445	22,130	6,884	Texas
Idaho	148,695	134,058	99,365	Utah
Illinois	443	248	205	Virginia
Kansas	26,596	12,910	7,082	Washington
Kentucky	287	101		Wisconsin
Missouri	198,469	199,632	160,121	Undistributed
Montana	19,607	10,653	4,430	
Nevada	9,846	11,529	7,930	
New Mexico	11,130	10,378	11,269	

[1] Included under "Undistributed." Bureau of Mines not at liber
[2] Bureau of Mines not at liberty to publish figures.
[3] Exclusive of the output from Virginia, figures for which the Bure

Mine production of recoverable lead in the principa the United States, 1929–1931, in

District	State
Southeastern Missouri region	Missouri
Coeur d'Alene region	Idaho
Bingham	Utah
Joplin region	Kansas, Missouri, Oklahoma
Tintic	Utah
Park City region	do
Rush Valley	do
Willow Creek	New Mexico
Tybo	Nevada
Eagle County	Colorado
Eagle	Montana
Central	New Mexico
Pioche	Nevada
Inyo County	California
Leadville	Colorado
Metaline	Washington
Pend d'Oreille	Idaho
Upper Mississippi Valley	Iowa, Northern Illinois, Wisconsin.
San Juan Mountains	Colorado
San Francisco	Utah
Yellow Pine	Nevada
Bisbee (Warren)	Arizona
Jack Rabbit	Nevada
Kentucky-Southern Illinois	Kentucky-Illinois
Aspen	Colorado
Northport	Washington
Big and Little Cottonwood	Utah
Texas	Idaho
Eureka	Nevada
Port Hill	Idaho
Warm Springs	do
Montana	Montana
Spruce Mountain	Nevada

Mine production of recoverable lead in the principal lead-producing districts of the United States, 1929–1931, in short tons—Continued

District	State	1929	1930	1931
Cedar Plains	Montana	1,177	120	25
Vulture	Arizona	777	80	22
Barker	Montana	6,137	4,578	21
Summit County	Colorado	369	29	18
Ophir	Utah	25	18	13
Bryant	Montana	344	25	7
Troy	do	49		3
Butte	do	8,239	2,540	
Banner	Arizona	2,938	929	
Dome	Idaho	1,870	829	
Magdalena	New Mexico	481	479	
Boulder	Idaho	(1)	168	
Austinville [2]	Virginia	(1)	(1)	(1)
Embree [2]	Tennessee		(1)	(1)
Oro Blanco [2]	Arizona	(1)	(1)	
St. Lawrence County [2]	New York		(1)	(1)

[1] Bureau of Mines not at liberty to publish figures. [2] Not listed according to rank.

LEAD SMELTERS AND REFINERIES

A list of primary lead smelters and refineries in the United States, Canada, and Mexico was given in the 1930 chapter of this series. During 1931 primary smelting operations were discontinued at the Balbach plant at Newark, N. J.

TARIFF

The tariff act of 1930 established duties as follows: 1½ cents per pound on lead content of ores, 2⅛ cents per pound on lead content of refined lead, base bullion, scrap, etc., and 2⅝ cents per pound on lead sheets, pipe, and wire. In February, 1931, the Tariff Commission was directed by a resolution of the United States Senate to investigate the differences in foreign and domestic costs of producing lead, but in December the resolution was rescinded and the investigation discontinued.

WORLD ASPECTS

WORLD SMELTER PRODUCTION

The following table shows the world smelter production of lead from 1927 to 1931, so far as statistics are available. Official figures are used wherever possible. The figures for countries where official data are not yet available are taken from the Year Book of the American Bureau of Metal Statistics and other reliable sources, but in later reports the official statistics will be substituted as received.

Duplication in figures showing world production is always possible, as some countries send "work lead" or base bullion to other countries for refining. Furthermore, secondary lead and antimonial lead are often included in the figures showing the foreign production, whereas the figures for the United States represent only refined primary lead that was smelted in this country, whatever the source of the ore; refined lead produced from foreign base bullion is excluded.

World production of lead, 1927–1931, i

[Compiled by L. M. Jones, of the Bureau

Country [1]	1927	1928
Argentina	7,800	8,291
Australia	167,016	157,505
Austria	8,086	8,135
Belgium	91,710	86,260
Canada	134,157	130,561
Chosen	824	710
Czechoslovakia	2,502	3,005
France	32,076	22,656
Germany [4]	84,000	87,000
Great Britain	6,132	8,038
Greece	5,325	7,306
India (Burma)	67,026	79,642
Indo-China	4	10
Italy	23,774	21,220
Japan	3,394	3,653
Mexico	230,782	227,860
Northern Rhodesia	5,951	4,751
Norway [5]	300	300
Peru	171	14,466
Poland	29,574	37,078
Portugal	60	84
Rumania	828	537
Russia	[6] 1,217	[6] 2,592
South-West Africa [6]	3,535	5,004
Spain	144,023	130,950
Sweden	330	
Tunisia	18,662	17,606
Turkey	6,531	8,062
United States (refined) [7]	635,651	592,238
Yugoslavia	10,672	13,875
	1,723,000	1,686,000

[1] By countries where smelted but not necessarily refined.
[2] In addition to the countries listed China smelts lead, but no reliabl
[3] Approximate production.
[4] Exclusive of secondary material. (Metallgesellschaft, Frankfort.)
[5] Year ended Sept. 30.
[6] Year ended Mar. 31 of year following that stated.
[7] Figures cover domestic refined and lead refined from foreign ore; r
base bullion not included.

The world smelter production of lead, as dete
of Mines, was 1,411,000 metric tons in 1931, 16
1930. The American Bureau of Metal Statist
output at 1,401,083 metric tons, 16 per cent less
1930; and the Metallgesellschaft, Frankfort on
1931 world output as 1,387,100 tons, also 16 pe
output.

Smelter production of lead was reported from
of these only 8 showed increases. Of the 1
produced at least 1 per cent of the world total
aggregating 10,978 tons and 10 decreases amou
The tonnage decrease in the United States was
in Australia, which had the second largest d
States also suffered the largest percentage d
compared with 22 per cent in Poland, 11 per c
9 per cent in both Canada and Germany.

The following table compares the average an
1925 to 1929 with that in 1930 and 1931 for th
ducing countries of the world. The table emp
which the United States has borne the brunt o
the present depression. In 7 of the 13 principal

the 1931 output exceeded the yearly average from 1925 to 1929; and in only 2 countries, the United States and France, was the percentage decline greater than the world average. The lead production of the United States in 1931 was 41 per cent less than the yearly average from 1925 to 1929, whereas that of the rest of the world decreased less than 1 per cent. For the same two periods the share of the United States in world production dropped from 38 to 27 per cent, whereas that of the British Empire, Mexico, and Germany made large gains.

Recent trends in smelter production of lead in the principal producing countries of the world

Country	Per cent of world total			Index [1925-1929 average=100]	
	1925-1929 average	1930	1931	1930	1931
United States	37.7	33.0	26.5	87	59
Mexico	12.4	13.1	15.6	100	106
Australia	9.7	10.2	10.8	105	94
Canada	7.6	8.3	9.0	108	99
Spain	8.6	7.4	7.8	86	76
Germany	5.0	6.6	7.2	133	122
Belgium	5.2	5.1	5.7	98	92
India	3.9	4.8	5.4	122	115
Poland	1.9	2.4	2.3	129	100
Italy	1.4	1.5	1.8	105	108
Russia	.1	.6	1.4	435	792
Tunisia	1.1	1.2	1.3	109	107
France	1.4	1.2	1.3	84	83
All others	4.0	4.6	3.9	113	82
World total	100.0	100.0	100.0	100	84
British Empire	22.1	24.2	26.2	109	100

WORLD CONSUMPTION

World consumption of lead in 1931 was estimated by the American Bureau of Metal Statistics at 1,270,600 metric tons compared with 1,539,900 tons in 1930 and 1,693,000 tons in 1929. The 1931 consumption was 17 per cent below that in 1930 and 25 per cent below that in 1929. The consumption of zinc in 1931 was 27 per cent less and that of copper 33 per cent less than in 1929.

In the table that follows the lead consumption of the principal consuming areas of the world is shown for the 5-year period, 1925 to 1929, and for 1930 and 1931. In general, the figures represent production plus imports minus exports. Except for the United States and Great Britain, increases and decreases in stocks have not been taken into account for any countries separately listed. As there probably has been some increase in stocks in most of these countries, the trends shown are not precisely comparable. Nevertheless, the data indicate the severity of curtailment in the United States compared with other nations. World consumption in 1931 was 315,000 tons below the yearly average for 1925 to 1929; and consumption in the United States dropped nearly 286,000 tons, 91 per cent of the total decline. Comparing relative decreases in the same two periods it is found that consumption of lead in the United States decreased 44 per cent, whereas consumption elsewhere declined only 3 per cent. France and Ru
tion at rates considerably above the avera
sumption in Europe was maintained re
being most seriously affected. Europe's
sumption increased from 49 per cent dur
cent in 1931, whereas that of the Unit
41 to 28 per cent.

*Recent trends in consumption of lead in the pri
the world*[1]

Area	Metric tons		
	1925-1929 average	1930	1931
By countries:			
United States	647,380	521,800	361,600
Great Britain	262,180	270,000	260,000
Germany	199,960	165,300	136,800
France	92,540	146,400	132,300
Russia	35,560	61,000	62,000
Japan	58,180	59,000	57,600
Italy	44,040	42,300	40,400
Belgium	37,160	41,900	31,800
All others	208,440	232,200	188,100
World total	1,586,040	1,539,900	1,270,600
By continents:			
Europe	782,720	871,200	777,900
North and South America	706,920	578,200	406,100
Asia	77,260	75,200	73,600
Australia	16,000	12,000	10,000
Africa	3,140	3,300	3,000

[1] Based on data shown on p. 55 of the 1931 Year Book of the A

SUMMARY OF LEAD INDUSTRY IN IMPO
COUNTRIES

AUSTRALIA

The smelter production of lead in Aust
long tons, a decrease of 11 per cent from
includes 133,306 tons of refined pig lead
South Australia, and 17,130 tons of lead b
being derived largely from the smelter a
which operated in 1931 for the first time.
and bullion declined from 152,216 tons i
1931. Ninety-seven per cent of the 1931 tot
Exports of lead in the form of ore totale
19,907 tons in 1930; Belgium was the princ

The mine production of lead in 1931 wa
of 24 per cent from 1930. Eighty-six p
derived from the lead and zinc concentrate
Hill district, about 12 per cent from Mc
from Tasmania. In the Broken Hill distr
(Ltd.), Broken Hill South (Ltd.), and N
were the only companies operating in 1931;
of ore, from which were obtained 125,736

and 172,079 tons of lead concentrates; the latter contained 126,722 tons of lead, 8,088 tons of zinc, and 5,386,457 ounces of silver. The ore treated in 1931 averaged approximately 15 per cent lead, 12 per cent zinc, and 7 ounces of silver.

Owing to extremely low zinc prices, only one company was saving the zinc content of the ore at the beginning of the year, and the continued decline in metal prices threatened to cause a complete shutdown of all activities in the district. This was averted, and zinc production was resumed by all active companies after adjustments in wages and freight rates. Another favorable factor was the 39 per cent decline in the exchange rate on Australian currency (United States gold basis) during 1931, which largely mitigated the effect of falling metal prices.

In Queensland, production of lead at Mount Isa began in June. Because the low price of zinc rendered its recovery unprofitable, the company decided to confine operations to ore containing as little zinc as possible. This led to utilization of a much larger percentage of zinc-free lead carbonate ore than was originally contemplated in the design of the plant, and in consequence metallurgical difficulties were encountered which prevented operation at full capacity. Instead of a monthly output of 6,000 tons of lead as planned, only 3,000 to 3,300 tons were obtained. The American Smelting & Refining Co., which owns a substantial interest in the controlling company and which acts as technical manager, was reported as having agreed to lend up to $1,000,000 for acquiring additional smelting equipment to raise production to rated capacity.

As a result of low metal prices the company reduced its estimate of ore reserves from 30,554,000 to 19,120,000 tons by the exclusion of 11,000,000 tons, assaying 4.8 per cent lead and 2.6 ounces of silver, mining of which was considered unprofitable at present metal prices. The recalculated reserves include 3,655,000 tons of carbonate ore assaying 9.4 per cent lead and 3.5 ounces of silver and 15,465,000 tons of sulphide ore assaying 8.4 per cent lead, 8.8 per cent zinc, and 5.1 ounces of silver.

In Tasmania lead production was derived largely from the North Mt. Farrell mine. The Rosebery mine was shut down in January, 1931, owing to low metal prices.

BELGIUM

Belgium ranked third in European lead production and seventh in world production in 1931 with an output estimated at 80,000 metric tons, 6 per cent under that for 1930. The lead smelted in Belgium is derived very largely from foreign lead ores; 56,000 tons were imported in 1931 compared with 40,160 tons in 1930. Much lead is also derived from the residues from foreign zinc ores smelted in Belgium. In 1931 Belgium imported 56,000 tons of pig lead, scrap, etc., and exported nearly 59,000 tons of lead in the form of pigs, pipes, sheets, etc.

CANADA

Canada ranked fourth in smelter production of lead in 1931, and contributed 9 per cent of the world total. Mine production declined 20 per cent, from 166,447 short tons in 1930 to 133,671 tons in 1931.

British Columbia contributed 98 per cen
Territory less than 2 per cent, and Onta
per cent. Exports of pig lead were 108
Britain took 44 per cent, Japan 26 per cen

By far the largest part of the Canad
from the Sullivan mine of the Consolidat
in British Columbia. In 1931, 1,621,143
or about 300,000 tons less than in 1930.
were maintained in 1931 in spite of red
increasing production in the higher-grad
At the company metallurgical plants at
were treated, from which were obtaine
6,572,119 ounces of silver, 608 tons of co
101,124 tons of zinc, and 162 tons of cad
slag fuming plant to treat the slag fro
makes possible recovery of 23 per cent mo
lead from the ore at lower cost than that
directly from Sullivan ore. This plant
flexibility in the lead-smelting operation w

The Kingdon Mining, Smelting & Ma
mine at Galetta, Ontario, permanently in
its smelter. Development at the Erringt
until metal prices recover.

GERMANY

Germany ranks third in consumption o
production. In 1931 it consumed about
smelted about 101,000 tons, but mined o
the requirements of industry and the expo
lead and 49,000 tons of lead ore were impo
22,000 tons of ore and 30,000 tons of pig
18 per cent of the lead ore imported, Sw
9 per cent, and Italy 7 per cent. The pr
lead were Australia, with 38 per cent of t
27 per cent. Most of the lead ore exporte
duced in Upper Silesia and shipped to n
The pig-lead export went to neighboring

During the current depression primar
been fairly well maintained, in spite of
sumption. Comparing 1931 with the 5-ye
it is found that consumption dropped 32
production increased 22 per cent and mi
Mine production was maintained by Gov
of the principal producers during 1930 a
half of 1932 the policy of Government ai
tinued on a broader basis by the creation
to be advanced to privately operated lead

GREAT BRITAIN

Great Britain produces less than 1 per
but ranks second in consumption; in 1931
of the total. Nearly 300,000 long tons
1931, of which 66 per cent came from t

Australia, Canada, and India and 27 per cent from Mexico and the United States. Approximately 18,500 tons of pig lead were reexported, and lead stocks increased greatly during 1931.

The new lead refinery of the Britannia Lead Co., which was designed to refine base bullion from Mount Isa, began operating in October. The plant has a rated capacity of 6,000 tons per month, but owing to the failure of the Mount Isa smelter to make the production expected, the full capacity of the refinery was not realized.

Abandonment of the gold standard in September, 1931, had no appreciable effect upon the British lead trade. Imposition of a 10 per cent tariff on March 1, 1932, succeeded in greatly curtailing imports of non-British lead during April and May, but subsequently the importation of foreign lead was resumed.

Lead consumption in Great Britain has held up remarkably well during the current depression. During the 5-year period 1925 to 1929 the yearly consumption averaged about 258,000 long tons; during 1930 it was about 266,000 tons; and in 1931, 256,000 tons, the latter being equivalent to 99 per cent of the average for 1925 to 1929. In the British Empire as a whole production has also been well maintained. From 1925 to 1929 the yearly output averaged 364,000 tons. In 1930 the output was 398,000 tons, but in 1931 it declined to 364,000 tons. The lead consumption of the Empire in 1931 was estimated at approximately 300,000 tons, indicating a surplus production of 64,000 tons (about 21 per cent of the total consumption).

INDIA

The Burma Corporation, the only lead producer of any importance in India, curtailed production as of May 1, 1931, in accordance with lead-cartel agreements. During the fiscal year ended June 30, 1931, the company mined 462,184 long tons of ore averaging 21.9 per cent lead, 11.4 per cent zinc, 1.62 per cent copper, and 19.5 ounces of silver. The tonnage was 7.7 per cent below that of the preceding year. Production of refined lead declined 3.5 per cent to 76,520 tons. Other products included 6,512,780 ounces of silver, 52,685 tons of zinc concentrates, 17,274 tons of copper matte, 3,449 tons of nickel speiss, and 1,555 tons of antimonial lead. Ore reserves as of June 30, 1931, were estimated at 4,233,120 tons assaying 25.5 per cent lead, 20.1 ounces of silver, 15.3 per cent zinc, and 0.76 per cent copper.

MEXICO

Smelter production of lead in Mexico increased nearly 1 per cent in 1931, but mine production decreased nearly 3 per cent. Among the factors that made possible maintenance of production at such high levels were decline in the foreign exchange value of Mexican currency and revision of the labor laws. It was also reported that Russia had purchased large quantities of Mexican lead during 1931.

About 230,000 tons of lead were exported in 1931—84 per cent in the form of refined lead, 12 per cent in base bullion, 1 per cent in antimonial lead, and 3 per cent in ores and concentrates. Much of the ore and base bullion is shipped to the United States, and most of the refined lead goes to Europe.

SPAIN

Notwithstanding the low prices for lead an
ances in Spain the decline in lead productio
was expected. Smelter production declined
tons in 1930 to 109,630 tons in 1931 (11 per ce
tion, according to Metallgesellschaft, fell fr
tons (8 per cent). Exports of pig lead de
83,000 tons. France took 41 per cent of the 19
20 per cent, Russia 16 per cent, and other coun
19 per cent decline in the foreign exchange va
ing 1931 (United States gold basis) favored
most of the lead was exported.

IMPORTS

The United States normally imports much
principally in base bullion and ore. Some o
mediate consumption; most of it, however, is
is smelted and refined in bond, and is then ree
lead or in manufactured products.

The following table shows the general imp
United States, by classes, including both in
consumption and imports for warehouse. Of t
in 1931, 61 per cent was in base bullion, 39 pe
than 0.1 per cent in reclaimed scrap, etc., impo
fication "pigs, bars, sheets, and old." Impor
showed declines, shipments of base bullion f
ore 47 per cent, and pigs, bars, etc., 95 per ce
lead in 1931 were 32 per cent below 1930, 6
record year 1927, and the lowest since 1916.

Lead imported into the United States, 1927–1931,

[General imports]

Year	Lead in ore	Lead in bullio
1927	81,276,126	236,567
1928	51,829,530	256,935
1929	62,661,371	166,141
1930	78,753,878	77,260
1931	41,775,674	64,639

[1] Reclaimed scrap, etc. No imports of pigs, bars, etc., recorded for 19

The next table shows general imports of lead
supplied 73 per cent of the 1931 total, Newfo
Canada 5 per cent, and South America (repor
cipally Bolivia) 4 per cent. Imports from
America decreased 85 and 90 per cent, respe
ments from Mexico and from "Other coun
large increase in the "Other countries" total
ments of lead concentrates from the Buchans m

Lead imported into the United States, in ore, base bullion, and refined, 1927–1931, by sources, in pounds

[General imports]

Year	Canada	Mexico	South America	Europe	Other countries	Total
1927	6,214,867	300,634,815	14,583,513	1,226,049	118,883	322,778,127
1928	14,352,967	276,184,287	20,408,574	56,406	85,915	310,088,149
1929	9,023,527	175,872,302	47,052,018	29,441	141,480	232,118,768
1930	34,536,897	73,442,591	44,943,694	226,294	3,283,888	156,433,364
1931	8,238,264	77,410,574	4,342,077	----------	[1] 19,446,230	106,436,145

[1] Of this total 19,415,545 pounds were from Newfoundland and Labrador.

The following tables show the imports of lead in ore, matte, and base bullion, by countries.

Lead imported into the United States, in ore and matte, 1927–1931, by countries, in short tons

[General imports]

Country	1927	1928	1929	1930	1931
Canada	2,558	7,131	3,953	17,257	2,614
Chile	3,877	504	2,295	3,313	1,866
Mexico	30,615	17,055	23,415	16,341	6,495
Newfoundland and Labrador	----------	----------	(1)	----------	9,708
Peru	3,415	1,170	1,601	831	104
Other countries	173	55	67	1,635	11
	40,638	25,915	31,331	39,377	20,888

[1] 671 pounds.

Lead imported into the United States, in base bullion, 1927–1931, by countries, in short tons

[General imports]

Country	1927	1928	1929	1930	1931
Mexico	117,938	119,935	63,458	20,350	32,210
Peru	----------	8,525	19,605	18,280	110
Spain	330	----------	----------	----------	----------
Other countries	10	8	8	----------	----------
	118,284	128,468	83,071	38,630	32,320

Statistics on imports for consumption, as shown in the tables that follow, include imports entered for immediate consumption and withdrawals from warehouse for domestic consumption. As most of the lead imported is smelted and refined in bond and reexported, the total imported for consumption is considerably less than general imports. In 1931, imports for consumption were equivalent to only about 41 per cent of the general imports of lead.

Lead remaining in warehouse in the United States pounds

[Stated in the form in which the material was en

Year	Ore (lead content)	Base bullion (lead content)	Pigs, bars, and old	Year
1927	99,526,339	126,669,674	[1] 19,326,011	1930
1928	97,645,207	137,500,524	8,278,733	1931
1929	120,413,999	150,868,776	2,656,648	

[1] Includes 397,712 pounds of lead in reclaimed scrap. Correspondir separately.
[2] Pigs, bars, and old included with base bullion; not recorded separa

Lead imported for consumption in the United St

Year	Lead in ore and matte[1]		Lead in base bullion		Pigs, bars, and ol	
	Pounds	Value	Pounds	Value	Pounds	Value
1927	70,260,478	$4,203,897	14,629,606	$925,328	9,933,679	$635,
1928	46,511,508	2,626,231	13,397,455	560,983	20,488,373	808,
1929	21,645,699	1,160,533	12,395,696	627,455	20,178,922	1,052,
1930	30,915,964	1,461,350	20,846,713	1,127,920	1,141,442	60,
1931	21,467,418	1,194,191	20,871,628	671,002	[2] 19,863	[2] 1,

[1] Classification as follows: Jan. 1, 1927, to June 17, 1930, "Lead in 1931, "Lead in ores, flue dust, and mattes, n.s.p.f."
[2] Reclaimed scrap, etc. No imports of pigs, bars, etc., recorded fo

Miscellaneous products containing lead imported fo States, 1927–1931

Year	Babbitt metal, solder, white metal, and other combinations, containing lead		
	Gross weight (pounds)	Lead content (pounds)	Value
1927	2,527,186	1,237,277	$932,055
1928	1,876,432	845,199	569,486
1929	3,010,465	1,326,102	777,354
1930	2,797,463	1,060,556	593,103
1931	1,812,653	619,861	436,574

EXPORTS

The chief lead export of the United St derived from treatment of foreign ores an decreased 55 per cent in 1931, amounted to record export in 1927, and were the lowes 85 per cent of the 1931 total, South Ameri per cent, and North America 2 per cent. creased 7 per cent due mainly to larger ex shipments to Europe decreased 97 per cent. importer in 1931 with 80 per cent of the second with 6 per cent. United Kingdom,

France each took several thousand tons in 1930, but in 1931 the combined exports to these countries amounted to only a little over 700 tons.

Refined pig lead exported from the United States, 1930 and 1931, by destinations

Destination	1930		1931	
	Short tons	Value	Short tons	Value
North America:				
Canada	9	$1,262	58	$20,714
Cuba	107	10,952	40	3,109
Mexico	40	6,454	171	13,409
Panama	91	10,540	129	11,572
Other	71	8,500	37	3,540
	318	37,708	435	52,344
South America:				
Argentina	934	75,400	226	12,646
Brazil	874	66,542	1,382	70,271
Chile	224	21,673	95	7,036
Colombia	25	3,071	6	696
Ecuador	(1)	91		
Peru	11	1,286	18	776
Uruguay	364	30,242	145	7,461
Other	10	1,271	31	2,531
	2,442	198,576	1,003	101,416
Europe:				
Belgium	576	61,915	17	847
Denmark	5,209	398,105		
France	3,001	239,444	318	17,711
Germany	823	68,755	52	2,385
Italy	532	41,070		
Netherlands	22	2,200	13	1,400
Sweden	7,557	601,335	392	21,727
United Kingdom	9,157	710,080	3	092
Other	1,026	79,662		
	27,809	2,202,026	795	44,762
Asia:				
China	953	78,843	(1)	20
Japan	15,653	1,293,142	17,301	973,368
Philippine Islands	543	40,208	400	28,210
Other	140	11,310	823	41,256
	17,289	1,432,503	18,524	1,042,854
Africa	358	32,557	8	605
Oceania: Australia	1	243		
	48,307	3,904,213	21,665	1,241,881

[1] Less than 1 ton.

Refined lead exported from the United States, 1927–1931

Year	Pigs, bars, and old		Foreign lead exported in manufactures with benefit of drawback (short tons)	Year	Pigs, bars, and old		Foreign lead exported in manufactures with benefit of drawback (short tons)
	Short tons	Value			Short tons	Value	
1927	125,267	$12,817,264	12,004	1930	48,307	$3,904,213	12,161
1928	116,269	10,359,221	13,224	1931	21,665	1,241,881	10,503
1929	73,251	7,178,337	13,086				

CONSUMPTION

REFINED PRIMARY PIG LEAD AVAILAB CONSUMPTION

The manufacturing industry of the United in four main forms—refined primary pig lead form of ore, antimonial lead containing both p lead, and secondary pig lead and alloys.

The following table shows the refined prim consumption from 1927 to 1931. It is intende mary lead or lead smelted directly from ore. some small discrepancies which should be poi mary lead smelters produce from secondary m is inseparable from the primary lead in the fi of lead as reported in this table may therefore c lead. There are also some inaccuracies in the exports, and warehouse transactions. Neverth the data available, the table gives approximatel refined lead available to American industry ea does not consider fluctuations in producers' an indicates the trend of consumption only in a

Refined primary pig lead available for consumption in 1931, in short tons

	1927	1928
Supply:		
Stock in bonded warehouse Jan. 1	10,711	9,46
Imports of pigs, bars, and old	2,467	66
Production	796,530	781,07
	809,708	791,19
Withdrawn:		
Exports—		
Pig lead	125,267	116,26
In manufactures, with benefit of drawback	12,004	13,22
Stock in bonded warehouse Dec. 31	9,464	4,13
	146,735	133,63
Supply available for consumption	662,973	657,56

[1] Stocks of pigs, bars, etc., in bonded warehouse not separately record with base bullion. (See table on p 369.)

[2] For purpose of calculating quantity available for domestic consumpt mated to have remained unchanged from the beginning of the year.

CONSUMPTION BY USES

The quantity of lead in all forms consumed by American industry is estimated each year by the American Bureau of Metal Statistics. The following table is quoted from the 1931 yearbook of that bureau.

Lead consumed in the United States,[1] 1927–1931, in short tons

Purpose	1927	1928	1929	1930	1931
White lead [2]	126,000	123,000	119,700	83,900	77,500
Red lead and litharge [3]	38,000	31,000	30,000	32,000	18,000
Storage batteries [4]	175,000	220,000	210,000	163,000	157,000
Cable covering [4]	161,000	180,000	220,000	208,000	117,000
Building [5]	88,000	96,000	96,000	67,000	40,000
Automobiles [5]	12,000	17,000	18,000	11,000	6,000
Railway equipment [5]	3,350	2,500	5,700	5,200	1,000
Shipbuilding [5]	200	100	300	500	400
Ammunition [4]	34,000	30,600	41,100	33,300	20,700
Terneplate [4]	3,900	4,400	4,200	2,700	2,200
Foil [4]	30,000	35,000	39,800	26,000	20,000
Bearing metal [4]	31,000	32,000	33,000	20,000	12,000
Solder [4]	35,000	37,000	37,000	27,000	20,500
Type metal [4]	16,000	17,000	18,000	16,000	14,400
Calking [6]	30,000	32,000	31,500	21,000	15,000
Castings [7]	17,000	18,000	18,000	12,000	7,000
Other uses [8]	40,500	40,000	50,000	40,000	30,000
Total	840,950	930,600	972,300	768,600	567,700

[1] Source: American Bureau of Metal Statistics. These estimates are for the total consumption of lead, irrespective of whether its origin be primary or secondary. Antimonial lead is included and the manufacture of lead for export under drawback provisions is included.
[2] From data of sales reported by U. S. Bureau of Mines for 1927. Later figures have been determined by an improved method.
[3] Exclusive of oxides for storage batteries
[4] Based on reports from a large proportion of manufacturers in each industry.
[5] Based on estimates of manufacture and the quantity of lead used per unit of manufacture. Under the head of building is included the lead used in chemical construction.
[6] Based on the estimated consumption of lead for this purpose by the railways.
[7] Estimates of persons engaged in the trades.
[8] Conjectural.

According to the foregoing table the lead consumed in the United States in 1931 was only 567,700 tons, a decrease of 26 per cent from 1930 and 42 per cent from 1929, the year of record consumption. The 1931 consumption was 9 per cent greater than that in 1921. As these two years represent periods of marked curtailment in industrial activity, it is interesting to compare them from the standpoint of the relative importance of the principal lead-consuming industries. In 1921 white lead ranked first in lead consumption and accounted for 26 per cent of the total; storage batteries ranked second with 17 per cent, cable covering third with 13 per cent, and building fourth with 9 per cent. By 1931 white lead had fallen to third place, accounting for only 14 per cent of the total; storage batteries ranked first with 28 per cent, cable covering second with 21 per cent, and building fourth with 7 per cent. If tonnages of lead used in these four industries in 1921 and 1931 are compared, it is found that white lead and building declined 43 and 17 per cent, respectively, whereas storage batteries and cable covering increased 80 and 75 per cent, respectively.

Consumption of lead in storage batteries was fairly well maintained in 1931 compared with 1930, the decline amounting to only 4 per cent, due to the importance of battery replacements in automo-

biles. The American Bureau of Metal Statis
duction of automobile storage batteries at 1
13,000,000 in 1930. Virtually all this declin
the decline in manufacture of automotive u
from 3,355,986 in 1930 to 2,389,730 in 1931 (2
tion of radio storage batteries declined from
in 1928 to 60,000 in 1930 but rose to 80,000
storage batteries of all kinds decreased fro
about 314,000 in 1931; in 1925 only 207,000
exported. The 157,000 tons of lead used in
storage batteries in 1931 included approxima
pig lead, 83,000 tons of antimonial pig lead, a
in the form of oxides.

A possible competitor of the lead storage ba
battery recently invented in France. The in
battery is superior to the present lead or nicke
said the plates do not disintegrate, there is no
to spill, no dangerous gases or vapors are gi
maintenance is not necessary. The iodine batt
easily transported. A disadvantage is high i
high output is obtained by placing a numbe
The development of this new battery apparent
the commercial stage.

The second largest use of lead in the Unit
cable covering, which ranked first in 1929 a
cent decline in this outlet for lead in 1931 ref
power and communication businesses during th
stallation of new cable and replacements ge
capital investments and are usually made with
normal increase in demand. As demand shov
the past two years, many companies probably
large capital commitments until prospects f
were brighter. Possibilities for consumption
lead in cable covering during the next decade
fact that one company operating in the New Y
estimates its requirements for new lead during
60,000 tons.

Compared with most of the principal lead-
manufacture of white lead was well maintaine
ment has suffered a steady decline in product
competition from cheaper white pigments, b
1931 seems to indicate that at the low prices p
white lead more than held its own in the paint
lead to the paint industry increased slightly
sumption of lithopone in paint decreased over
sales of zinc oxide decreased 20 per cent.

Consumption of lead in nonindustrial uses (
metal) was maintained at a much higher rate t
uses such as building, solder, foil, bearing m
construction. No outstanding new uses were

[9] Science News Letter, vol. 21, No. 584, June 18, 1932, p. 8

PRICES

The two major markets for lead in the United States are New York and St. Louis, and a large part of the lead produced in the United States is sold at prices based on quotations in these markets. The New York quotations are influenced to some extent by the lower prices usually prevailing on the London market, so that the New York price seldom exceeds the St. Louis price by as much as the freight differential, 0.35 cent a pound.

The following table shows the average monthly and yearly quoted prices of lead at St. Louis, New York, and London for 1929 to 1931.

Average monthly and yearly quoted prices of lead at St. Louis, New York, and London, 1929–1931, in cents per pound [1]

Month	1929			1930			1931		
	St. Louis	New York	London	St. Louis	New York	London	St. Louis	New York	London
January	6.50	6.65	4.79	6.10	6.25	4.08	4.00	4.80	3.01
February	6.73	6.86	5.01	6.09	6.24	4.60	4.33	4.54	2.92
March	7.38	7.50	5.50	5.56	5.67	4.08	4.28	4.53	2.85
April	7.03	7.20	5.37	5.43	5.53	4.09	4.17	4.39	2.69
May	6.77	7.00	5.19	5.41	5.51	3.86	3.65	3.82	2.50
June	6.80	7.00	5.13	5.31	5.39	3.89	3.76	3.92	2.52
July	6.61	6.80	4.94	5.15	5.23	3.94	4.22	4.40	2.76
August	6.55	6.75	5.02	5.33	5.49	3.98	4.22	4.40	2.59
September	6.69	6.89	5.10	5.35	5.49	3.89	4.22	4.33	2.41
October	6.67	6.87	5.05	5.00	5.15	3.42	3.78	3.96	2.30
November	6.13	6.29	4.71	4.95	5.10	3.45	3.76	3.94	2.42
December	6.10	6.25	4.66	4.95	5.10	3.31	3.59	3.79	2.29
Average	6.66	6.83	[2]5.04	5.38	5.52	[2]3.92	4.05	4.24	[2]2.64

[1] St. Louis: Metal Statistics, 1932, p. 349. Average daily quotations of soft Missouri lead, f. o. b. St. Louis (open market), as reported daily in the American Metal Market.
New York: American Metal Market, daily issues. Pig lead, New York (outside market), prompt shipment from West.
London: Metal Statistics, 1932, p. 353. Average price of foreign lead. Price per long ton, as published in Metal Statistics, converted to cents per pound at average exchange rate reported by the Federal Reserve Board.
[2] London quotations in pounds sterling per long ton as follows: 1929, £23.246; 1930, £18.075; 1931, £13.029.

To facilitate the settlement of its buying and selling contracts for lead the American Smelting & Refining Co., which controls a large part of the United States lead production, at frequent intervals publishes an official contract price based on the New York market. Following are the company's quotations for 50-ton lots, f. o. b. New York, in 1930 and 1931, in cents per pound.

1930		1931		
Feb. 27 6.10	May 20 5.50	Jan. 5 5.00	May 8 3.85	Nov. 9 3.95
Mar. 3 6.00	June 17 5.40	Jan. 7 4.85	May 11 3.75	Nov. 10 4.05
Mar. 6 5.85	June 23 5.25	Jan. 8 4.75	June 22 4.00	Nov. 19 3.95
Mar. 7 5.75	Aug. 1 5.35	Feb. 3 4.60	June 23 4.15	Nov. 23 3.85
Mar. 8 5.60	Aug. 4 5.50	Feb. 4 4.50	June 24 4.25	Dec. 14 3.75
Mar. 10 5.50	Oct. 1 5.35	Feb. 19 4.60	June 25 4.40	
Mar. 25 5.63	Oct. 4 5.25	Mar. 10 4.50	Oct. 2 4.25	
Mar. 26 5.75	Oct. 8 5.20	Apr. 23 4.35	Oct. 6 4.00	
Apr. 4 5.60	Oct. 9 5.15	Apr. 24 4.25	Oct. 20 3.75	
Apr. 7 5.50	Oct. 10 5.10	Apr. 28 4.10	Oct. 28 4.00	
May 13 5.60		Apr. 29 4.00	Nov. 2 3.85	

The average price of lead (New York) per pound, a decrease of 23 per cent from average since 1914; it was less than half cents in 1925. The quotation at the be 5.10 cents, but by the end of May it had d nouncement of the debt moratorium duri caused an upward movement which cont reached 4.40 cents, where it remained thro September. Early in October, as a resul market, a downward trend was resumed year the price stood again at 3.75 cents.

The London quotation (gold basis) av The London average for December was 0. average, whereas in New York the declin As in 1930, the yearly average of London cents below New York.