

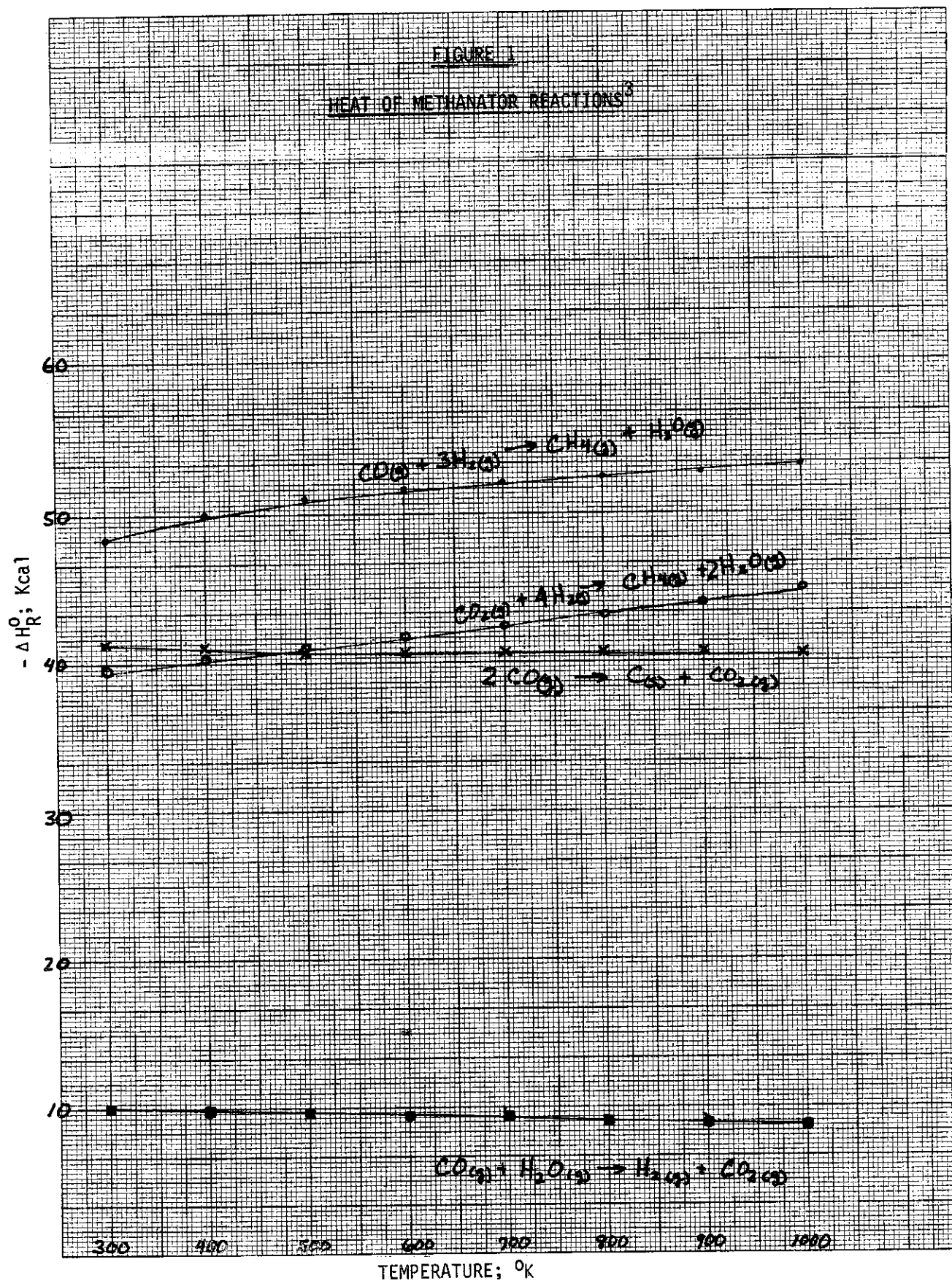
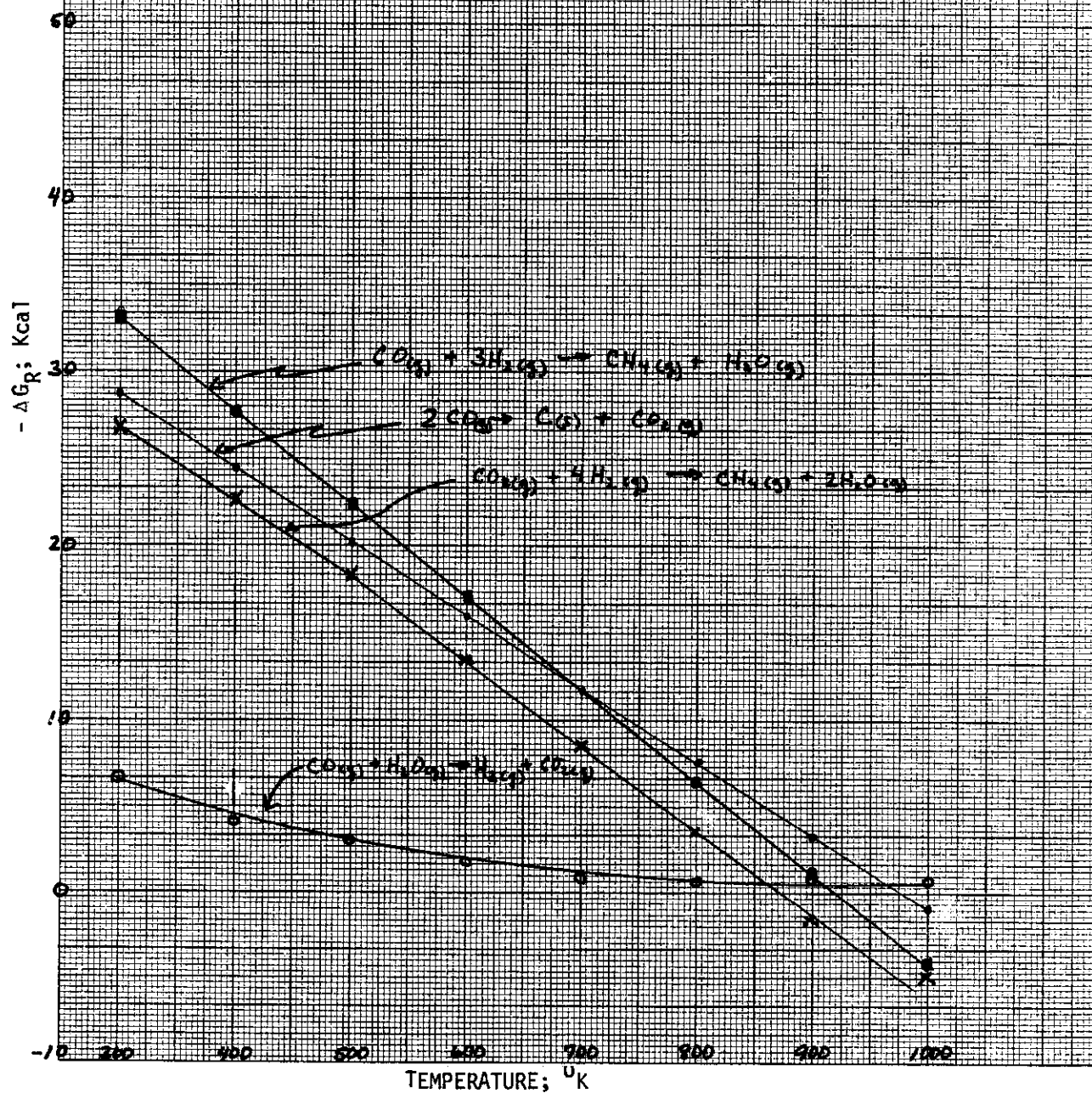


FIGURE 2
FREE ENERGIES OF METHANATOR REACTIONS¹



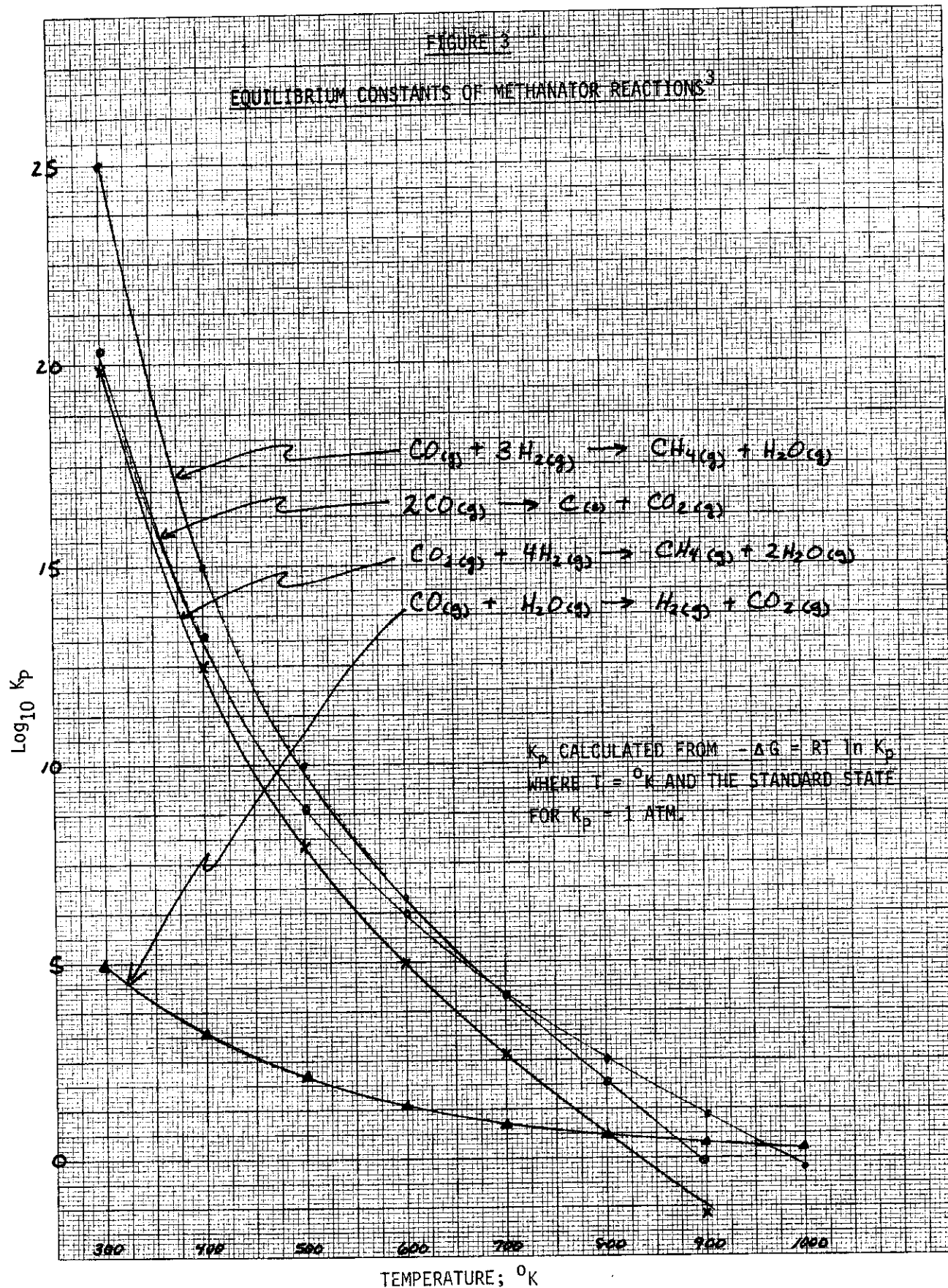


FIGURE 4

SCHEMATIC DIAGRAM OF REACTOR ASSEMBLY CARBON FORMATION STUDY IN METHANATION

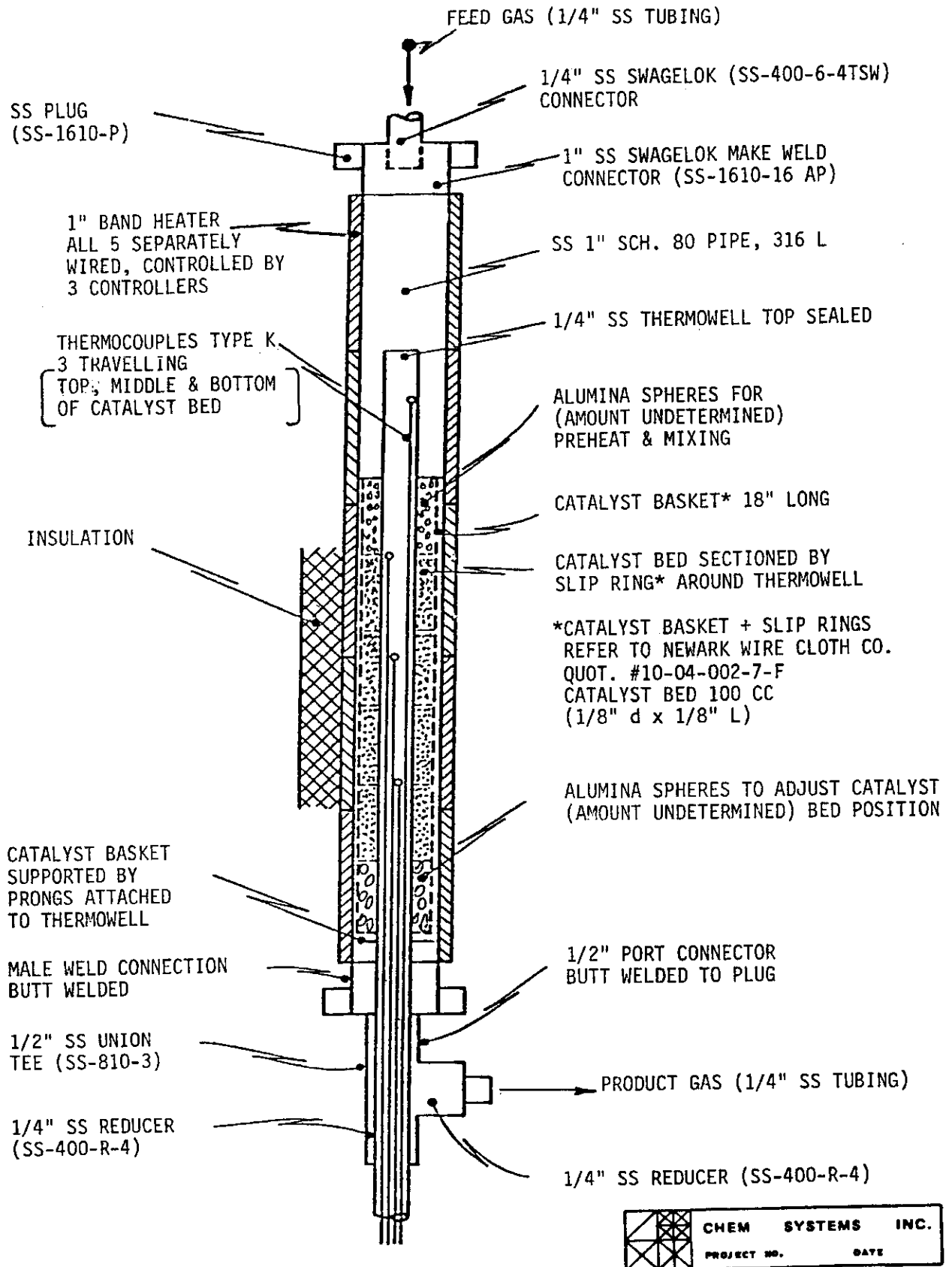
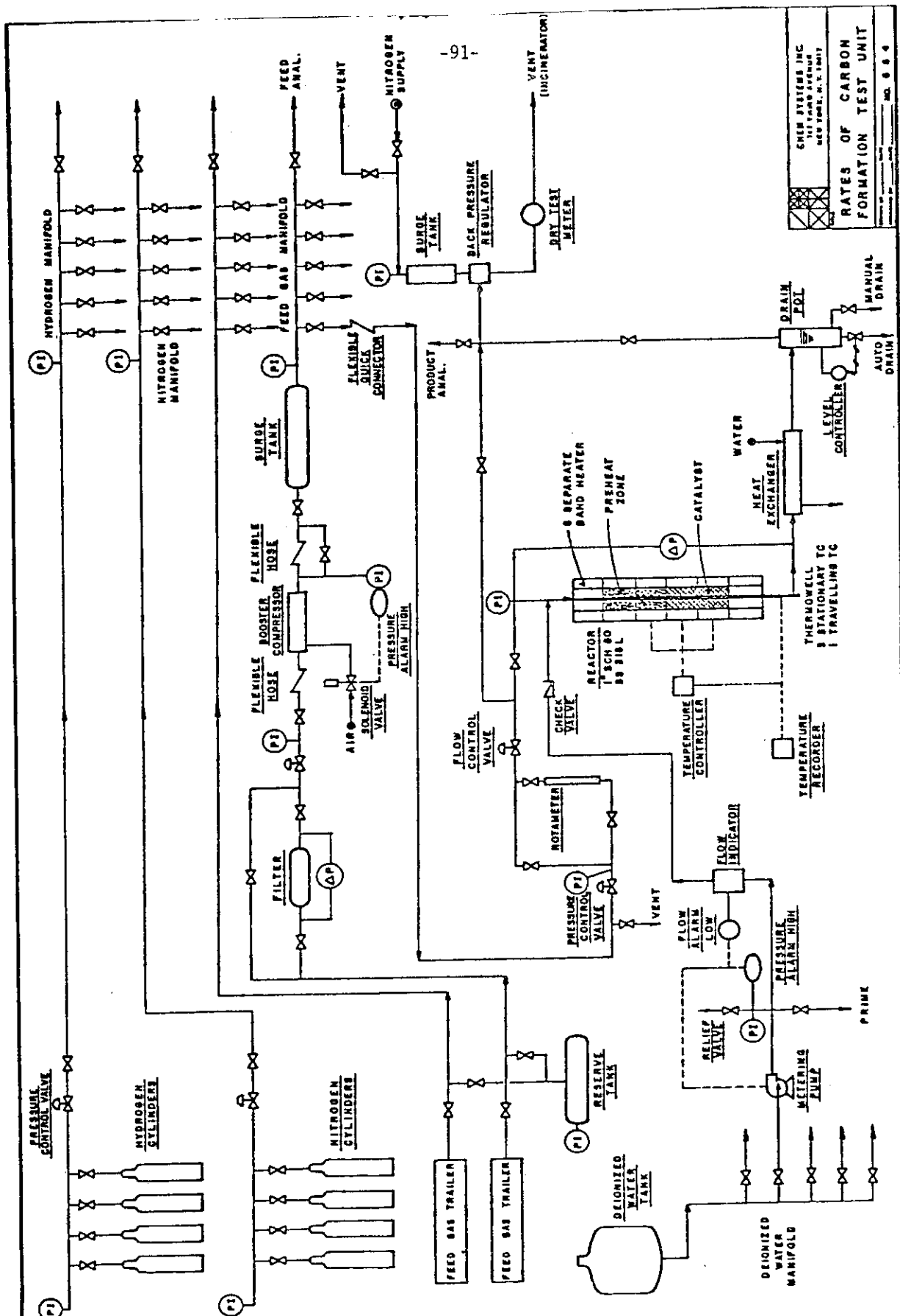
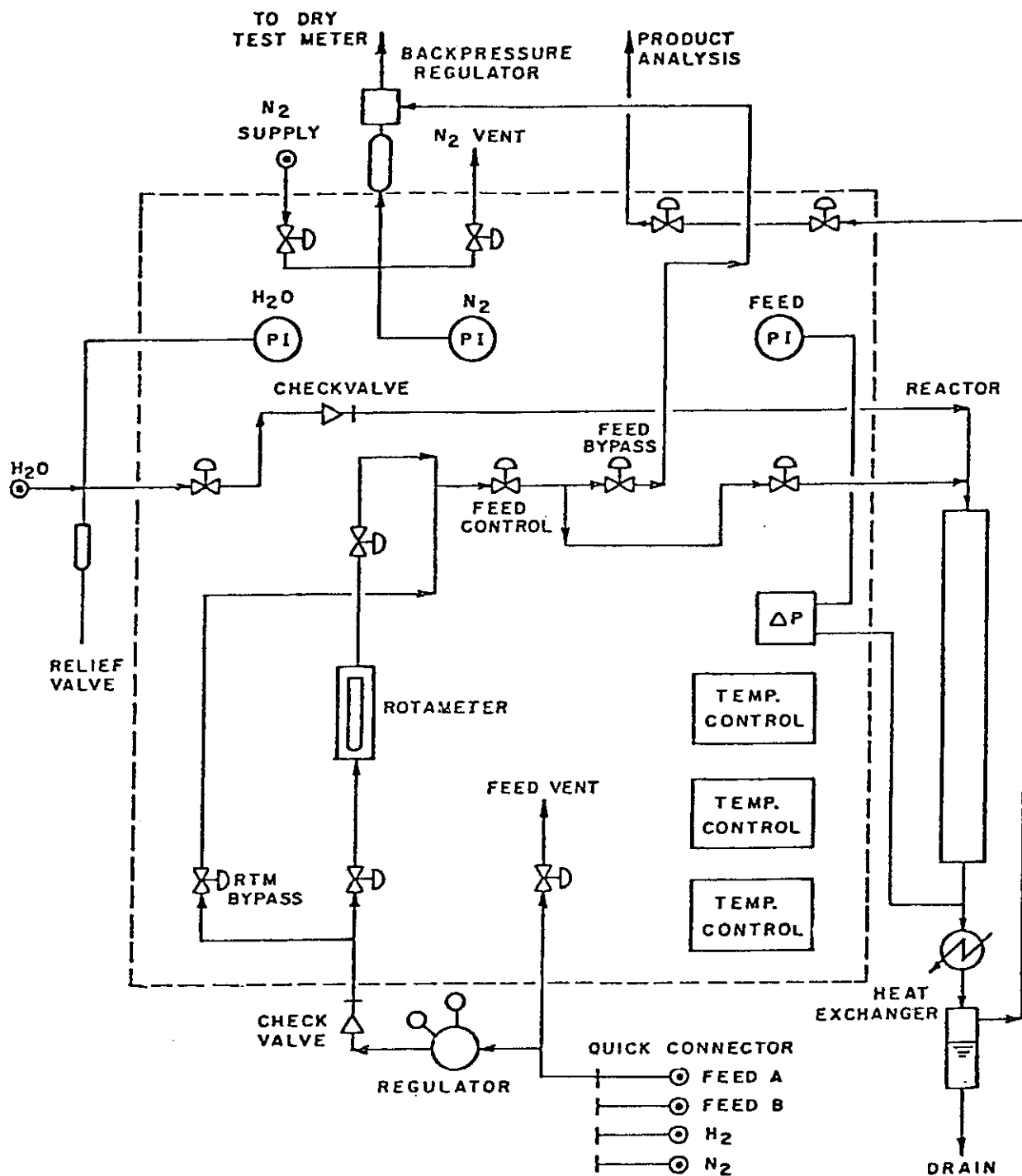


FIGURE 5



CARBON FORMATION REACTOR SYSTEM CONTROL PANEL



CARBON FORMATION BOOSTER CONTROL PANEL

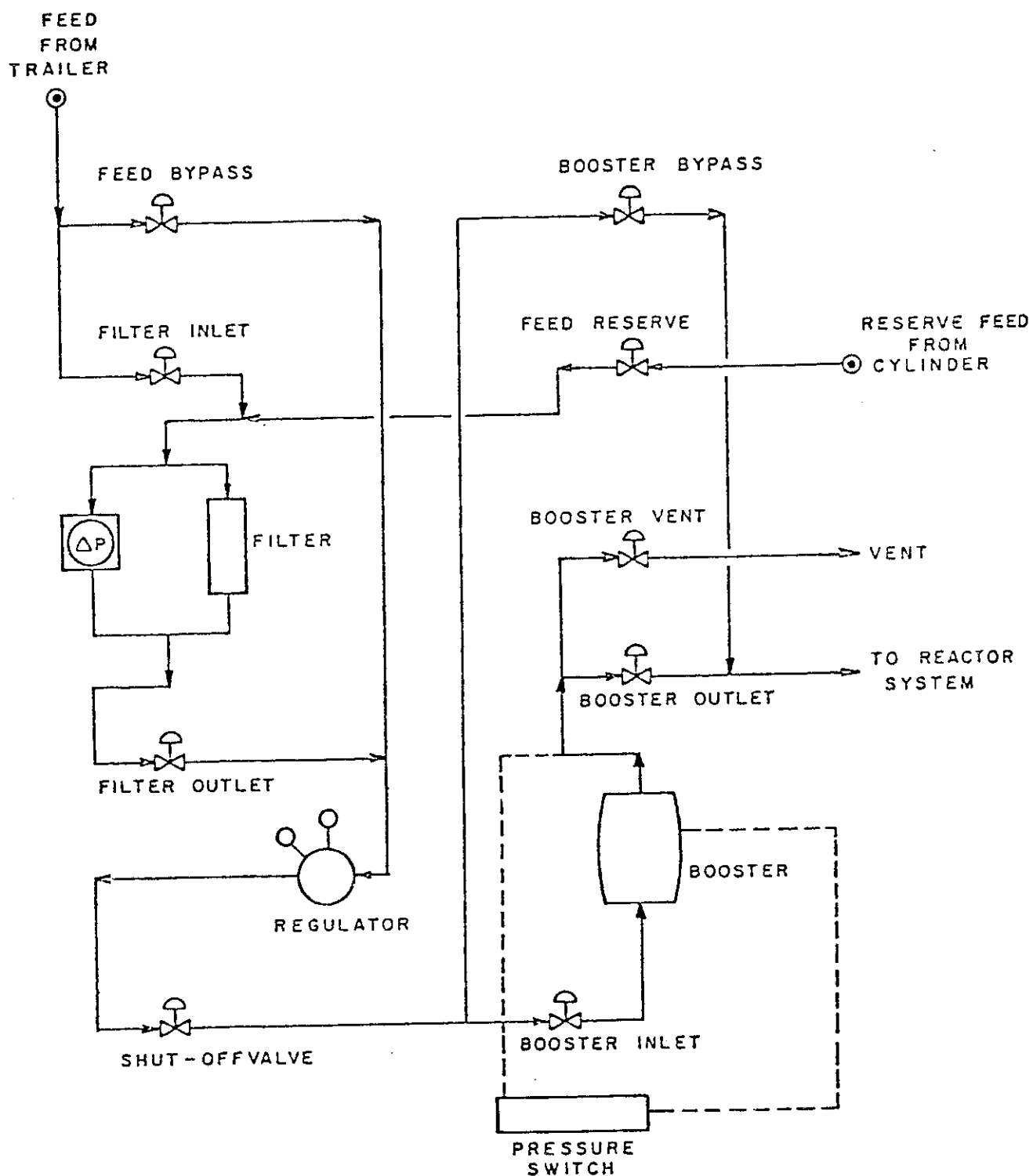


FIGURE 8

Atomic C-H-O Boundaries
for Graphite and Non-Ideal Carbon Formation

Source: C. F. Braun

Temperature: 900°C

Pressure : 515 PSIA

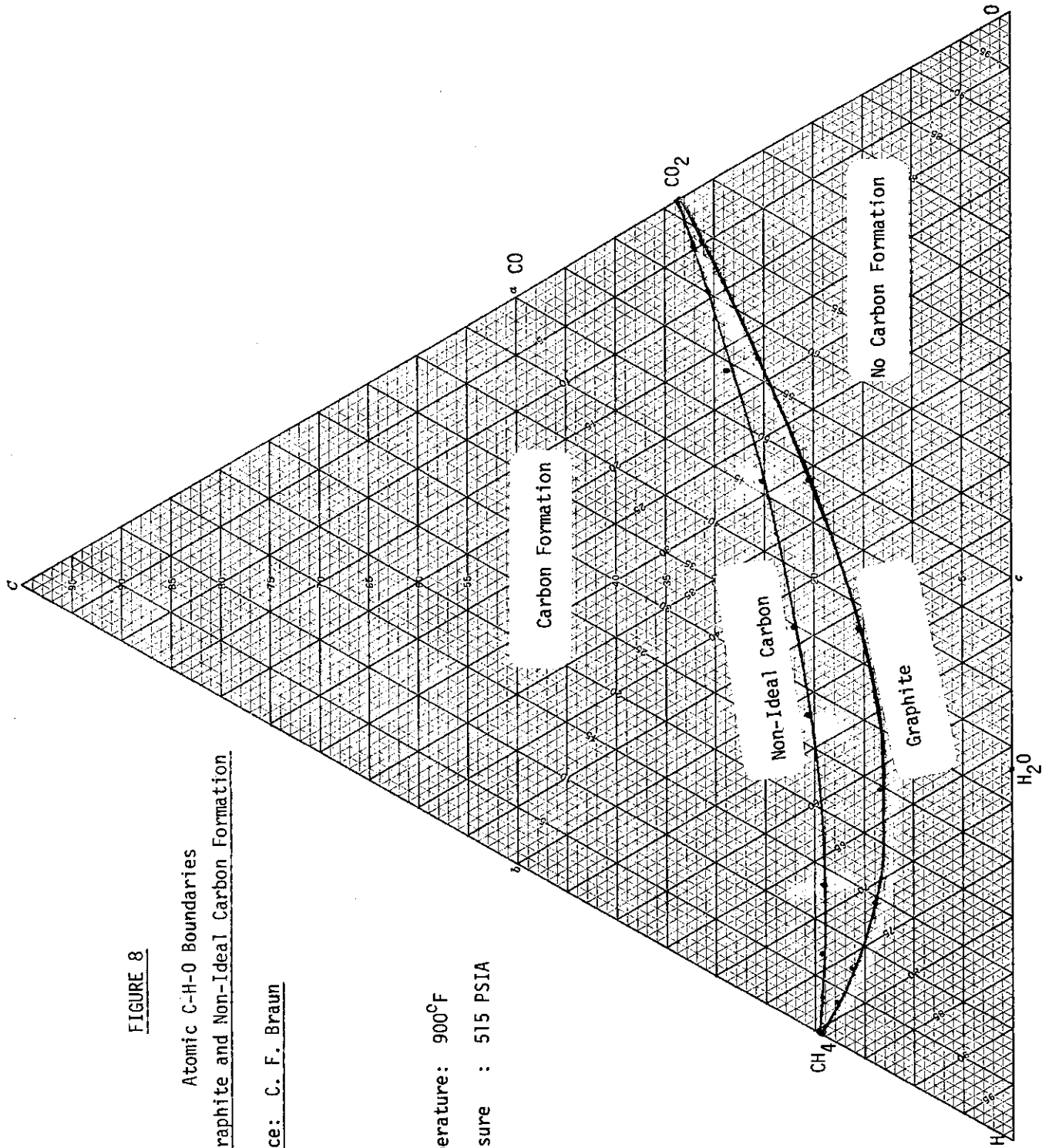


FIGURE 9

Atomic C-H-O Boundaries
for Graphite and Non-Ideal Carbon Formation

Source: C. F. Braun

Temperature: 900°F

Pressure : 1015 PSIA

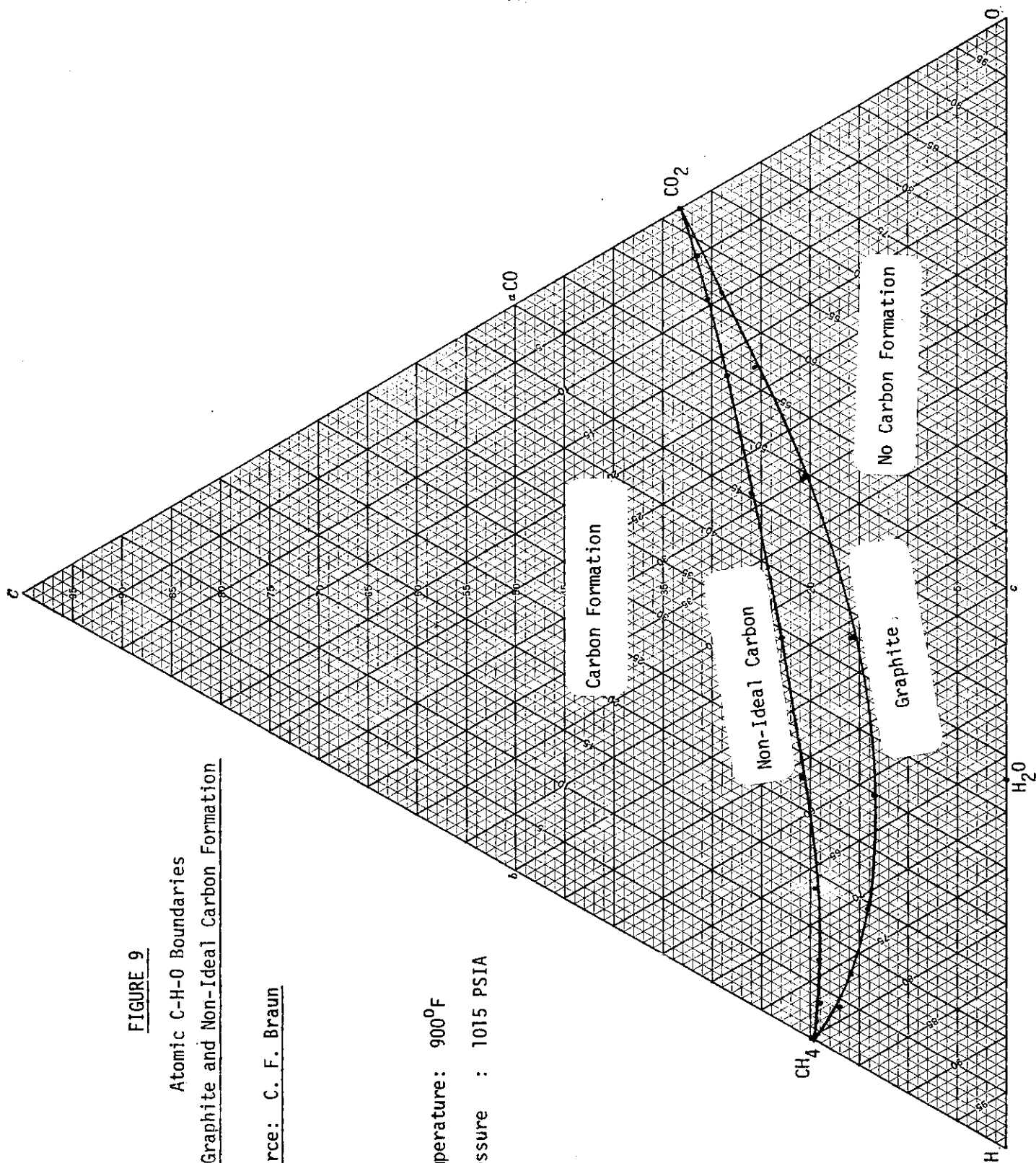
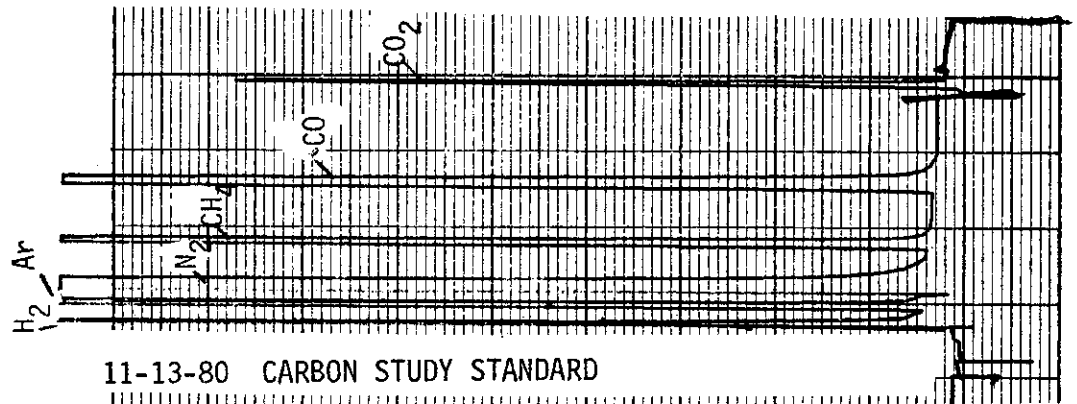


FIGURE 10

CARBON STUDY GAS STANDARD



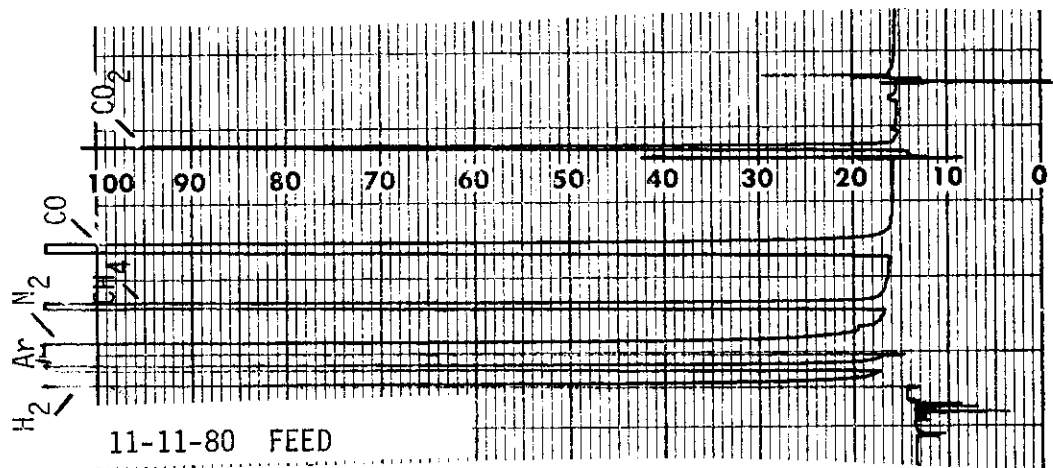
DATE 13 Nov 80
 TIME 1046
 SAMPLE NO. 5.
 PROGRAM NO. 1

NO.		TIME	AREA
1	H ₂	3.90	39489
2	Ar	4.68	127982
3	N ₂	5.25	1705408
4	CH ₄	7.16	66636
5	CO	9.45	90836
6	CO ₂	13.48	11140
7	--	14.16	140
	TOTAL		2041631

CALIBRATION		TIME	FACTORS
NO.			
1	H ₂	3.90	3152.
2	Ar	4.68	25550.
3	N ₂	5.25	22720.
4R	CH ₄	7.16	20760.
5	CO	9.45	23900.
6	CO ₂	13.48	27850.
		14.16	140.1

FIGURE 11

CARBON STUDY FEED GAS



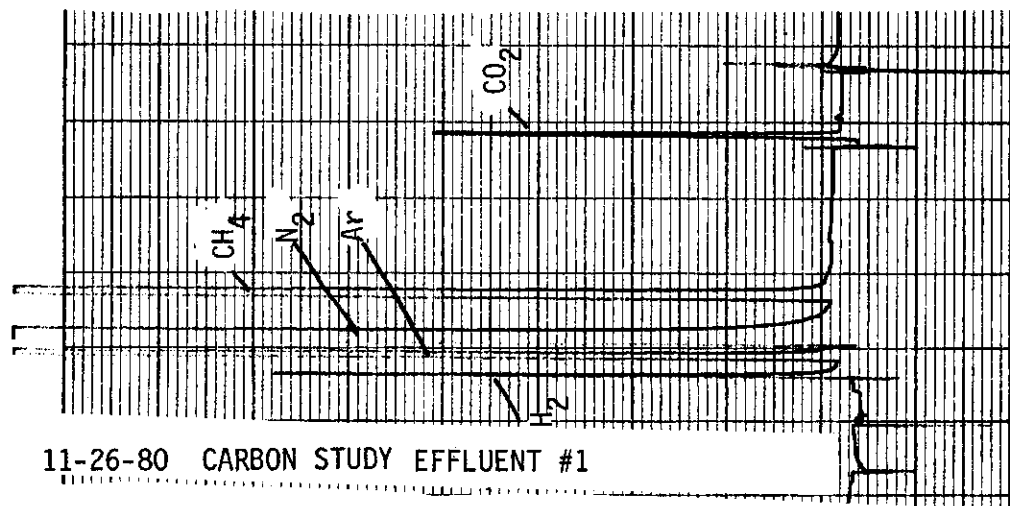
DATE 11 Nov 80
 TIME 1046
 SAMPLE NO. 5.
 PROGRAM NO. 1

NO.		TIME	AREA
1	H2	3.90	41540
2	Ar	4.68	132360
3	N2	5.27	1668096
4	CH4	7.17	67262
5	CO	9.53	87084
6	CO2	13.49	12484
TOTAL			2008826

EXTERNAL STANDARD			PCT CONC
NO.		TIME	
1	H2	3.90	13.270
2	Ar	4.68	5.211
3	N2	5.27	74.000
4R	CH4	7.17	3.260
5	CO	9.53	3.668
6	CO2	13.49	0.453
TOTAL			99.850

FIGURE 12

REACTOR #1 EFFLUENT
CATALYST: UCI-G87-S



DATE 26 Nov 80
TIME 1611
SAMPLE NO. 11.
PROGRAM NO. 1

NO.		TIME	AREA
1	H ₂	3.92	5452
2		4.36	5
3	Ar	4.68	151752
4	N ₂	5.18	1894496
5		6.23	147
6	CH ₄	7.07	168448
7		11.32	75
8	CO ₂	13.48	6736
9		12.16	118
TOTAL			2227229

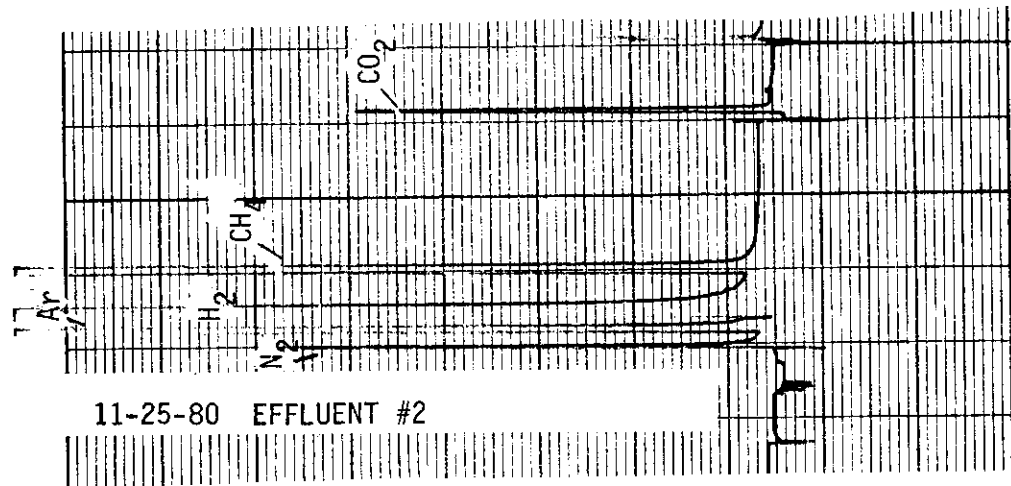
EXTERNAL STANDARD

NO.		TIME	PCT CONC
1	H ₂	3.92	1.585
2	Ar	4.68	5.974
3	N ₂	5.18	83.790
4R	CH ₄	7.07	7.923
6	CO ₂	13.48	0.218
TOTAL			98.310

FIGURE 13

REACTOR #2 EFFLUENT

CATALYST: UCI-C150-4-03



DATE 25 Nov. 80
TIME 2203
SAMPLE NO. 45.
PROGRAM NO. 1

NO.		TIME	AREA
1	H2	3.92	6043
2	Ar	4.67	150756
3	N2	5.19	1743520
4		6.60	35
5	CH4	7.06	167736
6	CO2	13.48	5618
7	C2	14.16	168
TOTAL			2073876

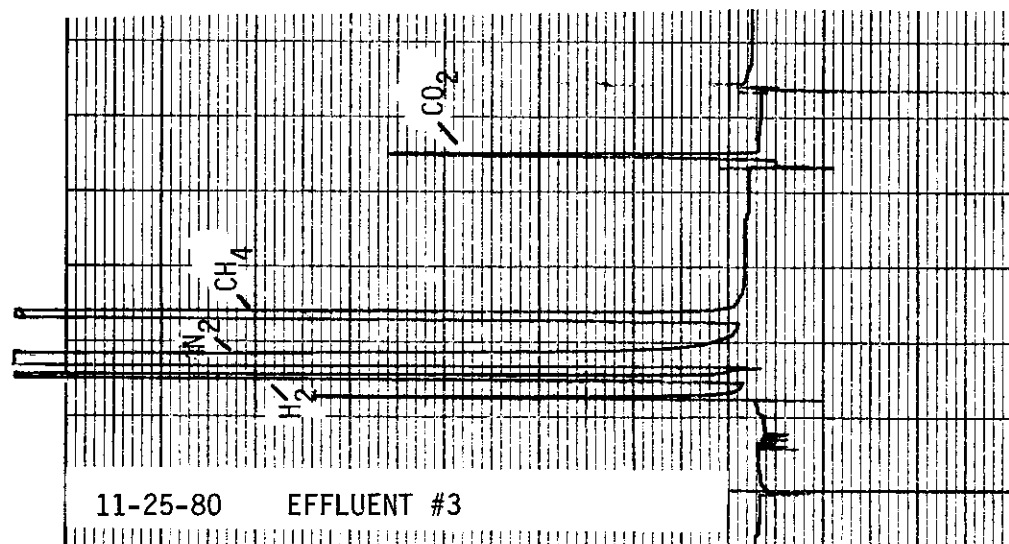
EXTERNAL STANDARD

NO.		TIME	PCT CONC
1	H2	3.92	1.742
2	Ar	4.67	5.994
3	N2	5.19	82.400
4R	CH4	7.06	7.987
6	CO2	3.48	0.196
			98.310

FIGURE 14

REACTOR #3 EFFLUENT

CATALYST: CRG-F (KATALCO)



DATE 25 Nov. 80
 TIME 1623
 SAMPLE NO. 28.
 PROGRAM NO. 1

NO.	TIME	AREA
1	3.92	5179
2	4.67	150580
3	5.19	1721536
4	7.06	167120
5	8.67	8
6	8.78	1
7	12.50	1
8	13.48	6103
9	14.16	162 TT
10	15.45	1
TOTAL		2050691

EXTERNAL STANDARD

NO.	TIME	PCT CONC
1	3.92	1.493
2	4.67	5.987
3	5.19	81.360
4R	7.06	7.958
6	3.48	0.213
TOTAL		97.010

FIGURE 15

REACTOR #4 EFFLUENT

CATALYST: Ni-3210 (HARSHAW)

DATE 25 Nov. 80
TIME 843
SAMPLE NO. 5.
PROGRAM NO. 1

NO.	TIME	AREA
1	3.91	17695
2	4.68	144224
3	5.19	1715936
4	7.07	151288
5	13.47	9323
6	14.16	71
7	15.98	2952
TOTAL		2041489

NO.	TIME	PCT CONC
1	3.91	5.099
2	4.68	5.734
3	5.19	81.090
4R	7.07	7.204
6	13.47	0.326
TOTAL		99.450

EXTERNAL STANDARD

NO.	EXTERNAL STANDARD
1	H ₂
2	Ar
3	N ₂
4R	CH ₄
6	CO ₂

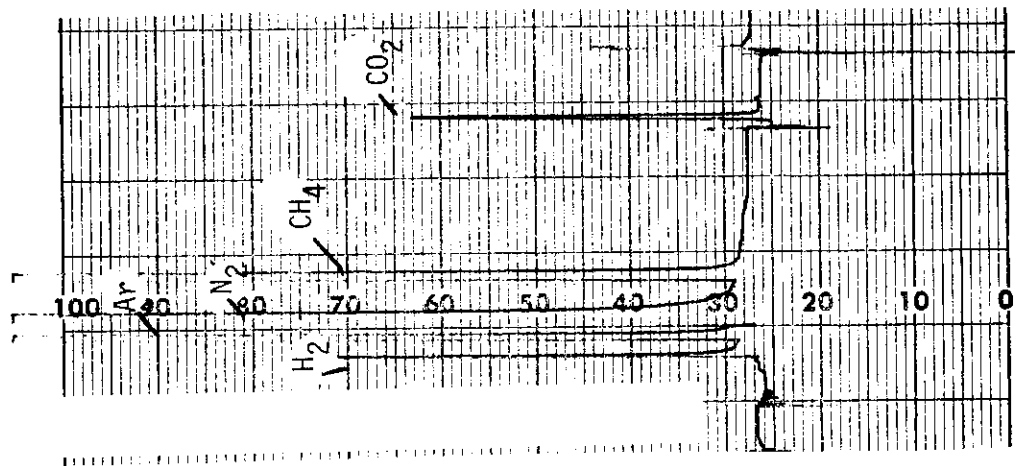
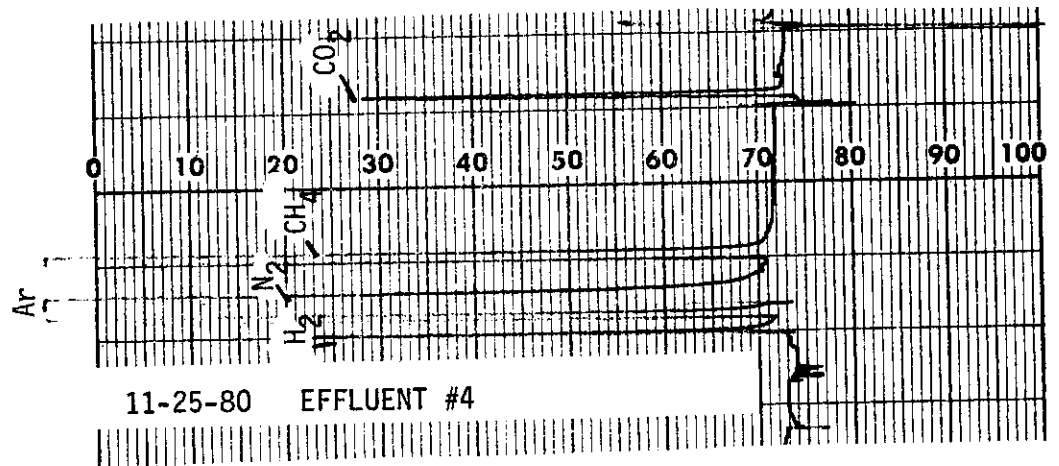


FIGURE 16

REACTOR #5 EFFLUENT

CATALYST: Ni-0104 (HARSHAW)



DATE 25 Nov. 80
 TIME 1303
 SAMPLE NO. 18.
 PROGRAM NO. 1

NO.		TIME	AREA
1	H ₂	3.92	6651
2	Ar	4.68	149072
3	N ₂	5.19	1711136
4	CH ₄	7.07	162760
5	CO ₂	13.48	11284
6	C ₂	14.16	156
7		15.06	17
TOTAL			2041076

VB

EXTERNAL STANDARD

NO.		TIME	PCT CONC
1	H ₂	3.92	1.917
2	Ar	4.68	5.927
3	N ₂	5.19	80.870
4R	CH ₄	7.07	7.750
6	CO ₂	3.48	0.395
TOTAL			96.850

VB

FIGURE 17

TEMPERATURE PROFILE OF RUN 215-6-111

182°C, 1000 psia, 0% Steam

Catalyst - UO₂-187 S

HOURS ON STREAM

● 0 HRS.
○ 75 HRS.
△ 120 HRS.

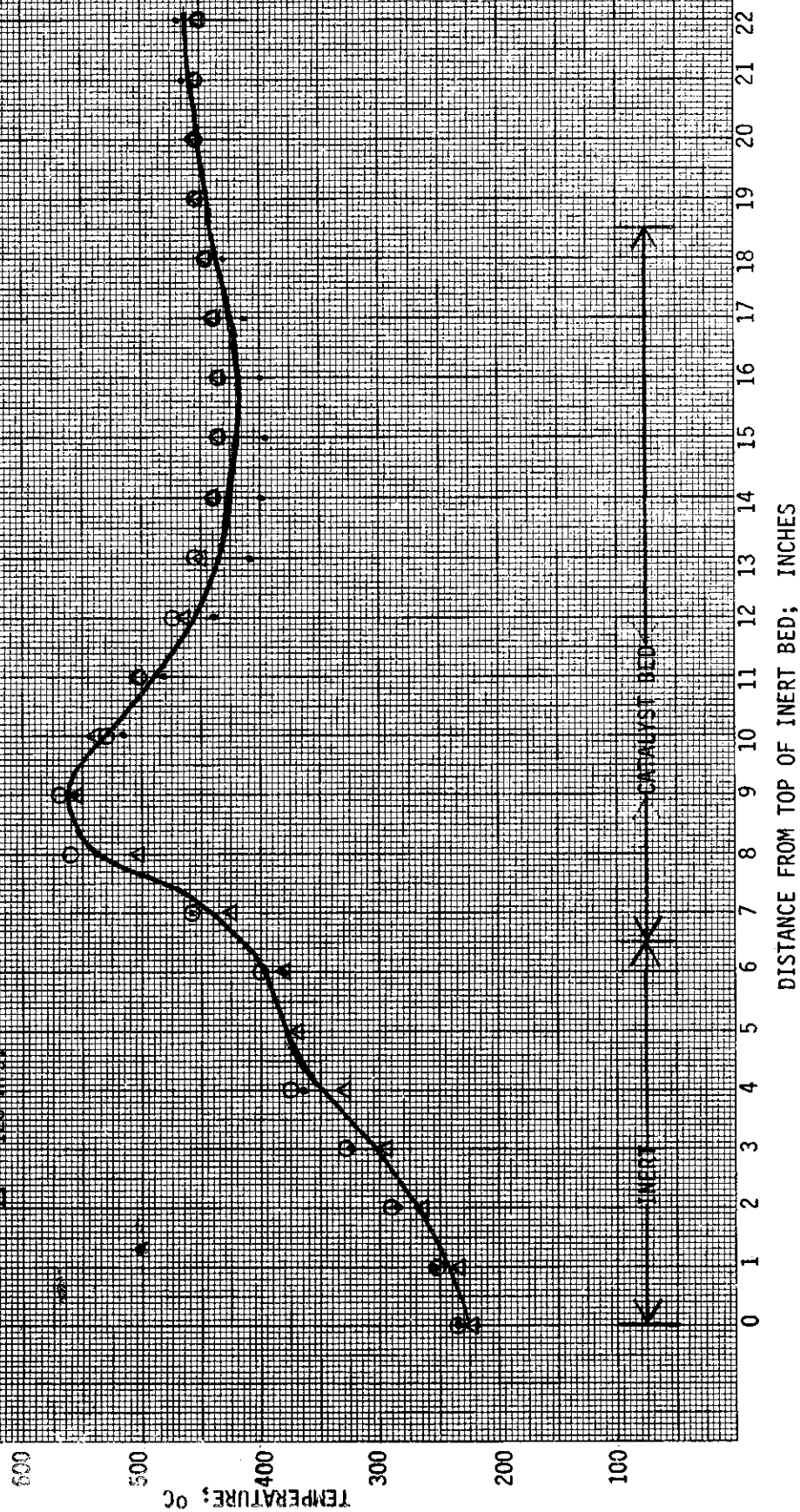


FIGURE 18

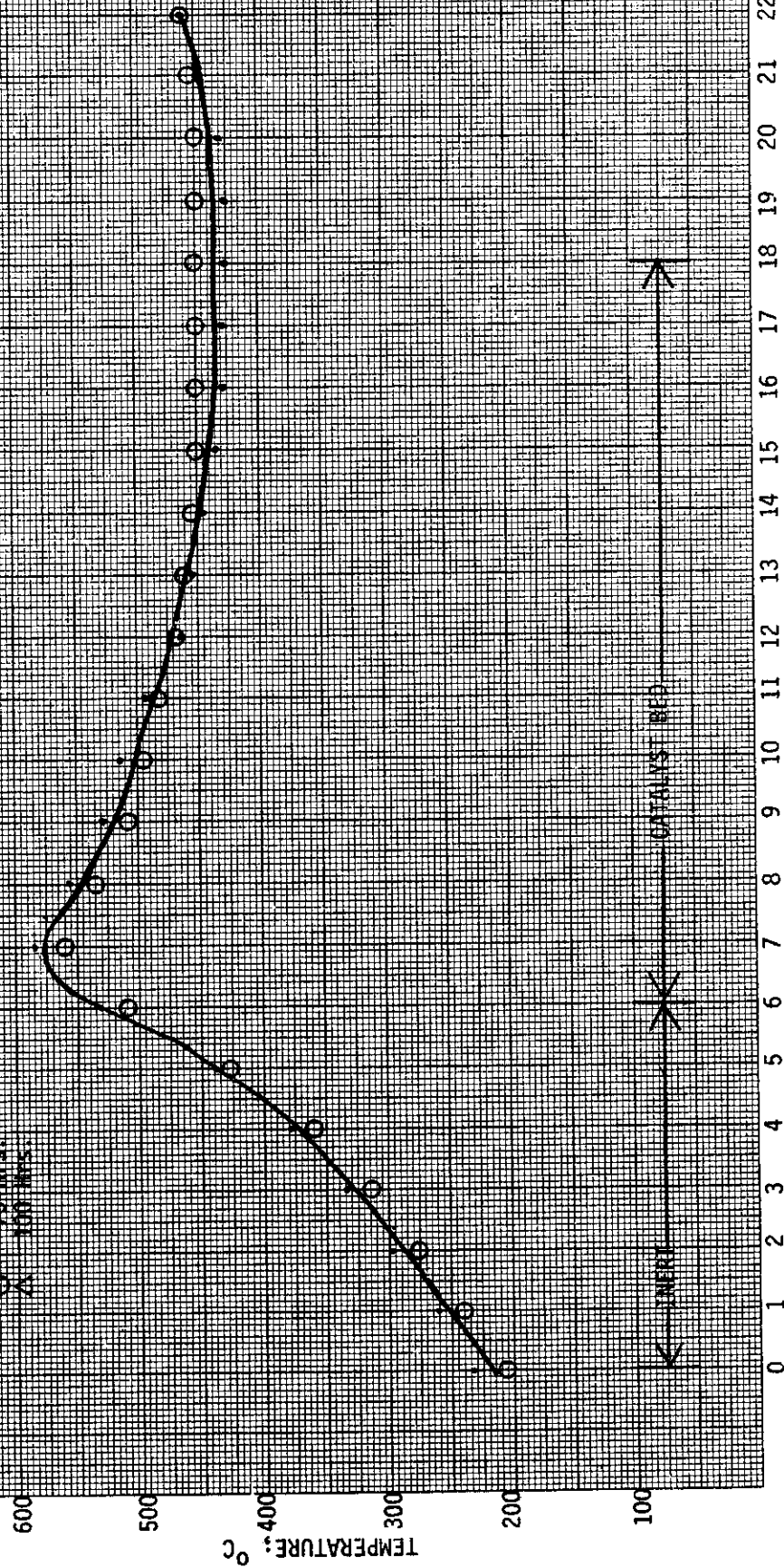
TEMPERATURE PROFILE OF RUN 215-8-2-2

482° F; 1000 psig; 0% Steam

Catalyst - UCL-C150-0-03

HOURS ON STREAM

- 0 HRS.
- 75 HRS.
- △ 100 HRS.



DISTANCE FROM TOP OF INERT BED; INCHES

FIGURE 19

TEMPERATURE PROFILE OF RUN 215-8-313

682°C, 1000 psig, 0% steam

Catalyst - Katalco LUG-F

Hours on Stream

● 0 hrs.

○ 75 hrs.

△ 100 hrs.

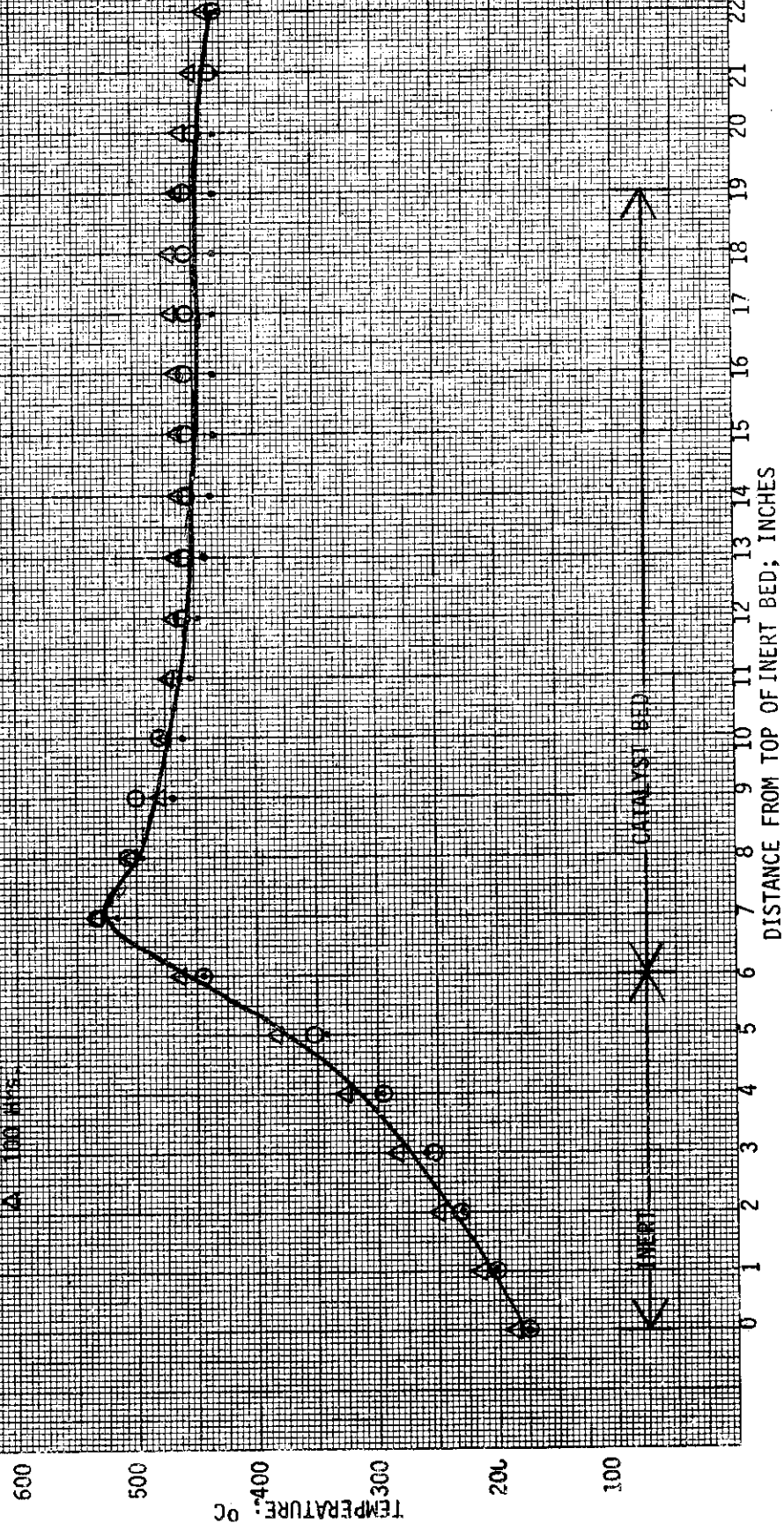


FIGURE 20

TEMPERATURE PROFILE OF RUN 215-8-4-4

182°C, 1000 psig, 0% Steam

Catalyst - Harshaw W-3210

Hours on Stream

- 0 HRS.
- 78 HRS.
- △ 100 HRS.

