A-33

Mr Sawyer: By-Products 4/2/47

Mr Smith and I have approached this subject on a comprehensive scale starting with a table of the elements. The problem involves quantities present, recoverability, salability and dollar profits. Some elements are by-products of by-products, the recovery of the first presenting a cheap source of the second. The fact that ~~even~~ only small quantities of an element are now in evidence does not bar it from the list because we lack information regarding the mineral associates of our zinc and we are not now producing zinc ~~now do~~ in quantity nor have we spectographic reports on the zinc cycle.

The list of those present includes bismuth, arsenic, antimony, cadmium, indium, tin, zinc, tellurium, thallium, germanium and gallium. and these will be taken up in turn. The platinum group and, strangely, selenium appear to be absent. We have but ~~two or~~ three exits from the metallurgical flow sheet - slags, flue losses and metals produced — neglecting wind losses, leaching from ore beds, and such. The reverberatory slags, once made, do not at present offer obvious ~~attack~~ points of attack although ~~large~~ values ~~of tin and zinc~~ may be present.

Lead (blast furnace) slags obviously offer attractive recovery possibilities. Some 5% of the dust entering the flue systems is lost out of the stack in addition to any volatile products such as chlorides. If by-products are not recovered as such they build up in the nearly closed cycle until the slags, dusts and bullion content balance the intake. ~~In one sense we are compelled to at least recover~~ In one sense our elaborate ~~recovery~~ smoke system is a metallurgical liability in that we have to deal metallurgically with a lot of circulating impurities in far greater concentration than the entering ores indicate. Fishing impurities out of circulation therefore has an indirect cash return ~~by lowered~~ in lowered operating costs while presenting a raw ~~material~~ by-product sources free of cost.

Bismuth. This may be regarded as a completed job. Our recoveries are high, we have a market for ~~all we can produce~~ more than we can produce and have a million-dollar-a-year business. The only problem is to find more bismuth-carrying ores. The fact that the problem looked anything but inviting at the outset is the main justification for feeling

~~that~~ lack of immediate market is no reason to waste rather than recover any by-product ~~existing~~ present in at least moderate quantity.

Arsenic Metallurgically arsenic is a prime offender in that it poisons any metal product and ~~does~~ makes smelting creates smelting difficulties, especially in the lead cycle, ~~tieing up~~ forming speiss, etc. It is very desirable to ~~get~~ this element out of the circulating system as soon as possible and the separations ~~have been~~ already made in this direction help concentrate other by-products. ~~The recovery of bismuth, and antimony, etc., from~~ arsenical flue dusts We are now ~~not~~ wasting a large money maker by discarding large quantities of crude arsenic flue dusts, for ~~the~~ good temporary operating reasons, ~~to be sure~~, but under present market conditions I believe ~~am~~ sure a way will be found to solve the packaging problem and eventually to ~~place~~ raise all of our arsenic to a marketable grade. ~~Say 2¢ a lb. profit on 7000 tons a year would net $280,000, a very substantial sum and worth great effort. The war demand has revolutionized the~~ ~~market from a greatly overstocked supply~~

This does not mean 99% As_2O_3 which is a luxury for limited ~~used~~ uses, but 95% or better — possibly even 94%. Below 94% would probably curtail the use and also hurt us in more competitive times.

I have been discussing ~~Europe~~ the arsenic market with A.S.&R. The economics are simply that the war wiped out all stocks but Sweden's and while present Western Hemisphere production (leaving Cerro out of the picture) is some 25000 tons a year the demand is probably 45000. This is merely a reflection of changed farming and weed-killing methods since before the war and the imbalance is likely to continue unless organic competitors (DDT, ~~etc~~ etc.) make a much better showing than they have to date. The present A.S.&R. price is 6¢ a lb for refined arsenic in barrels. Foreign arsenic is offered at 7 to 10¢. The General Chemical Company is anxious to make a long term contract for a substantial tonnage. Sweden does not enter into the picture because while they have stored 300,000 tons of 70% As_2O_3 they have refining capacity for only 2000 tons a month which is easily sold near home. Later this year they ~~have~~ will start a new plant which however only doubles their tonnage.

Ga Cd [20 ms a yr.] Reverb. Slag Steam Pt Slag

Ge [#50 a yr. 100 a yr.] As ~~Se~~ In Zn ~~Sb~~ Te ~~Bi~~ Tl — 3# a day

Bi (Cu Pb Ag Au Zn)

could be 3 or 0 tons 30% Te stored .005% in Cu blister
Cerro — 1 ton a month
Colcord — Rubber — dead 1.25 Vanderbilt Drahenfeld

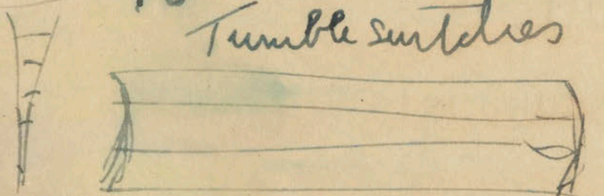
Te — USA — 20 ton Te a year
Engl. 4 + 5 Hallett

Cu

Ga + Ge wh traces in roaster feed
Ge ditto in calcine
Ge + Ga wh tr. in roaster Cottr dust
Reverb. slag wh tr. Ge
Cu matte neither
Hot Reverb. Cottr. wh tr. Ge
Conv Cottrell fl. dust wh tr Ga + Ge
Conv. slag wt Ge.
flue dust neither
As Cottr. dust Ge
Combined dust Ge
Stack dust Ge

steam pipe in reverbs.

Ga 1/40 th < than Zn.
Tumble switches



Zn ?
~~Cd~~
Ga
In,
Ge
Cd
[illegible]

Pb

Sinter feed — Ge
Sinter Ge
Fl dust Ge
Roaster Cottr Ge
BF Slag Ge + Ga + Tl
BF ~~Fl dust~~ — Ge — strong Tl
Matte Ge Tl
Slag Ge
Accretions Ga
Bullion Ge after drossing w
Dross — Ge ~

Betts Electr. strong Tl
slimes

###

Cu refy slime — w. tr Tl

Thallium - Now #15 per lb. metal or sulphate
Has been #35 to 50 Used to be #10
Still very short but some imports now
arriving and several competitive products
known to be reckoned with. Rat + ant
poison only material use — metallurgical
uses negligible.
Probably #15 safe future for estimates
(Wright)

Germanium - Very successful in certain
rectifier uses. Better than selenium.
Telephone Co. paying #50 a lb. for 99.9+
Tonnage not yet great and adequate
supplies obtainable at this price.

Thallium - Enters Cu plants - ends always to flue dusts → Pb dust
+ lead anodes → fine lead via electrolysis. 90% Tl in a month Pb dust - Fine Pb now
about 0.0004 0.0001% to 0.0040% Rt 40 000 tons a year — 0.1 to 1.6 tons
a year = 240 to 3600#. Chemical Eng.

Gates

Indium -

300t dross a year @ 0.3% In = 1800# @ 30 = $54000

bag house - 2 stage reduction

~~Fleming process~~

Tellurium — Probably Cu origin — Split between blister + flue dust

Pb furnace splits between Pb + dust

Cu anodes - ~~9~~ $7\frac{1}{2}$ or $2\frac{1}{2}$% slimes @ 1% Te

on say 70 tons a day - $2\frac{1}{2}$% of 70 = 1.75 tons

@ 1% = 0.0175 tons = ~~0.350~~ 35# a day

35 x 365 = ~~12775~~# a year ← high?

25,550 tons a year @ 0.01% = 2.555 tons = 5110 lbs.

Not much from Cu

Stock pile of soda slags 100 tons ?

1 ton a month

365
x 35
1825
1095
12775

Ga ?

Germanium - Zn analyses

Tin — In Cu plant - Rev. flux — Poor recovery

60 tons a year cutters. Statistics?

As -

6% ... 5% ... 40% ... 70% As_2O_3 ... Dustburg: 100 tons a month

Coal Chi: ... ...

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

October 8, 1946

Mr. Lawrence Addicks,
Bel Air, Maryland.

Dear Mr. Addicks:

TIN - 1945 - OROYA

We have no data relative to the amount of tin in the copper ores treated at Oroya during 1945 nor 1946 to date.

Some scattered assays indicate an average assay of about 0.05% Sn in reverberatory slag, hence the tin lost in reverberatory slag may have been of the order of 379,000 lbs. Sn.

The roasted cottrell dust to the lead plant contained about --- 264,600 lbs. Sn.
Most of which probably came from copper ores.
The lead ores treated carried --- 41,400 " "
Tin to be accounted for at Pb Plant 306,000 " "

The Villa Rica and San Gregorio ores were the richest in tin of any of the ores treated at lead plant.

The Tin dross produced in 1945 carried	127,222	lbs. Sn.
In Lead anodes	3,058	" "
In Matte & Speiss to copper plant	14,088	" "
Lost in Pb BF slag	88,222	" "
Accounted for	232,580	" "
Unaccounted for	73,420	" "

Undoubtedly some of the unaccounted for tin was recovered as cottrell dust from the dearsenizing roaster, from sinter plant and the lead blast furnace and was returned to the lead plant as roasted cottrell dust.

Some tin also must have been lost in the gases passing thru the chimney.

Very truly yours,

W. C. Smith

WCS:RL

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

October 9, 1946

Mr. Lawrence Addicks
Bel Air, Maryland

Dear Mr. Addicks:

ZINC - 1945 - OROYA

The Zinc in 570343 tons of charge to the copper plant at Oroya was 7,275 tons

The 371844 tons of reverb slag contained 6,460 "

Balance to be accounted for 795 "

The roasted cottrell dust to the lead plant contained 508 tons of Zn. Most of which probably came from the copper plant. Some additional zinc was transferred from the Copper plant to the lead plant in reverb and converter slags used as flux and some zinc was lost in roaster, reverb. and converter gases thru the cottrells.

Lead Plant

Zinc in lead ores (includes 508 tons in cottrell dust)		5120 tons
Zinc in pyrite flux		200 "
Zinc in refinery slag		18 "
Zinc in slag fluxes		402 "
Total Zinc charged		5742 "
Zinc in 55,109 tons Pb. BF Slag	4,575 tons	
Zinc in Matte & Speiss	373 "	
	4,948 "	4948 "
Zinc unaccounted for		794 "

×70%320 2.5 tons per 6400,000 lbs @10¢ = $640,000 a year

Part of the difference can be accounted for in Cottrell dusts from the sintering plant, and lead blast furnaces and largely returned to the lead plant

and some is lost in fume passing the cottrells in waste gases.

St. Joe Zinc Process

We can make some wild guesses as to the outcome of the St. Joe Co's zinc recovery process as applied to Oroya lead blast furnace slag.

Zinc in Slag	8.3%
Zinc in treated Slag	3.0%
Zinc to Zn vapor	5.3%
Zinc recovery from vapor	95%

Zinc recovery per ton slag 5.3% x 2000 x 95% = 100.7 lbs.
Net value of zinc at Oroya (10-2) = 8¢ per lb.
Value of recovered zinc at Oroya per ton slag $8.06

	Per ton Slag	
Cost of power 600 KWH .1¢	$ .60	
Electrodes 10 lbs. @ 20¢	2.00	
Coke 4% @ $11.00	.44	
Repairs	.10	
Supplies	.10	
Labof	1.00	
	$ 4.24	4.24
Profit per ton slag		$ 3.82
Profit per year (55000 tons)		$ 200000.00

Very truly yours,

W. C. Smith

WCS:RL

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

October 9, 1946

Mr. Lawrence Addicks,
Bel Air, Maryland.

Dear Mr. Addicks:

SULPHUR IN COPPER PLANT - 1945

Sulphur in Ores to Roasters	161176 tons	
" in As Calcines	1120 "	
" in Ores to Converters	6465 "	
Total Sulphur	168761 "	
Sulphur Volatilized		
Roasters	86843 "	51.46 %
Reverberatories	25567 "	15.15 %
Converters	47370 "	28.07 %
Total S Volatilized	159780 "	94.68 %
Sulphur in Reverb. Slag	7192 "	4.26 %
In Slag to Pb. BF & chips,etc.	1789 "	1.06 %
	168761 "	100.00 %
Reverb. Loss of Sulphur		
Total to Reverbs.	80592 "	
Volatilized	25567 "	31.75 %

The volatilization of 31.75% of the sulphur in the reverberatory charge would seem to be high, yet it is only about 15% to the total sulphur in the materials treated by the copper plant.

In the roasting operations a large part of the iron in the charge is converted from FeS_2 and FeS to Fe_2O_3 as indicated by color of the calcines. Undoubtedly some sulphates also are formed. The iron in the reverberatory slag is mainly as FeO, hence a reduction of the Fe_2O_3 to FeO must take place during the smelting and the chief reducing agent present in the charge is sulphide sulphur. The result of this reaction being SO_2.

Any sulphates in the reverb. charge would tend to react with S in the charge to form SO_2. On above basis we can account for the apparent heavy volatilization of sulphur in the reverbs.

Yours truly,

W. C. Smith

WCS:RL

L. Addicks

CERRO DE PASCO CORPORATION - LA OROYA

Correspondencia Interdepartamental

Fecha: October 30, 1952

A: A.H.Engelhardt, Manager of Operations

De: J.W.Hanley, Assistant Manager of Operations

Materia: Indium - Possible Future Production

Please refer to the memorandum from L.Addicks to R.P.Koenig under date of October 7, 1952, and memorandum from R.P.Koenig under date of October 14, 1952, on the above subject.

A meeting was held on Saturday, October 25, 1952, with Messrs. Engelhardt, Barker, Schellinger, Engemann, Lacy, and the writer, to discuss the possibility of indium production. As stated in paragraph 4 of Mr. Addicks' memorandum, the indium content of San Cristobal concentrates did contain 32 ozs. per ton. This concentrate came from ore mined in the central orebody at San Cristobal.

It was decided to make a complete survey of the products entering the plant, both Corporation ores and concentrates and also custom ores and concentrates. In addition to the ores and concentrates entering the plant the survey will be carried further so as to include all interplant products, in order that the indium may be traced through the circuit. The survey will be a spectrographic one and will be under the direction of Messrs. Schellinger and Engemann of the Research Department.

Mr. Lacy stated that he will arrange to have samples taken at San Cristobal by Mr. Zuñiga the geologist there, these samples to be taken from the western, dike (both copper and lead sections, and the San Antonio orebodies. Mine samples will also be taken at Cerro de Pasco from both the current (L.306 orebodies) and also from the sections of the non-1A class orebodies. Mr. Lacy pointed out that at Cerro de Pasco they have taken a small number of samples and in these samples indium is generally associated with the sections high in bismuth content. He also stated that the bismuth tends to occur along the eastern wall of the Cerro orebodies near the old silver stopes.

It was of interest to all concerned to know that indium was reported in the liquator lead of the Paragsha concentrate that was sent to Palmerton for treatment. Since this is

the case, by treating zinc plant residues through the sterling plant, indium contained in these residues from the electrolytic plant will be recovered in the fraction from the liquators. It has been known for some time that the residues from the electrolytic zinc plant (when treating Cerro ores) do carry small amounts of indium.

We do at present have a process for the production of indium. When more data is available from the survey to be made, it should not be too difficult to design a plant to handle the indium from the various sources. It will, of course, at this point depend on the economic feasibility and the conditions in existence at that time.

In connection with indium and the possibility of the production of same, a by-product plant for a number of metals was discussed. The idea of the by-product plant would be to combine the production of cadmium, tin, indium, thallium, etc. in one unit, so that these metals could be produced in one building so that the same supervision and labor could be used should such a program be warranted.

The survey of indium and other metals will be started as soon as possible and we all concur, as stated in paragraph 5 of Mr. Addicks' memorandum to Mr. Koenig, should it appear favorable, a development fund should be provided and spent at the direction of Meesrs. Seeds and Smith.

JWH/be

cc: AHE (5)
AKS (2)
WCL
FILE (JWH)

J. W. Hanley

(RP 1-7-52)

CERRO DE PASCO COPPER CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

October 31, 1946

Mr. Lawrence Addicks
Bel Air, Maryland

Antimony Oroya 1945

Dear Mr. Addicks:

No records are available showing the antimony received in copper ores at Oroya.

Some assays indicate the possible loss of Sb in reverb slag was of the order of	1200 tons
The roasted cottrell dust to the lead plant carried most of which probably came from Cu ores.	469 tons
Some additional antimony was lost in crude As203 and in the fume from roasters, reverbs, and converters which passed the cottrells.	
At the lead plant we received Sb in new lead ores	467 tons
Sb in roasted cottrell dust.	469 "
Total new antimony.	936 tons
The lead anodes produced contained indicating that a large part of the antimony in anodes was returned to the lead plant mostly in refinery slag.	1413 tons
The antimony in the crude antimony metal produced was or only about 30% of the new antimony to the lead plant.	296 tons

Mr. Merz has proposed a double treatment for the refinery slags to increase the recovery of antimony as antimonial lead.

1st debismuthize, desilverize and decopperize the refinery slags by partial reduction.

2nd complete reduction of the treated slag to produce a high antimony lead alloy which can be blended with refined lead to give antimonial lead of the required grade.

No results have been reported to date.

Yours truly,

W. C. Smith

WCS:NG

BY-PRODUCTS

Mr. Smith and I have approached this subject on a comprehensive scale starting with a table of the elements. The problem involves quantities present, recoverability, salability and dollar profits. Some elements are by-products of by-products, the recovery of the first presenting a cheap source of the second. The fact that only small quantities of an element are now in evidence does not bar it from the list because we lack information regarding the mineral associates of our zinc and we are not now producing zinc in quantity nor have we spectrographic reports on the zinc cycle.

The list of those present includes bismuth, arsenic, antimony, cadmium, indium, tin, zinc, tellurium, thallium, germanium and gallium. These will be taken up in turn. The platinum group and, strangely, selenium appear to be absent. We have but three exits from the metallurgical flow sheet - slags, flue losses and metals produced - neglecting wind losses, leaching from ore beds, and such. The reverberatory slags, once made, do not at present offer obvious points of attack although values may be present. Lead blast furnace slags obviously offer attractive recovery possibilities. Some 5% of the dust entering the flue systems is lost out of the stack in addition to any volatile products such as chlorides. If by-products are not recovered as such they build up in the nearly closed cycle until the slags, dust and bullion content balance the intake. In one sense, an elaborate smoke system is a metallurgical liability in that we have to deal metallurgically with a lot of circulating impurities in far greater concentration than the entering ores indicate. Fishing impurities out of circulation therefore has an indirect cash return in lowered operating costs while presenting a raw by-product sources free of cost.

BY-PRODUCTS

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FORM 45G 10M 10-51

CERRO DE PASCO CORPORATION • NEW YORK

INTER-DEPARTMENT MEMORANDUM

Date: February 3, 1953

To: Indium Metal File

From: O. J. Seeds

Subject: End Use Development
General Electric Co., Schenectady
Contact: W. J. Van Natten
Turbine Division Laboratory
Building 7 - Room 107

COPY

Mr. Van Natten is responsible for soldering procedures throughout the works. Two types of soft solders are currently used in large quantities: on Government specifications, 60% Sn, 40% Pb; on G. E. commercial products, 40% Sn, 60% Pb is used. Rosin flux is standard. Mr. Van Natten will cooperate with us in an effort to disprove Bell Laboratories (E. E. Schumacher) contention that additions of small amounts of indium do not improve the wetability and spreadability of soft solder. The higher price for solder with indium would not discourage its use, if: all other factors (strength, freedom from deleterious effects under wide variations of temperature (-100°C + 100°C), etc. were equal. The increased number of joints per pound obtainable from indium solder would be translated into actual labor savings, which would undoubtedly be greater than the difference in the solder cost.

He (Van N.) recited his experience with a new rosin flux compared to one regularly used. The manufacturer claimed greater coverage for regular solder with the new flux. The slump test was used with two exactly equal weights of the same solder on copper plate using both fluxes. Carefully measured areas covered by the solder specimens revealed only an insignificant difference in favor of the new flux. (Bell Labs. say there is no difference with indium in solder by their test. Our slump test shows nearly 2 x area covered).

At G. E., the new flux tried out on the production line proved the manufacturer correct and a substantial increase of coverage per pound of solder was noted.

Van N. wants to make such a practical test of solder - 60% Pb, 40% Sn, on commercial items.

He also has need for an indium added lead-silver eutectic solder. He hopes that the addition of indium will provide a quicker set-time, smoother flow and greater spreading.

I promised full cooperation in compounding various mixtures, made up in rosin core, if necessary, and delivery of trial quantities for G. E. tests.

Even though percentages in solder would be relatively small, the overall consumption of indium would become significant if these tests prove our assumptions are correct. Therefore, this avenue should be exhaustively covered.

Original signed by
O. J. Seeds

O. J. Seeds

OJS:ch

cc: R. P. Koenig
A. R. Merz
L. Addicks
W. C. Smith

CERRO DE PASCO CORPORATION

SUMMARY OF BISMUTH ALLOY SALES

	December - 1952 Lbs.	@	Value	January 1 to December 31, 1952 Lbs.	@	Value
Cerrobase	4,211	$1.33	$ 5,600.06	136,386	$1.33	$ 181,606.34
Cerrobend	18,304	1.55	28,379.67	283,938	1.58	447,721.54
Cerrocast	2,407	1.67	4,020.63	10,171	1.67	17,007.96
Cerrodent	127	1.64	208.28	1,183	1.64	1,941.98
Cerromatrix	7,314	1.36	9,959.-	212,553	1.36	289,065.15
Cerrosafe	7,165	1.34	9,601.28	69,043	1.37	94,325.22
Cerrotru	14,094	1.83	25,791.89	125,527	1.83	229,855.47
Cerrohi	12	.43	5.10	29,544	.42	12,532.28
Thallium	-	-	-	13	12.35	160.50
Sundry	21,443	1.28	27,349.36	100,674	1.42	142,740.90
	75,077	$1.48	$110,915.27	969,032	$ 1.46	$1,416,957.34
Bismuth content of above	37,964			476,097		
Similar prior period	82,167	$1.52	$124,688.15	690,570	$ 1.57	$1,085,615.03
Bismuth content of above	43,234			357,040		

1-29-53-R-Acct.
G.P.Sawyer
F.F.Russell
H.D.Starr
R.F.Mitchell
F.W.Holshuher
A.R.Merz
W.S.K.Stage
Acct. (3)
O.J.Seeds (4)
J.J.Emmerick

CERRO DE PASCO CORPORATION

BISMUTH ALLOY POSITION AND SUNDRY METALS

DECEMBER 1952

Metals	Belmont S.& R.Works lbs.	New York Office lbs.	Consignment lbs.	Total lbs.
Cerrobase	6,935	188	10,402	17,525
Cerrobend	8,461	88	20,593	29,142
Cerrocast	1,397	62	2,648	4,107
Cerrodent	220	3	762	985
Cerrohi	1,623	32	746	2,401
Cerromatrix	8,920	106	16,289	25,315
Cerrosafe	3,371	40	6,911	10,322
Cerrotru	3,782	40	13,522	17,344
C.de P. 5160-1	196	-	-	196
5250-1	497	-	-	497
	35,402	559	71,873	107,834
Bismuth Content of above	16,993	265	38,830	56,088
Antimony	9,145		9,145	
Cadmium	5,391		5,391	
Dross	433		433	
Lead	58,903		58,903	
Lead-Tin Antimony	13,670		13,670	
Tin	10,531		10,531	

1-29-53-R.Acct.

G.P.Sawyer
F.F.Russell
H.D.Starr
R.F.Mitchell
F.W.Holshuher
A.R.Merz
O.J.Seeds (4)
J.J.Emmerick
Acct. (3)

CERRO DE PASCO CORPORATION

SUMMARY OF INDIUM AND INDIUM ALLOY SALES

	December - 1952 Lbs.	Ozs.	@	Value	January 1 to December 31, 1952 Lbs.	Ozs.	@	Value
Cerrowlow #105	1	-	$ 8.13	$ 8.13	29	12	$ 8.14	$ 242.14
117	4,247	4	7.81	33,172.64	5,921	12	7.79	46,125.46
125	-	-	-	-	-	8	8.22	4.11
136	29	-	8.39	243.28	403	9	8.46	3,415.84
140	-	-	-	-	21	8	3.38	72.67
147	45	10	3.08	140.63	57	4	3.08	176.41
174	5	7	10.31	56.07	56	15	10.32	587.48
Cerroseal	280	14	17.73	4,980.20	2,095	10	18.12	37,970.23
C.de P. #4950-1	-	-	-	-	2,490	-	5.04	12,549.60
	4,609	3	$ 8.37	$38,600.95	11,076	14	$ 9.13	$101,143.94
Indium	-	-	-	-	2	-	$31.41	$ 62.82
Similar prior period: Indium alloys	88	-	$11.02	$ 969.54	1,454	3	$ 9.52	$ 13,838.19
Indium	2	2	$32.82	$ 69.74	31	8	$28.78	$ 906.64

1-29-53-R-Acct.

G.P.Sawyer
F.F.Russell
H.D.Starr
R.F.Mitchell
F.W.Holshuher
A.R.Merz
O.J.Seeds $4)
J.J.Emmerick
Acct. (3)