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An Investigation of
THE RECOVERY OF GOLD AND SILVER
from a Project Telluride sample
submitted by
DENNIS FAIRBAIRN, P. Eng.
Progress Report No. 1


Project No. L.R. 2201

NOTE:

This report refers to the samples as received.

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LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
October 19, 1979



I N T R O D U C T I O N

In a letter dated September 12, 1979, Mr. D. Fairbairn requested that we conduct testwork to investigate the concentration of gold and silver by flotation. Recommendations for alternate methods of concentration were also to be made.

LAKEFIELD RESEARCH OF CANADA LIMITED

D. M. Wyslouzil

D.M. Wyslouzil, P. Eng.,
Manager

K.W. Sarbutt

K.W. Sarbutt
Project Metallurgist

Investigation by : S. Wile

S U M M A R Y

1. Head Sample Analysis

The sample was crushed to minus 13 mm and split into 4 portions. One-half of each portion was crushed to minus 10 mesh and an assay sample was prepared from the minus 10 mesh material.

	<u>Assay Au g/t</u>	<u>Ag g/t</u>
Portion 1	7.12	190.8
2	6.86	190.0
3	6.86	185.7
4	6.61	178.4
Average	6.86	186.2

Equal weights of the minus 10 mesh material were then composited for testwork.

The average head analysis as calculated from the test results was 7.14 g/t Au, 188.4 g/t Ag.

2. Flotation Testwork

Rougher flotation tests were conducted at varying fineness of primary grind. A series of concentrates were recovered using Z-6 and AF-25 as the collectors and frother. CuSO_4 was used as an activator in Test 1. The results of the tests are summarized in Table 1.

Summary - Continued

2. Flotation Testwork

Table No. 1 - Rougher Flotation Results

Test No.	Grind % -200 Mesh	Flotation Time Minutes	% Weight Recovered	Assays g/t		% Recovery	
				Au	Ag	Au	Ag
1	62.6	2	5.13	114.6	3209	84.7	85.7
		4	6.89	91.7	2531	91.1	90.8
		7	10.34	63.6	1739	94.8	93.6
		9	11.51	57.7	1575	95.7	94.4
		Flotation Tailing	88.49	0.34	12.18	4.3	5.6
Head (Calc.)			100.00	6.94	192.1	100.0	100.0
2	62.6	9	14.62	49.5	1204	96.2	95.0
		Flotation Tailing	85.38	0.34	10.81	3.8	5.0
		Head (Calc.)			100.00	7.52	185.2
3	76.6	2	6.42	97.1	2571	86.3	87.7
		4	9.29	71.3	1869	91.8	92.2
		7	12.94	52.9	1378	94.9	94.7
		9	16.13	43.0	1117	96.1	95.7
		Flotation Tailing	83.87	0.34	9.61	3.9	4.3
		Head (Calc.)			100.00	7.22	188.2
4	44.1	3	6.09	92.3	2567	81.8	83.1
		5	8.15	74.5	2048	88.4	88.7
		7	9.91	63.4	1729	91.5	91.1
		9	11.38	56.4	1533	93.4	92.8
		Flotation Tailing	88.62	0.51	15.27	6.6	7.2
		Head (Calc.)			100.0	6.87	188.0

The rougher concentrate from Test 2 was cleaned three times by refloatation. The results of the cleaner flotation are summarized in Table 2.

Summary - Continued

2. Flotation Testwork

Table 2 - Cleaner Flotation Results

Product	Weight %	Assay, g/t		% Recovery	
		Au	Ag	Au	Ag
3rd Cleaner Conc.	3.77	167.0	4135	83.7	84.2
2nd Cleaner Conc.	4.38	148.7	3672	86.6	86.9
1st Cleaner Conc.	6.47	105.6	2591	90.8	90.5
Rougher Concentrate	14.62	49.5	1204	96.2	95.0

The Au and Ag grade-recovery curves from Tests 1 to 4 are shown in Figure No. 1.

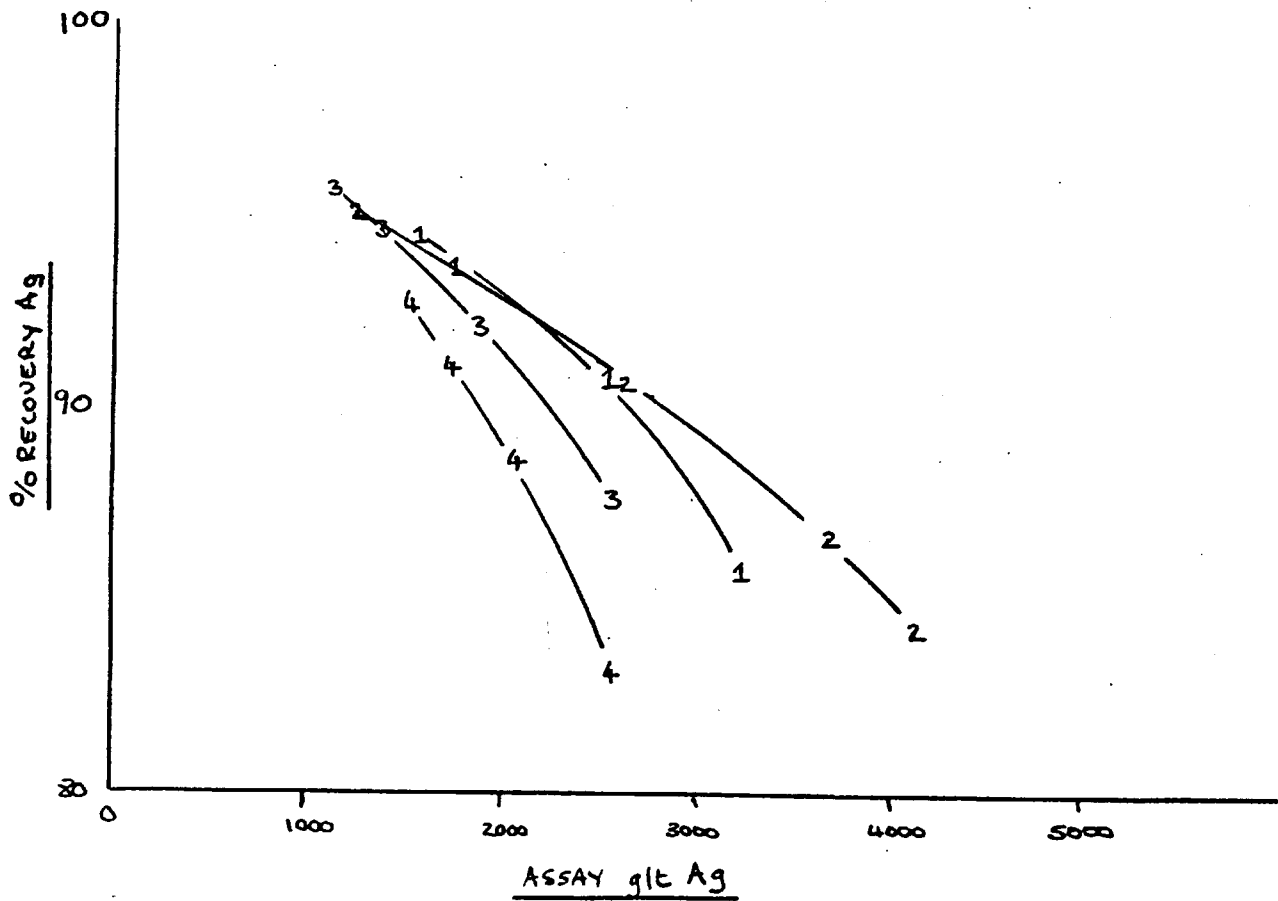
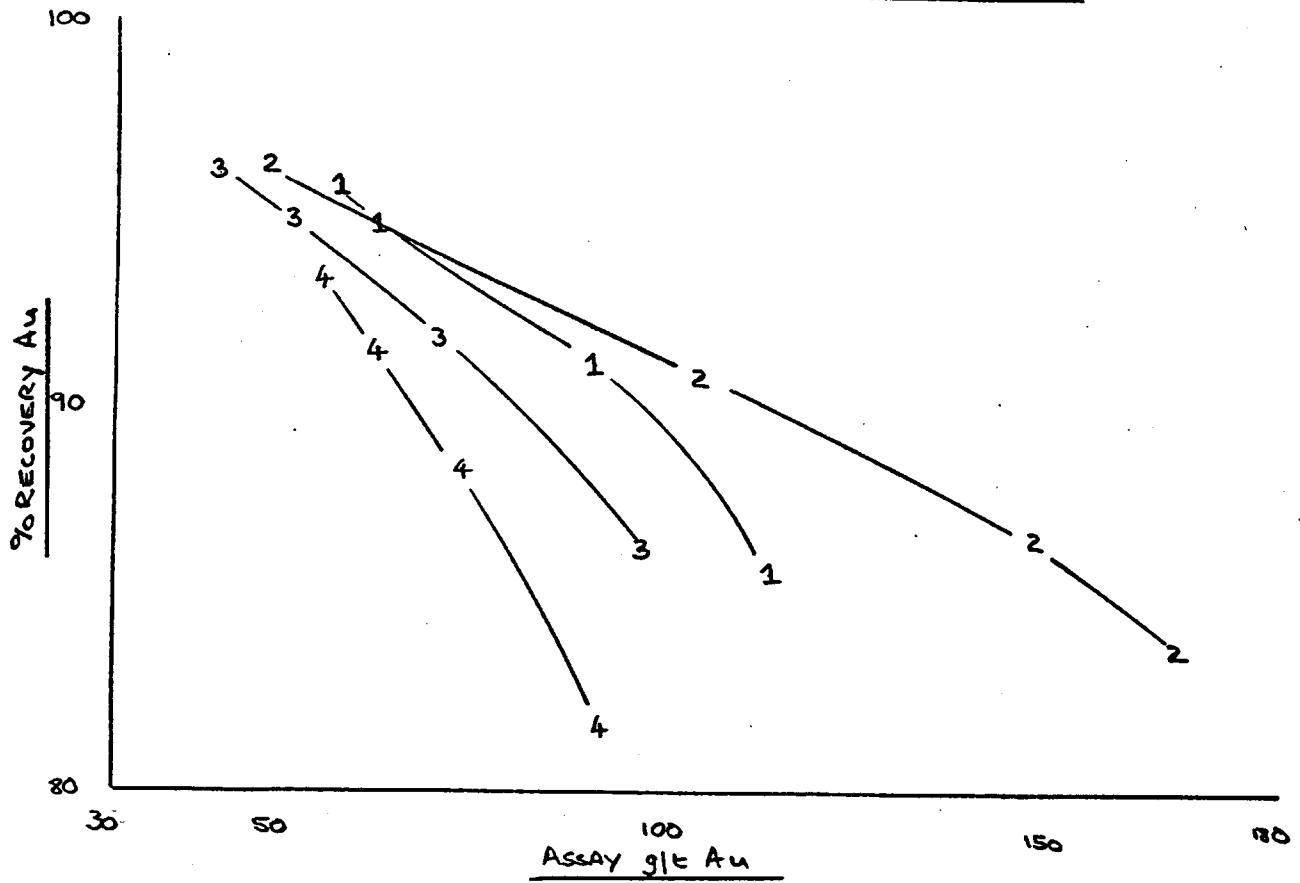
95 % of the Au and 94 % of the Ag were recovered in 10.5 percent of the weight after rougher flotation at a grind of 62.6 percent passing 200 mesh.

Increasing the fineness of grind to 76.6 percent passing 200 mesh resulted in a slight increase in overall Au and Ag recoveries but with higher weight recovery and hence lower concentrate grades.

Recoveries were still high at the coarse grind of 44 percent passing 200 mesh although concentrate grades were low.

Concentrate grade was increased by cleaning the rougher concentrate. Losses of Au and Ag to the cleaner tailings were high however and a closed circuit cycle test would be necessary to determine the concentrate grade and recovery with recirculation of the cleaner tailings to the rougher flotation.

FIGURE 1
Au & Ag GRADE-RECOVERY CURVES



Summary - Continued

3. Discussion and Recommendations

High Au and Ag recoveries were obtained with simple flotation procedures. Just rougher flotation with Z-6 and AF25 recovered 95 % of the Au in 10.5 percent of the weight. This concentrate could be further upgraded by reflation. Closed circuit cycle tests would be necessary to determine the concentrate grade-recovery relationship.

A possible alternate method of preconcentration could be gravity separation at a coarse grind say 30 to 40 percent passing 200 mesh. This could be investigated by passing a ground sample over a Wilfley table.

SAMPLE PREPARATION

Three cartons of ore weighing approximately 73 kg were received at Lakefield on August 16, 1979, and given our Reference No. 7921939.

The sample was crushed to minus $\frac{1}{2}$ inch and riffled into 4 portions. Each portion was then riffled in half and half was stored. The other half was roll-crushed to minus 10 mesh and an assay sample prepared.

Equal weights of the minus 10 mesh material were then composited and riffled into 2 kg charges for testwork.

DETAILS OF TESTS

Test No. 1

Purpose: To investigate rougher flotation at 62.6 % minus 200 mesh.
Procedure: As below. Rougher concentrates were kept separate for assay.
Feed: 2000 grams minus 10 mesh.
Grind: 20 minutes at 65 percent solids in the lab ball mill.
Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Z - 6	AF-25	MIBC	CuSO ₄	Grind	Cond.	Froth	
Grind	-	-	-	-	20	-	-	7.2
Rougher 1	25	12.5	20	-	-	1	2	-
2	25	12.5	-	-	-	1	2	-
	-	-	-	210	-	5	-	-
3	25	12.5	-	-	-	1	3	-
4	25	12.5	-	-	-	1	2	-

Test No. 1 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Au	Ag	Au	Ag
1. Rougher Conc. 1	5.13	114.56	3209.1	84.7	85.7
2. Rougher Conc. 2	1.76	25.04	552.9	6.4	5.1
3. Rougher Conc. 3	3.45	7.55	159.2	3.7	2.8
4. Rougher Conc. 4	1.17	5.49	126.6	0.9	0.8
5. Rougher Tail.	88.49	0.34	12.18	4.3	5.6
Head (Calculated)	100.00	6.94	192.1	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	6.89	91.70	2530.6	91.1	90.8
Products 1 to 3	10.34	63.62	1739.4	94.8	93.6
Products 1 to 4	11.51	57.71	1575.4	95.7	94.4

Screen Analysis

Composite of All Products

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	1.0	1.0	99.0
100	4.6	5.6	94.4
150	10.8	16.4	83.6
200	21.0	37.4	62.6
270	11.0	48.4	51.6
400	15.7	64.1	35.9
- 400	35.9	100.0	-
Total	100.0	-	-

Test No. 2

Purpose: To repeat conditions of Test 1, but omit the CuSO₄ and clean the rougher concentrate.

Procedure: As below.

Feed: 2000 grams minus 10 mesh.

Grind: 20 minutes at 65 percent solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t			Time, minutes			pH
	Z - 6	AF-25	MIBC	Grind	Cond.	Froth	
Grind	-	-	-	20	-	-	-
Rougher	25	12.5	20	-	1	2	-
	25	12.5	-	-	1	2	-
	25	12.5	-	-	1	3	-
	25	12.5	-	-	1	2	-
1st Cleaner	-	-	10	-	1	4	6.5
2nd Cleaner	-	-	15	-	1	3	6.6
3rd Cleaner	-	-	10	-	1	2	-

Stage
Flotation Cell
Speed: r.p.m.

Rougher
1000 g D-1
1800

1st Cleaner
500 g D-1
1500

Test No. 2 - Continued

Metallurgical Results

Product	Weight %	Assays, g/t		% Distribution	
		Au	Ag	Au	Ag
1. 3rd Cleaner Conc.	3.77	167.04	4135.21	83.7	84.2
2. 3rd Cleaner Tail.	0.61	35.51	811.82	2.9	2.7
3. 2nd Cleaner Tail.	2.09	15.09	323.45	4.2	3.6
4. 1st Cleaner Tail.	8.15	4.97	102.39	5.4	4.5
5. Rougher Tail.	85.38	0.34	10.81	3.8	5.0
Head (Calculated)	100.00	7.52	185.2	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	4.38	148.72	367.36	86.6	86.9
Products 1 to 3	6.47	105.55	2590.57	90.8	90.5
Products 1 to 4	14.62	49.48	1203.52	96.2	95.0

Test No. 3

Purpose: To repeat Test 1 with 76.6 % minus 200 mesh mill discharge.

Procedure: Rougher concentrates were floated separately and assayed individually.

Feed: 2000 grams minus 10 mesh.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t			Time, minutes			pH
	Z - 6	AF-25	MIBC	Grind	Cond.	Froth	
Grind	-	-	-	30	-	-	-
Rougher 1	25	12.5	20	-	1	2	6.6
2	25	12.5	-	-	1	2	-
3	25	12.5	-	-	1	3	-
4	25	12.5	-	-	1	2	-

Test No. 3 - Continued

Metallurgical Results

Product	Weight %	Assays, g/t		% Distribution	
		Au	Ag	Au	Ag
1. Rougher Conc. No. 1	6.42	97.07	2571.47	86.3	87.7
2. Rougher Conc. No. 2	2.87	13.72	296.70	5.5	4.5
3. Rougher Conc. No. 3	3.65	6.17	129.32	3.1	2.5
4. Rougher Conc. No. 4	3.19	2.74	57.80	1.2	1.0
5. Rougher Tailing	83.87	0.34	9.61	3.9	4.3
Head (Calculated)	100.00	7.22	188.2	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	9.29	71.32	1868.72	91.8	92.2
Products 1 to 3	12.94	52.94	1378.08	94.9	94.7
Products 1 to 4	16.13	43.01	1116.97	96.1	95.7

Screen Analysis

Rougher Tailing

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	0.1	0.1	99.9
100	1.2	1.3	98.7
150	5.8	7.1	92.9
200	16.3	23.4	76.6
270	22.3	45.7	54.3
400	16.9	62.6	37.4
- 400	37.4	100.0	-
Total	100.0	-	-

Test No. 4

Purpose: To investigate rougher flotation at 44.1 % minus 200 mesh.

Procedure: As outlined below.

Feed: 2000 grams minus 10 mesh.

Grind: 12 minutes at 65 percent solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t			Time, minutes			pH
	Z - 6	AF-25	MIBC	Grind	Cond.	Froth	
Grind	-	-	-	12	-	-	-
Rougher 1	25	12.5	20	-	1	3	7.3
2	25	12.5	-	-	1	2	-
3	25	12.5	-	-	1	2	-
4	25	12.5	-	-	1	2	-

Test No. 4 - Continued

Metallurgical Results

Product	Weight %	Assays, g/t		% Distribution	
		Au	Ag	Au	Ag
1. Rougher Conc. 1	6.09	92.27	2566.7	81.8	83.1
2. Rougher Conc. 2	2.06	21.95	513.8	6.6	5.6
3. Rougher Conc. 3	1.76	12.01	253.5	3.1	2.4
4. Rougher Conc. 4	1.47	8.92	211.3	1.9	1.7
5. Rougher Tail.	88.62	0.51	15.27	6.6	7.2
Head (Calculated)	100.00	6.87	188.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	8.15	74.50	204.8	88.4	88.7
Products 1 to 3	9.91	63.40	1729.0	91.5	91.1
Products 1 to 4	11.38	56.36	1533.0	93.4	92.8

Screen Analysis

Composite of All Products

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	13.4	13.4	86.6
100	14.2	27.6	72.4
150	14.5	42.1	57.9
200	13.8	55.9	44.1
270	11.5	67.4	32.6
400	8.4	75.8	24.2
- 400	24.2	100.0	-
Total	100.0	-	-

LAKEFIELD RESEARCH OF CANADA LIMITED
 Lakefield, Ontario
 October 19, 1979 / dmm

Tyneside Rd., RR 3,
Mount Hope, Ontario. LOR LWO.
August 19th., 1979.

Lakefield Research of Canada, Ltd.,
Box 430,
Lakefield, Ontario.

Attention: D.M. Wyslouzil, P.Eng..

Re: Project Deehorn.

Dear Sirs:

On Thursday, August 16th., I left with you three cartons of ore which weighed approximately 60 lbs. each. On this ore, certain tests are to be performed in two consecutive phases.

Phase 2 is not to be started until after completion of Phase 1, and after further consultation between us.

Phase 1 consists simply of crushing, quartering, and assaying each quarter for gold and silver.

Phase 2 will consist of tests to determine, on a relatively rough or preliminary basis, the most promisingly economic method of concentration or recovery of the silver and gold values.

I explained that we were here involved with a small, developed, deposit which is too small to support a normal mining operation, -- a deposit which is in an environmentally sensitive area. The tonnage to be handled would be small; possibly, 50 to 100 tons per day.

It followed that the tests therefor not be definitive, but that they be performed only in such depth as to enable us to estimate the capital and operating costs which would be incurred with the chosen process, and also to assess the environmental impact thereof.

It was, as I have said, agreed that you would advise me immediately the gold and silver assays have been completed. This, because the gold and silver values in this particular sample could possibly be too low for meaningful testing. (There is probably no free or visible gold in the samples because it is present as Tellurides and is therefor difficult to evaluate in the field).

Both Dr. Franc Joubin and I will be anticipating a communication from you within the next week to ten days.

Thanking you for your cooperation and attention, I am,

yours very truly,


Dennis Fairbairn, P.Eng..

cc. FRS. ✓

LAKEFIELD RESEARCH OF CANADA LIMITED
 LAKEFIELD, ONTARIO
 CANADA

TPS FILE

Certificate of Analysis

Date: January 22, 1980

Received: _____

From: Dr. F. Joubin,
 170 Bloor Street, West,
 Suite 418,
 TORONTO, Ontario. N5S 1T9

Our Reference No. L.R. 2201

Invoice No. 14527

Samples submitted to us show results as follows:

Head Composite of Portions 1-4

2201- Fairbain

<u>Element</u>	<u>Concentration</u>
Ti	ND
Cr	ND
Mn	FT
Fe	M
Co	ND
Ni	ND
Cu	TL
Zn	L
As	ND
Bi	ND
Pb	T
Th	ND
U	ND
Se	ND
Hg	ND
Y	ND
Cb	ND
Mo	ND
Ag	T
Cd	TL
Sn	ND
Sb	ND
Te	T

Symbols -

- ND - Not Detected
- FT - 0.01 or less
- T - 0.01 to 0.10
- TL - 0.05 to 0.50
- L - 0.10 to 1.00
- LM - 0.50 to 5.00
- M - 1.00 to 10.00

To: Dr. F. Joubin (2)

SIGNED D.M. Wyslouzil
 D.M. Wyslouzil, M.A.S.C. P. ENG.,

LAKEFIELD RESEARCH OF CANADA LIMITED

LAKEFIELD, ONTARIO

CANADA K0L 2H0

P.O. BOX 480

PHONE (705) 652-2841

TELEX No.

06 962842

October 19, 1979

Mr. Dennis Fairbairn, P. Eng.,
Tyneside Road,
R.R. No. 3,
Mount Hope, Ontario.
LOR 1W0

Dear Mr. Fairbairn:

We are pleased to enclose three copies of our report on An Investigation of Gold and Silver from a Project Telluride sample submitted by Dennis Fairbairn, P. Eng., on behalf of Dr. F. Joubin.

Yours sincerely,

LAKEFIELD RESEARCH OF CANADA LIMITED

D. M. Wyslouzil

D.M. Wyslouzil, P. Eng.,

Manager

DMW/dmm

c.c. Dr. F. Joubin (3)

*Call
Pl reach this
person - or his
today) capacity
for me*

Jan 17.

*I wish to discuss
with him an
Oct 1979 project
L.R. 2201*

*N.B.
ONE COPY
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BY F.R.I.*