M-COLDWATER-69(8)A.

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Rough planning of

Coal Mine Development

on Merritt Lease

B C, Canada

Vol. 1

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Sumicol Consultants Co., Ltd.

C O N T E N T S

1. Introduction

We carried the field survey on Merritt Lease, BC, Canada, in July 1969, and had obtained the conclusion in outline in our previous report (August 20, 1969; Coal Survey Report on Merritt Lease, BC, Canada). But we must survey moreover to put forward the plan of coal mine development.

Therefore, in previous report we recommended to do 3 drillings in No. 2, No. 3 and No. 4. Lately the drillings were completed and the core samples were sent to Japan.

In this report, we will look again at the coal reserve and quality in Merritt Lease from the result of 3 drillings, and devise the developing plan of this mining area, and attempt the trial calculation on the production cost.

2. Logging Data of No. 2, No. 3 and No. 4 Drill

At the 3 specified positions which had been appointed by us in our previous report, the 3 drillings have been done as follows, and shown in Fig. 1.

No. 2 Drill

Dip	90^o	
Lat.	7300	
Dep.	9100	
Elev.	2160 ft	
# 8	128.0 - 135.0 ft	2A
# 4	—	
# 5	399.5 - 405.0 ft	
# 1	543.5 - 576.0 ft	
Final depth	592.0 ft	

No. 3 Drill

Dip	90^o	
Lat.	5200	
Dep.	9700	
Elev.	2215 ft	
# 6	199.0 - 203.5 ft	
# 8	335.0 - 352.0 ft	3A
no name	389.0 - 393.0 ft	3B
# 4	490.0 - 500.0 ft	
no name	671.0 - 680.0 ft	
Final depth	691.0 ft	

No. 4 Drill

Dip	90^o
Lat.	6600
Dep.	11300
Elev.	2025 ft

# 6	165.0 - 186.0 ft
no name	194.0 - 194.5 ft
# 8	278.5 - 284.0 ft
no name	339.0 - 343.0 ft
# 4	462.0 - 471.0 ft
no name	550.0 - 556.0 ft
Final depth	564. 0 ft

3. Planning Area in This Report

In the previous report we divided the planning area into two areas of monoclinal low dipped A area and synclinal steep dipped B area. We concluded that it would be difficult to work the coal mine in B area for its complicated geological structure.

Consequently we will take A area for evaluation alone in this report.

4. Coal Seams

The coal seams confirmed by these 3 drills, No. 2, No. 3 and No. 4 have been correlated with each other as the following table according to the geological structure, distance and rock character of the interval beds of coal seams, and thickness of coal seams, etc.

Name of Coal Seam	Middlesboro Mine Gr. Th. in feet	No. 1 Drill			No. 2 Drill			No. 3 Drill			No. 4 Drill		
		Net Th in ft.	Gr. Th in ft.	Ratio %	Net Th	Gr. Th	Ratio	Net Th	Gr. Th	Ratio	Net Th	Gr. Th	Ratio
# 8	8.0				7.2	7.7	93.5	16.1	17.7	91.0	5.7	6.0	95.0
# 4	28.0	4.07	5.67	71.8				6.7	9.6	69.9	6.5	8.9	73.0
# 5	5.0	3.26	4.50	72.5	5.6	7.5	74.7	21.4	28.2	75.8			
# 1	30.0	5.88	6.23	94.4	19.8	22.4	88.4						

From the above mentioned table we have estimated the thickness of each coal seam as follows:

Name of Coal	Average Gross Thickness in feet (meter)	Ratio %	Average ~~Gross~~ Net Thickness in feet (meter)
# 8	10.5 (3.21)	92	9.67 (2.95)
# 4	9.25 (2.82)	72	6.65 (2.03)
# 5	17.8 (5.43)	73	13.00 (3.97)
# 1	22.4 (6,83)	93	20.80 (6.35)

5. Collecting of Coal Samples

Under consideration of mining condition we collected the coal samples from the cores of No. 2 No. 3 and No. 4 drill by the method shown in Fig. 2 - Fig. 4 and sampling data are shown as follows:

No. 2 Drill

Sample No.	Seam No.	Gross Th.(ft)	Net Th. (ft)	Ratio %
2 - A	# 8	3.91	3.41	87.3
2 - B	# 5	5.74	5.57	97.0
2 - C	# 1 Upper8	10.99	10.74	97.8
2 - D	# 1 Middle	6.01	4.09	68.1
2 - E	# 1 Lower	6.09	5.58	91.6

No. 3 Drill

Sample No.	Seam No.	Gross Th. (ft)	Net Th. (ft)	Ratio %
3 - A	# 8	18.31	16.66	90.9
3 - B	no name	5.74	5.17	89.9
3 - C	# 4	9.93	6.89	69.1
3 - D	# 5	17.18	14.08	81.9

No. 4 Drill

Sample No.	Seam No.	Gross Th (ft.)	Net Th. (ft)	Ratio %
4 - A	# 8	6.24	5.91	94.6
4 - B	# 4	9.28	6.70	72.3

6. Quality

On all samples the float sink test (Fig. 5 - Fig. 15), proximate analysis (Table 1), coke button index test (Table 1) and fluidity test (Fig. 16 - Fig. 26) have been conducted. However, the samples used for analysis, C. B. I and fluidity test, were skimmed as the floats by 1.4 specific gravity liquid mixed CCl_4 in benzine.

For reference 2 samples, 3-B and 3-D, have been treated through the microscopic analysis of coal petrography (Table 2).

8. Quantity of production

Mineable reserves in 1000 T	7,118
Scale of annual production in 1000 T	350
Working days	230 day
Numbers of shifts	2 shift/day

3rd Shift is prepared for mining machinery maintenance or other works.

Annual Production	clean coal	350,000 T
Daily Production in clean coal		1,520 T/day
Daily Production in raw coal		2,280 T/day
	Recovery ratio for washing	66.5%

Note:

Annual speed in level down

depth 2100 - 1000 = 1100 = 335 M

mineable reserves per 1.0 M depth 20,000 T

annual speed in level down 350,000 ÷ 20,000 = 17 M/year

depth between upper gangway and lower gangway 200 (60 M)

life of gangway 60 M ÷ 17 M/year = 3.5 years

9. Opening of the mine

According to the data obtained by the drillings, we established geological structure in the field, The structures we found are syncline, anticline and monocline. As both wings of synclinal structure belong to steep dipped seam, we were obliged to determine only the part of monoclinal structure as the basis for calculating mineable coal reserves. # 4 and # 1 coal seams can not be located from surface to 1800 Level, therefore, we should consider the working of mining plan as follows:

(1) upto 1800 Level # 8, # 5 to be worked

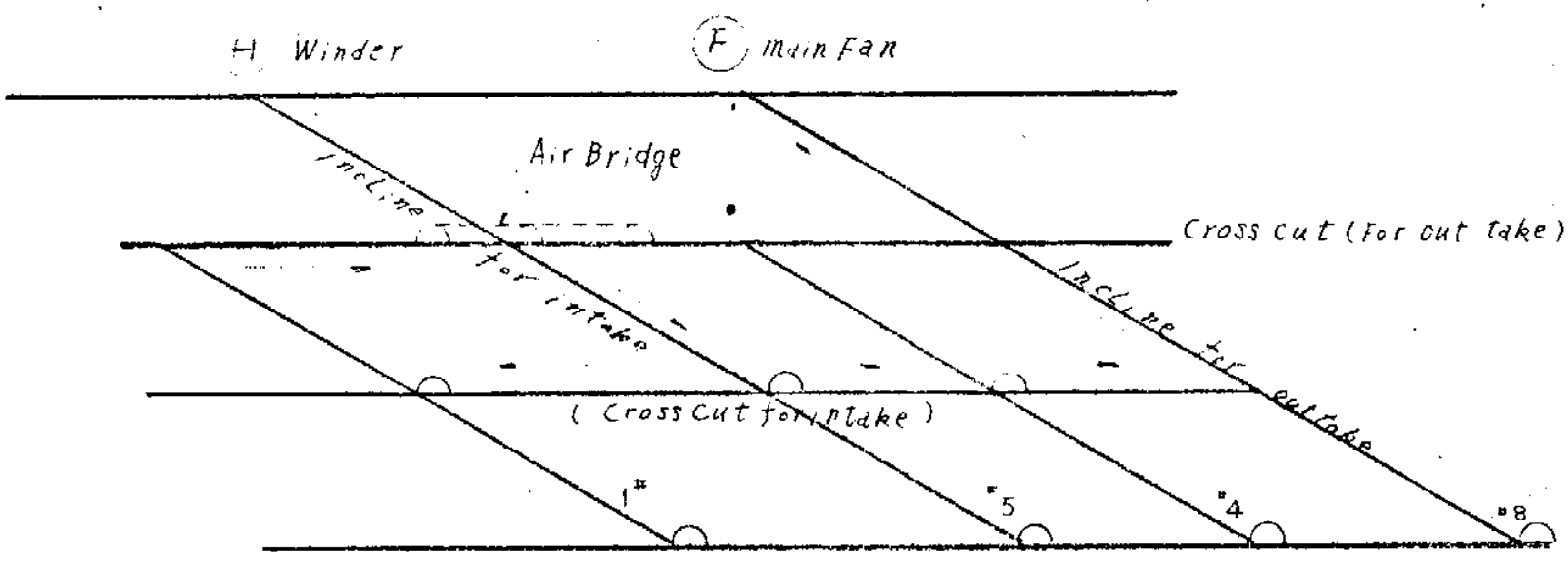
(2) below 1800 Level # 8, # 4, # 5, # 1 to be worked

It is necessary to construct 2 inclined shafts, one inclined shaft at # 5 being used as intake and mainbelt conveyor way, the other at # 8 as outtake way.

Each coal seam should be jointed by crosscut. The ventilation at # 1 seam should be prepared by air crossing (Air Bridge) on the outtake crosscut near-by # 5 seam.

The skeleton is generally shown as follows.

Skeleton:



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a) Length of main gangway

1) Inclined shaft

Inclined shaft for intake	1400 M
" " for outtake	1350 M

2) Crosscut

2100' Level	230 M	# 8 # 5
2000'	280	# 8 # 5
1800'	650	#1 # 5 # 4 # 8
1600'	600	do
1400'	670	do
1200'	570	do
1000'	450	# 1 # 5 # 4
Total	3,530 M	

Note: 1. Crosscut should be constructed in the middle of the strike length.

2. Intake and Outtake crosscut is kept ordinary depth of 200' (about 60 M)

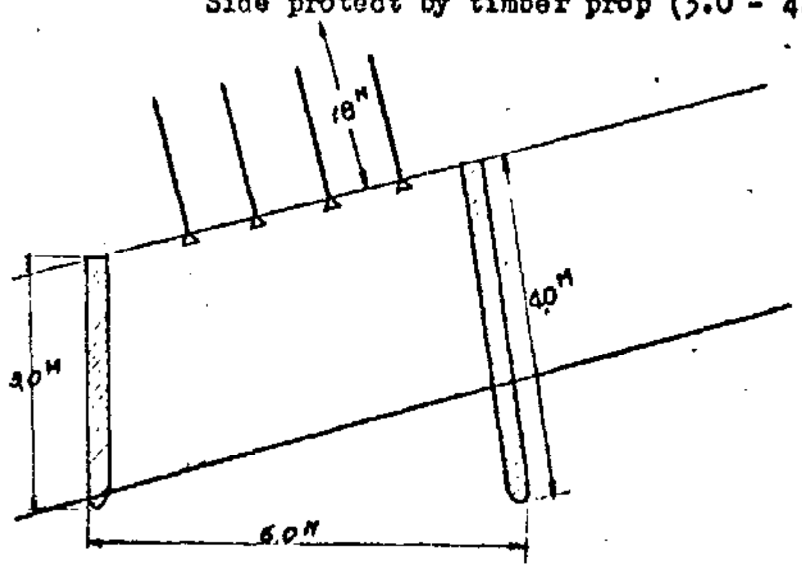
b) Sequence of working

1) upto 1800' # 8 # 5 coal seam

2) below 1800' # 8 # 4 # 5 # 1 coal seam

c) Mining specification of room and pillar method.

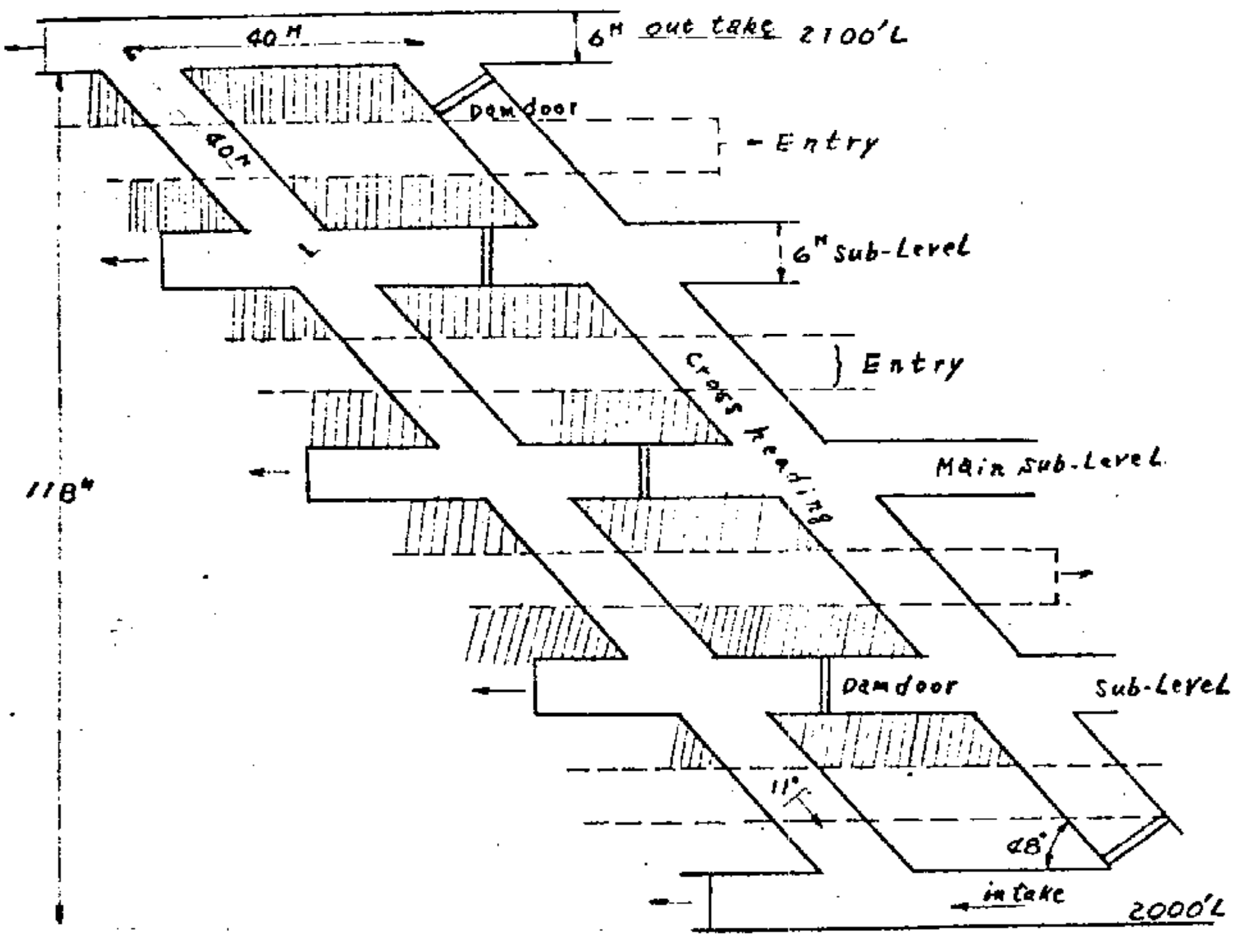
Block size	$\frac{3}{4}$ 40 M x 40 M (centre to centre)
Width Gangway	6.0 M
Interval support	1.5 M
Kinds of Support	Roof protect by roof belts (1.8 M x 4 Nos) Side protect by timber prop (3.0 - 4.0 M x 2 Nos)



10. Mining Method

a) Room and Pillar, one step mining by c ontinuous miner

b) Mining standard is as follows.



Notes: In this figure, mining method is shown as example at 2000 - 2100'.

After outtake and intake tunnels are constructed, 2 cross headings are held about 11° in appearance dip, these cross headings are located in 48° against the direction of true dip.

11. Continuous miner

Kinds of machine	Joy 8CM - 2A Roto Ripper
Nominal cutting efficiency	8 - 10 t/min (in raw coal)
Planning efficiency	7 t/min
Max cutting height	3.1 M

a) Production per meter (in Raw Coal)

Name of coal seam	height	width	advance		average specific gravity		condition factor	
# 4	2.8 x	6.0	x 1.0	x	1.43	x	0.9	= 21.6 t
# 8 # 5 # 1	3.1 x	6.0	x 1.0	x	1.43	x	0.9	= 24.0 t

Both # 5 and # 4 coal seams are also mined by one step mining.

b) Required Cutting time per support

# 4	21.6 t/m	x 1.5 M	= 32.4 t	(in Raw Coal)
# 8, # 5, # 1	24.0	x 1.5	= 36.0 t	(do)

Notes: As this coal measure is of tertiary age.
We presume to be a little difficulty on the roof controlling in practical mining.

Cutting time

# 4	32.4 t	÷ 7 t/min	=	4.7 min/per support
# 8, # 5, # 1	36.0 t	÷ 7 t/min	=	5.2

c) Expensed timejon roof bolting and supporting

Drilling speed	presumed 2 min/M	
Drilling time per hole	2 min/M x 1.8 M	= 3.6 min
Take-out		0.5 min
Preparing		1.0 min
Roof bolting		3.0 min
Total		8.1 min/1 roof bolt

As 2-roof bolter is used,

expenses time per support is as follows:

8.1 min x 4 nos ÷ 2 bolters = 16.2 min/1 support.

Besides, when the roof-bolter is working,

2 timber props must be set.

d) Total expensed time per one support

# 4	4.7 min	+ 16.2 min	+ 1 min (extra)	= 21.9 min
# 8, # 5, # 1	5.2	+ 16.2	+ 1 (do)	= 22.4

12. Efficiency of production on 1 unit continuous miner per shift

a) Actual working time 360 min

Working time on labour regulation	480 min
Going and coming in the mine	60 min
Lunch & rest	60 min

b) Efficiecy of production

		raw coal/shift	clean coal/shift	clean coal/shift
# 4	32.4 t x (360 ÷ 21.9)	= 533 t/shift	360 t/shift	720
# 8, # 5, # 1	36 t x (360 ÷ 22.4)	= 580	390 t/shift	780

13. Required numbers of continuous miner

1. One continuous miner must be operated at each coal seam and total 2 continuous miners must be worked. One continuous miner must have 2 shuttle cars. In this way, it will be more cost saving than employing other combinations.

2. On this basis one continuous miner can produce 720 - 780 t/day clean coal, so that it is possible to produce 1520 t/day by 2 unit miers.

14. Efficiency and numbers of Shuttle car

Type Joy 10sc6

a) Nominal

Capacity $295\ ft^3 \doteq 10.4\ M^3$

Tram speed 3.9 - 4.9 miles/hour = 6.4 - 7.8 KM/h = 100 - 130 m/min

Discharge time 45 sec

b) Planning

Average tram speed 80 M/min

Discharge time 1.5 min/trip

Loading time 1.5 min/trip

Capacity 9 t/trip

Range of operation by Shuttle car 200 M

Time per trip

(200 M x 2 ÷ 80 M/min) + 1.5 min + 1.5 min + 2 min (waiting time etc.) = 10 min/trip

Required numbers of trip per one support (per 1.5 M)

4 32.4 t ÷ 9 t ≐ 3.6 trips

8, # 5, # 1 36 t ÷ 9 t = 4 trips

Required transporting time per one support (1.5 M)

# 4	10 min x 3.6 trip	= 36 min	36÷21.9=1.7 Nos
# 8, # 5, # 1	10 4.0	= 40	40÷22.4=1.8 Nos

Required numbers of shuttle cars

According to the above mentioned calculation, it is necessary to use 2 shuttle cars per continuous miner. In order to work in 2 coal seams.

2 Nos x 2 = 4 Nos

15. Required numbers of main underground machinery

Item / Machinery	Specification	for use	for common (NOS)	for spare (NOS)	Total
Continuous miner	Joy 8CM-2A	Mining Drifting	2		2
Shuttle car	Joy 10SC6	do	4		4
Roof bolters		do	4		4
Ratio feeder		do	2	1	3
Diesel shuttle car		do	2		2
Loader		Digging for crossout	1		1
Pump (main)	1.5 m^3/min 150KW with pipe line	Dranage	2	1	3
Pump (local)	0.5 m^3/min	do	2	1	3
Portable compressor		Drilling	2	1	3
Belt Conveyor (main)	750 m/m	Incline crosscut	700 M		700
(branch)	"	Coal getting	2400 M		2400 M
Local fan	5.5 KW	Local ventilation	2	1	3

Notes: Main ventilator and winders are written in other table.

16. Life of mine

The mineable reserves are classified due to the distribution of coal seams as follows:

level	Name of coal seam	Mineable reserves (1000 t)	Ratio of M.R. (%)
Above 1800'	No. 8	596	8.4
	No. 5	540	7.6
	Total	1,136	16.0
Below 1800'	No. 8	1,011	14.2
	No. 4	1,619	22.6
	No. 5	1,580	22.2
	No. 1	1,782	25.0
	Total	5,982	84.0
Grand total		7,118	100

Life of mine

Above 1800'	1,136 ÷ 350 = 3.3 years	
Below 1800'	5,982 ÷ 350 = 17	
Total	20.3 = 20 years	

7. Members of underground men (including Foreman, etc.)

item / shift / member underground	Seam No.A				Seam No.B				Common				Total			
	1	2	3	total	1	2	3	total	1	2	3	total	1	2	3	total
Shot ligher	1	1		2	1	1		2					2	2		4
Driver, helper for Continuous miner	2	2		4	2	2		4					4	4		8
Driver, helper for Shuttle car	4	4		8	4	4		8					8	8		16
Roof bolter	3	3		6	3	3		6					6	6		12
Watchman for belt conveyor	1			.1		1		1	1	1		2	2	2		4
Mechanician	1			1		1		1					1	1		2
Electrician		1		1	1			1					1	1		2
Others	3	2		5	3	2		5	4		4	8	10	4	4	18
Foreman									1			1	1			1
Chief F reman									1			1	1			1
Total	15	13		28	14	14		28	11	1	4	16	40	28	4	72

Notes: Others are meaning of driver, helper of diesel shuttle cars, ventilator men, carpenter, piping men, etc.

Efficiency per underground man

Raw Coal 2,280 ÷ 72 = 31.6 t/head/day

Clean Coal 1,520 ÷ 72 = 21.4 t/head/day

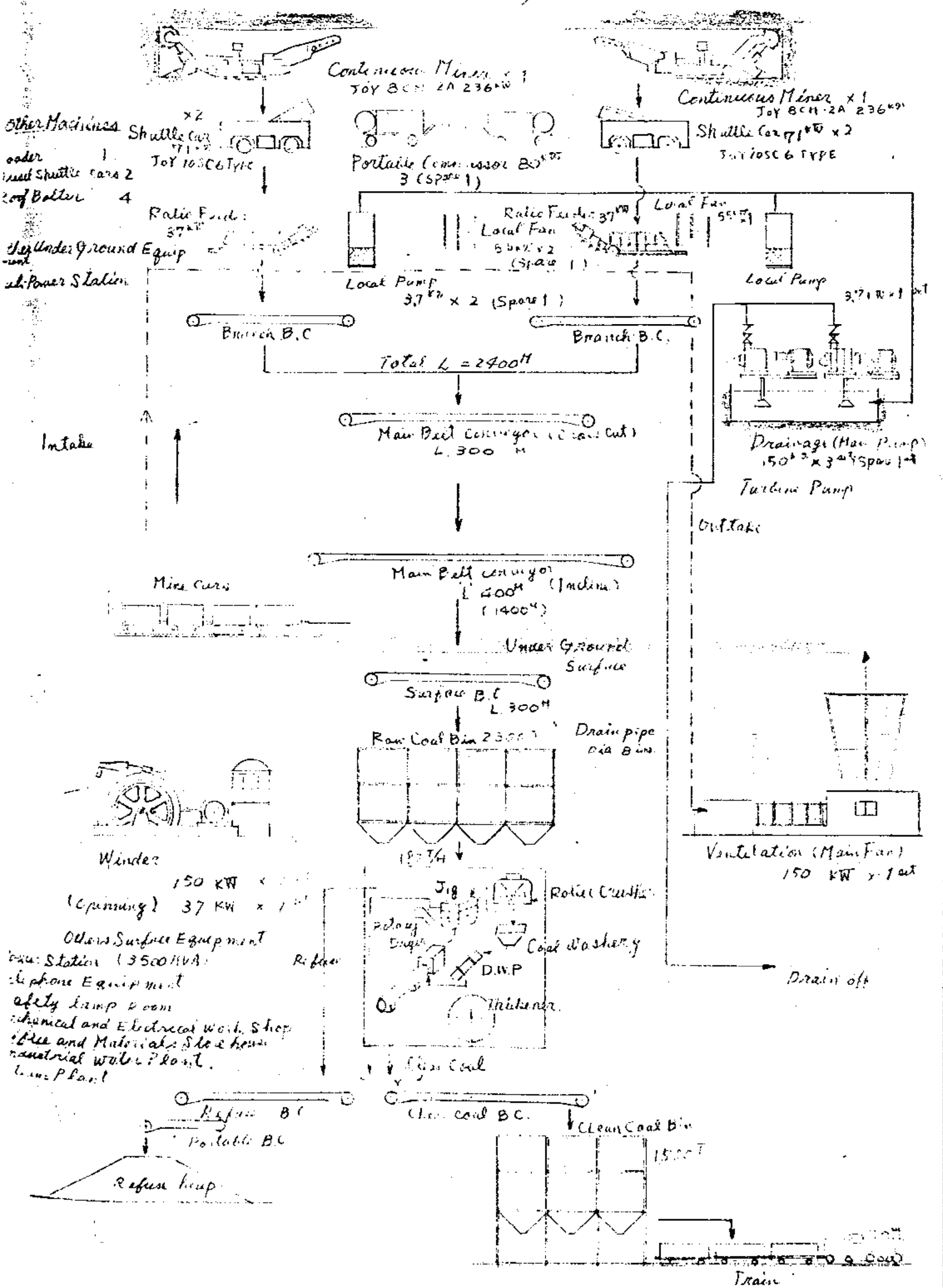
Efficiency per total member in this mine.

		underground men		surface men	
Raw Coal	2,280 ÷ (	72	+	42	) = 20 t/head/day
Clean Coal	1,520 ÷ (	72	+	42	) = 13.4 t/head/day

(including superintendent)

Extension of belt conveyor, shifting of ratio feeder and underground sub-station are worked in overtime work after normal work finished.

18. Production System



19. Mechanical Equipment

Items	Description	Specification
Haulage	Belt Conveyor (Underground)	Branch Belt Conveyor. Width: 750mm Speed: 90m/min, Total Length: 2400m Capacity: 175t/h Main Belt Conveyor (Crosscut) Width: 750mm, Speed: 120m/min Total Length: 300m, Q:200t/h Main Belt Conveyor (Inclination) Width: 750mm, Speed: 120m/min Capacity: 200t/h
	Winder 150KW	Slope with Inclination: 16°, Length: 1400m Winding Speed: 120m/min, Pull: 4800Kg Rope dia: 24mm, Room: 66m^2
	Winder 37KW	Winding Speed: 90m/min, Pull: 2600Kg Rope dia: 16mm
	Belt Conveyor (Surface)	Main Belt Conveyor, Width: 750mm Speed: 120m/min, Capacity: 200t/h
Drainage	Main Pump (150KW × 3)	1.5m^3/min × 400mH × 3 Turbin Pumps with Automatic Control Equipment (Spare 1)
	Drain Pipe	8 in Dia, Pipe lines underground 1700m surface 300m
	Local Pump (3.7KW × 3)	0.5m^3/min × 20mH × 3 Suction Pump (Spare 1)
Ventilation	Main Fan	4000m^3/min × 150mm Aq × 150KW Axial Flow Fan, Fan Room: 66m^2 with fire resistant construction
	Underground Local Fan (5.5KW × 3)	200m^3/min × 80mm Aq × dia 630mm Propeller Fan
Others	Telephone Equipment	30 lines
	Mechanical and Electrical Workshop	Lathe, Milling Machine, Electric Welder Drilling Machine, Travelling Crane and Room
	Safety Lamp Room9	Safety Lamp: 100 set
	Office and Materials Store house	Office: 100m^2 with accommodation of 30 persons Materials Store house: 100m^2
	Boiler Room	2500Kg/H × 5Kg/cm^2 Package Boiler, 10m^3/H Water Softer, Steam Header, Steam Pipelines: 6 in Dia × 500m, 4 in Dia × 500m

20. Installed Capacity

	Items	Unit Capacity	Number	Total Capacity	Remarks
Face	Continuous miner Joy 8CM-2A	263KW (350HP)	2	526KW	
	Shuttle car Joy 10SC-6	71KW (95HP)	4	284	
	Roof bolter	60KW (80HP)	4	240	
	Ratio Feeder	37KW (50HP)	2 + 1	74	1 - spare
	Loader	93KW (124HP)	1	93	
	Portable compressor	80KW (106HP)	2 + 1	160	1 - spare
	Lighting, Etc.	10KW	2	20	
	Branch belt conveyor	15KW	10	150	
	Local fan	5.5KW	2 + 1	11	1 - spare
	Total			1,558KW	
Under-ground (exclude face)	Main belt conveyor	15KW	5	75	
	Main Pump	150KW	2 + 1	300	1 - spare
	Local Pump	3.7KW	2 + 1	7.4	1 - spare
	Small winder	37KW	1	37	
	Lighting, etc.	10KW	2	20	
	Total			440KW	
Pitmouth	Belt conveyor(Incline)	300KW	1	300	
	Main ventilation fan	150KW	1	150	
	Main winder (Incline)	150KW	1	150	
	Lighting, etc.	20KW	3	60	
	Total			660KW	
Surface	Coal preparation			1,800	
	Steam boiler			50	
	Water supply			50	
	Office, Workshop,etc.			100	
	Total			2,000KW	
	Grand Total			4,658 - 4,700KW	

21. Planning of Washery

1. Basic data

(1) Average Quality of Clean Coal

The average quality of float at specific gravity 1.4 for 11 samples

Proximate analysis		mean
Inherent moisture	2.0 - 4.0 %	2.94 %
Ash	6.1 - 9.0 "	7.54 "
Volatile matter	34.2 - 39.5 "	37.3 "
Fixed Carbon	50.2 - 55.9 "	52.2 "
Calorific Value	7,170 - 7,600 Kcal/Kg	7,350 Kcal/Kg
Calorific Value (a.d.f.)	8,090 - 8,370 "	8,200 "
Fuel ratio	1.3 - 1.6	1.4
C. B. I	1 ½ - 7 ½	3.2
Total sulphur	0.49 - 0.78	0.66
Max. fluidity	2.1 - 478	
Max. Temp. of fluidity	417 - 442°C	430°C

(2) Quality of Raw Coal

Specific gravity	1.33 - 1.59	1.43
Float recovery at specific gravity 1.4	37.8 - 81.7 %	65.3 %
Grain size distribution	undecided	

(3) Production

Annual production of clean coal	350,000 ton/year
Theoretical recovery	70 %
Efficiency of coal washing	95 %
Actual recovery	66.5 %
Annual production of raw coal	527,000 ton/year

(4) Capacity of Washery

Days operated	230 day/year
Shifts operated	2 shift/day
Daily production of raw coal	mean 2,280 T/D
" " clean coal	" 1,520 T/D

(5) Washability Curve

This plan is based on the Washability Curve 3 - D.

2. Summary

(1) Grain size distribution of raw coal

The grain size distribution of raw coal is supposed as follows:

+ 65 m/m	10%	65 - 30 m/m	15%	30 - 10 m/m	35%
10 - 6 m/m	10%	6 m/m	30%		

(2) Recovery of clean coal

Ash content of washed coal	8.6%
Theoretical recovery	70%
Actual recovery	66.5%

(3) Middling coal

By the employment of rewashing machine, the production of middling coal is possible. However, in our imagination there is no demand for middling coal. The rewashing machine is not included in this planning.

(4) Product

As the average quality of raw coal corresponds nearly to sample 3 - D, We used the washability curve of sample 3 - D.

Products:

	Ash %	Wt. %	Cap. T/H	Product T/Y	Size m/m
Clean Coal	8.6	66.5	119.6	350,000	-30
Refuse	51	33.5	60.4	177,000	—
Total	22.8	100	180	527,000	—

(5) Drying

The clean coal is dried for the prevention of freezing in the winter: the grain size of dried coal is minus 6m/m.- the coal of size 6 - 30m/m, without drying, are blended into the coal of size -6m/m at the clean coal bin.

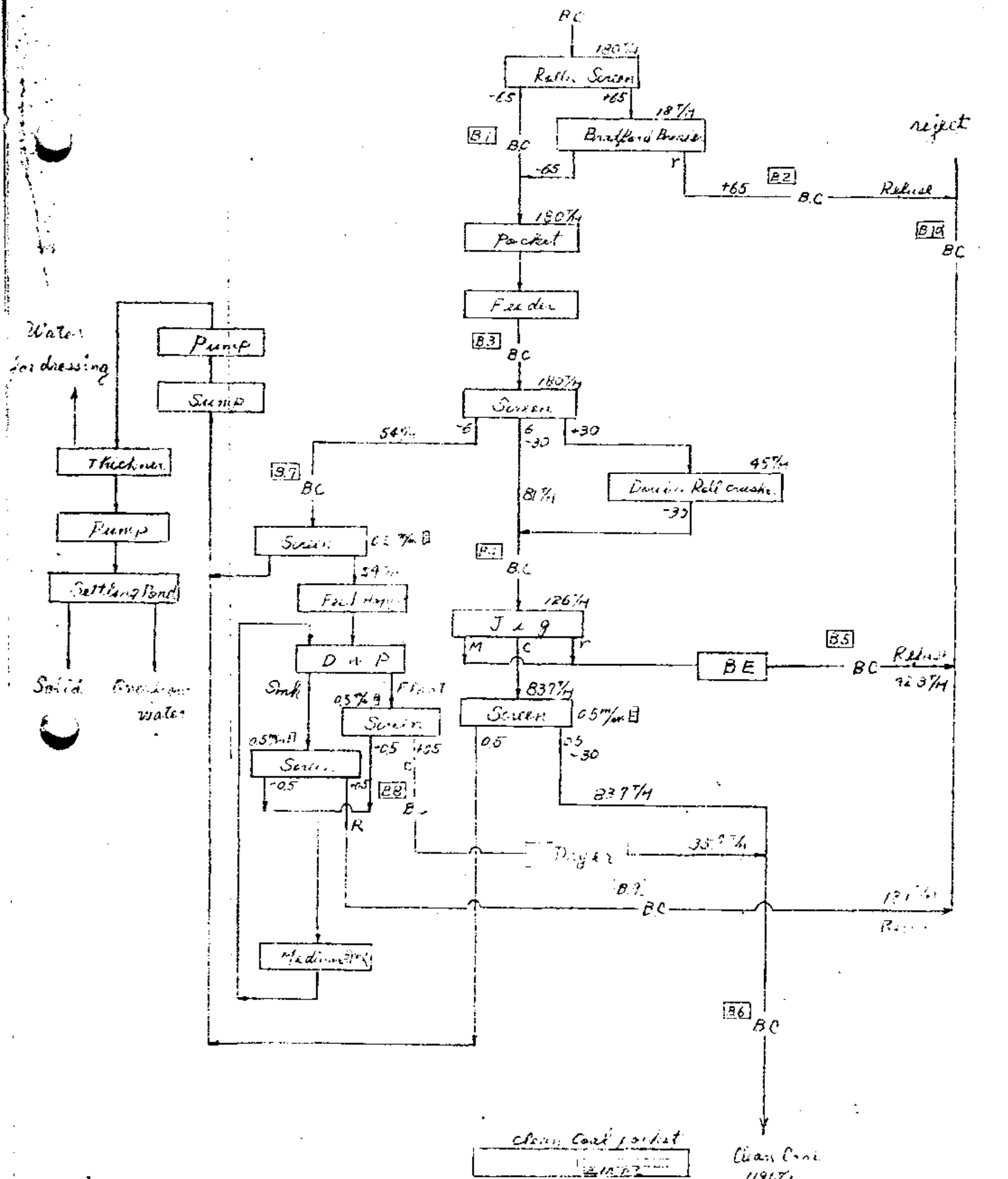
(a) Quantity of dry coal

$$350,000 \text{ ton/year} \times \frac{54 \text{ T/H}}{180 \text{ T/H}} \times \frac{5 \text{ months}}{12 \text{ months}} = 43,800 \text{ tpn/year}$$

(b) Drying condition

Moisture before drying	15%
" after "	4%

22. Flow-Sheet of washing



Grain size of raw coal

+65	10%
30 ~ 65	15 〃
10 ~ 30	35 〃
6 ~ 10	10 〃
-6	30 〃
	100%

Product

	Ash%		T/H
Clean Coal	8.6	66.5	119.6
Refuse	51.9	33.5	60.4
計	22.8%	100	180

23. Summary of Investment and Depreciation Cost

Items	Description	Number	Price	Life time	Annual repayment	Cost per ton
Coal getting			US$	yrs.	r 0.09 US$	US$
Continuous miner	Joy 8CM-2A	2	333,400	5	85,710	
Shuttle car	Joy 10SC6	4	222,400	5	57,180	
Roof bolter		4	2,400	5	620	
Ratio feeder		3	50,000	5	12,850	
Diesel shuttle car		2	111,200	5	28,590	
Loader		1	83,300	5	21,420	
Pump (main)	1.5m /min, 150 KW with pipe line	3	83,300	5	21,420	
" (local)	0.5m /min, 3.7 KW	3	6,900	5	1,770	
Portable compressor		3	16,800	7	3,340	
Belt conveyor(main)	Incline 400M, width: 750m/m, crosscut 300" width: 750m/m	700M	194,600	8	35,160	
" (branch)	"	2400M	134,400 532,800	2 8	76,400 96,260	
Local fan	5.5KW	3	2,800	5	720	
Air duct	30"	3000M	18,300	2	10,400	
Total			1,792,600		451,840	1.291
Mechanical & Elictrical part						
Water supply	Water for mine operation 3 ton/min	1	11,100	20	1,220	
"	Water for drinking	1	25,000	20	2,740	
Steam boiler	5 ton/hr	1	111,100	20	12,170	
Main ventilator	150 KW	1	41,700	10	6,500	
Wi[illegible]r	150 KW 37 KW	1 1	61,100	7	12,140	

Items	Description	Number	Price	Life time	Annual repayment	Cost per ton
Substation	3,500 KVA	1	66,700	20	7,310	
Underground substation			55,600	10	8,660	
Surface power distribution			33,300	20	3,650	
Underground power cable			63,900	10	9,960	
Telephone equipment	30 circuits		13,900	10	2,170	
Safety mine lamp	100		6,900	10	1,080	
Sprinkling pipe line	3", 3000M		22,200	10	3,460	
Mechanical & electrical workshop		1	111,100	15	13,780	
Total			623,600		84,840	0.242
<u>Coal preparation</u>						
Washery	Washery, refuse dump		1,061,100	10	165,340	
Belt conveyor	From pit mount to washery, width:750mm	300M	83,300	15	10,330	
Railway-yard		1000M	55,600	15	6,900	
Coal drying equipment			277,800	15	34,460	
Total			1,477,800		217,030	0.620
<u>Civil engineering & structure</u>						
Road way		3KM	50,000	15	6,200	
Structure	Office, garage, storehouse, magazine		166,700	15	20,680	
Surface haulage	1-Diesel locomotive Truck 2 KM		22,200	15	2,750	
Total			238,900		29,630	0.085

Items	Description	Number	Price	Life time	Annual repayment	Cost per ton
<u>Others</u>						
Design and survey		,	555,600	20	60,870	
Total			555,600		60,870	
<u>Drifting</u>						
Inclined shafts (intake and outtake)	139 US$/M	length 2,750M	382,250	20	41,900	
Cross cut	166 "	3,530M	585,980	5	150,600	
Total			968,230		192,500	0.550
Grand Total			5,656,730		1,036,710	2.962

24. Summary of Running costs

Annual production = 350,000 ton

	Costs	Remarks
Coal getting	US$/ton	
Wages	1.32	
Material	0.85	
Depreciation	1.29	Interest: 9 per cent
Drifting	0.55	
Total	4.01	
Surface		
Wages	0.50	28 persons
Material	0.10	
Depreciation	0.50	Interest: 9 per cent
Repair expenses	0.09	
Fuel	0.06	Steam boiler
Total	1.25	
Coal preparation		
Wages	0.23	14 persons
Material	0.12	
Other expenses	0.06	
Depreciation	0.62	Interest: 9 per cent
Fuel	0.06	Coal drying in winter season
Total	1.09	
Power	0.57	
Total	0.57	
Grand Total	6.92	

25. Labour costs

Items	Wages	Number	Expenses US$/Y	Remarks
Underground	US$			
Coal getting-1st shift	23.32	24	128,726	230 days/year
2nd shift	23.83	20	109,618	"
Mechanician 1st shift	23.69	2	10,896	"
2nd shift	24.20	2	11,132	"
Others 1st shift	23.32	10	53,636	"
2nd shift	23.83	4	21,924	"
3rd shift	24.13	4	22,200	"
Overtime pay	24.13	(6)	33,299	"
Shot lighter	9,170/year	4	36,680	
Foreman	13,750/year	1	13,750	
Chief foreman	18,330/year	1	18,330	
Total		72	460,192	
Surface				
Winding man	5,270/year	2	10,540	
Main conv. operator	"	2	10,540	
" . watchman	"	2	10,540	
Main Fan watchman	"	0	0	Tele-control
Fitler	"	6	31,620	
Electrician	"	3	15,810	
Lamp man8	"	1	5,270	
Stoker	"	1	5,270	
Substation	"	2	10,540	
Coal Dresser	"	13	68,510	
Mine surveyor	"	2	10,540	
Clerk, Mining	"	1	5,270	
Store keeper	"	1	5,270	
Accountant, General Affairs	"	1	5,270	
Others	"	1	5,270	
Foreman, Mechanic	11,000/year	1	11,000	
" General Affairs	"	1	11,000	
" Coal dressing	"	1	11,000	
Superintendent	22,920	1	22,920	
Total		42	256,180	
Grand Total		114	716,372	

26. Expenses of materials (underground)

Tonnage production per support in digging

No. of seam	Raw Coal	Clean Coal
# 4	32.4 t	21.6 t
# 8, # 5, # 1	36	24

a) Expenses of materials fper support

Roof bolt	6' x 1"	1.44 US$ x 4 +=	5.76 US$
Steel wedge		0.183 x 4 =	0.73
Plate washer	4" x 4"	0.245 x 4 =	0.98
Total			7.47

Expenses per tonnage of Clean Coal

# 4	7.47 US$ ÷ 21.6t = 0.35 US$/t
# 8, # 5, # 1	7.47 ÷ 24 t = 0.31

b) Timber

3.0 M x 0.15 Mϕ	1 Nos	0.92 US$
4.0 x 0.15 Mϕ	1 Nos	1.53

Expenses per tonnage of Clean Coal

# 4	(0.92 + 1.53) US$ ÷ 21.6 t = 0.11 US$/t
# 8, # 5, # 1	(0.92 + 1.53) ÷ 24 5t = 0.10

c)	Wodden board	0.05 US$/t
d)	Canvas for wall brattice, air brattice, etc.	0.05 US$/t
e)	Pipes, hose	0.05 US$/t
f)	Spare parts for continuous miner, shuttle cars	0.12 US$/t
g)	Bits	0.06 US$/t
h)	Diesel oil, lubricant, other oils	0.04 US$/t

Expenses of materials per each coal seam are as follows:

# 4	0.83 $ + 0.06 $ (etc.) = 0.89 US$
# 8, # 5, # 1	0.78 + 0.05 = 0.83

Average $\frac{0.89 \times 1 + 0.83 \times 3}{4} = 0.85$ US$/t

27. Calculation of annual power consumption and power cost

Items	Description	Remarks
Installed capacity	4,700 KW	
Demand factor	70 %	
Power factor	85%	
Diversity factor	110 %	
Capacity of Substation	3,500 KVA	
Load factor	50 %	
Annual Power Consumption	4,700 × 0.7 × 24 × 365 × 0.5 = 14,410,200 KWH	
Unit Price of Power	0.0139 US$/KWH	Supposition
Annual Power Charge	14,410,200 × 0.0139 = 200,302 US$/y	
KWH/ton	14,410,200/350,000 = 41.2 KWH/ton	
Power Cost	200,302/350,000 = 0.572 US$/ton	

28. The problematical points in this report

a) From the data available, coal seams can not be correlated with each other to our satisfaction. If accurate correlation could be made, we will be possible to confirm number of mineable coal seams, the degree of expansion or reduction of coal thickness, and the more detailed geological structure.

b) If details about coal seams are obtained, we will expect the suitable selection and improvement of mining method, the possibility of selective mining, the stability of quality and he increasing of coal reserve.

c) The hardness of coal and rock, and the condition of roof and floor of coal seam are not clear. By means of confirmation of the, awe will be able to elevate the mining efficiency.

d) Provided that the mining method is improved and the mining efficiency is elevated, we will be able to increase the coal production and improve the mining recovery by the same equipment and the same number of men.

e) If the selective mining is possible, we will be able to improve the recovery for coal washing.

f) The survey of the glacial moraine is not sufficient. The gush water from the moraine and the tertiary coal measure will have the important effects upon the method of inclined shaft opening and the pumping equipment. Therefore, we must survey on the quantity of gush water.

g) The coal sampled from No.4 Drill have good quality, compared with those from other drills, in coking and fluid properties. Consequently, we will be possible to grasp the reserve of good quality coal by surveying in adjacent area.

h) The grain size distribution of raw coal is not clear. If it becomes clear, we will be possible to design the most suitable washing plant.

i) The treatment of slime coal and the use of middling coal are not clear.

j) Labour circumstances in Merrit area are not clear.

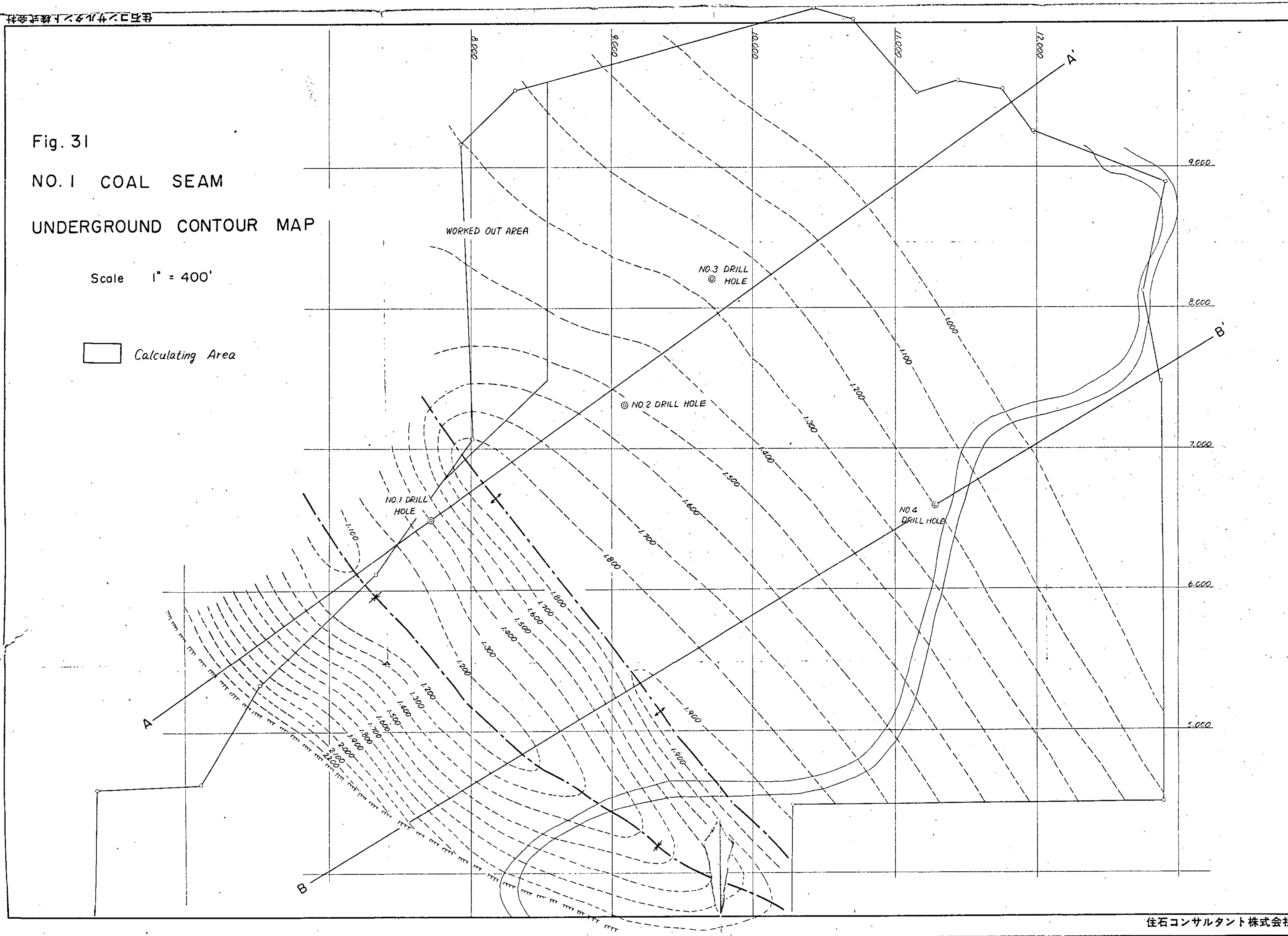
k) The expense of inland freight, production taxes, insurances, royalty, the expense of general management, and the profit margin are not summed up in this production cost.

Fig. 31

NO. I COAL SEAM

UNDERGROUND CONTOUR MAP

Scale 1" = 400'



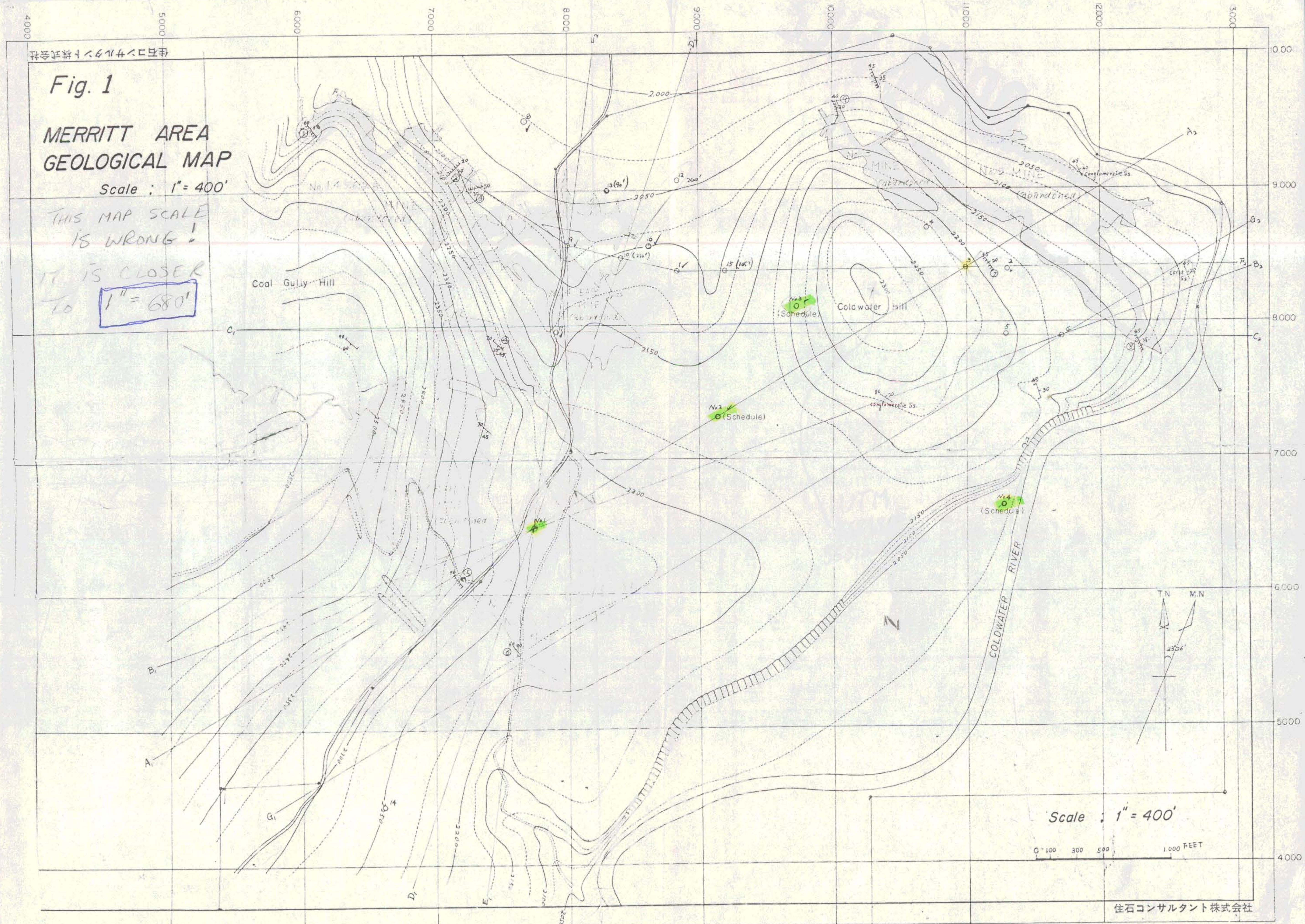


Fig. 1
MERRITT AREA
GEOLOGICAL MAP
Scale : 1" = 400'
THIS MAP SCALE IS WRONG!
IT IS CLOSER TO 1" = 680'
Coal Gully Hill
Coldwater Hill
No.1
No.2 (Schedule)
No.3 (Schedule)
No.4 (Schedule)
No.2 MINE (abandoned)
COLDWATER RIVER
conglomeratic Ss.
T.N
M.N
Scale : 1" = 400'
0 100 300 500 1,000 FEET
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
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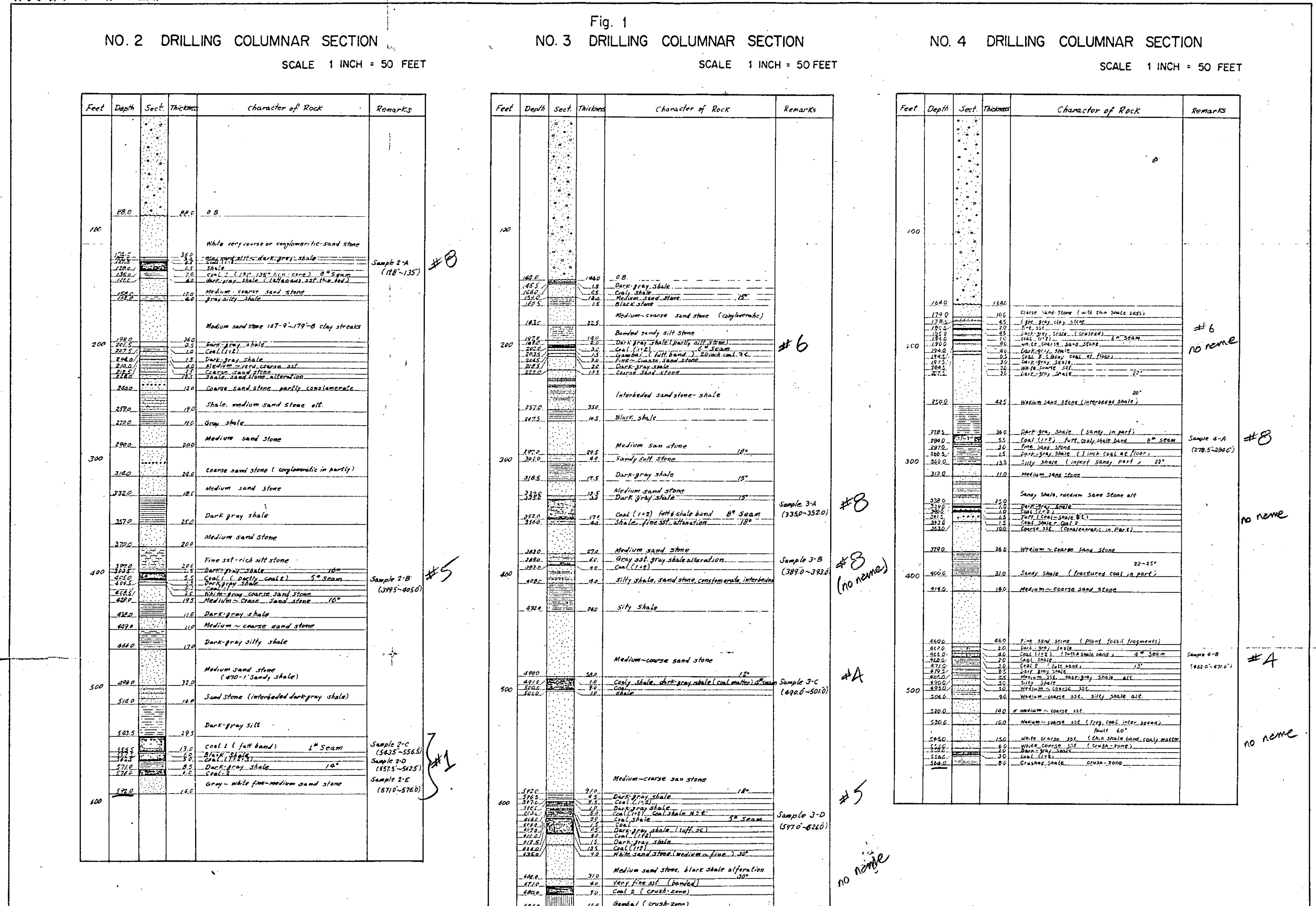

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FIG. 2 COLUMNAR SECTION OF COAL SAMPLED FROM NO.2 DRILLING CORE SCALE 1 INCH = 1 FEET

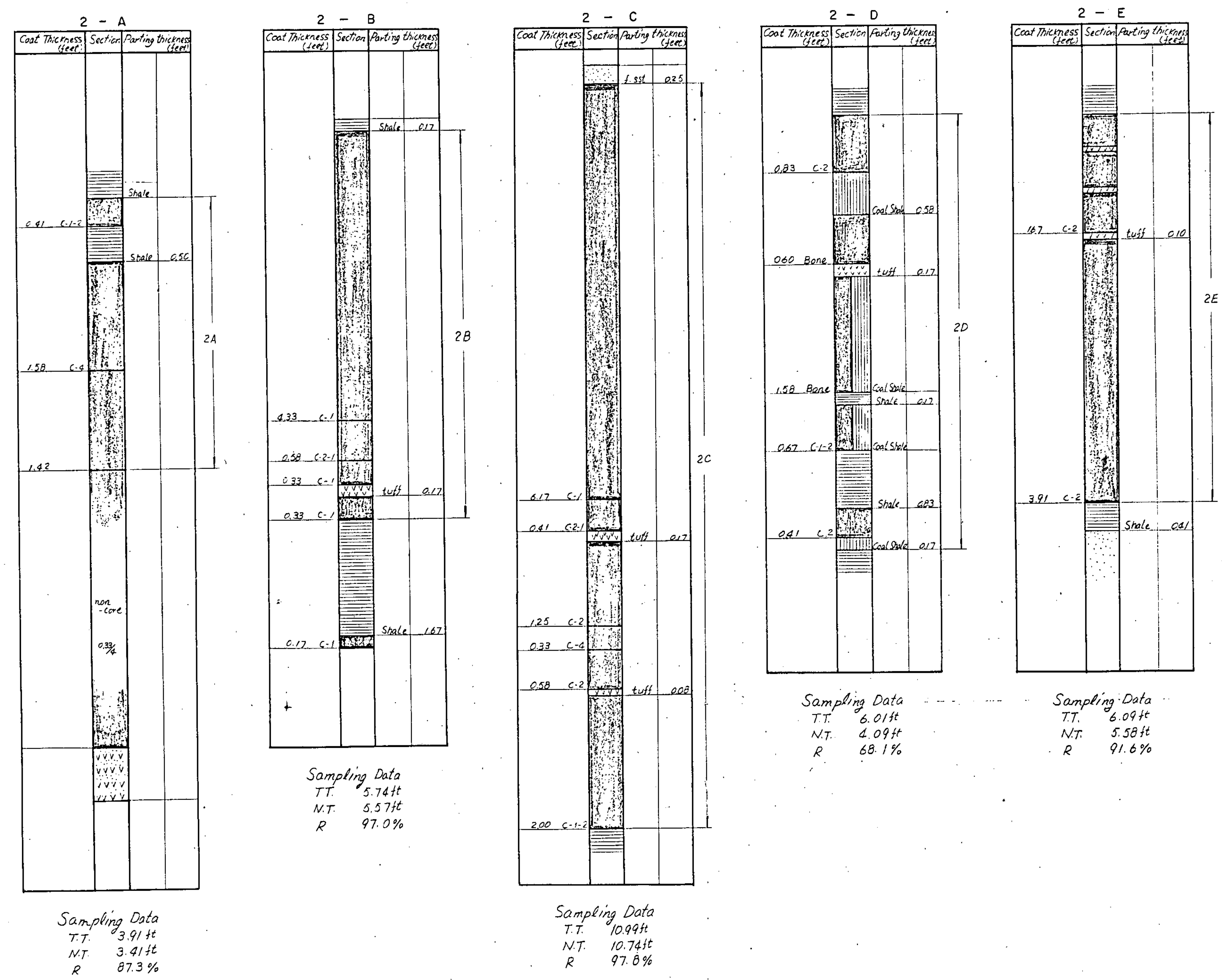


FIG. 3 COLUMNAR SECTION OF COAL SAMPLED FROM NO.3 DRILLING CORE SCALE 1 INCH = 1 FEET

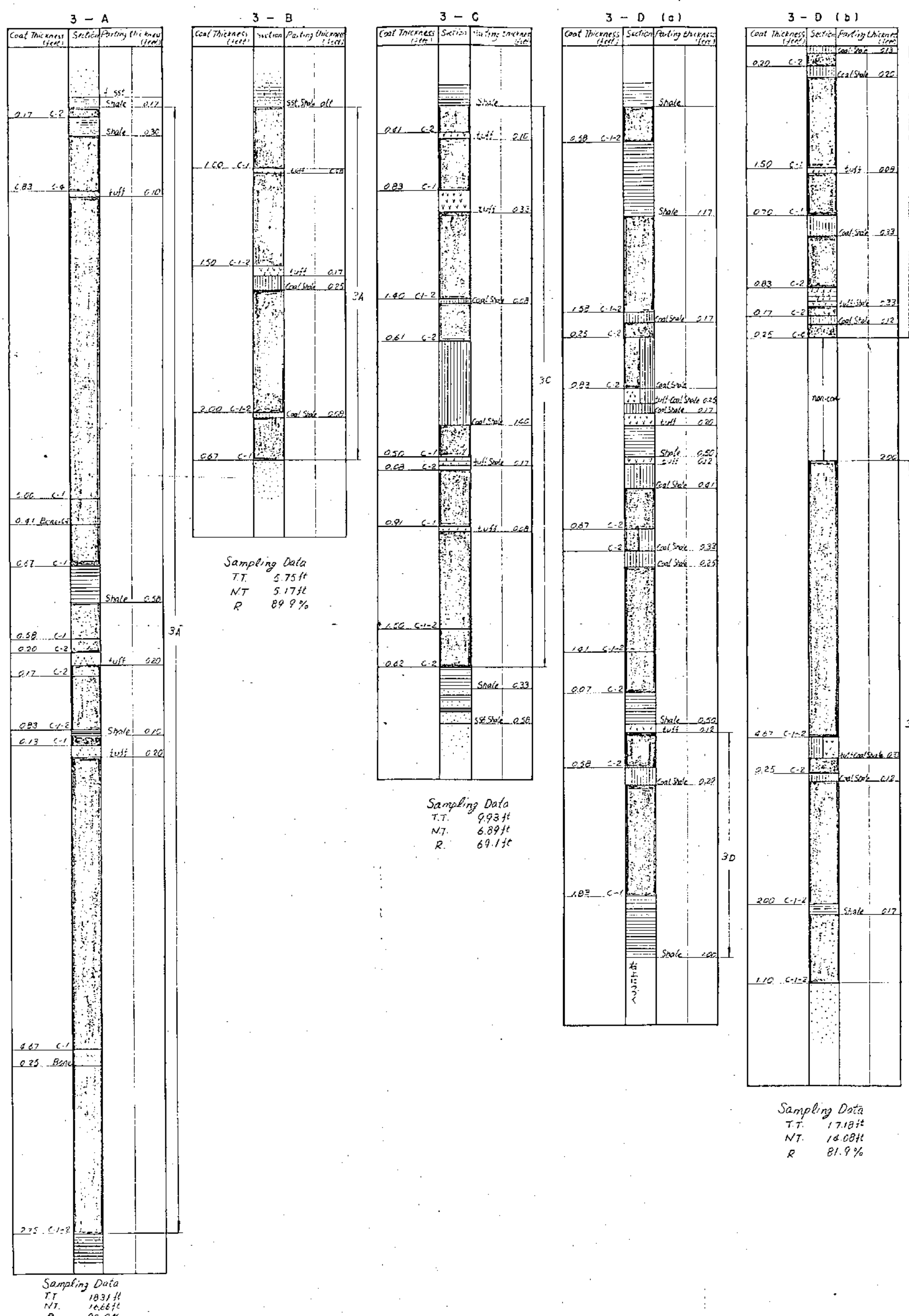
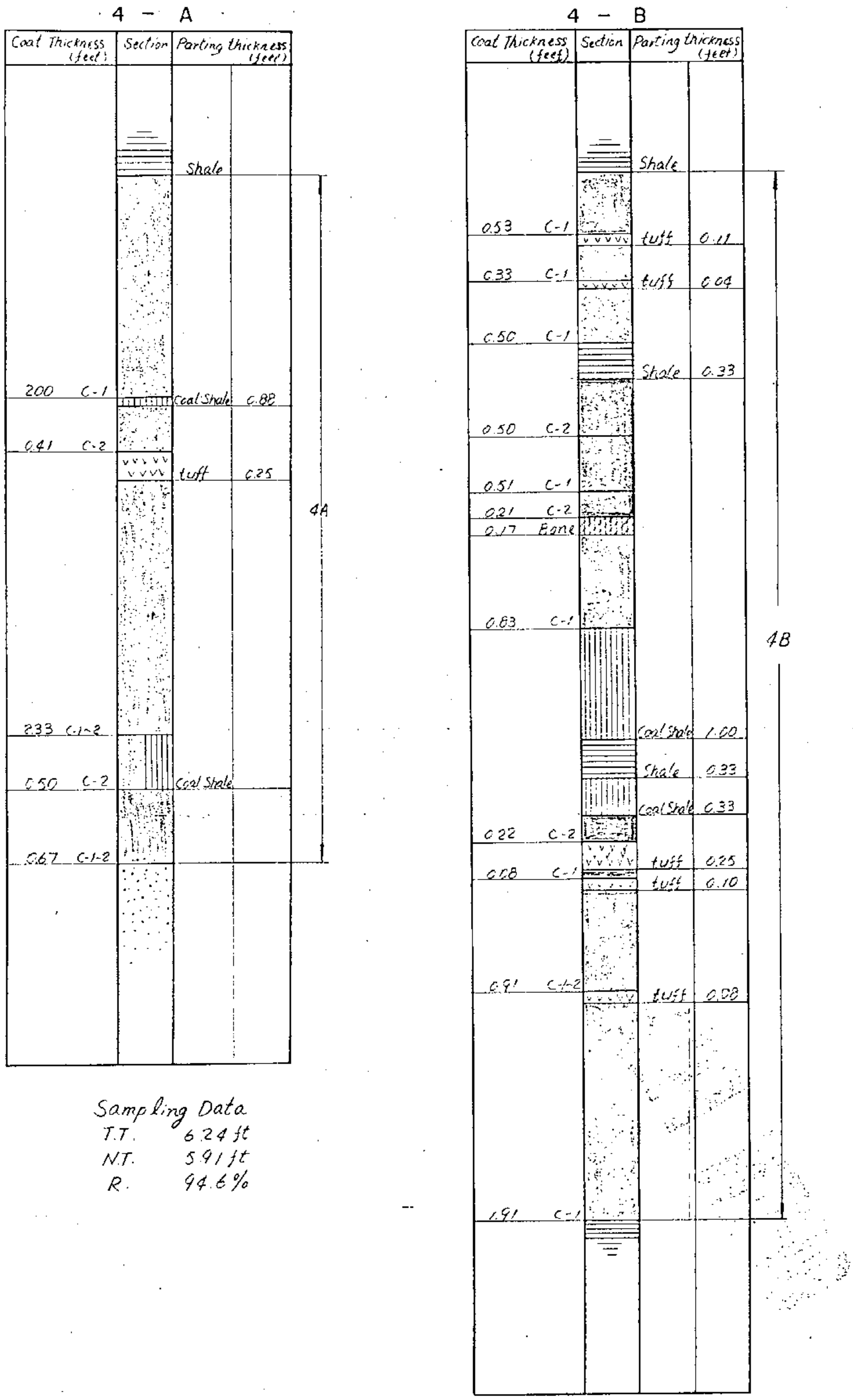


FIG. 4 COLUMNAR SECTION OF COAL SAMPLED FROM NO.4 DRILLING CORE

SCALE 1 INCH = 1 FEET



Sampling Data (4 - A)
T.T. 6.24 ft
N.T. 5.91 ft
R. 94.6%

Sampling Data (4 - B)
T.T. 9.28 ft
N.T. 6.70 ft
R 72.3%

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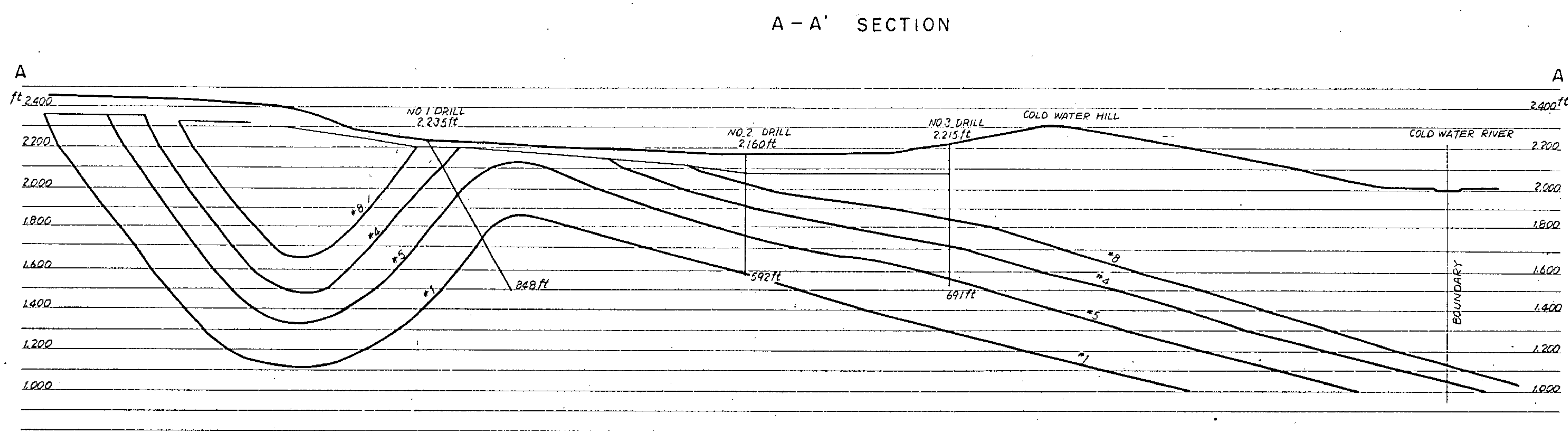
Fig. 27 GEOLOGICAL SECTION SE TO NW

Scale 1" = 400'



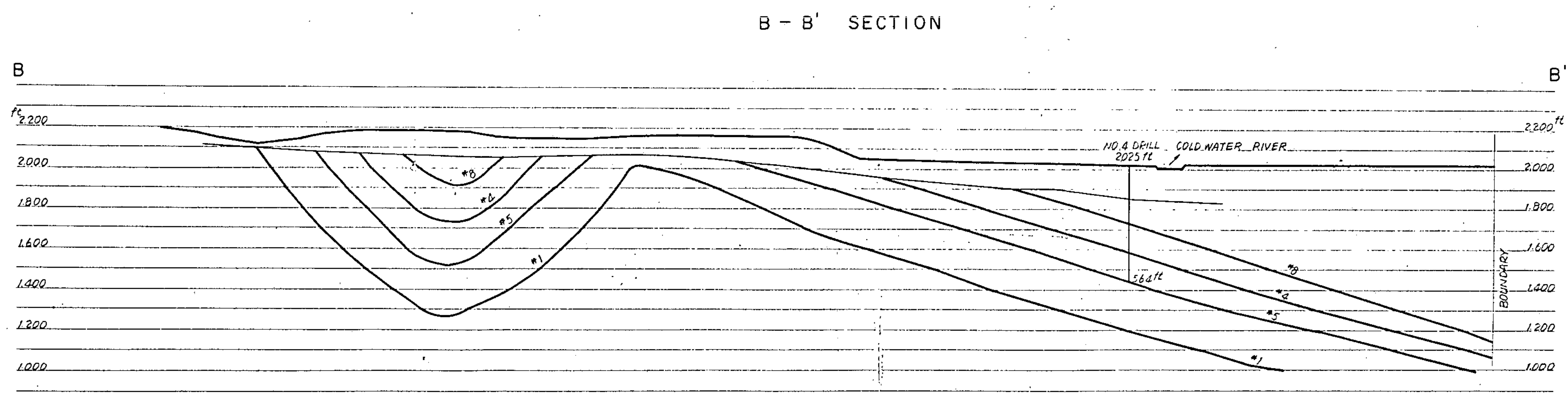


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Fig. 28

NO.8 COAL SEAM

UNDERGROUND CONTOUR MAP

Scale 1" = 400'

▭ Calculating Area

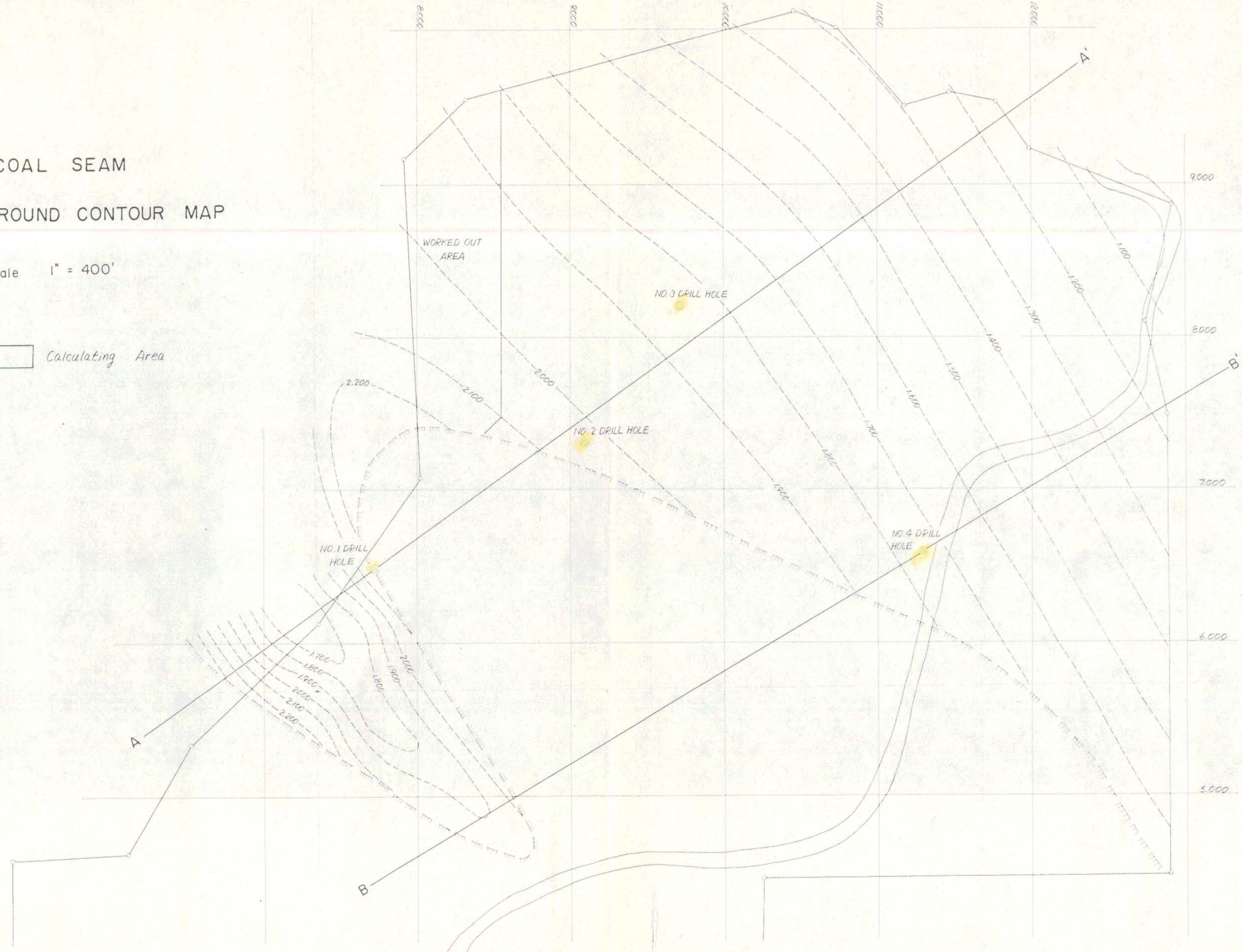

Fig. 29

NO. 4 COAL SEAM

UNDERGROUND CONTOUR MAP

Scale 1" = 400'

☐ Calculating Area

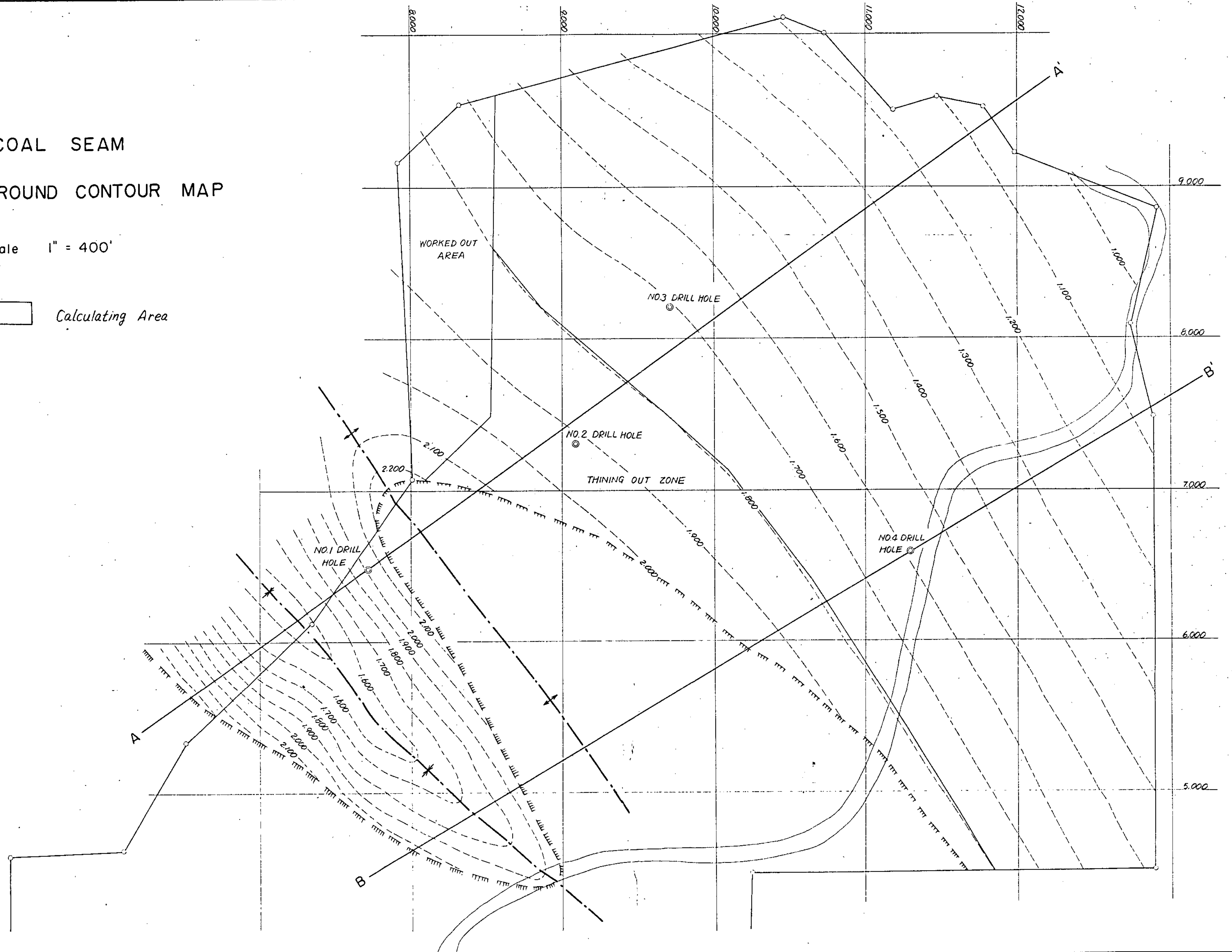

Fig. 30

NO.5 COAL SEAM

UNDERGROUND CONTOUR MAP

Scale 1" = 400'

Calculating Area

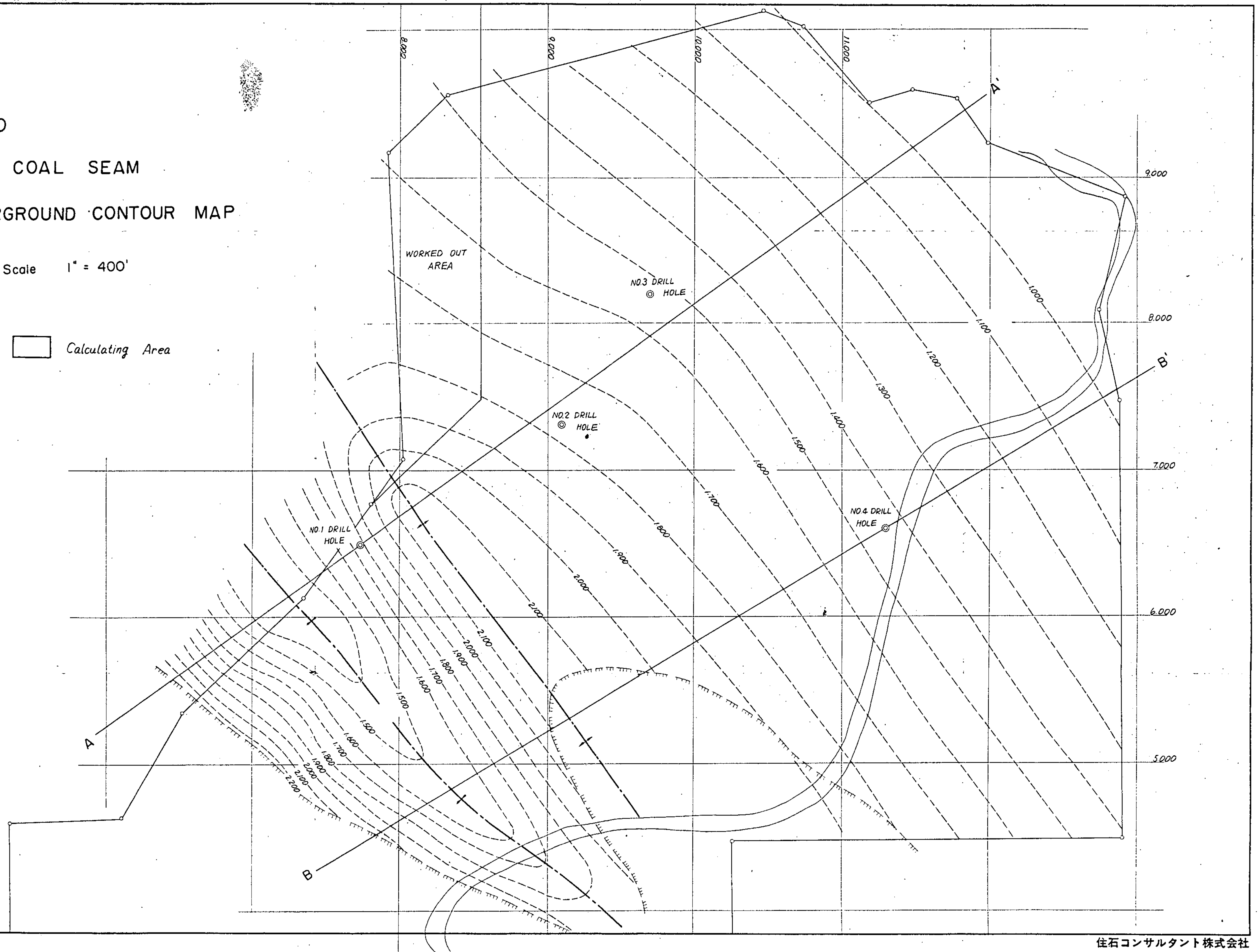

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Fig. 5 FLOAT SINK TEST

Name	Z - A	Remark	MERRITT COAL	Page	1
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

Sp.Gr.	Observed W%	Observed A%	Observed $\Sigma W_{n-1} + \frac{1}{2} W_n$	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 −↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
~1.25	8.4	2.7		22.7	22.7	8.4	2.7	91.6	15.5	
1.25~1.3	52.9	5.8		306.8	329.5	61.3	5.4	38.7	28.7	81.5
1.3~1.4	20.2	14.9		301.0	630.5	81.5	7.7	18.5	43.8	28.4
1.4~1.5	8.2	29.2		239.4	869.9	89.7	9.7	10.3	55.4	12.3
1.5~1.6	4.1	39.3		161.1	1031.0	93.8	11.0	6.2	66.2	5.7
1.6~1.7	1.6	48.2		77.1	1108.7	95.4	11.6	4.5	74.2	2.4
1.7~1.8	0.8	60.7		48.6	1157.3	96.2	12.0	3.8	75.0	
1.8~	3.8	75.0		285.0	1442.3	100.0	14.4			
~										
~				mm	Wt%	Ash%				
TOTAL	100.0	14.4		65~0.5	92.2	14.4				
				-0.5	7.8	21.7				
				TOTAL	100.0	15.0				

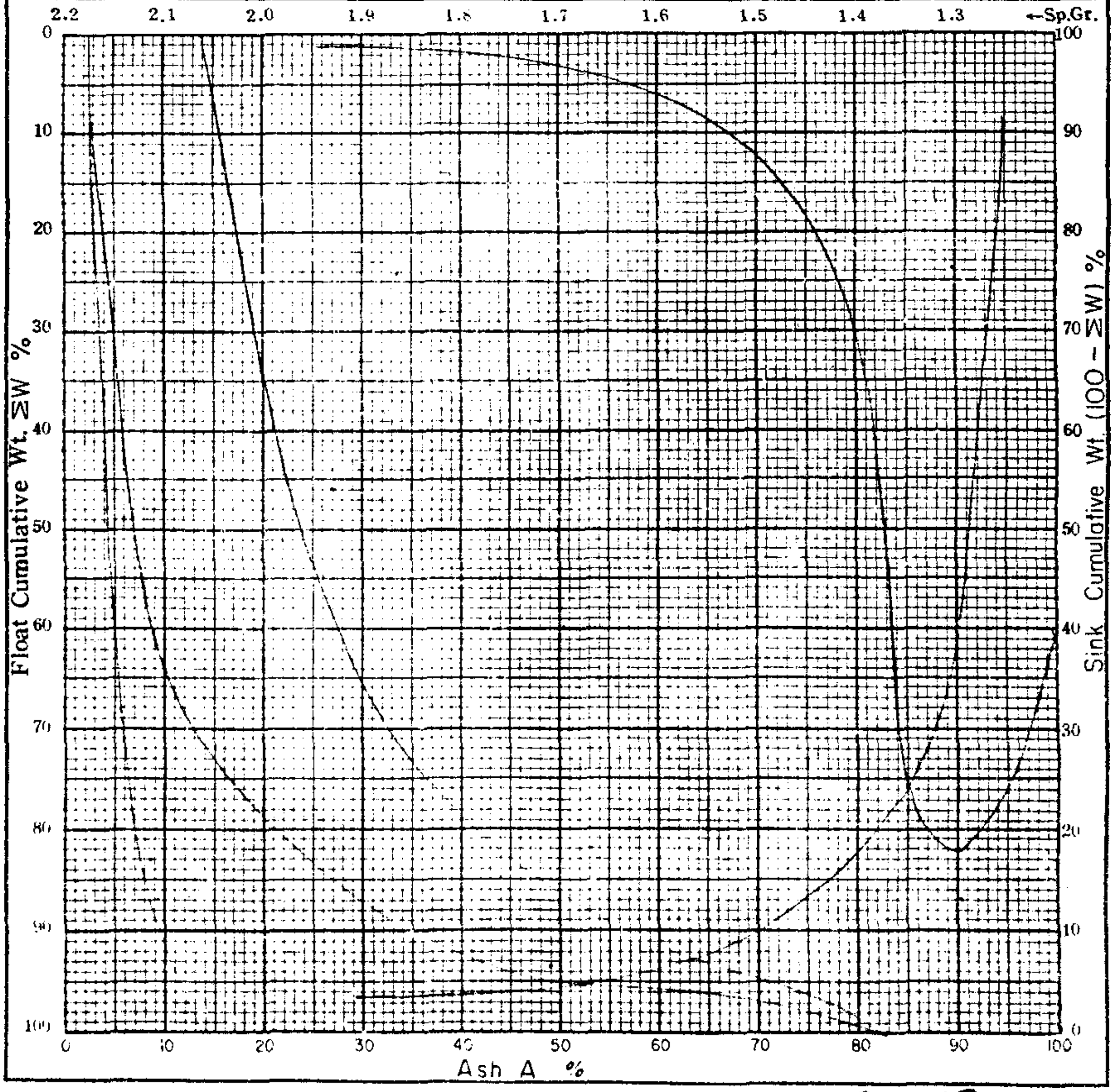

Fig. 6 FLOAT SINK TEST

Name	2 - B	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

	Observed			Float				Sink		±0.1
Sp.Gr.	W%	A%	ΣWn-1 + ½Wn	WA	↓ΣWA	↓ΣW	↓ΣWA / ↓ΣW	100 -↓ΣW	↑ΣWA / ↑ΣW	Distribution
~1.25	3.2	2.3		7.4	7.4	3.2	2.3	96.8	20.2	
1.25 ~ 1.3	51.9	5.8		301.0	308.4	55.1	5.6	44.9	36.9	
1.3 ~ 1.4	18.3	15.7		287.3	595.7	73.4	8.1	26.6	51.4	23.4
1.4 ~ 1.5	7.9	26.0		205.4	801.1	81.3	9.8	18.7	62.2	26.2
1.5 ~ 1.6	3.4	37.1		126.1	927.2	84.7	11.0	15.3	67.8	11.3
1.6 ~ 1.7	3.1	47.2		146.3	1073.5	87.8	12.2	12.2	73.0	6.5
1.7 ~ 1.8	2.3	58.3		134.1	1207.6	90.1	13.3	9.9	76.4	5.4
1.8 ~	9.9	76.4		756.4	1964.0	100.0	19.6			
~										
~				mm	Wt%	Ash%				
TOTAL	100.0	19.6		65~0.5	96.6	19.6				
				-0.5	3.4	21.1				
				TOTAL	100.0	19.7				

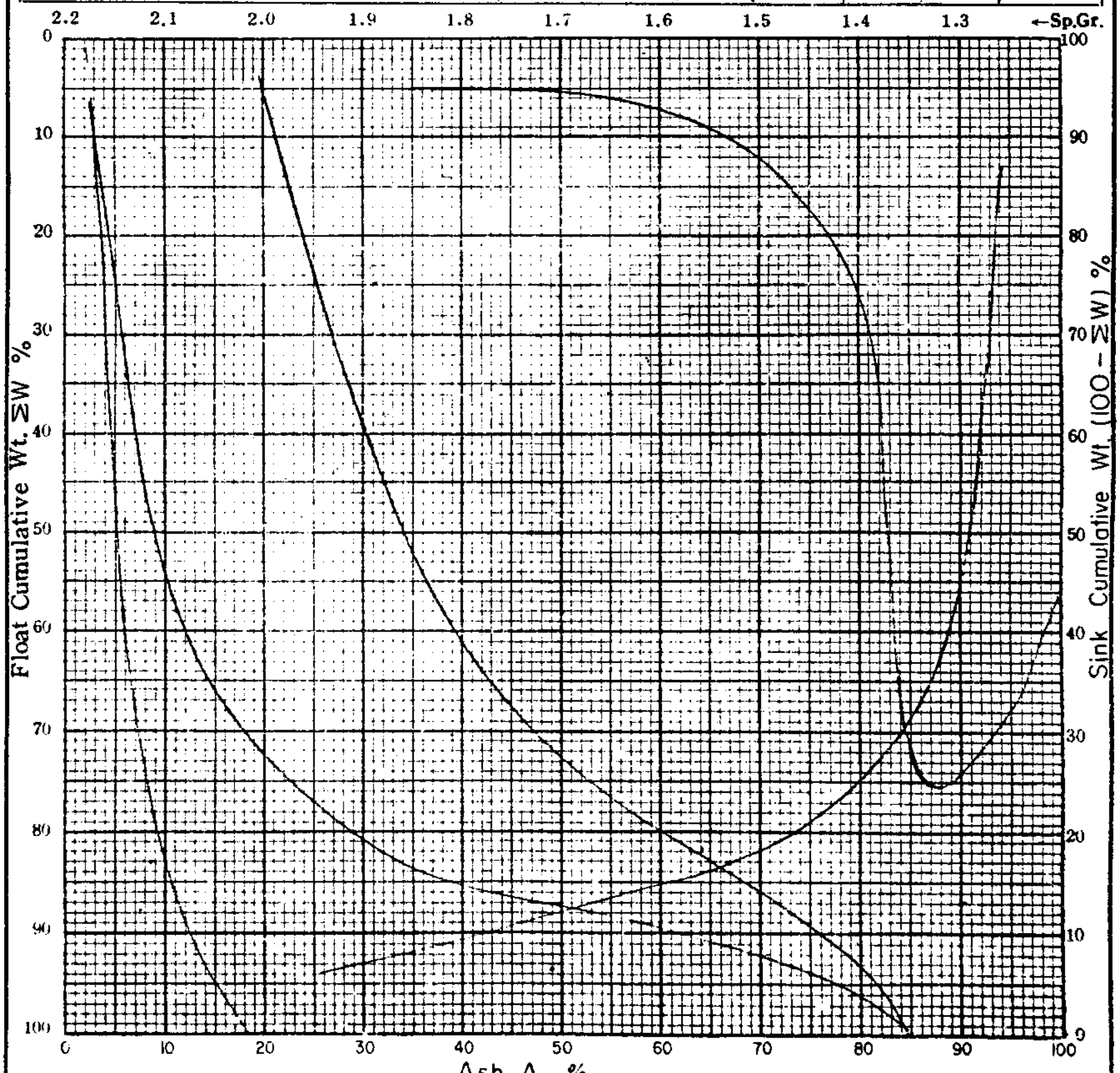

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Fig 7 FLOAT SINK TEST

Name	2 - C	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

	Sp.Gr.	Observed W%	Observed A%	Observed ΣWn-1 +½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
	~1.25	4.7	2.4		11.3	11.3	4.7	2.4	95.3	25.7	
	1.25 ~ 1.3	41.6	5.0		208.0	219.3	46.3	4.7	53.7	41.9	62.2
	1.3 ~ 1.4	15.9	14.4		229.0	448.3	62.2	7.2	37.8	53.5	23.4
	1.4 ~ 1.5	7.5	25.5		191.3	639.6	69.7	9.2	30.3	60.4	12.3
	1.5 ~ 1.6	4.8	35.9		172.3	811.9	74.5	10.9	25.5	65.0	8.2
	1.6 ~ 1.7	3.4	46.4		157.8	969.2	77.9	12.5	22.1	67.4	6.7
	1.7 ~ 1.8	3.3	56.1		185.1	1154.3	81.2	14.2	18.8	69.4	
	1.8 ~	18.8	69.4		1304.7	2459.0	100.0	24.6			
	~										
	~										
	TOTAL	100.0	24.6								

mm	Wt%	Ash%
65-0.5	98.1	24.6
-0.5	1.9	21.5
TOTAL	100.0	24.5

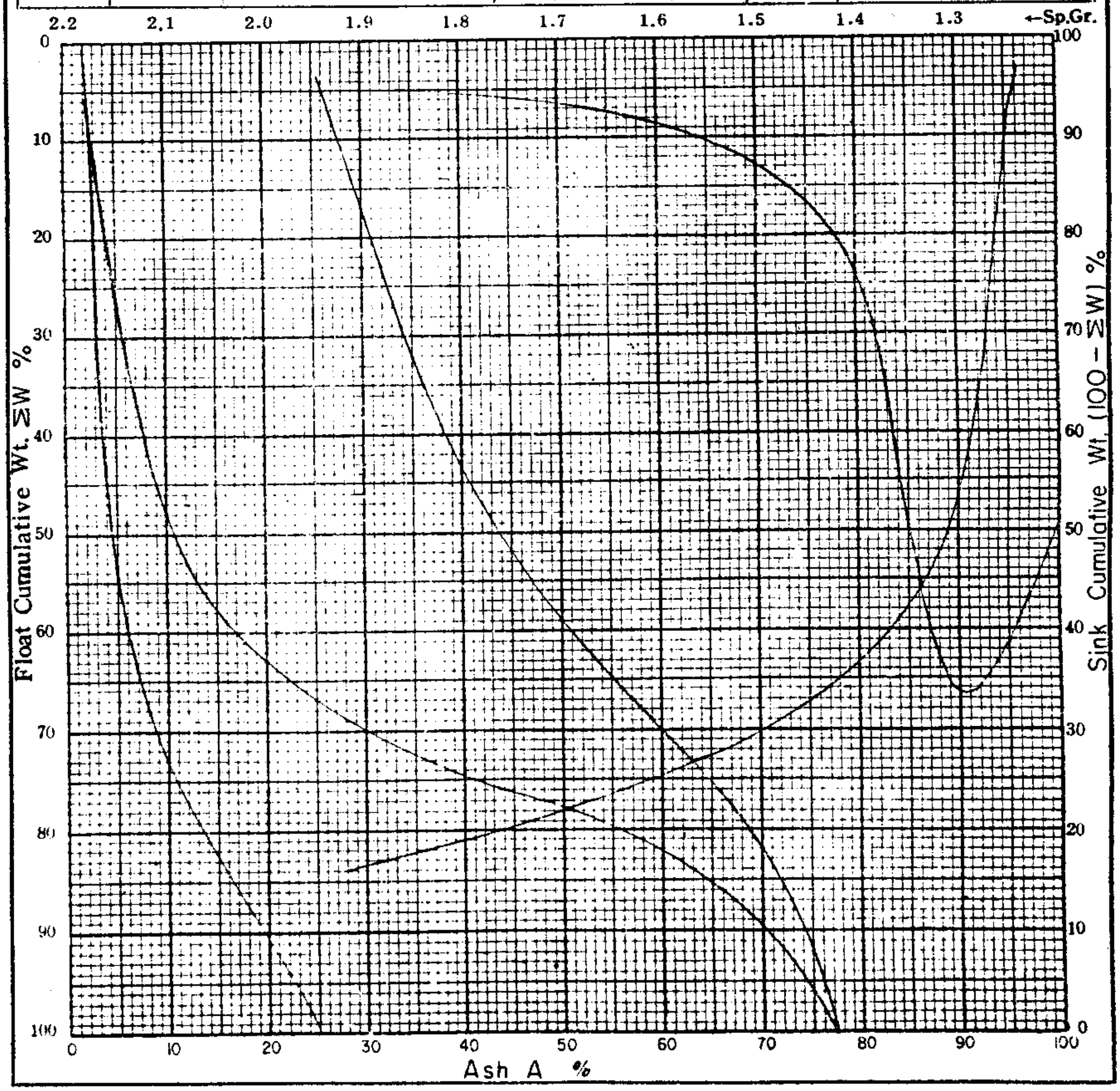

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Fig. 8 **FLOAT SINK TEST**

Name	2 - D	Remark	MERRITT COAL	Page	/
Date	. . .			Size	65 ~ 0.5 m/m

	Sp.Gr.	Observed W%	Observed A%	Observed ΣWn-1 + ½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribu-tion
	~1.25	1.6	1.9		3.0	3.0	1.6	1.9	98.4	41.0	
	1.25 ~ 1.3	16.5	4.2		69.3	72.3	18.1	4.0	81.9	48.3	33.2
	1.3 ~ 1.4	15.1	13.7		206.9	279.2	33.2	8.4	66.8	55.7	24.4
	1.4 ~ 1.5	9.3	25.8		240.0	519.2	42.5	12.2	57.5	61.0	17.6
	1.5 ~ 1.6	8.3	37.0		307.1	826.3	50.8	16.3	49.2	65.2	17.6
	1.6 ~ 1.7	9.3	45.3		421.3	1247.6	60.1	20.8	39.9	69.8	17.2
	1.7 ~ 1.8	7.9	55.9		441.6	1689.2	68.0	24.8	32.0	73.1	
	1.8 ~	32.0	73.1		2339.2	4028.4	100.0	40.3			
	~										
	~										
	TOTAL	100.0	40.3								

mm	wt%	Ash%
65~0.5	96.7	40.3
-0.5	3.3	29.4
TOTAL	100.0	39.9

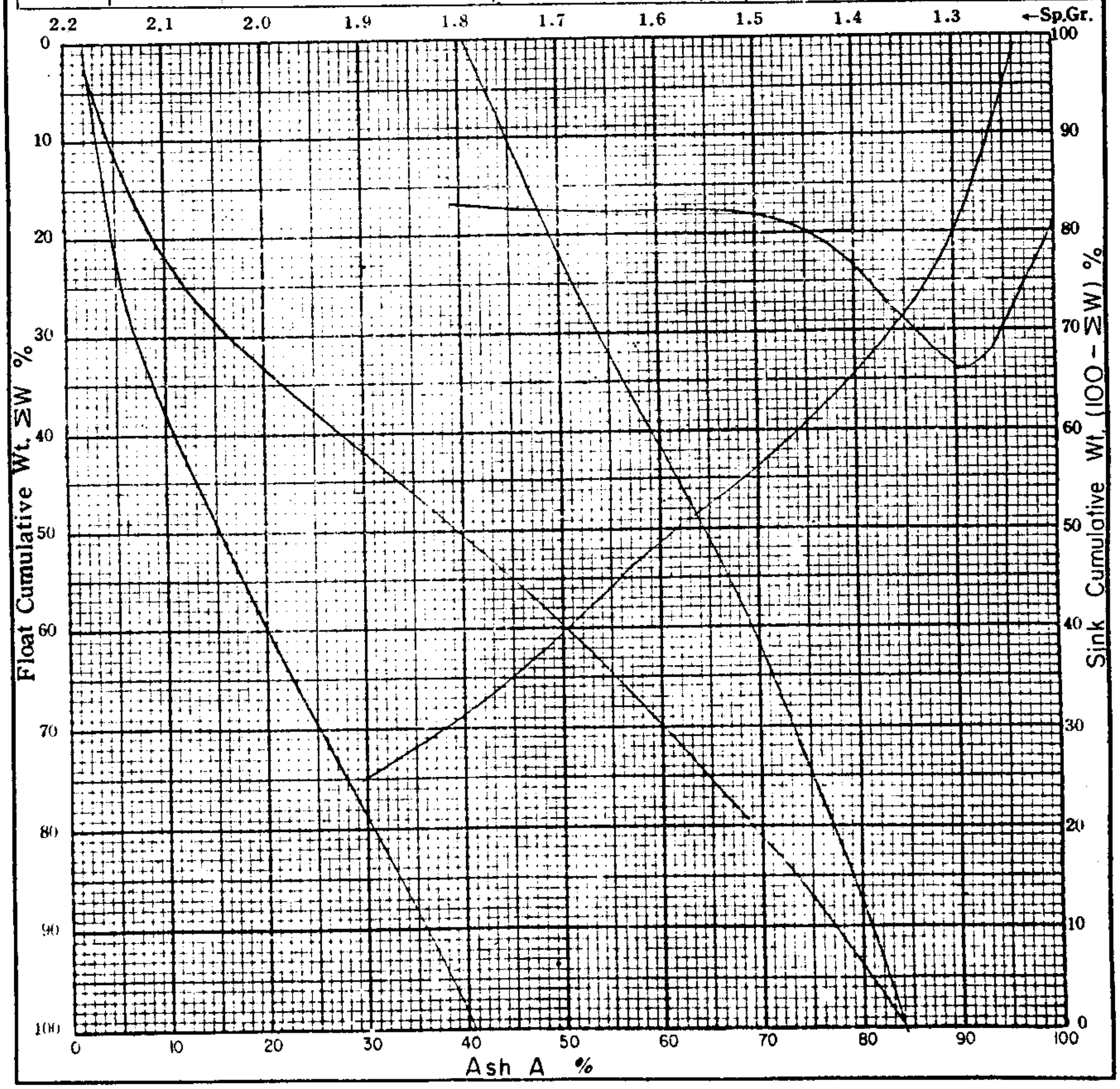

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Fig. 9 **FLOAT SINK TEST**

Name	2 - E	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

	Sp.Gr.	Observed			Float				Sink		±0.1
		W%	A%	ΣWn-1 + ½Wn	WA	↓ΣWA	↓ΣW	↓ΣWA / ↓ΣW	100 -↓ΣW	↑ΣWA / ↑ΣW	Distribution
	~1.25	0.9	2.5		2.3	2.3	0.9	2.5	99.1	18.6	
	1.25~1.3	54.4	4.4		239.4	241.7	55.3	4.4	44.7	35.8	77.4
	1.3 ~1.4	22.1	13.0		287.3	529.0	77.4	6.8	22.6	58.3	24.5
	1.4 ~1.5	2.4	26.2		62.9	591.9	79.8	7.4	20.2	62.0	4.3
	1.5 ~1.6	1.9	38.6		73.3	665.2	81.7	8.1	18.3	64.4	4.7
	1.6 ~1.7	2.8	45.7		128.0	793.2	84.5	9.4	15.5	67.9	4.3
	1.7 ~1.8	1.5	57.9		86.9	880.1	86.0	10.2	14.0	68.9	
	1.8 ~	14.0	68.9		964.6	1844.9	100.0	18.4			
	~										
	~				mm	Wt%	Ash%				
	TOTAL	100.0	18.4		65~0.5	94.7	18.4				
					-0.5	5.3	23.7				
					TOTAL	100.0	18.7				

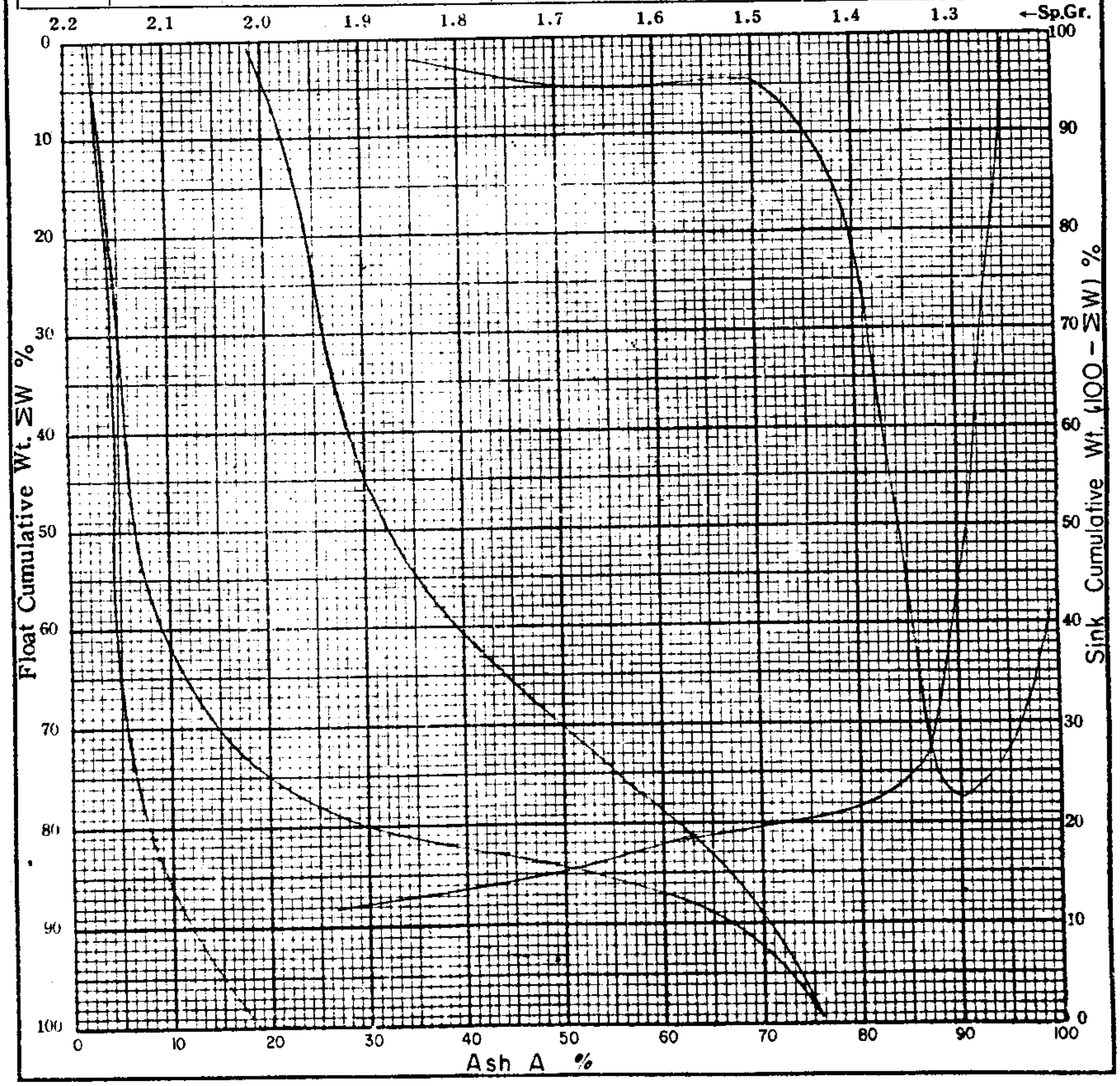

Fig.10

FLOAT SINK TEST

Name	3 - A	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65~0.5 m/m

Sp.Gr.	Observed W%	Observed A%	ΣWn-1 +½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
~1.25	0.5	2.8		1.4	1.4	0.5	2.8	99.5	32.0	
1.25~1.3	41.8	4.8		200.6	202.0	42.3	4.7	57.7	51.7	59.6
1.3~1.4	17.3	12.7		219.7	421.7	59.6	7.1	40.4	68.4	22.6
1.4~1.5	5.3	25.5		135.2	556.9	64.9	8.6	35.1	74.9	9.1
1.5~1.6	3.8	37.6		142.9	699.8	68.7	10.2	31.3	79.4	6.0
1.6~1.7	2.2	45.4		99.9	799.7	70.9	11.3	29.1	81.9	3.9
1.7~1.8	1.7	54.2		92.1	891.8	72.6	12.3	21.4	83.7	
1.8~	27.4	83.7		2293.4	3185.2	100.0	31.9			
~										
~				mm	wt%	Ash%				
TOTAL	100.0	31.9		65~0.5	98.0	31.9				
				-0.5	2.0	24.9				
				TOTAL	100.0	31.8				

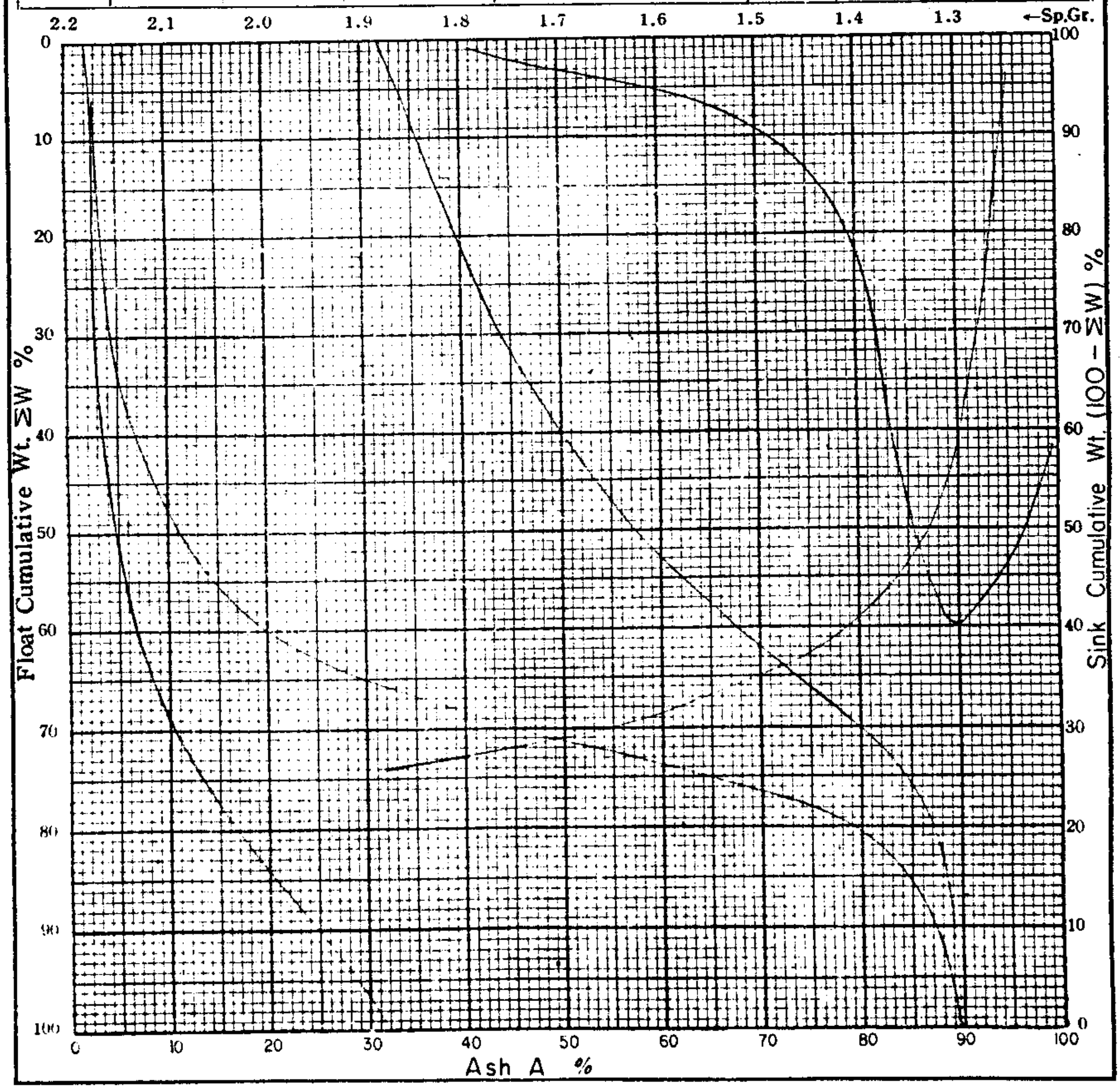

Fig. 11 FLOAT SINK TEST

Name	3 - B	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

Sp.Gr.	Observed W%	Observed A%	Observed ΣWn-1 + ½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
~1.25	4.4	2.3		10.1	10.1	4.4	2.3	95.6	22.5	
1.25 ~ 1.3	52.8	4.3		227.0	237.1	57.2	4.2	42.8	45.0	74.8
1.3 ~ 1.4	17.6	11.9		209.4	446.5	74.8	6.0	25.2	68.1	19.4
1.4 ~ 1.5	1.8	25.0		45.0	491.5	76.6	6.4	23.4	71.4	5.4
1.5 ~ 1.6	3.6	43.1		155.2	646.7	80.2	8.1	19.8	76.4	4.4
1.6 ~ 1.7	0.8	45.6		36.5	683.2	81.0	8.4	19.0	77.8	3.3
1.7 ~ 1.8	2.5	51.4		135.3	818.5	83.5	9.8	16.5	81.4	
1.8 ~	16.5	81.4		134[illegible]	2161.6	100.0	21.6			
~										
~				mm	Wt%	Ash%				
TOTAL	100.0	21.6		65~0.5	96.2	21.6				
				-0.5	3.8	23.6				
				TOTAL	100.0	21.7				

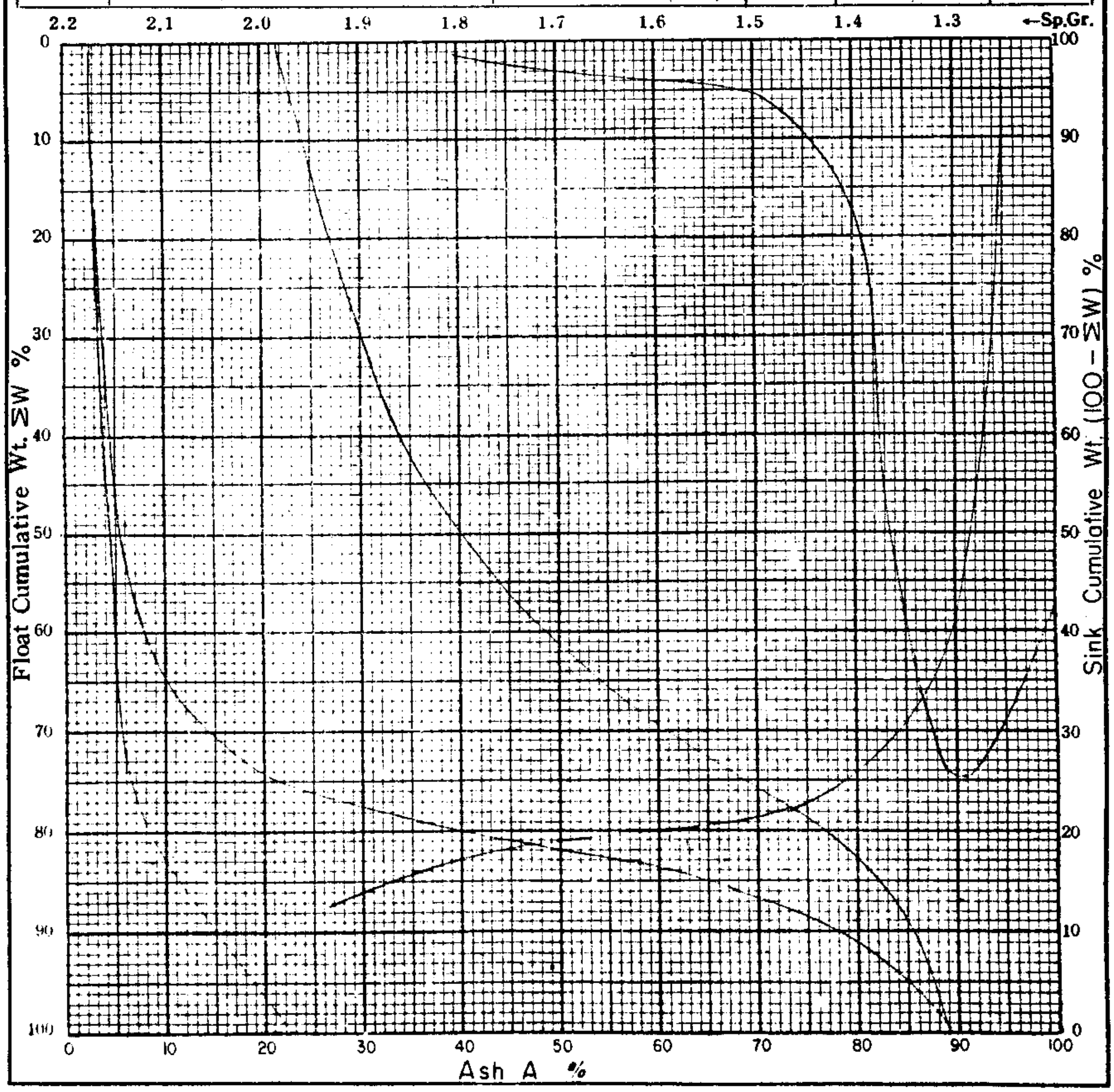

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Fig. 12

FLOAT SINK TEST

Name	3 - C	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5 m/m

Sp.Gr.	Observed W%	Observed A%	$\Sigma W_{n-1} + \frac{1}{2} W_n$	Float WA	Float $\downarrow\Sigma WA$	Float $\downarrow\Sigma W$	Float $\frac{\downarrow\Sigma WA}{\downarrow\Sigma W}$	Sink $100 - \downarrow\Sigma W$	Sink $\frac{\uparrow\Sigma WA}{\uparrow\Sigma W}$	±0.1 Distribu-tion
~ 1.25	7.4	3.1		22.9	22.9	7.4	3.1	92.6	25.2	
1.25 ~ 1.3	51.0	4.6		234.6	257.5	58.4	4.4	41.6	50.4	71.9
1.3 ~ 1.4	13.5	13.5		182.3	439.8	71.9	6.1	28.1	68.1	17.4
1.4 ~ 1.5	3.9	27.8		108.4	548.2	75.8	7.2	24.2	74.6	5.5
1.5 ~ 1.6	1.6	40.1		64.2	612.4	77.4	7.9	22.6	77.0	3.7
1.6 ~ 1.7	2.1	50.6		106.3	718.7	79.5	9.0	20.5	79.8	2.9
1.7 ~ 1.8	0.8	55.7		44.6	763.3	80.3	9.5	19.7	80.7	
1.8 ~	19.7	80.7		1589.8	2353.1	100.0	23.5			
~										
~										
TOTAL	100.0	23.5								

mm	Wt %	Ash%
65 ~ 0.5	96.2	23.5
-0.5	3.8	33.4
TOTAL	100.0	23.9

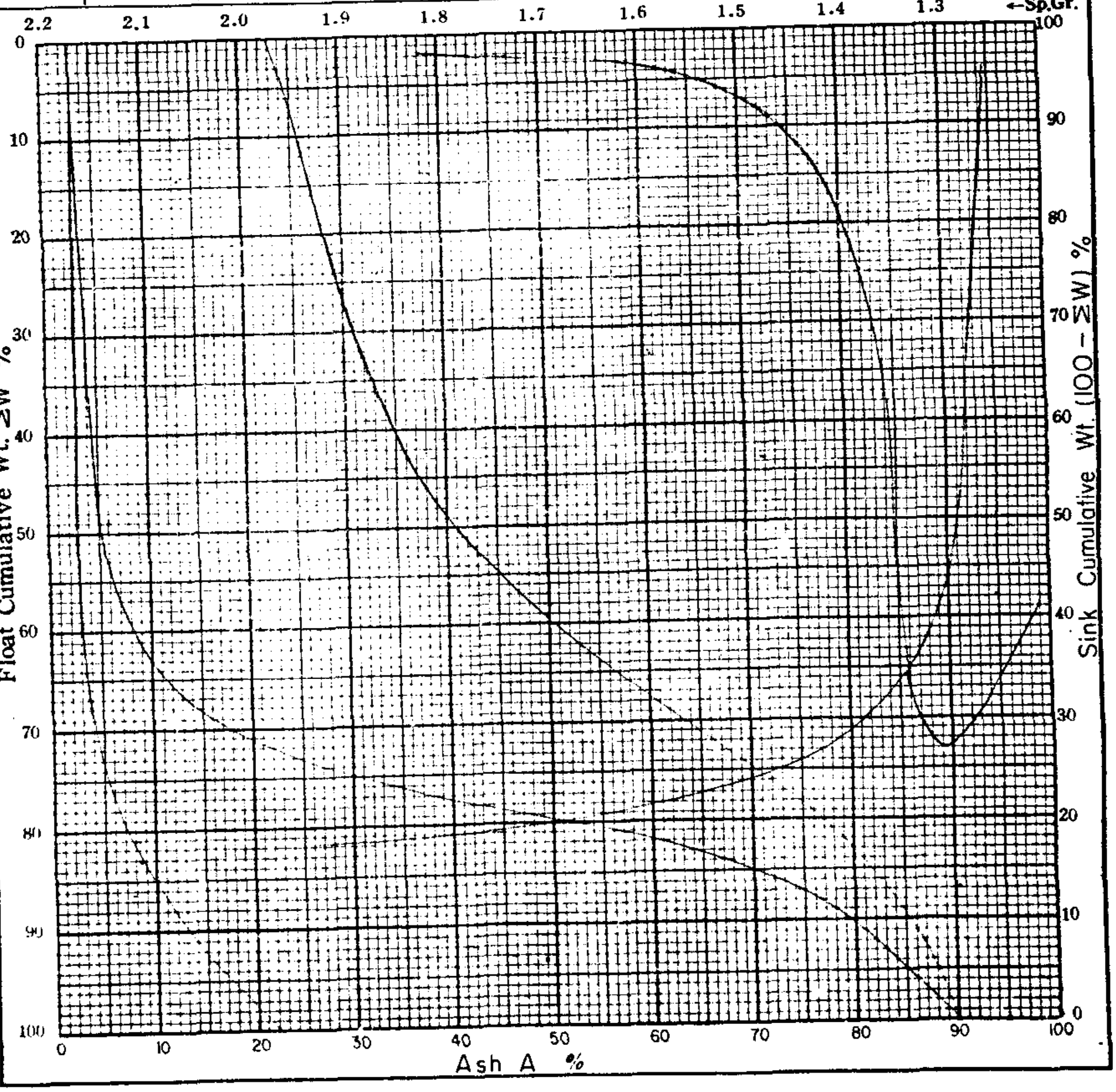

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Fig 13 **FLOAT SINK TEST**

Name	3 - D	Remark	MERRITT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 05 m/m

Sp.Gr.	Observed W%	Observed A%	ΣWn-1 + ½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
~1.25	1.6	2.3		3.7	3.7	1.6	2.3	98.4	23.2	
1.25~1.3	35.9	4.1		147.2	150.9	37.5	4.0	62.5	34.1	
1.3~1.4	27.1	11.8		319.8	470.7	64.6	7.3	35.4	51.2	64.6
1.4~1.5	7.6	24.5		186.2	656.9	72.2	9.1	27.8	58.5	34.2
1.5~1.6	3.9	35.8		139.6	796.5	76.1	10.5	23.9	62.2	11.5
1.6~1.7	3.4	42.7		145.2	941.7	79.5	11.8	20.5	65.1	7.3
1.7~1.8	6.6	56.5		372.9	1314.6	86.1	15.3	13.9	69.7	10.0
1.8~	13.9	69.7		468.8	2283.4	100.0	22.8			
~										
~										
TOTAL	100.0	22.8								

mm	Wt%	Ash%
65~0.5	98.2	22.8
-0.5	1.8	25.0
TOTAL	100.0	22.8

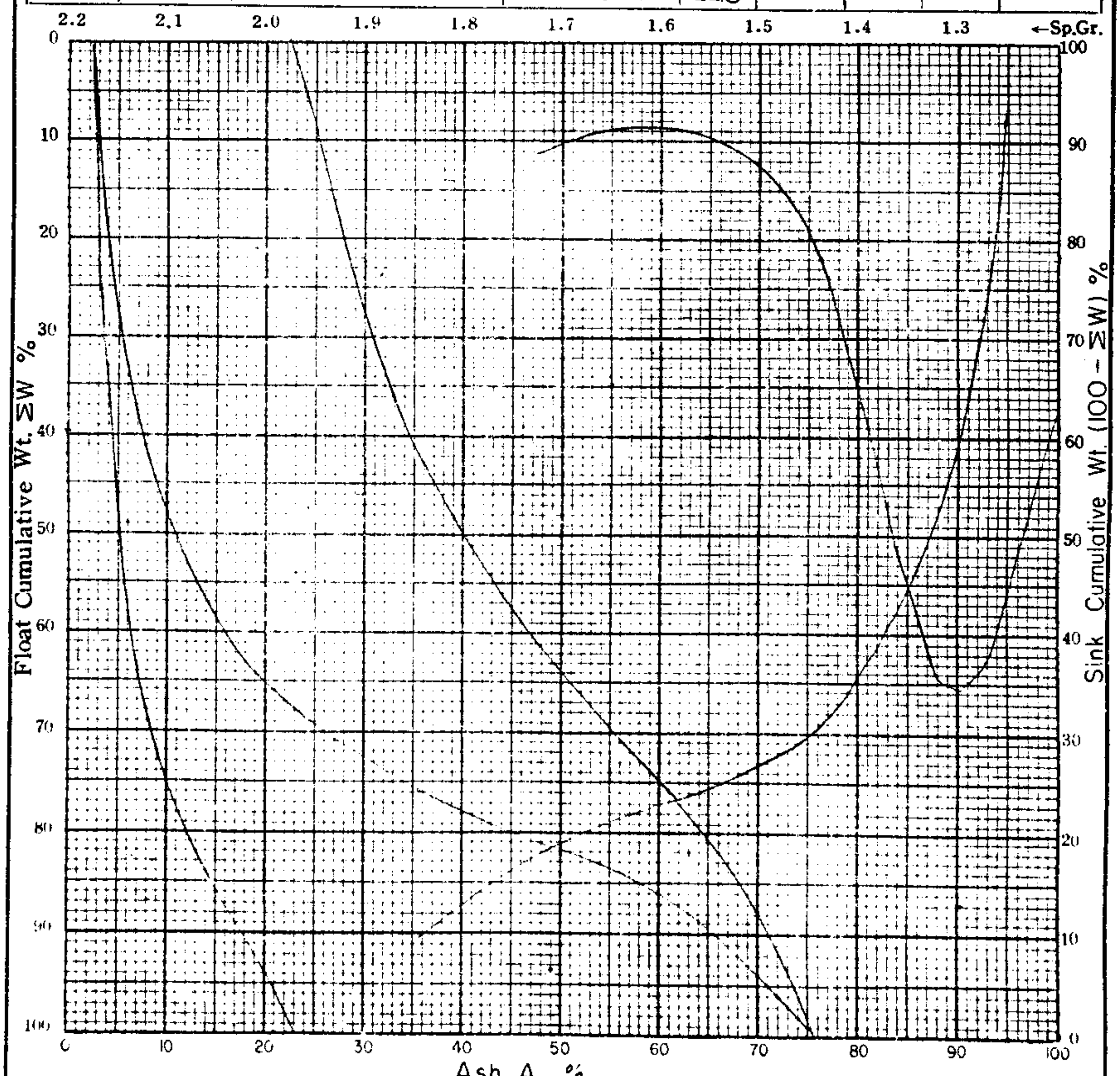

Fig. 14 FLOAT SINK TEST

Name	4 - A	Remark	MERRTT COAL	Page	/
Date	1970. 2. 23.			Size	65 ~ 0.5

Sp.Gr.	Observed W%	Observed A%	ΣWn-1 + ½Wn	Float WA	Float ↓ΣWA	Float ↓ΣW	Float ↓ΣWA / ↓ΣW	Sink 100 -↓ΣW	Sink ↑ΣWA / ↑ΣW	±0.1 Distribution
~1.25	4.2	4.1		17.2	17.2	4.2	4.1	95.8	15.7	
1.25~1.3	57.4	4.3		246.8	264.0	61.6	4.3	38.4	32.8	
1.3~1.4	20.1	13.9		279.4	543.4	81.7	6.7	18.3	48.0	81.8
1.4~1.5	5.1	28.3		144.3	687.7	86.8	7.9	13.2	63.2	25.2
1.5~1.6	4.5	37.9		170.6	858.3	91.3	9.4	8.7	76.2	9.6
1.6~1.7	0.4	46.6		18.6	876.9	91.7	9.6	8.3	77.8	4.9
1.7~1.8	0.4	56.1		22.4	899.3	92.1	9.8	7.9	78.8	0.8
1.8~	7.9	78.8		622.5	1521.8	100.0	15.2			
~										
~										
TOTAL	100.0	15.2								

mm	Wt %	Ash %
65~05	96.1	15.2
-05	3.9	17.8
TOTAL	100.0	15.3

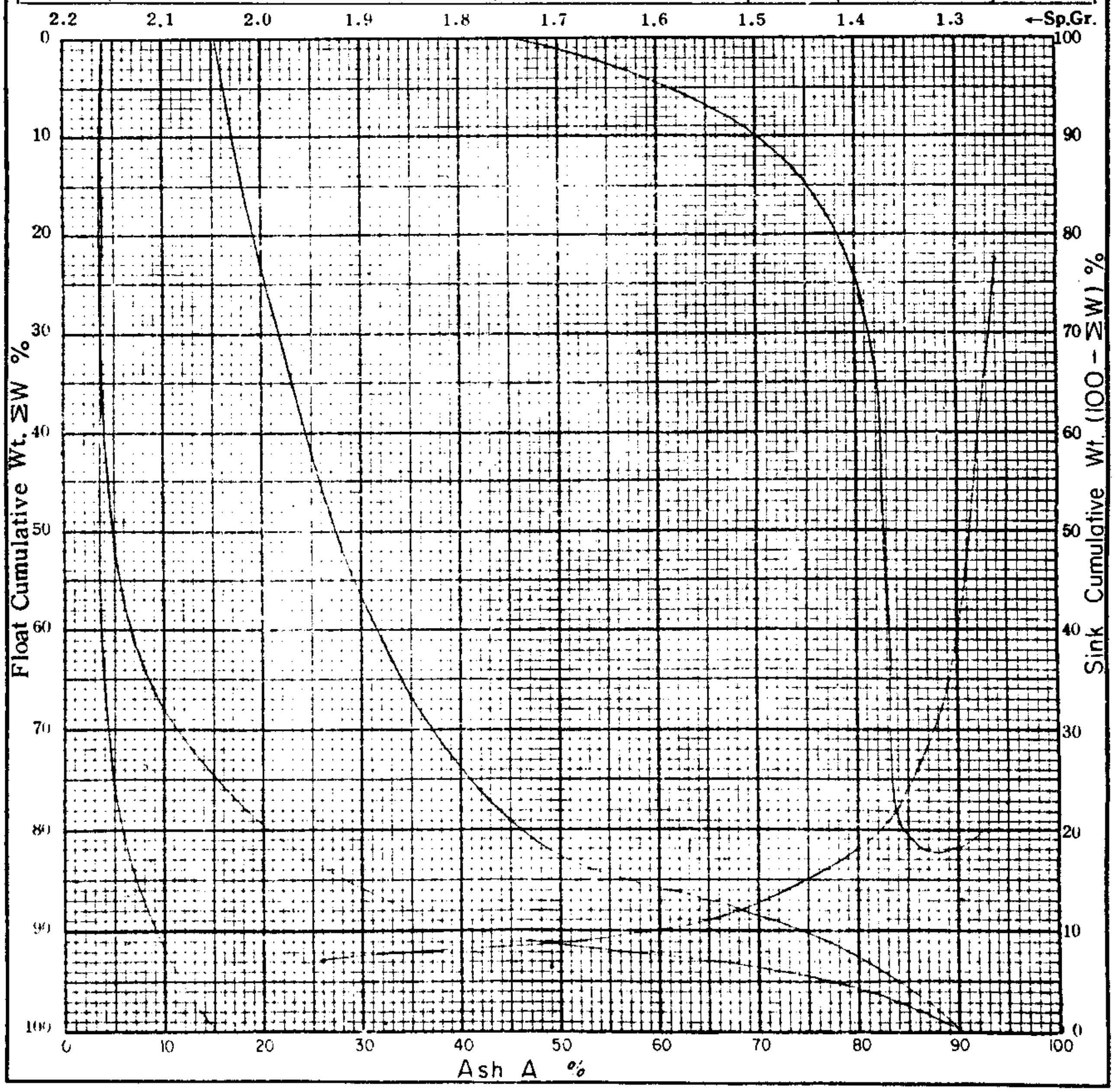

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Fig. 15 FLOAT SINK TEST

Name	*4 - B*	Remark	*MERRITT COAL*	Page	/
Date	*1970. 2. 23.*			Size	*65 ~ 0.5*

	Sp.Gr.	Observed W%	Observed A%	Observed $\Sigma Wn_{-1} + \frac{1}{2}Wn$	Float WA	Float $\downarrow\Sigma WA$	Float $\downarrow\Sigma W$	Float $\frac{\downarrow\Sigma WA}{\downarrow\Sigma W}$	Sink $100 - \downarrow\Sigma W$	Sink $\frac{\uparrow\Sigma WA}{\uparrow\Sigma W}$	±0.1 Distribution
	~1.25	0.1	4.2		0.4	0.4	0.1	4.2	99.9	41.4	
	1.25~1.3	23.5	5.5		129.3	129.7	23.6	5.5	76.4	53.2	
	1.3~1.4	14.2	14.4		204.5	334.2	37.8	8.9	62.2	62.0	37.8
	1.4~1.5	6.0	28.1		168.6	502.8	43.8	11.5	56.2	65.6	20.2
	1.5~1.6	5.7	38.9		221.7	724.5	49.5	14.7	50.5	68.6	11.2
	1.6~1.7	2.1	44.7		93.9	818.4	51.6	15.8	48.4	69.7	7.8
	1.7~1.8	1.2	56.4		67.7	886.1	52.8	16.8	47.2	70.0	3.3
	1.8~	47.2	70.0		3304.0	4190.1	100.0	41.9			
	~										
	~										
	TOTAL	100.0	41.9								

mm	Wt%	Ash%
65~0.5	99.5	41.9
-0.5	0.5	26.3
TOTAL	100.0	41.8

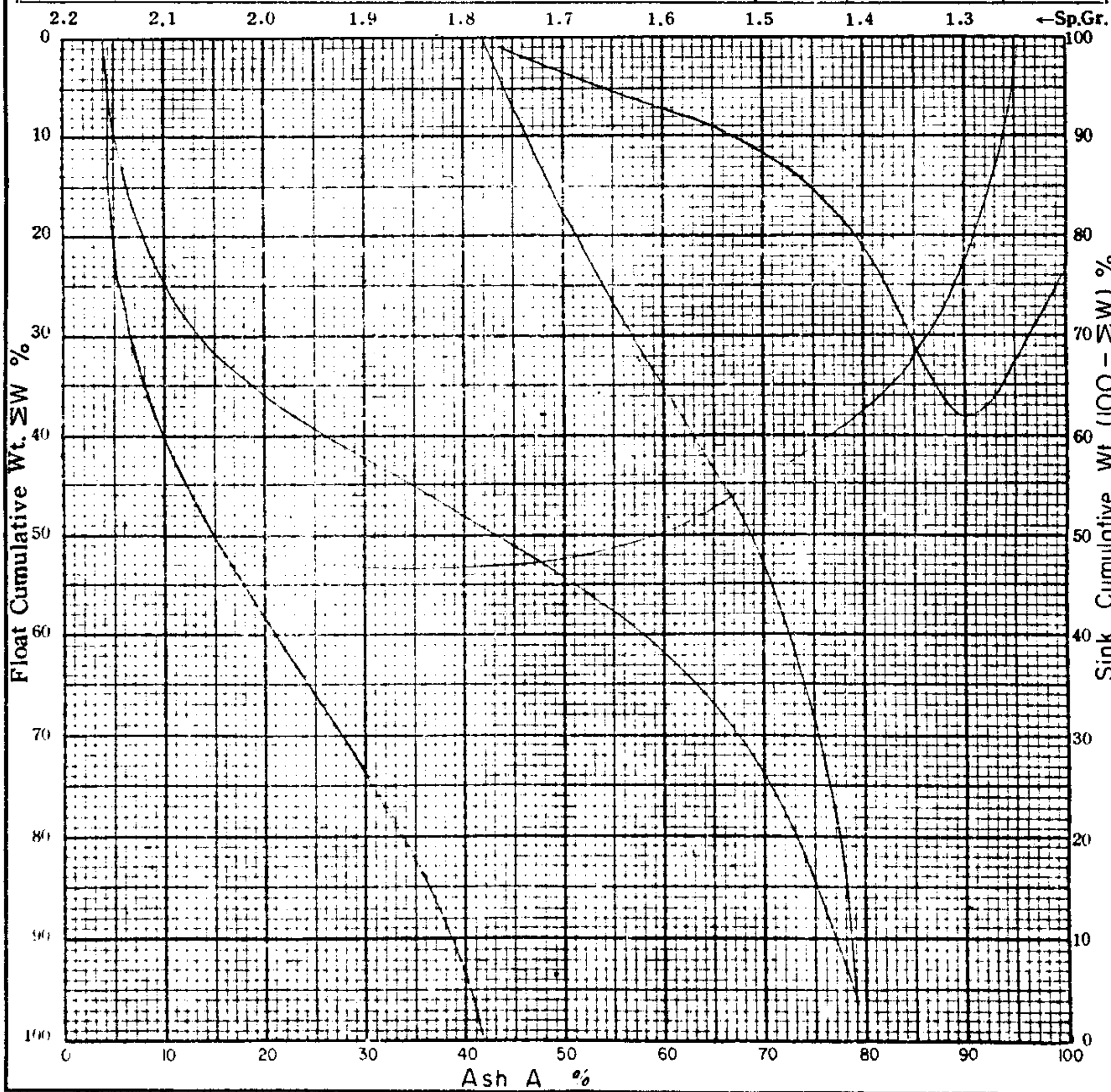

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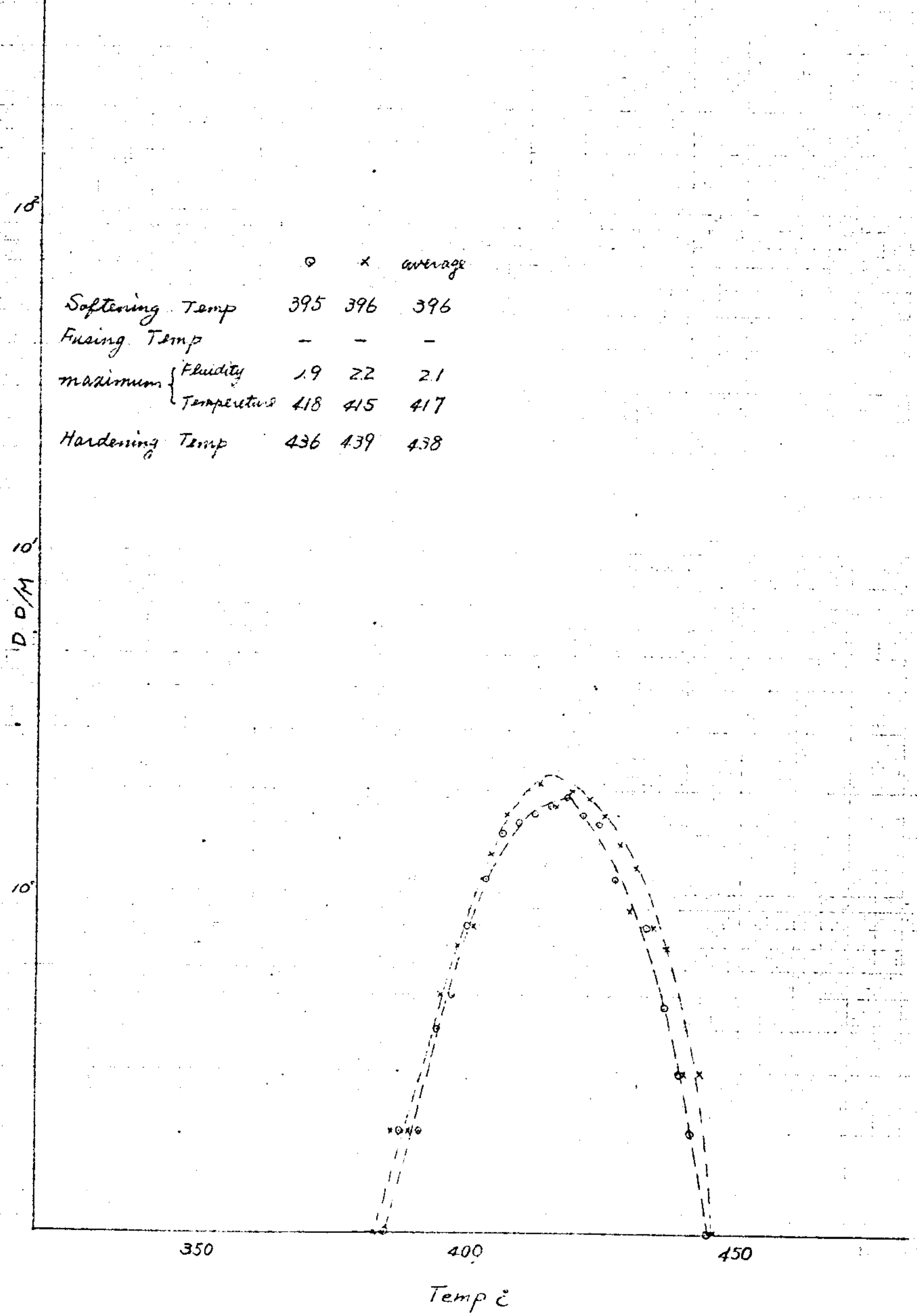
Fig. 16. Fluidity Curve of Sample Z-A measured by Automatic Gieseler plastometer



		o	×	average
Softening Temp		395	396	396
Fusing Temp		–	–	–
maximum	Fluidity	1.9	2.2	2.1
	Temperature	418	415	417
Hardening Temp		436	439	438

Fig. 17 Fluidity Curve of Sample Z-B
measured by Automatic Gieseler plastometer

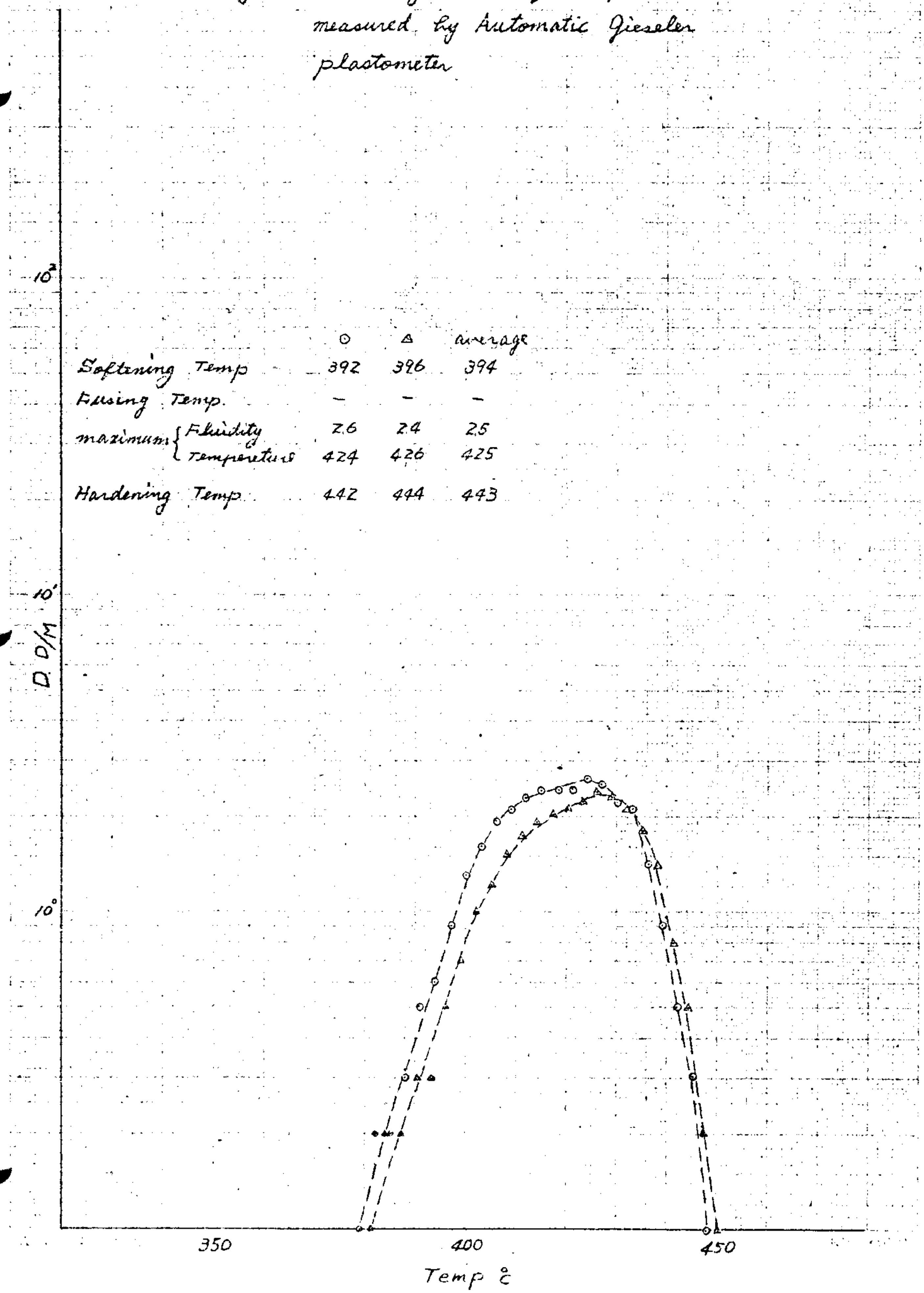
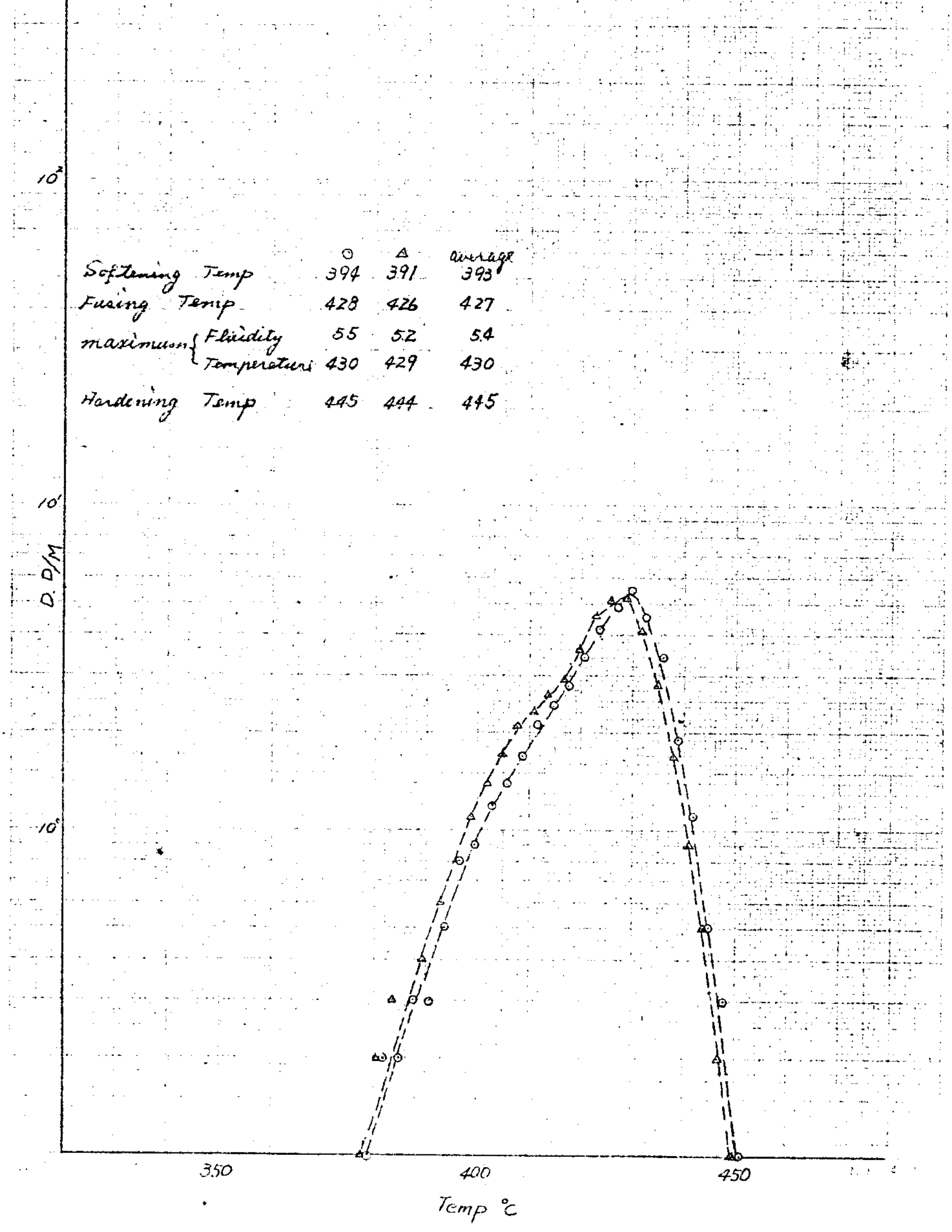
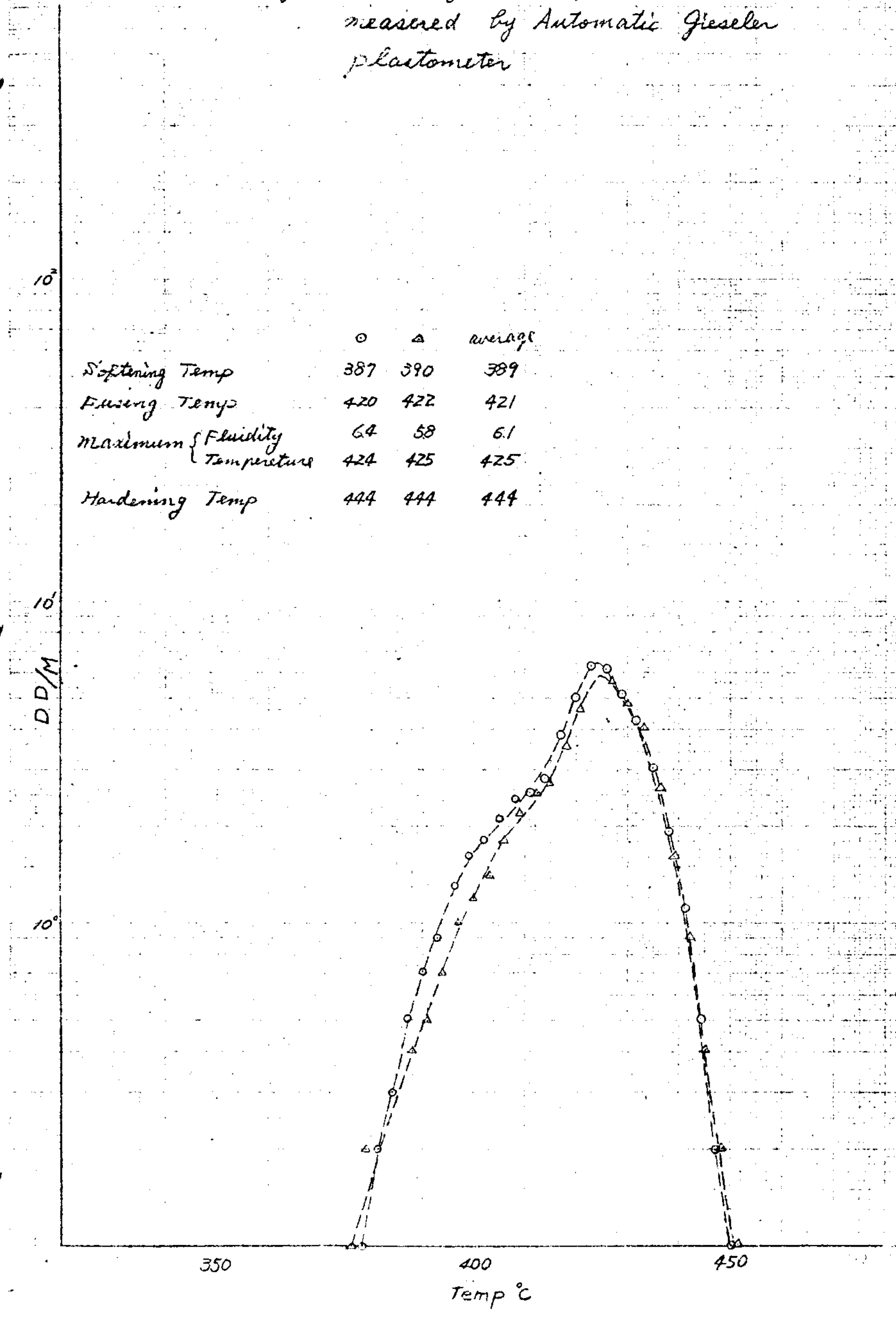


Fig. 18. Fluidity Curve of Sample Z-C measured by Automatic Gieseler plastometer



		○	△	average
Softening Temp		394	391	393
Fusing Temp		428	426	427
maximum	Fluidity	55	52	54
	Temperature	430	429	430
Hardening Temp		445	444	445

Fig. 19. Fluidity Curve of Sample Z-D measured by Automatic Gieseler plastometer



	⊙	△	average
Softening Temp	387	390	389
Fusing Temp	420	422	421
Maximum { Fluidity	64	58	6.1
Maximum { Temperature	424	425	425
Hardening Temp	444	444	444

Fig. 20. Fluidity Curve of Sample Z-E measured by Automatic Gieseler plastometer

	⊙	△	average
Softening Temp	391	393	392
Fusing Temp	422	424	423
Maximum Fluidity	70	6.9	7.0
Maximum Temperature	430	430	430
Hardening Temp	448	450	449

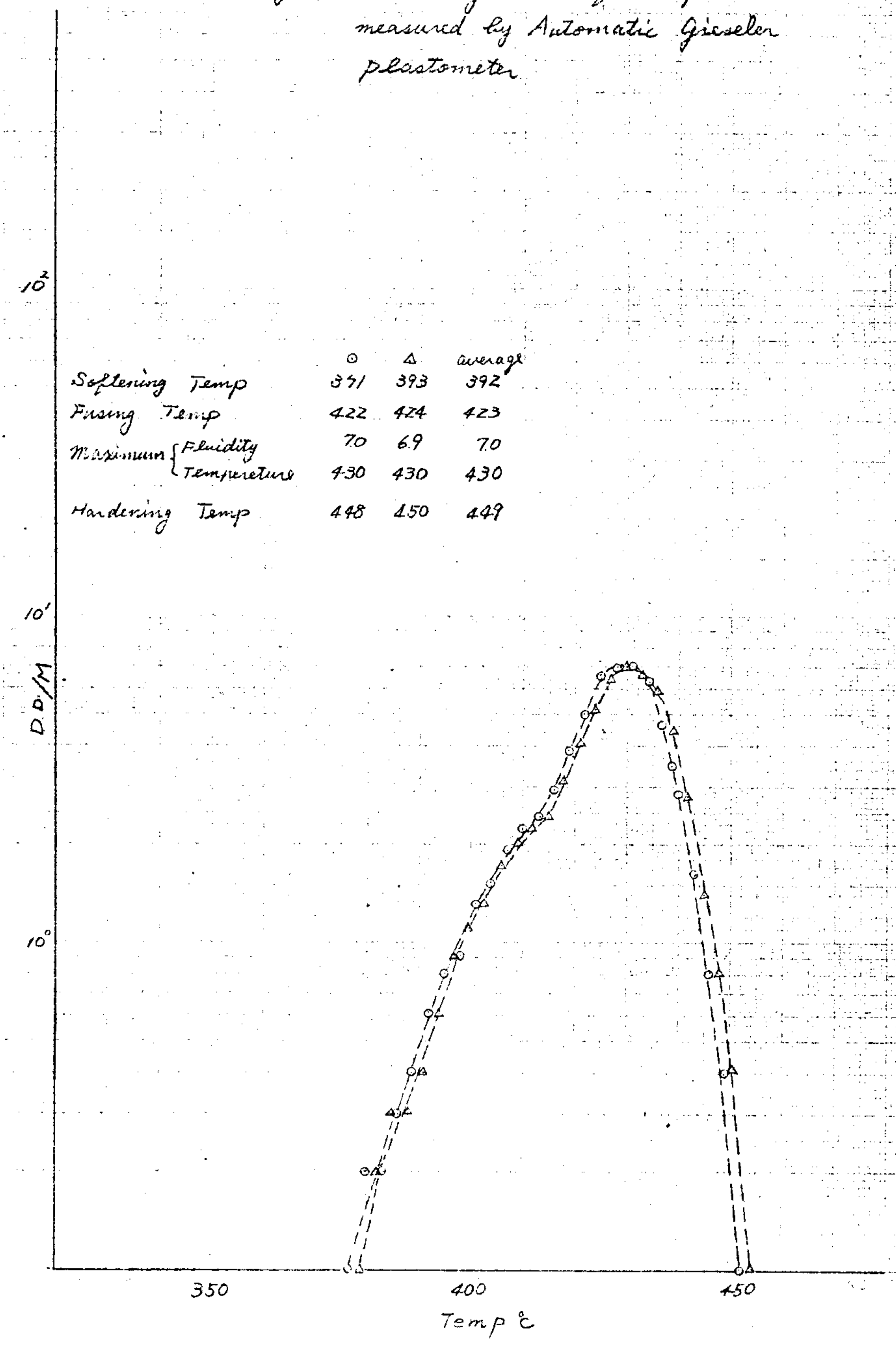
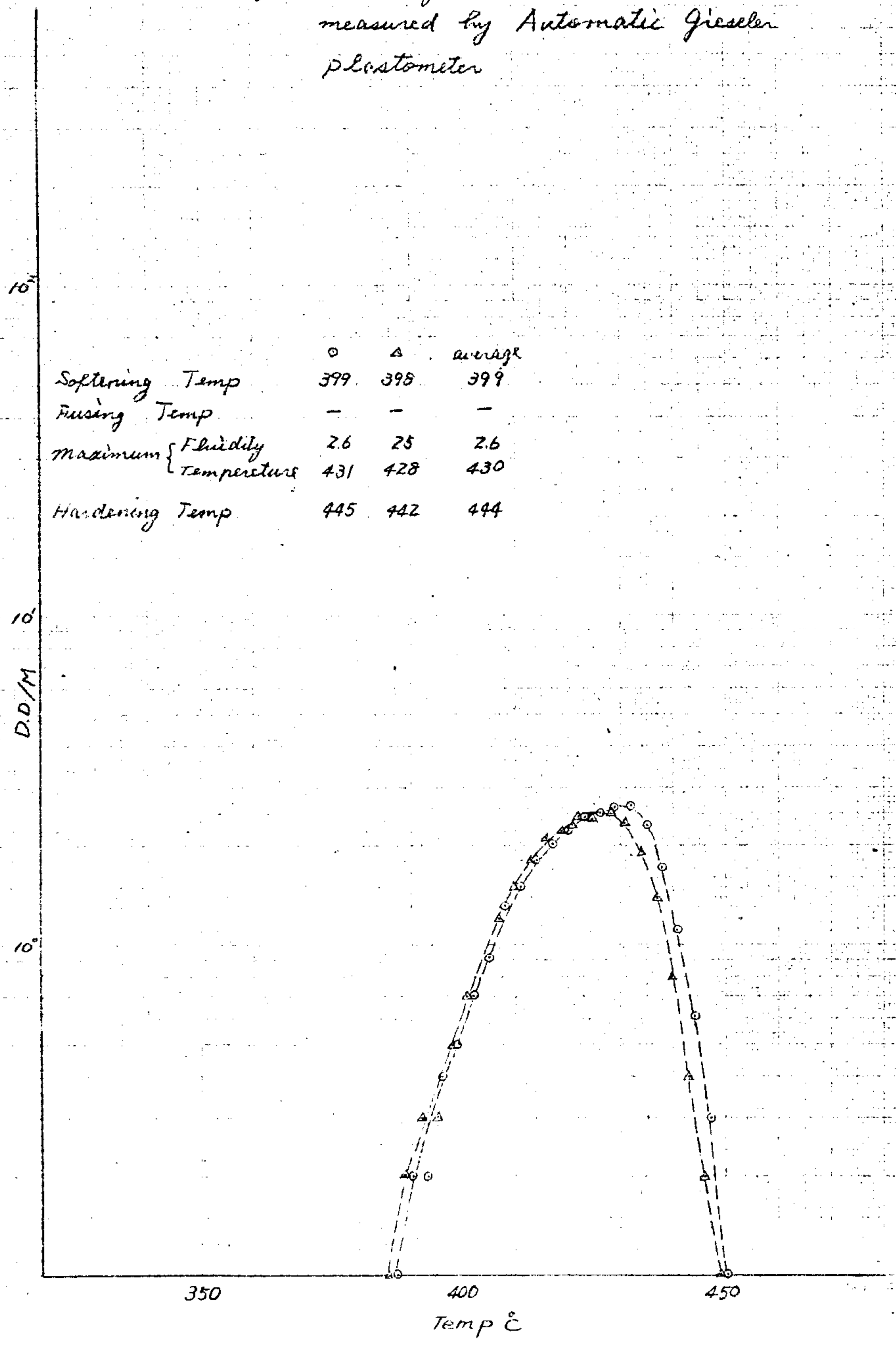


Fig. 21. Fluidity Curve of Sample 3-A measured by Automatic Gieseler plastometer



	⊙	△	average
Softening Temp	399	398	399
Fusing Temp	—	—	—
maximum Fluidity	2.6	25	2.6
maximum Temperature	431	428	430
Hardening Temp	445	442	444

Fig. 22. Fluidity Curve of Sample 3-B measured by Automatic Gieseler plastometer

		⊙	△	average
Softening Temp		398	398	398
Fusing Temp		—	—	—
maximum	Fluidity	29	25	27
	Temperature	428	427	428
Hardening Temp		447	447	447

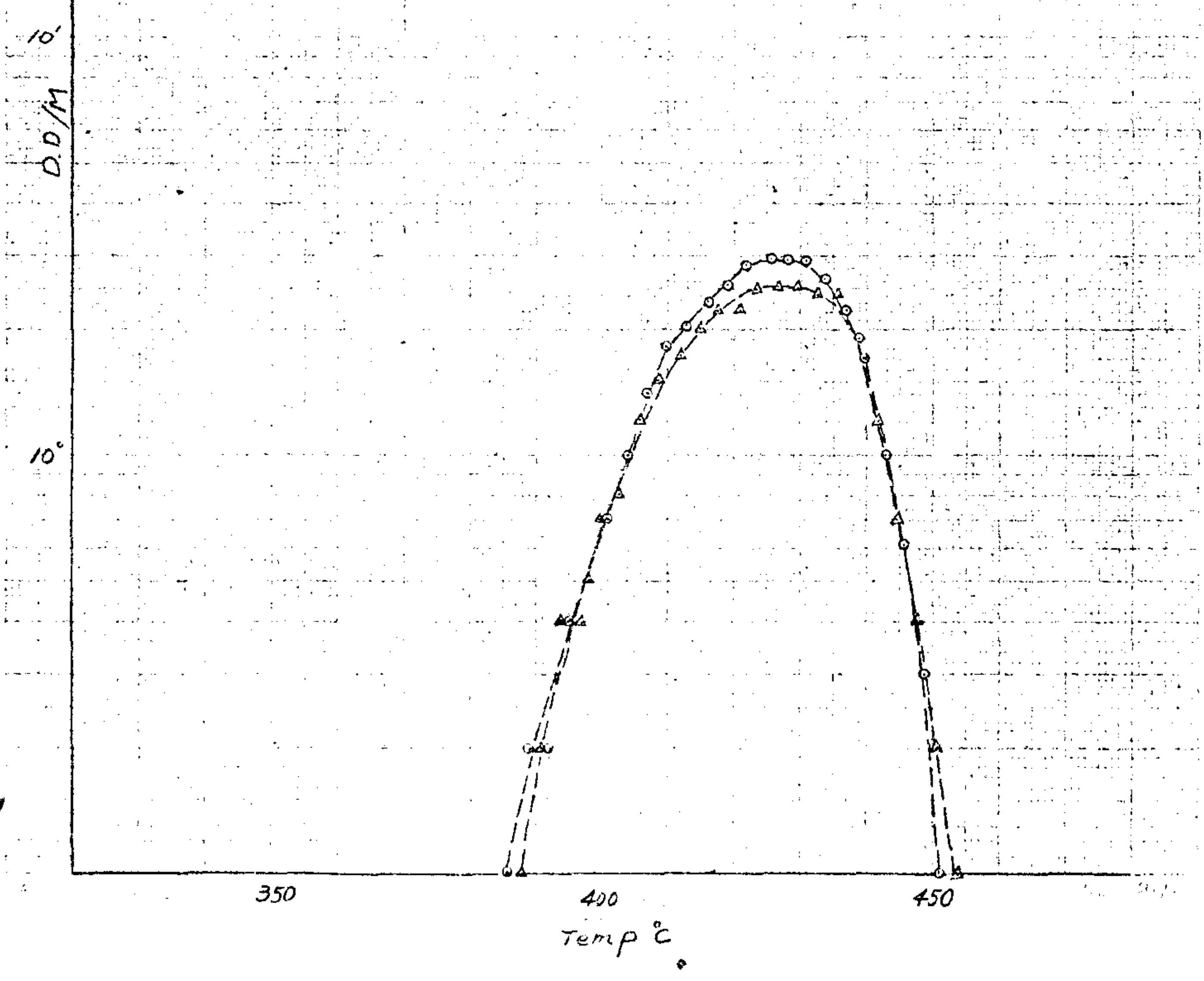
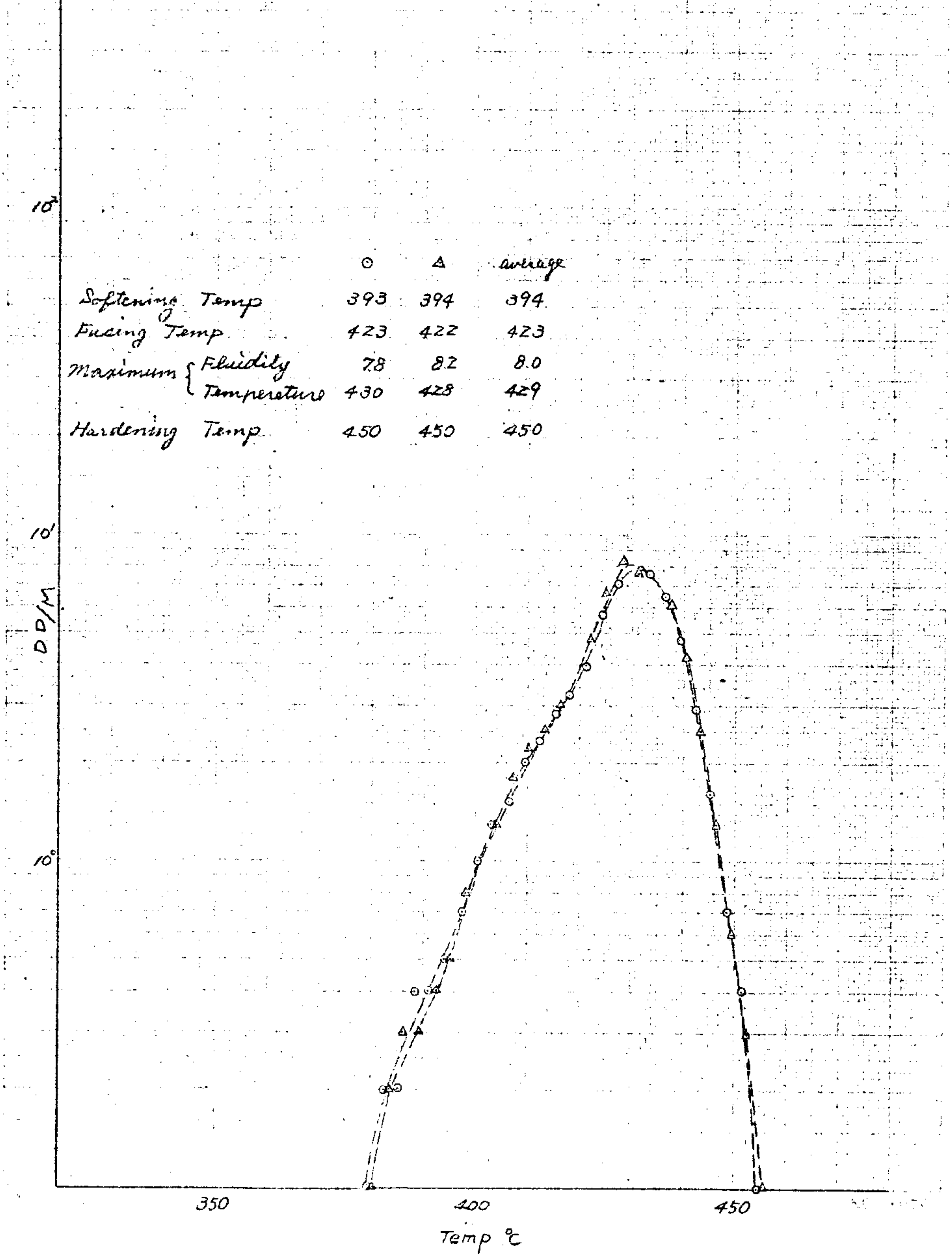


Fig. 23. Fluidity Curve of Sample 3-C measured by Automatic Gieseler plastometer



	⊙	△	average
Softening Temp	393	394	394
Fusing Temp	423	422	423
Maximum Fluidity	7.8	8.2	8.0
Maximum Temperature	430	428	429
Hardening Temp	450	450	450

Fig. 24. Fluidity Curve of Sample 3-D measured by Automatic Gieseler plastometer

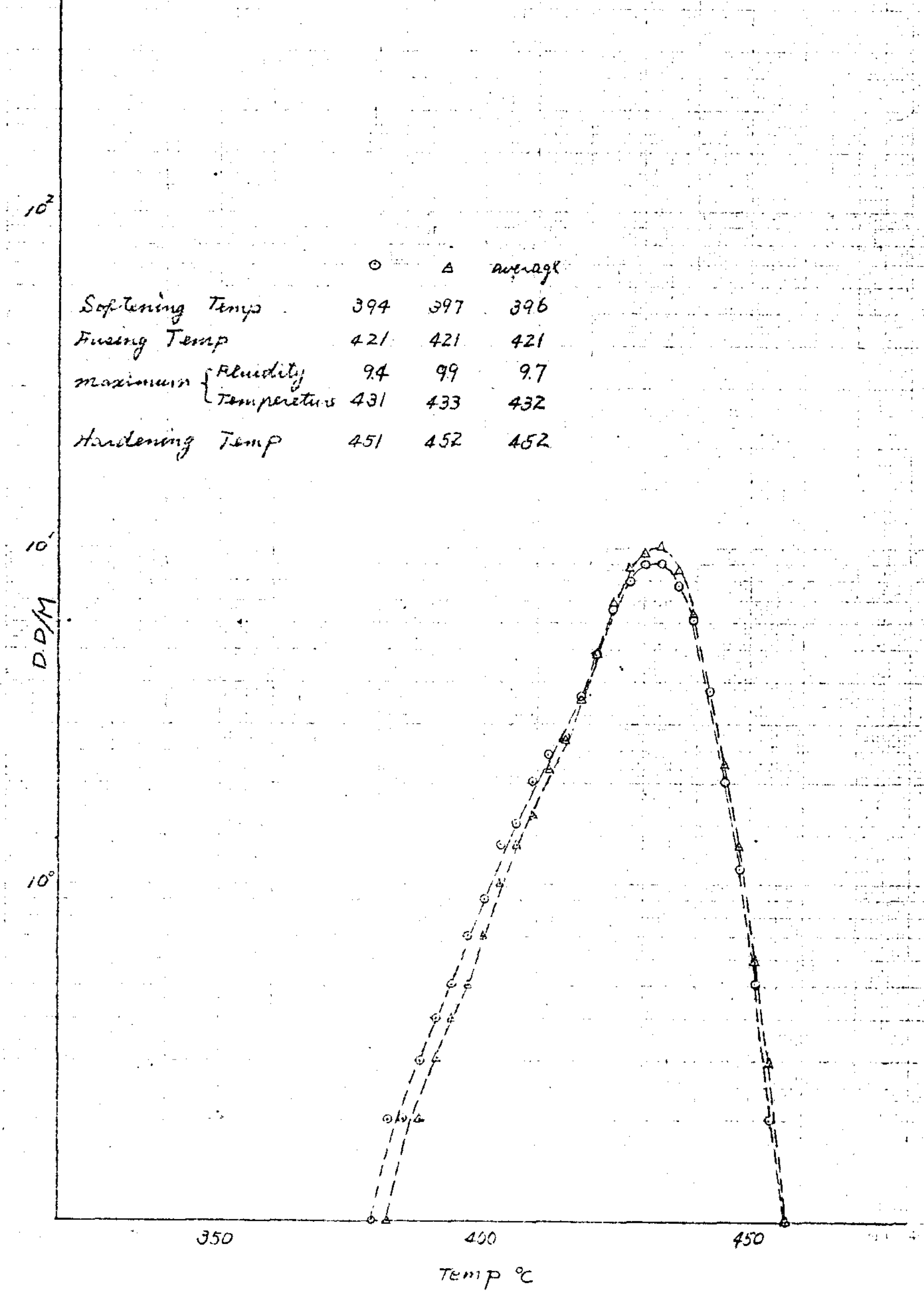


Fig. 25. Fluidity Curve of Sample 4-A measured by Automatic Gieseler plastometer

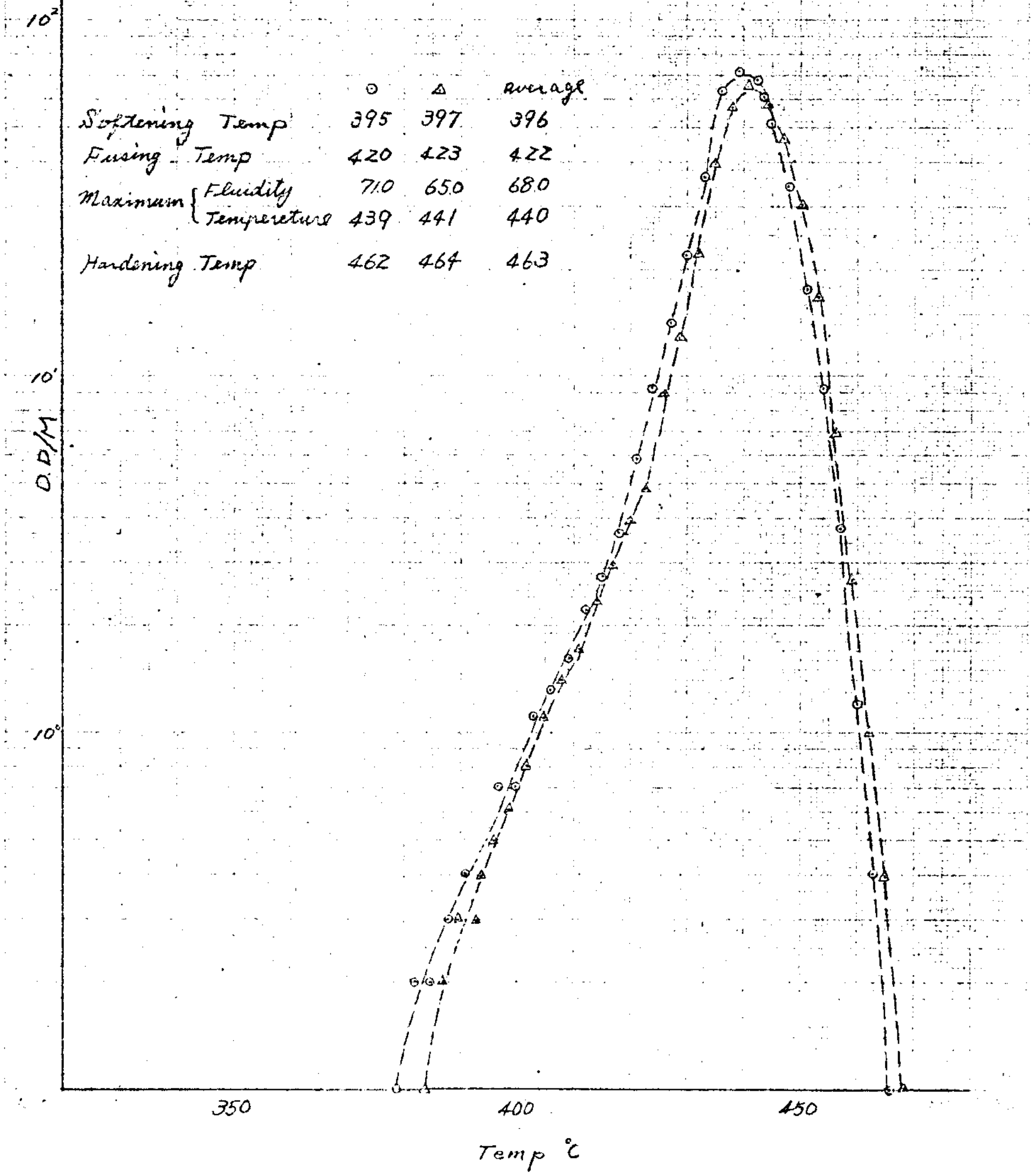


Fig. 26. Fluidity Curve of Sample 4-B measured by Automatic Gieseler plastometer

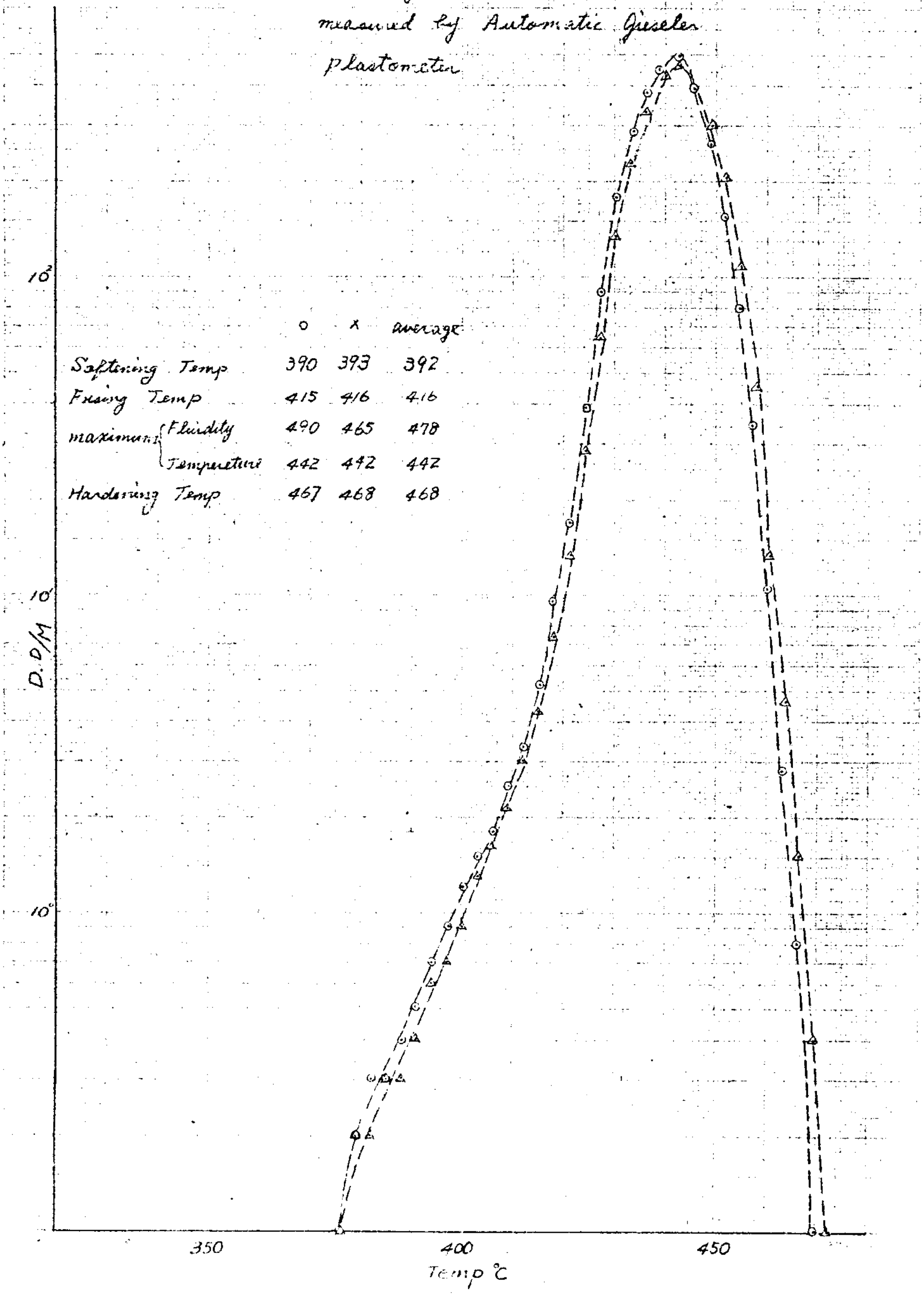


TABLE 1

CHEMCAL ANALYSIS OF MERRITT COAL

SAMPLED FROM NO.2, NO.3 AND NO.4 DRILLING

NO. of COALSEAM	SAMPLE NO.	PROXIMATE ANALYSIS				CAL. Kcal/kg	D.A.F.CAL. Kcal/kg	FUEL RATIO	C. B. I.	TOTAL SULP. %	FLUIDITY	
		MOIS %	ASH %	VOLT. %	CARB. %						MAX. FLUID.	MAX. TEMP.°C
8#	2 ~ A	4.0	7.3	37.6	51.1	7.170	8.090	1.36	1 1/2	0.64	2.1	417
5#	2 ~ B	3.6	7.9	38.1	50.4	7.220	8.160	1.32	3	0.58	2.5	425
1#	2 ~ C	2.9	8.3	37.7	51.1	7.270	8.190	1.36	3 1/2	0.57	5.4	430
1#	2 ~ D	2.8	8.6	38.4	50.2	7.260	8.200	1.31	3 1/2	0.69	6.1	425
1#	2 ~ E	2.9	7.3	37.3	52.5	7.370	8.210	1.41	3	0.83	7.0	430
8#	3 ~ A	3.3	7.5	38.1	51.1	7.280	8.170	1.34	2 1/2	0.49	2.6	430
8#	3 ~ B	3.2	6.1	38.5	52.2	7.430	8.190	1.36	2	0.78	2.7	428
4#	3 ~ C	2.8	6.4	39.5	51.3	7.500	8.150	1.30	3	0.71	8.0	429
5#	3 ~ D	2.5	7.7	36.5	53.3	7.430	8.270	1.46	2 1/2	0.69	9.7	432
8#	4 ~ A	2.3	6.9	34.9	55.9	7.600	8.370	1.60	3	0.61	68.0	440
4#	4 ~ B	2.0	9.0	34.2	54.8	7.270	8.170	1.60	7 1/2	0.64	478	442

All samples were prepared for the floats under 1.4 specific grauity.

Table 2 Petrographic Analysis

o Sample 3 - B

Reactive

V_7	V_8	V_9	E	R	1/3SF	Total
5.6	68.9	9.0	~~109~~ 10.9	0.4	0.1	95.2%

Inerts

2/3SF	M	F	M-M	Total
0.3	1.1	0.4	3.0	4.8%

Composition Blance Index = 0.14
Strength Index = 2.6
Stability factor = 0 - 10

o Sample 3 - D

Reactive

V_4	V_5	V_6	V_7	V_8	E	R	1/3SF	Total
4.0	8.1	24.1	36.1	4.0	15.7	2.8	-	94.8%

Inerts

2/3SF	M	F	M-M	Total
-	1.1	1.1	3.0	5.2%

Composition Blance Index = 0.17
Strength Index = 2.3
Stability factor = 0.10

7. Coal Reserves

Calculation of the coal reserves has been done based on the following assumption.

a) Calculation is done only on the monoclinal low dipped area, named A area, in our previous report.

b) The coal seams under calculation are 4 seams, # 8, # 4, # 5 and # 1.

c) The average thickness of coal seams are shown as follows:

Name of coal seam	Gross Th. in meter	Net Th. in meter
# 8	3.21	2.95
# 4	2.82	2.03
# 5	5.43	3.95
# 1	6.83	6.36

From the roof condition of coal seam, we considered it would be difficult to work by the multiple step method of continuous miner, so we limited the cutting height of each coal seam under 3.10 m (122").

Consequently, we adopt the following thickness of each coal seam used on the reserve calculation.

Name of seam	Thickness used on calculation in meter
# 8	3.10
# 4	2.80
# 5	3.10
# 1	3.10

d) Specific Gravity

As the result of the float sink test the average value of specific gravity turned out to be 1.43 as shown hereunder.

Sample No.	Specific Gravity
2 - A	1.33
2 - B	1.38
2 - C	1.44
2 - D	1.59
2 - E	1.34
3 - A	1.51
3 - B	1.41
3 - C	1.39
3 - D	1.43
4 - A	1.35
4 - B	1.59
Average	1.43

e) Dip

Though, depending on location, the dips of coal seams vary from 10 to 20 degree, the average dips are as follows:

Name of coal seam	Average dip
# 8	15° 13'
# 4	14° 52'
# 5	15° 25'
# 1	16° 11'

f) Limitation of Depth

The limited depth of coal seam under calculation is 1000 ft above the sea level. The average elevation of topographical relief is 2100 ft.

g) Recovery factor for geological condition
80%

h) Recovery factor for mining condition

50%, as one step mining by room and pillar method.

i) Recovery factor for washing condition

As the result of the float sink test, the recovery of the floats under 1.4 specific gravity is as follows:

Sample No.	Ash %	Recovery %
2 - A	7.3	81.5
2 - B	7.9	73.4
2 - C	8.3	62.2
2 - D	8.6	33.2
2 - E	7.3	77.4
3 - A	7.5	59.6
3 - B	6.1	74.8
3 - C	6.4	71.9
3 - D	7.7	64.6
4 - A	6.9	81.7
4 - B	9.0	37.8
Average	7.55	65.3

On the assumption that recovery can be raised up to 70% by the possible selective mining, and lower quality is admitted (about 8% ash), and efficiency of washery is fixed at 95%, we will conclude 66.5% recovery for washing. Then the total recovery against the mineable clean coal reserves will be 26.6%. The diagrams for the calculation of coal reserves are shown in Fig. 27 - Fig. 31.

Table 3 Mineable Coal Reserves

e of Seam	Thickness in meter	Sp.gr.	Plain Area in 1000 m^2	Dip ° '	Inclinal Area in 1000 m^2	Coal Reserve in 1000 ton	Recovery in %mm	Clean Coal Reserves in 1000 ton	Ratio of Reserves %
3	3.10	1.43	1,313	15-13	1,360	6,040	26.6	1,607	22.6
[illegible]	2.80	1.43	1,459	14-52	1,510	6,050	26.6	1,609	22.6
5	3.10	1.43	1,734	15-25	1,800	7,970	26.6	2,120	29.8
[illegible]	3.10	1.43	1,452	16.11	1,512	6,700	26.6	1,782	25.0
l						26,760		7,118	100.0

Ton = Metric Ton