

• Run # 2/23 Mar 1968 HJH .147" D. x .250" L pyrophyllite core inside  
 .187" O.D. x .147" I.D. x .250" L graphite tube with .031" thk x .187" D graphite disks  
 each end. No disks were .003" thk x 7/16" D.

• Run # 1/25 Mar 1968 HJH pyroph. core  
 T.C. connections through Ni tabs to anvils

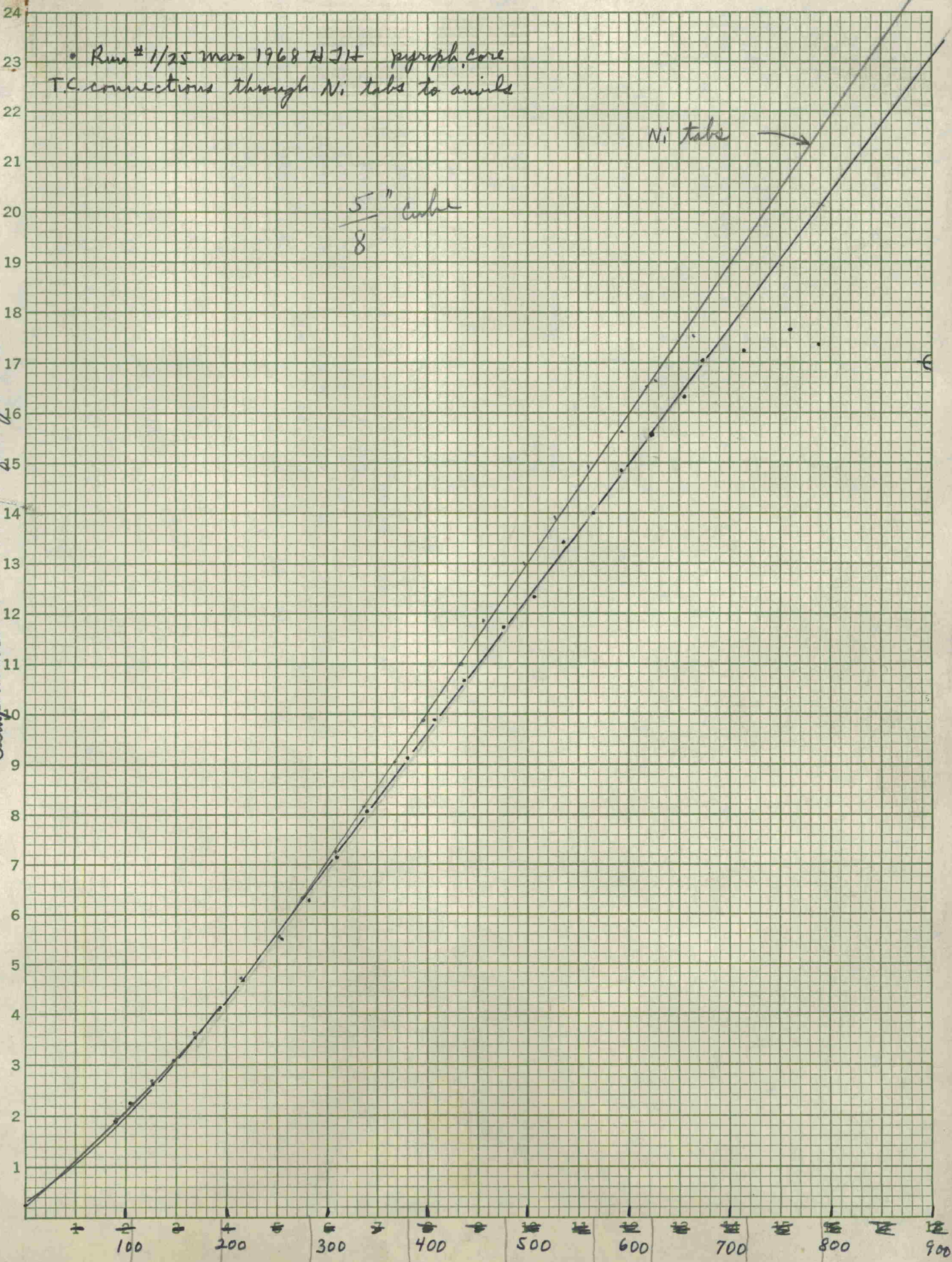
$\frac{5}{8}$ " cube

Ni tabs

Temperature hundreds of degrees C

5 Squares to the Centimeter  
 MADE IN U.S.A.

12-189  
 5789



HEATING POWER (WATTS)

AMS 104 152 190 224 251 266 275 286 300



Average of runs # 1/16 Mar and # 2/22 Mar 1968 H.J. Hall  
 BN core .149" D X .250 Long in graphite cyl .187 O.D. X .147 I.D. X 1/4" L with  
 graphite end disks .035" thick X 3/16" D.

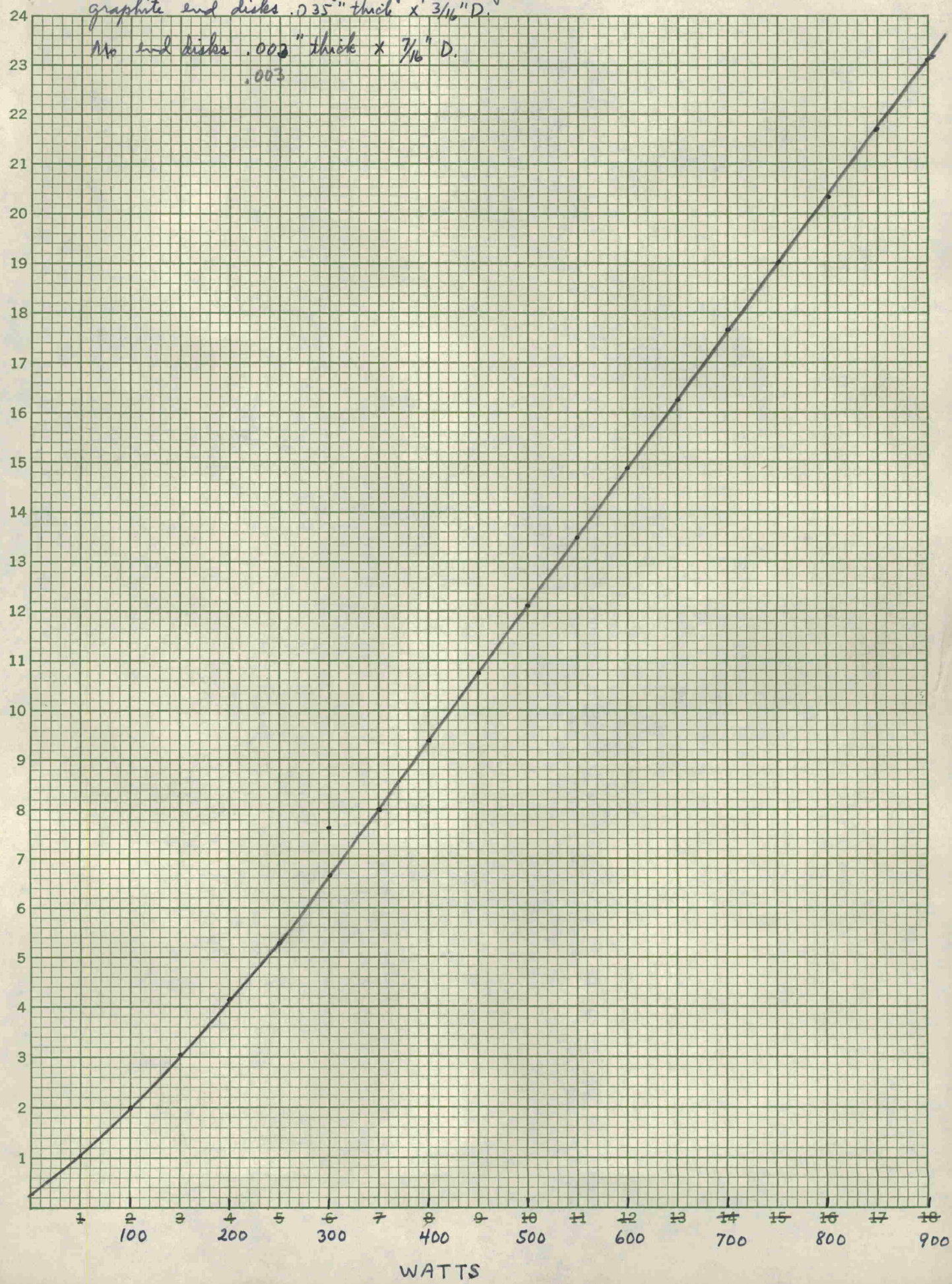
5/8 cube

No end disks .003" thick X 7/16" D.  
 .003

5 Squares to the Centimeter  
 MADE IN U.S.A.

12-189  
 5789

TEMPERATURE in hundreds of °C



WATTS



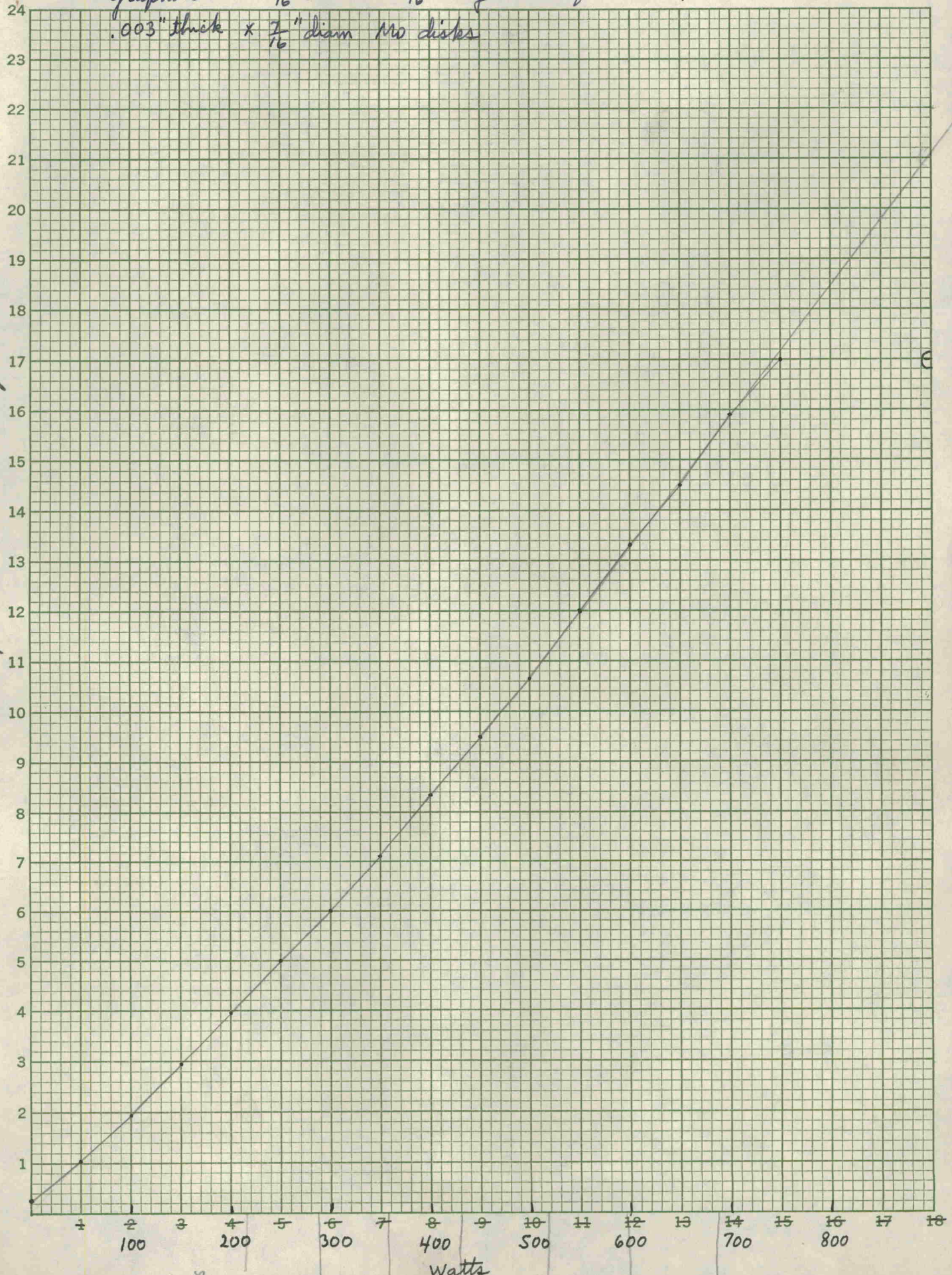
5/8 cube

average of Runs #1/13 Mar 1968 and #1/14 Mar 1968 H. Tracy Hall  
graphite core  $\frac{3}{16}$ " diam x  $\frac{5}{16}$ " long (self heater)  
.003" thick x  $\frac{7}{16}$ " diam no disks

5 Squares to the Centimeter  
MADE IN U.S.A.

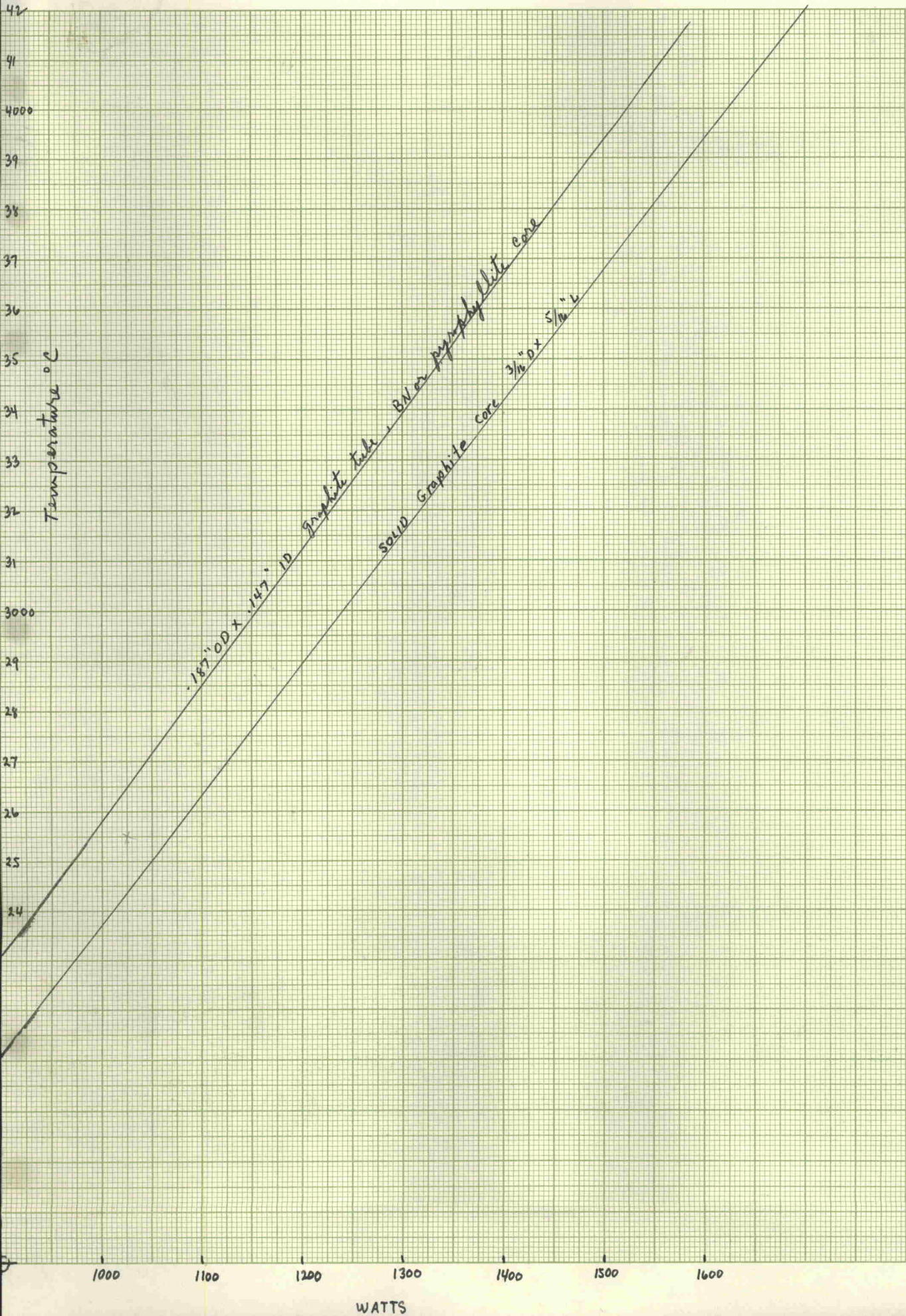
Temperature in hundreds of °C

12-189  
5789

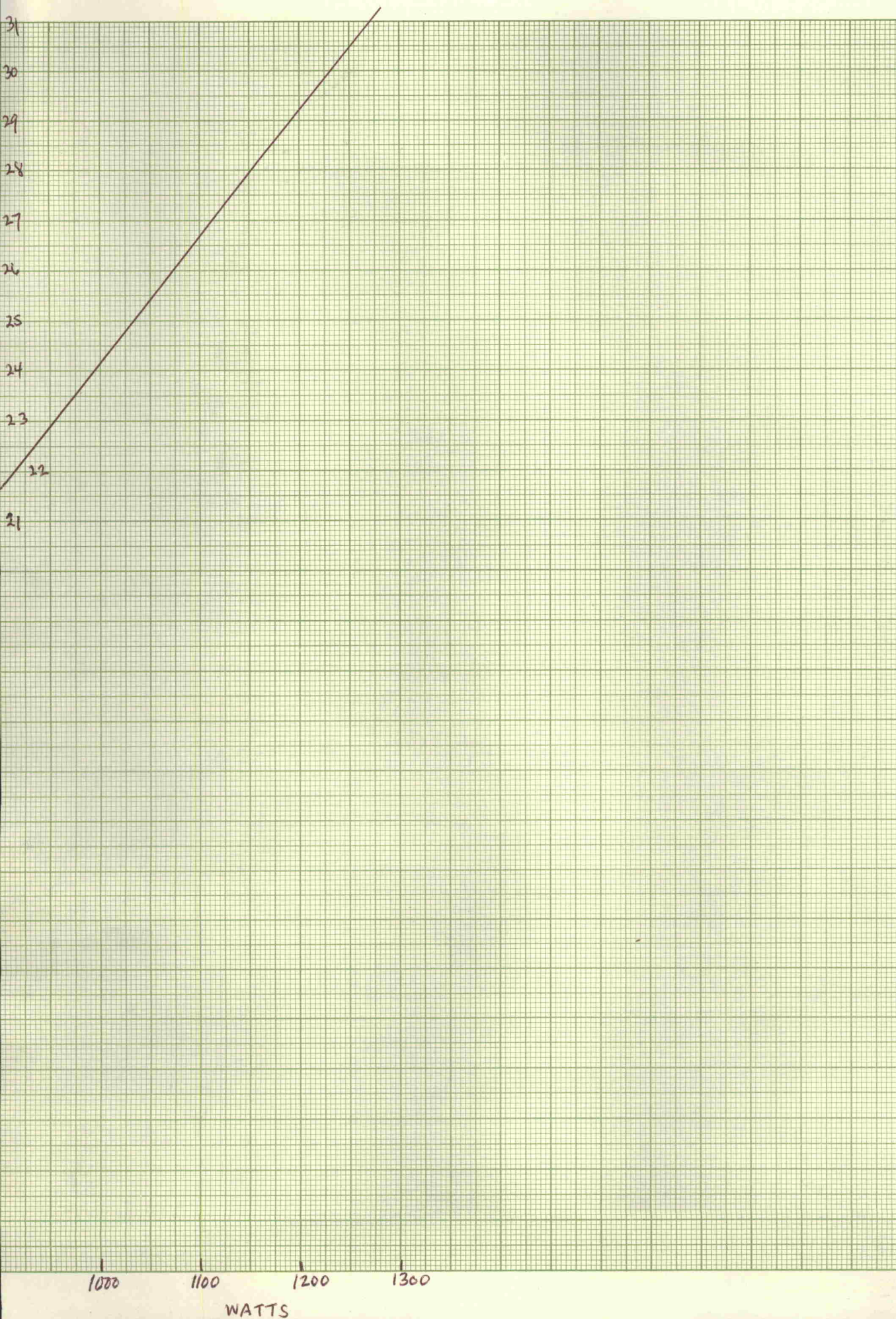


AM15  
245  
280  
308  
336  
362  
380  
400











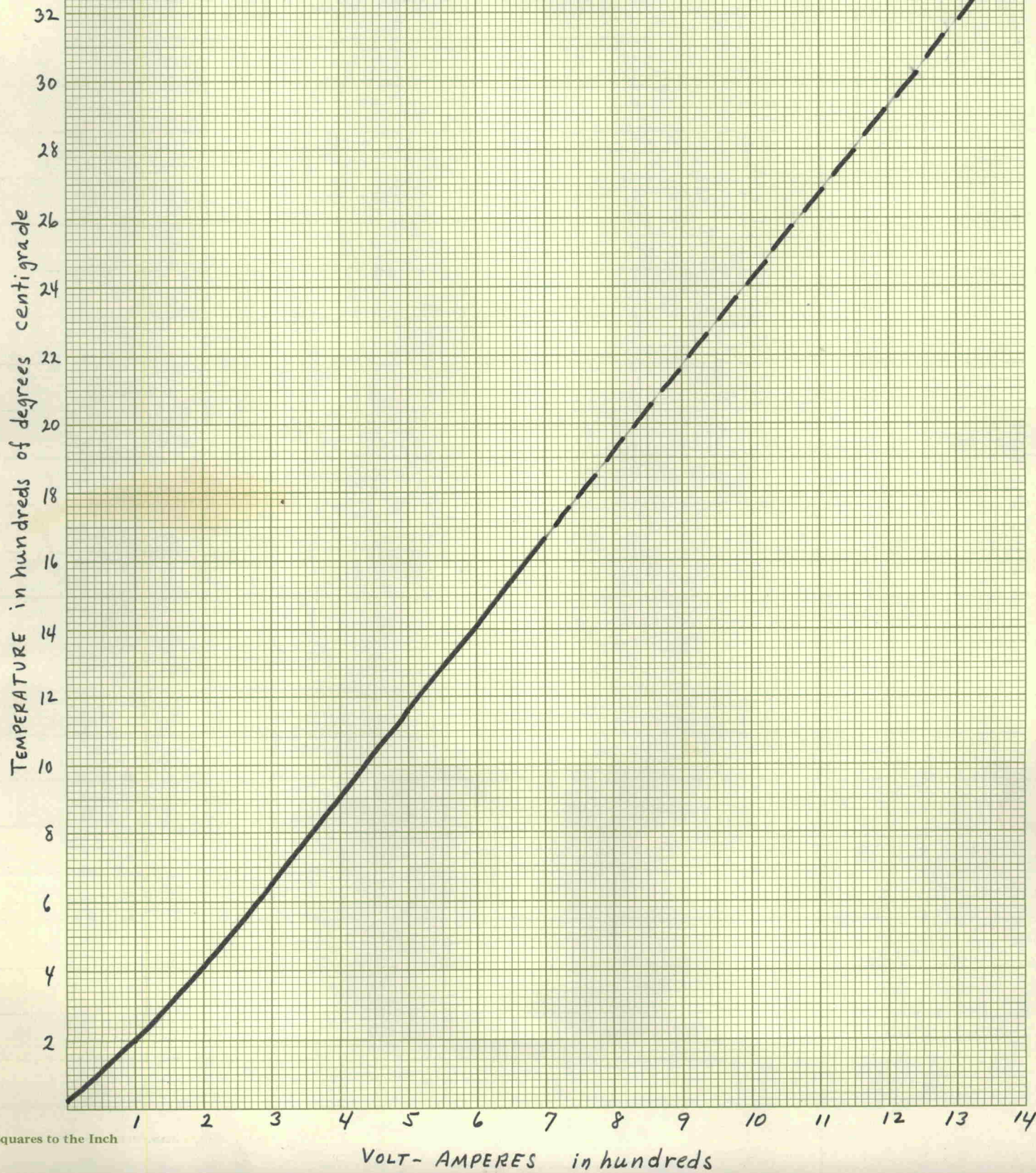
3/8" cubic anvils - 85 lb

H. J. Hall

diamond powder sample

run # 3/23 May 1968

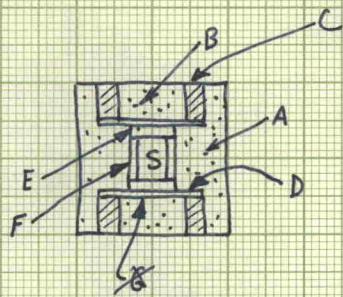
FIG. 4





Run #2 / 23 May 1968  
 H. Tracy Hall 85 kbar

3/8" cubic anvils  
 200 ton Press



A = pyrophyllite cube 7/32" on edge  
 painted with red Fe<sub>2</sub>O<sub>3</sub>  
 B = pyrophyllite cyl 7/32" D x 3/32" L

C = steel current ring 5/16" OD x 7/32" ID x 3/32" L

D = Mo disk 5/16" D x .005" thick

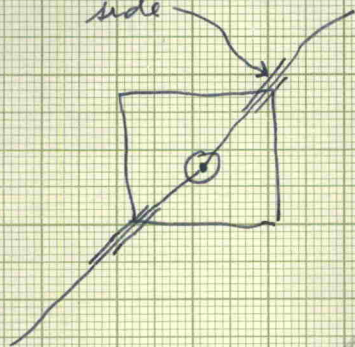
E = AGSR graphite disk .030" thk x .155" D.

F = AGSR graphite tube .155" OD x .100" ID x 5/32" L

S = sample = diamond powder  
 1-5 μ size, natural, from  
 Michael Werdiger Co.

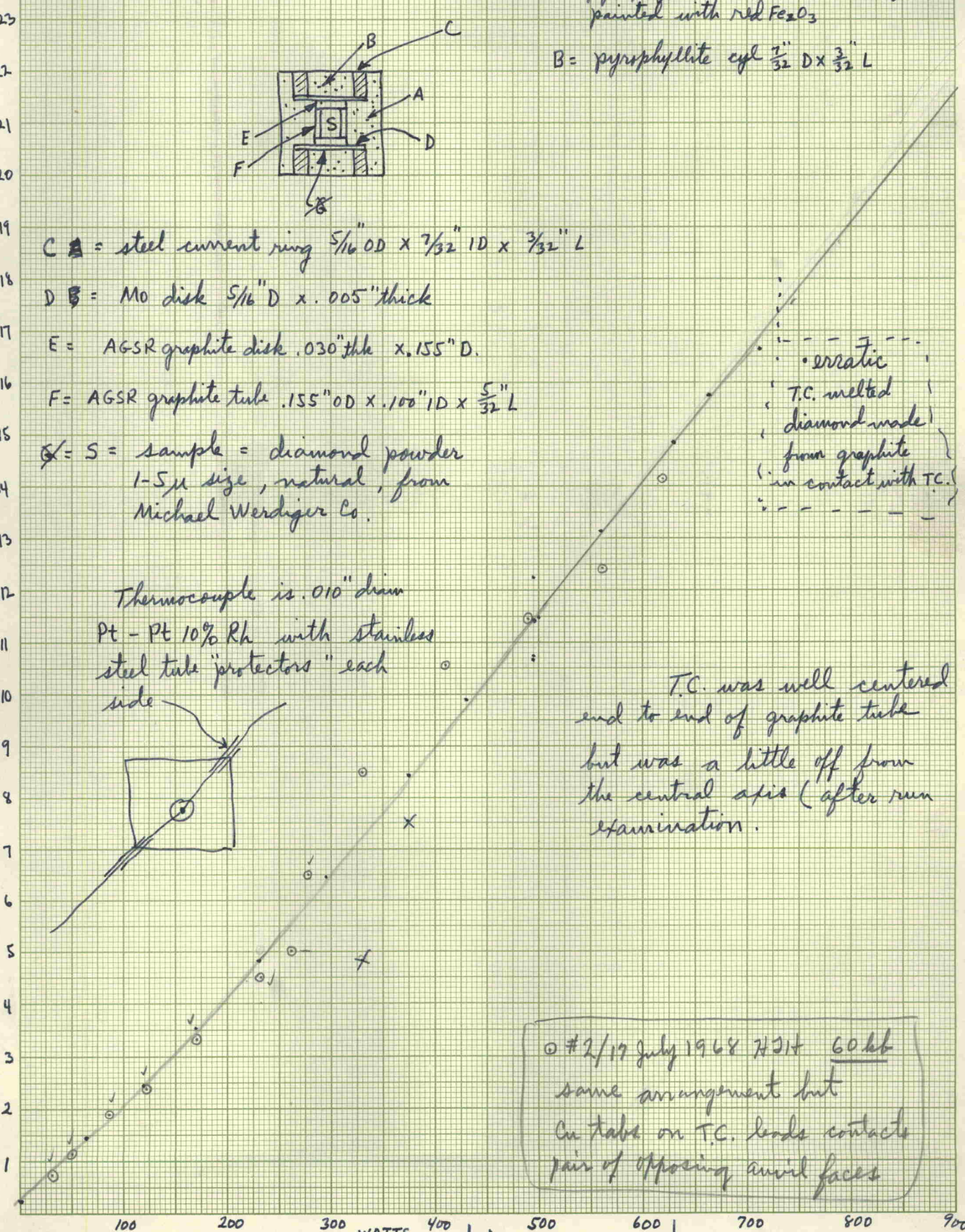
Temp hundreds of degrees C

Thermocouple is .010" diam  
 Pt - Pt 10% Rh with stainless  
 steel tube "protectors" each  
 side



erratic  
 T.C. melted  
 diamond made  
 from graphite  
 in contact with T.C.

T.C. was well centered  
 end to end of graphite tube  
 but was a little off from  
 the central axis (after run  
 examination).



#2/19 July 1968 HJH 60 kb  
 same arrangement but  
 Cu tabs on T.C. leads contacts  
 pair of opposing anvil faces

ampere → 200 230 260 280 300 340 360 400 set



3/8" on edge cubic anode

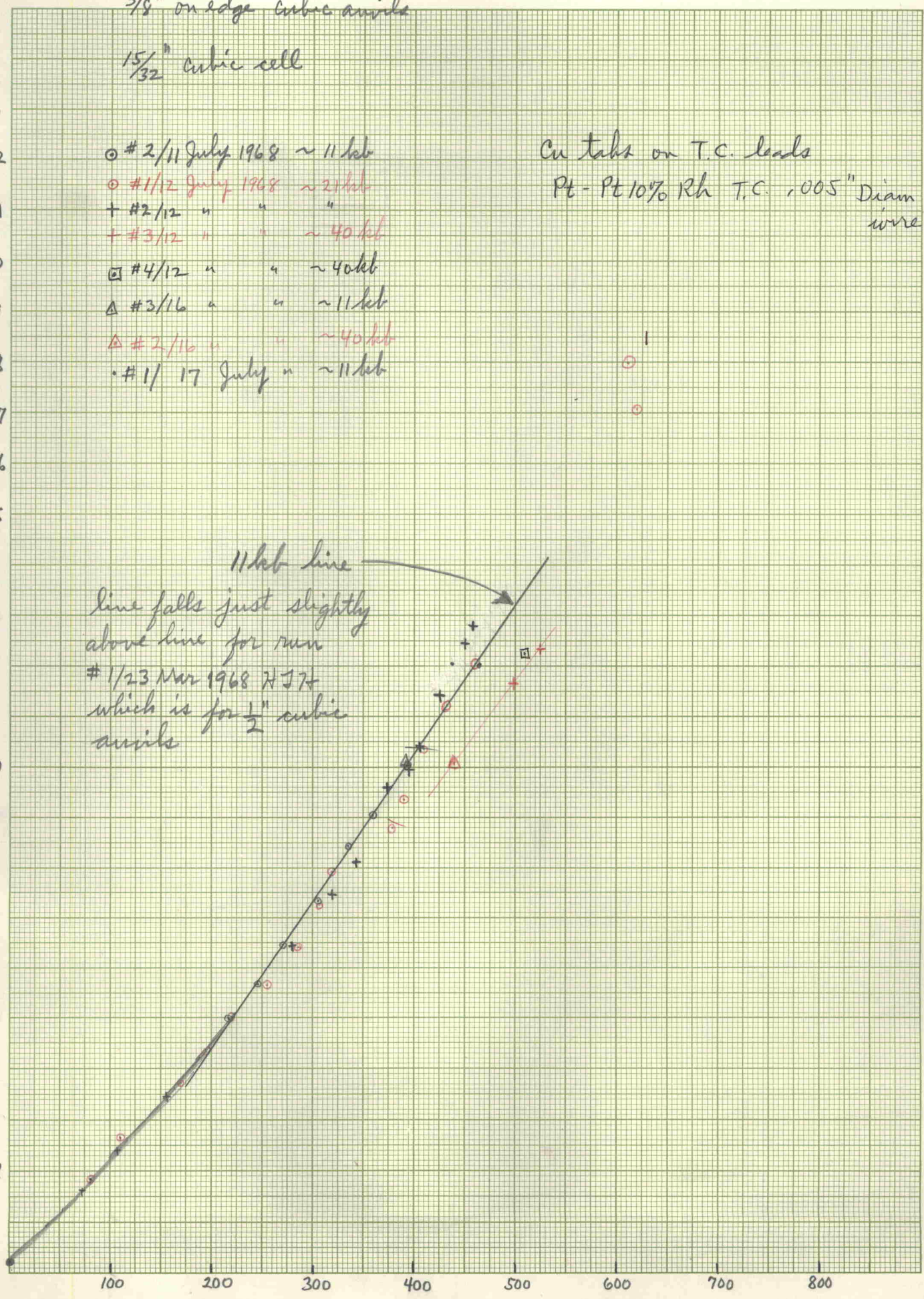
15/32" cubic cell

Temp. in hundreds of °C

Cu tabs on T.C. leads  
Pt-Pt 10% Rh T.C. .005" Diam wire

- # 2/11 July 1968 ~ 11 lab
- # 1/12 July 1968 ~ 21 lab
- + # 2/12 " " ~ "
- + # 3/12 " " ~ 40 lab
- # 4/12 " " ~ 40 lab
- △ # 3/16 " " ~ 11 lab
- △ # 2/16 " " ~ 40 lab
- # 1/17 July " ~ 11 lab

23  
22  
21  
20  
19  
18  
17  
16  
15  
14  
13  
12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1



11 lab line  
line falls just slightly above line for run  
# 1/23 Mar 1968 HJT  
which is for 1/2" cubic anode



Run #2/23 Mar 1968  
 Pt-Pt 10% Rh T.C.  
 5/8" on edge pyroph cubes  
 1/2" cubic anvils

147" D x 1/4" L pyrophyllite Core

7000 psi oil  
 200 ton cubic Press.

3/16" O.D. x 147" I.D. x 1/4" L graphite tube with .031" thick  
 x 3/16" D graphite end disks . . . 003" x 1/16" D. No disks

⊗ "diagonal" T.C.

time	variables	amps	volts	watts	T.C. reading	T.C. Correction	mv.	T °C
0	50/120	100	.90	90	1.20	.14	1.35	190°C
	55	104	.99	103	1.52		1.66	224
	60	121	1.05	127	1.83		1.97	261
	65	131	1.13	200 <sup>148</sup>	2.24		2.38	308
8 min	70	141	1.20	169	2.69		2.83	355
	75	152	1.28	194	3.25		3.39	414
	80	162	1.34	217	3.75		3.89	466
	85	179	1.42	254	4.59		4.73	551
15 min	90	190	1.48	281	5.37		5.51	628
	95	200	1.55	310	6.30		6.44	717
	100	210	1.62	340	7.25		7.39	805
	105	224	1.70	380	8.45		8.59	914
	110	232	1.76	408	9.30		9.44	988
21 min	115	240	1.82	437	10.2		10.34	1065
	120	251	1.90	476	11.5		11.64	1174
	125	258	1.97	508	12.2		12.34	1234
	130	261	2.05	535	13.5		13.64	1342
	135	266	2.12	564	14.2		14.34	1400
	140	270	2.19	592	15.2		15.34	1485
	145	275	2.26	622	16.1		16.24	1560
	150	279	2.35	656	17.0		17.14	1635
34 min	155	280	2.40	672	17.9		18.04	1703
	160	286	2.50	715	18.0		18.14	1722
	165	297	2.56	760	18.5		18.64	1765
39 min	170	300	2.63	789	18.2		18.34	1738

Results fall <sup>very</sup> close to those of #2/22 Mar 1968 HJ4 which had a BN core.



Volt. reg.  
23.8°C  
Pt - Pt 10% Rh  
.010" D Coupl.

Run #1  
13 Mar 1968 JH  
Temp Calib

oil P 7000 psi  
 $\frac{1}{2}$ " annils (cubic)

.003 Ms disks  
 $\frac{3}{16}$ D x  $\frac{5}{16}$ L graphite cyl

time	var	volts	amps	watts	mv	23.8°C Temp correct	correct mv	T °C
0 min	20/120	.43	110	47.3	$4.98 \times 10^4$	+ .13	.63	98
	30/120	.55	145	79.7	9.30 "		1.06	154
	40 "	.66	180	118.7	$1.56 \times 10^3$		1.69	230
	50	.77	210	162	$2.36 \times 10^3$		2.49	319
5 min	60	.88	245	216	$3.40 \times 10^3$		3.53	429
	70	1.03	280	288	4.67 "		4.80	558
	80	1.16	308	357	6.39 "		6.52	725
	90	1.28	336	430	<del>8.40</del> $8.46 \times 10^3$		8.59	914
10 min	100	1.43	362	517	$1.08 \times 10^2$		10.93	1118
	110	1.57	380	596	1.36 "		13.73	1349
	120	1.72	400	687	1.61 "		16.23	1559
	130		Current falling from 410 amps initial.					
15 min	130	1.80	390	702	$1.80 \times 10^2$		18.13	1720°C
	130 "	1.90	382		$1.77 \times 10^2$			
	↓							
	50	.83	165		$2.00 \times 10^3$			
	40	.71	150		$1.34 \times 10^3$			
	30	.58	120		$8.26 \times 10^4$			
	20	.48	100		$4.82 \times 10^4$			
	↓							
	50	.82	165		$1.98 \times 10^3$			
22 min	60	.95	193		$2.68 \times 10^3$			
	70	1.09	212		3.75 "			
	80	1.25	<del>230</del> 207		$4.40 \times 10^3$			
			falling					
25 min	90	1.42	220		$5.75 \times 10^3$			
	100	1.52	280		8.42 "			
	110	1.64	325		$1.16 \times 10^2$			
28 min	120	1.77	350		$1.42 \times 10^2$			
29	130	1.92	365		$1.67 \times 10^2$			
	140	2.07	393		1.83 "			
	150/120		4	burnout				
	"	2.62	0					
	0	0	0					

~  $1.4 \times 10^4$  + slowly falling at 33 min  
no change +.13 .27 45°C  
Annul Temp no doubt



(Temp. Calib) Run #1/25 Mar 1968 H J H. pyrophyllite core same as # 2/23 Mar  
 but T.C. connected to two opposing anvils thru Ni .002" thick folded  
 around lead wires 7000 psi oil ref. temp = 24°C

time	variact	amp	volt	watt	TC reading mV	Correction	mV	T°C
0	50/120	100	.91	91	1.27	<del>+1.14</del> +1.14 mV	1.41	195
	55	108	.99	107	1.58	+1.14 mV	1.62	221
	60	120	1.05	126	1.89		2.03	268
	65	132	1.12	148	2.26		2.40	309
	70	141	1.20	169	2.75		2.89	362
	75	153	1.26	193	3.22		3.36	411
13 min	80	162	1.33	215	3.80		3.94	471
	85	179	1.41	252	4.62		4.76	554
	90	187	1.48	276	5.42		5.56	633
	95	200	1.55	310	6.35		6.49	722
	100	208	1.62	337	7.35		7.49	815
	105	218	1.69	368	8.34		8.48	905
	110	227	1.75	397	<del>8.30</del> <sup>9.30</sup>		9.44	988
	115	235	1.84	432	10.6		10.74	1100
	120	241	1.90	457	11.6		11.74	1184
29 min	125	251	1.98	497	13.0		13.14	1300
	130	258	2.05	528	14.1		14.24	1392
	135	266	2.11	561	15.3		15.44	1493
	140	270	2.19	592	16.1		16.24	1560
	145	274	2.26	619	17.2		17.34	1653
	145/140	273	2.30	627	17.4		17.44	1662
	145/180	273	2.35	642	18.0		18.14	1722
47 min	145/220	275	2.41	663	<del>18.4</del>		18.54	1755



Run #1/23 Mar 1968 HJ Hall

7000 psi  $\frac{1}{2}$ " cubic anvils

Ref. Temp 23.8°C

time	variacs	amps	volts	Watts	TC. emf.	Correction mV	EMF	Temp. °C
0 min	50/120	102	.88	89.7	1.25 mV.	+1.14 mV.	1.39 mV.	194
	55	119	.97	115.4	1.61		1.75	235
	60	126	1.04	131	1.96		<del>2.10</del> 2.70	275
	65	139	1.12	155.5	2.35		2.49	320
	70	150	1.19	177.3	2.81		2.95	368
	75	160	1.25	200	3.33		3.47	423
	80	170	1.33	226	3.95		4.09	487
16 min	85	183	1.41	256	4.67		4.81	559
	90	195	1.46	285	5.38		5.52	629
	95	207	1.54	318	6.40		6.54	726
	100	215	1.61	346	7.37		7.51	816
	105	226	1.68	380	8.39		8.53	908
	110	234	1.75	410	9.45		9.59	1002
28 min	115	243	1.83	445	10.7		10.84	1108
	120	253	1.90	480	11.9		12.04	1208
	125	260	1.96	510	13.0		13.14	1300
	130	268	2.04	546	14.1		14.24	1392 <del>1492</del>
38 min	135	270	2.12	573	14.7		14.84	1442
	140	274	2.19	600	16.1		16.24	1560
	145	280	2.25	630	17.3		17.44	1662
	150	283	2.33	659	18.2		18.34	1738
	155	288	2.40	690	18.3		18.44	1747
48 min	160	298	2.48	740	16.3		16.44	1576

Curve follows run #2/22 Mar 1968 up to 800°C. It then diverges at an increased slope (steeper slope - higher temp). At 700 watts it reads 1850°C whereas #2/22 Mar reads 1780°C.



Thermocouple runs # 1/16 Mar 1968 HJH ← (A)  
 and # 2/22 Mar 1968 HJH ← (B)  
 Averaged

Watts	T °C
50	102
100	200
150	305
200	415
250	530
300	<del>765</del> 665
350	800
400	940
450	1075
500	1210
550	1350
600	1490
650	1625
700	1765
750	1900
800	2035
850	2170
900	2310

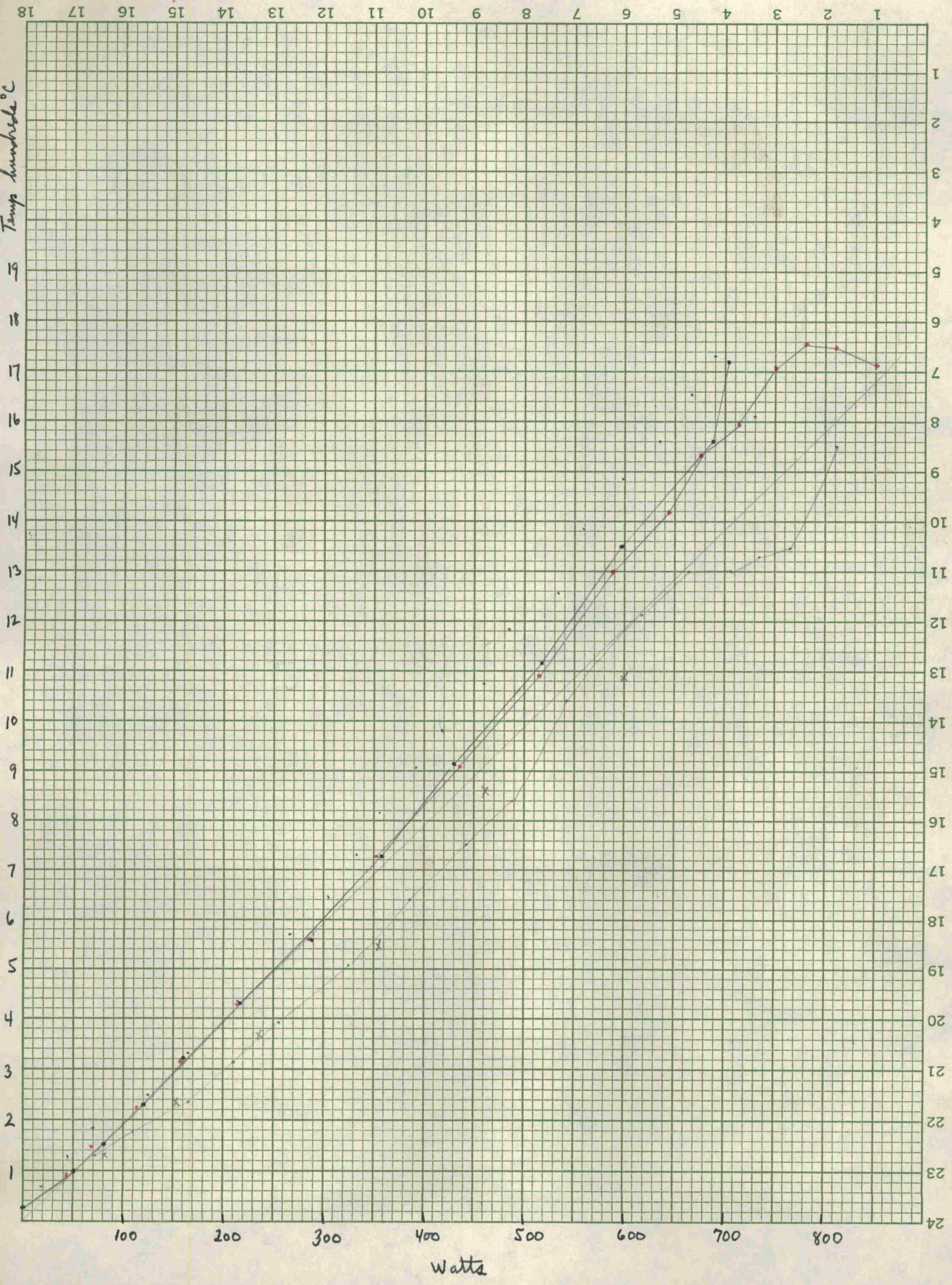
above 500°C, (A) was  
 about 25°C lower than  
 (B).

extrapolated



• Run #1/13 mar 1968 HJH  
 • Run #1/14 mar 1968 HJH

See notebook p. 487



12-189  
5789

5 Squares to the Centimeter  
MADE IN U.S.A.

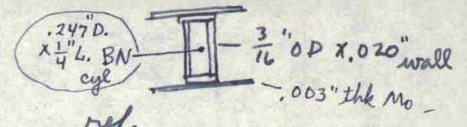


23.9°C  
ref.

Run # 2/22 Mar 1968

Pt. Pt 10% Rh T.C.  
7000 psi oil  
200 ton cubic press

1/2" anivils  
filter air



ref.  
mw  
corr.

Correct  
mw.

T°C

Time	var.	amps	volts	watts	TC volts	ref. mw corr.	Correct mw.	T°C
1/4 min	50/120	100	.92	92	1.17 x 10 <sup>-3</sup>	+14	1.31	184
	60	119	1.05	125	1.77		1.91	254
	70	137	1.20	164	2.65		2.79	351
	75	145	1.26	183	3.11		3.25	400
12 min	80	160	1.34	214	3.68		3.82	459
	85	179	1.42	254	4.48		4.62	540
	90	188	1.46	274	5.20		5.34	611
	95	200	1.53	306	6.19		6.33	707
	100	213	1.61	343	7.31		7.45	811
	105	223	1.68	374	8.26		8.40	897
23 min	110	235	1.76	414	9.36		9.50	994
	115	243	1.82	442	10.2		10.34	1074
	120	253	1.90	480	11.5		11.64	1176
28 min	125	262	1.97	516	12.6		12.74	1266
	130	270	2.04	550	13.9		14.14	1384
	135	279	2.10	586	15.0		15.14	1466
	140	285	2.17	618	16.1		16.24	1560
	145	288	2.25	648	16.8		16.94	1620
	150	292	2.31	674	17.8		17.94	1705
	155	295	2.39	705	17.8		17.94	1705
	160	300	2.48	744	17.0		17.14	1637
	165	304	2.54	772	16.1		16.24	1560



Run #1/16 Mar 1968  
H J Hall

7000 psi 23.8 °C room temp  
Pt - Pt 10% Rh T.C. .010" diam

Time	var	amps	volts	Watts	T.C. volts	mm. O Cor	Correct mm	T °C
0	<del>40/120</del>	<del>~70</del>	<del>.76</del>			<del>7.14</del>		
0	<del>40/120</del>	<del>~60</del>	<del>.76</del>			<del>7.14</del>		
0	40/120	~60	.76	45	$7.2 \times 10^4$		.86	129
	50/120	~80	.88	70	$1.15 \times 10^{-3}$		1.29	182
	60/120	120	1.05	126	1.73 "		1.87	250
	70	139	1.18	164	2.48 "		2.62	332
	80	162	1.33	215	3.45		3.59	435
	90	182	1.47	268	4.80		4.94	572
	95	198	1.55	306	5.53		5.67	643
12 min	100	205	1.62	332	6.45		6.59	731
	105	212 A	1.68 v	356 w.	7.40		7.54	819
	110	223	1.76	392	8.36		8.50	906
	115	230	1.82	418	9.20		9.34	980
19 min	120	240	1.91	458	$1.03 \times 10^2$		10.44	1075
	125	246	1.97	485	$11.6 \times 10^3$		11.74	1184
	130	259	2.05	532	12.5 "		12.64	1258
	135	266	2.10	558	14.0 "		14.14	1384
25 min	140	276	2.17	598	15.2		15.34	1485
	145	282	2.25	635	16.1		16.24	1560
	150	287	2.32	666	17.2		17.34	1653
	155	290	2.38	690	18.1		18.24	1730
30 min	160	297	2.46	730	$16.7 \times 10^3$		16.84	1611
	120/120	253	1.88	<del>288</del> 475	9.3		9.44	988
	100	220	1.60	352	6.05		6.19	693 <del>693</del>
	80 <del>80</del>	182	1.31	238	3.58		3.72	449
	60	150	1.02	153	1.87		2.01	365
39 min	40	110	.76	84	.857		1.00	145
	0	0	0					
40 min	0	0	0	0	.12		.26	42 °C

Exam: T.C. didn't appear melted or to have reacted  
no dense BN. - good steady run.

gaskets extended ~  $\frac{5}{16}$ " length  
thicknesses are:   

.036	.044	.042	are 39.7 ± 2.3
.042	.038	.035	
.036	.040	.042	
.041	.041	.039	



Run# 1/15 Mar '68 7000 psi

15 Mar 1968 AJH

23.60°C room T.

Time	var	amps	volts	watts	volts <del>mv</del>	0 corr mv.	corrected mv	T°C
0								
0	10/120	-	.35		$7.4 \times 10^{-5}$	+14	.21	36
	20/120	-	.48		$1.54 \times 10^{-4}$		.29	49
	30/120	~30	.63	18	2.86 "		.43	70
	40/120	~65	.76	45	4.70 "		.61	96
	50/120	~80	.89	71	7.45 "		.89	132
	60/120	105	1.04	109	$1.12 \times 10^{-3}$		1.26	179
	70/120	136	1.21	165	1.62 "		1.76	238
	80/120	157	1.34	210	2.30 "		2.44	314
9 min	90	180	1.47	255	3.06 "		3.20	394
	100	201	1.62	325	4.15 "		4.29	507
	110	221	1.75	386	5.50 "		5.64	640
	120	230	1.92	442	6.70 "		6.84	755
	130	236	2.07	488	7.63 "		7.77	840
	140	245	2.21	541	<del>9.50</del> 9.90 "		10.04	1040
16 min	150	261	2.36	616	$1.20 \times 10^{-2}$		12.14	1216
	155	274	2.42	663	$1.30 \times 10^{-2}$		13.14	1300
	160	2.85	2.48	706	1.30 "		13.14	1300
	165	2.87	2.56	734	1.33 "		13.44	1328
21 min	170	2.92	2.63	767	1.45 "		14.64	1342
23	175	300	2.70	810	1.60 "		16.14	1552
	140/120	275	2.18	600	1.05 "		10.64	1092
	120/120	243	1.89	459	$6.75 \times 10^{-3}$		6.89	860
	100	208	1.71	355	4.52 "		4.66	544
	80	180	1.32	237	2.83 "		2.97	370
	60	1.48	1.03	152	1.62 "		1.76	238
	40	105	.76	80	$7.80 \times 10^{-4}$		.92	133
30	0	0	0					
30 1/2					$1.42 \times 10^{-4}$		.14	
31 min					1.37 "		.14	
32					1.22 "		.12	



H. J. Hall 14 Mar 1968

Thermocouple runs of 13 and 14 March averaged

Watts	temp °C
50	102
100	195
150	295
200	395
250	500
300	600
350	710
400	835
450	950
500	1065
550	1200
600	1330
650	1450
700	1590
750	1700
800	
850	
900	
950	
1000	



Pt 10% Rb  
couple

Run #1/14 Mar 1968 H. J. Hall - Temp. Calib. run same as #1/13 Mar  
"shorted" anvil fixed - 7000 psi oil room temp = 24.4°C = ref. temp.

time	Var	amps	volts	watts	emf	Cov.	emf <sup>mmr.</sup>	T
0	10/120				$1.85 \times 10^{-4}$	$\frac{+}{0.14 \text{ mmr.}}$	$\frac{.32}{1.85 \times 10^{-4}}$	53°C
	20 "	98	.43	42	4.42 "		.58	91
	30 "	122	.54	66	8.62 "		1.00	146
	40 "	168	.67	113	$1.48 \times 10^{-3}$		1.62	221
4 min	50 "	201	.78	157	$2.31 \times 10^{-3}$		2.45	316
	60 "	238	.89	212	3.38 "		3.52	428
	70 "	275	1.04	285	4.67 "		4.81	559
6 1/2 "	80 "	303	1.16	351	6.42 "		6.56	728
	90 "	334	1.30	434	8.42 "		8.56	911
	100 "	359	1.43	514	$1.05 \times 10^{-2}$		10.64	1092
10 min	110 "	376	1.57	589	$1.30 \times 10^{-2}$		13.14	1300
	115 "	386	1.67	644	1.44 "		14.54	1417
12 "	120 "	394	1.72	676	1.58 "		15.94	1534
	125 "	394	1.81	712	1.65 "		16.64	1594
14 1/2 "	130 "	397	1.89	749	1.78 "		17.94	1704
	135 "	<del>400</del> <sup>398</sup>	1.96	779	1.84 "		18.54	1757
17	140 "	398	2.04	811	1.83 "		18.44	1747
	145 "	403	2.12	852	1.79 "		18.04	1713
20 min	150 "	400	2.20	880	~1.70			
20 1/4	0	0	0	0	$2.2 \times 10^{-4}$		.36	60
22 min	"	"	"	0	$1.55 \times 10^{-4}$		.29	49
23	"	"	"	0	1.38 "		.28	47°C

burn out



3

4000

3000

Temp.  
OK

2000

1000

20

40

60

80

100

120

TUNGSTEN

Resistance microhm cm

