Electron Current in a Retarding Field for Cylinders
of Various Radii Ratios from 1 to ∞

Table 10
Electron current in a retarding field for cylinders of various radii ratios from 1 to ∞. (Section 60.)

Initial Copy

$\frac{1}{a} = \infty$

s	$F_1(s)$	$\ln F_1(s)$	$\log_{10} F_1(s)$	Slope	Disp.
0	1.0000	0	0	0	0
0.5	.8012	-.2216	-.0962	.608	.2784
1.0	.5724	-.5579	-.2423	.728	.4421
1.5	.3916	-.9374	-.4071	.787	.5626
2.0	.2615	-1.3414	-.5826	.826	.6586
3.0	.1116	-2.1927	-.9523	.872	.8073
4.0	4.601×10^{-2}	-3.0788	-1.3371	.898	.9212
5.0	1.857×10^{-2}	-3.9864	-1.7313	.9157	1.0136
6.0	$.7383\times10^{-2}$	-4.9086	-2.1318	.9281	1.0914
7.0	$.2905\times10^{-2}$	-5.8413	-2.5368	.9370	1.1587
8.0	$.1134\times10^{-2}$	-6.7820	-2.9454	.9444	1.2180
9.0	4.398×10^{-4}	-7.7291	-3.3567	.9501	1.2709
10.0	1.697×10^{-4}	-8.6812	-3.7702	.954	1.3188
12.0	$.2498\times10^{-4}$	-10.5974	-4.6024	.962	1.4026
14.0	3.632×10^{-6}	-12.526	-5.4400	.967	1.474
16.0	$.5234\times10^{-6}$	-14.463	-6.2812	.970	1.537
18.0	7.488×10^{-8}	-16.407	-7.1255	.974	1.593
20.0	1.066×10^{-8}	-18.357	-7.9723	.977	1.643

$\frac{1}{a} = 5.0$

s	$F(s,a)$	$\ln F(s,a)$	$\log_{10} F(s,a)$	Slope	Disp.
0	1.0000	0	0	0	0
0.5	.7979	-.2257	-.0980	.619	.2743
1.0	.5668	-.5678	-.2466	.740	.4322
1.5	.3854	-.9535	-.4141	.800	.5465
2.0	.2557	-1.3639	-.5923	.839	.6361
3.0	.1077	-2.2280	-.9676	.886	.7720
4.0	4.384×10^{-2}	-3.1272	-1.3581	.911	.8728
5.0	1.747×10^{-2}	-4.0475	-1.7578	.9286	.9525
6.0	$.6858\times10^{-2}$	-4.9824	-2.1638	.9406	1.0176
7.0	$.2664\times10^{-2}$	-5.9278	-2.5744	.9499	1.0722
8.0	$.1027\times10^{-2}$	-6.8811	-2.9884	.9566	1.1189
9.0	3.935×10^{-4}	-7.8405	-3.4051	.9622	1.1595
10.0	1.500×10^{-4}	-8.8050	-3.8240	.9667	1.1950
12.0	$.2154\times10^{-4}$	-10.7454	-4.6667	.9733	1.2546
14.0	3.059×10^{-6}	-12.6973	-5.5144	.9784	1.3027
16.0	$.4307\times10^{-6}$	-14.6578	-6.3658	.9821	1.3422
18.0	6.026×10^{-8}	-16.6247	-7.2200	.9848	1.3753
20.0	$.8386\times10^{-8}$	-18.5967	-8.0764	.9872	1.4033

$\frac{1}{a} = 4.0$

s	F(s,a)	ln F(s,a)	$\log_{10} F(s,a)$	slope	Disp
0	1.0000	0	0	0	0
0.5	.7960	-.2281	-.0991	.625	.2719
1.0	.5635	-.5736	-.2491	.747	.4264
1.5	.3818	-.9628	-.4182	.807	.5372
2.0	.2524	-1.3768	-.5979	.847	.6232
3.0	.1056	-2.2482	-.9764	.893	.7518
4.0	4.266×10^{-2}	-3.1544	-1.3699	.918	.8456
5.0	1.688×10^{-2}	-4.0817	-1.7727	.9358	.9183
6.0	$.6582 \times 10^{-2}$	-5.0234	-2.1816	.9472	.9766
7.0	$.2541 \times 10^{-2}$	-5.9753	-2.5950	.9566	1.0247
8.0	9.731×10^{-4}	-6.9351	-3.0119	.9631	1.0649
9.0	3.705×10^{-4}	-7.9007	-3.4312	.9685	1.0993
10.0	1.404×10^{-4}	-8.8712	-3.8527	.9725	1.1288
12.0	$.1994 \times 10^{-4}$	-10.8230	-4.7004	.9789	1.1770
14.0	2.801×10^{-6}	-12.7857	-5.5528	.9836	1.2143
16.0	$.3904 \times 10^{-6}$	-14.7562	-6.4085	.9869	1.2438
18.0	5.410×10^{-8}	-16.7324	-7.2668	.9893	1.2676
20.0	$.7464 \times 10^{-8}$	-18.7132	-8.1270	.9915	1.2868

$\frac{1}{a} = 3.0$

s	F(s,a)	ln F(s,a)	$\log_{10} F(s,a)$	slope	disp.
0	1.0000	0	0	0	0
0.5	.7916	-.2336	-.1015	.640	.2664
1.0	.5562	-.5866	-.2548	.762	.4134
1.5	.3739	-.9837	-.4272	.823	.5163
2.0	.2452	-1.4056	-.6105	.863	.5944
3.0	.1010	-2.2926	-.9956	.907	.7074
4.0	4.022×10^{-2}	-3.2135	-1.3956	.933	.7865
5.0	1.568×10^{-2}	-4.1552	-1.8046	.9492	.8448
6.0	$.6039 \times 10^{-2}$	-5.1104	-2.2194	.9609	.8896
7.0	$.2299 \times 10^{-2}$	-6.0752	-2.6384	.9687	.9248
8.0	8.701×10^{-4}	-7.0469	-3.0604	.9747	.9531
9.0	3.276×10^{-8}	-8.0239	-3.4847	.9795	.9761
10.0	1.228×10^{-4}	-9.0050	-3.9108	.9829	.9950
12.0	$.1710 \times 10^{-4}$	-10.9764	-4.7670	.9883	1.0236
14.0	2.361×10^{-6}	-12.9564	-5.6269	.9916	1.0436
16.0	$.3242 \times 10^{-6}$	-14.9420	-6.4892	.9940	1.0580
18.0	4.433×10^{-8}	-16.9316	-7.3533	.9957	1.0684
20.0	$.6045 \times 10^{-8}$	-18.9240	-8.2186	.9968	1.0760

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$\frac{1}{a} = 2.5$

s	F(s,a)	ln F(s,a)	$\log_{10} F(s,a)$	Slope	Disp.
0	1.0000	0	0	0	0
0.5	.7867	-.2399	-.1042	.658	.2601
1.0	.5486	-.6005	-.2608	.780	.3995
1.5	.3658	-1.0058	-.4368	.839	.4942
2.0	.2379	-1.4357	-.6235	.878	.5643
3.0	9.651×10^{-2}	-2.3381	-1.0154	.922	.6619
4.0	3.788×10^{-2}	-3.2735	-1.4217	.947	.7265
5.0	1.458×10^{-2}	-4.2280	-1.8362	.9610	.7720
6.0	$.5544 \times 10^{-2}$	-5.1949	-2.2561	.9724	.8051
7.0	$.2090 \times 10^{-2}$	-6.1704	2.6708	.9787	.8296
8.0	7.836×10^{-4}	-7.1516	-3.1059	.9840	.8484
9.0	2.924×10^{-4}	-8.1373	-3.5340	.9878	.8627
10.0	1.088×10^{-4}	-9.1263	-3.9635	.9902	.8737
12.0	$.1495 \times 10^{-4}$	-11.1107	-4.8253	.9941	.8893
14.0	2.043×10^{-6}	-13.1011	-5.6897	.9962	.8989
16.0	$.2782 \times 10^{-6}$	-15.0950	-6.5557	.9977	.9050
18.0	3.779×10^{-8}	-17.0912	-7.4226	.9984	.9088
20.0	$.5127 \times 10^{-8}$	-19.0887	-8.2901	.9990	.9113

$\frac{1}{a} = 2.0$

s	F(s,a)	ln F(s,a)	$\log_{10} F(s,a)$	Slope	Disp.
0	1.0000	0	0	0	0
0.5	.7773	-.2520	-.1094	.688	.2480
1.0	.5335	-.6284	-.2729	.812	.3716
1.5	.3501	-1.0494	-.4557	.870	.4506
2.0	.2244	-1.4943	-.6490	.908	.5057
3.0	8.859×10^{-2}	-2.4238	-1.0526	.947	.5762
4.0	3.397×10^{-2}	-3.3824	-1.4690	.968	.6176
5.0	1.282×10^{-2}	-4.3567	-1.8921	.9794	.6433
6.0	$.4795 \times 10^{-2}$	-5.3402	-2.3192	.9876	.6598
7.0	$.1783 \times 10^{-2}$	-6.3296	-2.7489	.9911	.6704
8.0	6.607×10^{-4}	-7.3222	-3.1800	.9941	.6778
9.0	2.442×10^{-4}	-8.3173	-3.6122	.9963	.6827
10.0	$.9014 \times 10^{-4}$	-9.3141	-4.0451	.9974	.6859
12.0	$.1224 \times 10^{-4}$	-11.3104	-4.9120	.9988	.6896
14.0	1.660×10^{-6}	-13.3086	-5.7799	.9993	.6914
16.0	2.249×10^{-6}	-15.3077	-6.6480	.9998	.6923
18.0	3.044×10^{-8}	-17.3074	-7.5165	.9999	.6926
20.0	$.4121 \times 10^{-8}$	-19.3073	-8.3851	1.0	.6927

Form 10V Addison-Wesley Press, Inc., Cambridge 42, Mass. Printed in U.S.A.

$\frac{1}{a} = 1.5$

s	$F(s,a)$	$\ln F(s,a)$	$\log_{10} F(s,a)$	slope	disp.
0	1.0000	0	0	0	0
0.5	.7678	-.2642	-.1147	.8543	.2358
1.0	.4960	-.7012	-.3045	.8942	.2988
1.5	.3142	-1.1577	-.5028	.9320	.3429
2.0	.1953	-1.6330	-.7092	.9640	.3670
3.0	7.357×10^{-2}	-2.6095	-1.1333	.9866	.3905
4.0	2.731×10^{-2}	-3.6006	-1.5637	.9950	.3994
5.0	1.008×10^{-2}	-4.5971	-1.9965	.9977	.4029
6.0	$.3714 \times 10^{-2}$	-5.5956	-2.4296	.9990	.4044
7.0	$.1367 \times 10^{-2}$	-6.5952	-2.8643	.9996	.4048
8.0	5.035×10^{-4}	-7.5949	-3.2984	.9998	.4051
9.0	1.851×10^{-4}	-8.5946	-3.7326	.9999	.4054
10.0	$.6810 \times 10^{-4}$	-9.5946	-4.1669	1.0000	.4054
12.0	9.216×10^{-6}	-11.595	-5.0354	1.0000	.405
14.0	1.247×10^{-6}	-13.595	-5.9042	1.0000	.405
16.0	$.1688 \times 10^{-6}$	-15.595	-6.7728	1.0000	.405
18.0	2.284×10^{-8}	-17.595	-7.6414	1.0000	.405
20.0	$.3091 \times 10^{-8}$	-19.595	-8.5100	1.0000	.405

$\frac{1}{a} = 1.0$

s	$F(s,a)$	$\ln F(s,a)$	$\log_{10} F(s,a)$	slope	disp.
0	1.0	0	0	1.0	0
0.5	.6065	-.5	-.2171		
1.0	.3679	-1.0	-.4343		
1.5	.2231	-1.5	-.6514		
2.0	.1353	-2.0	-.8686		
3.0	4.979×10^{-2}	-3.0	-1.3029		
4.0	1.832×10^{-2}	-4.0	-1.7372		
5.0	$.6738 \times 10^{-2}$	-5.0	-2.1715		
6.0	$.2479 \times 10^{-2}$	-6.0	-2.6058		
7.0	9.119×10^{-4}	-7.0	-3.0401		
8.0	3.355×10^{-4}	-8.0	-3.4744		
9.0	1.234×10^{-4}	-9.0	-3.9087		
10.0.	$.4540 \times 10^{-4}$	-10.0	-4.3429		
12.0	6.144×10^{-6}	-12.0	-5.2115		
14.0	$.8315 \times 10^{-6}$	-14.0	-6.0801		
16.0	$.1125 \times 10^{-6}$	-16.0	-6.9487		
18.0	1.523×10^{-8}	-18.0	-7.8173		
20.0	$.2061 \times 10^{-8}$	-20.0	-8.6859		

Fig 1

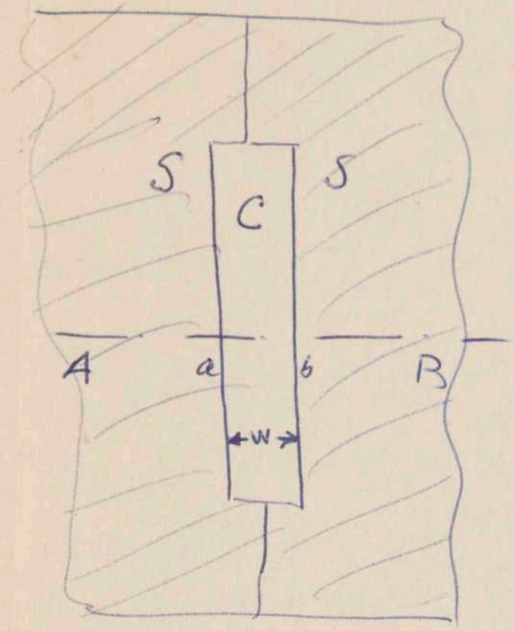
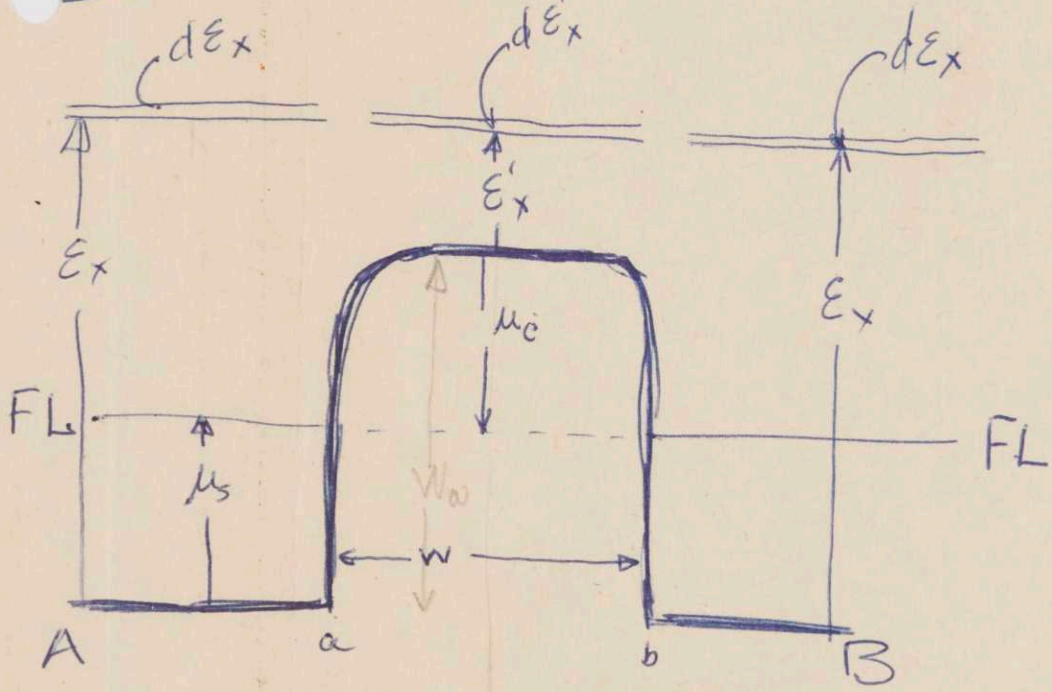
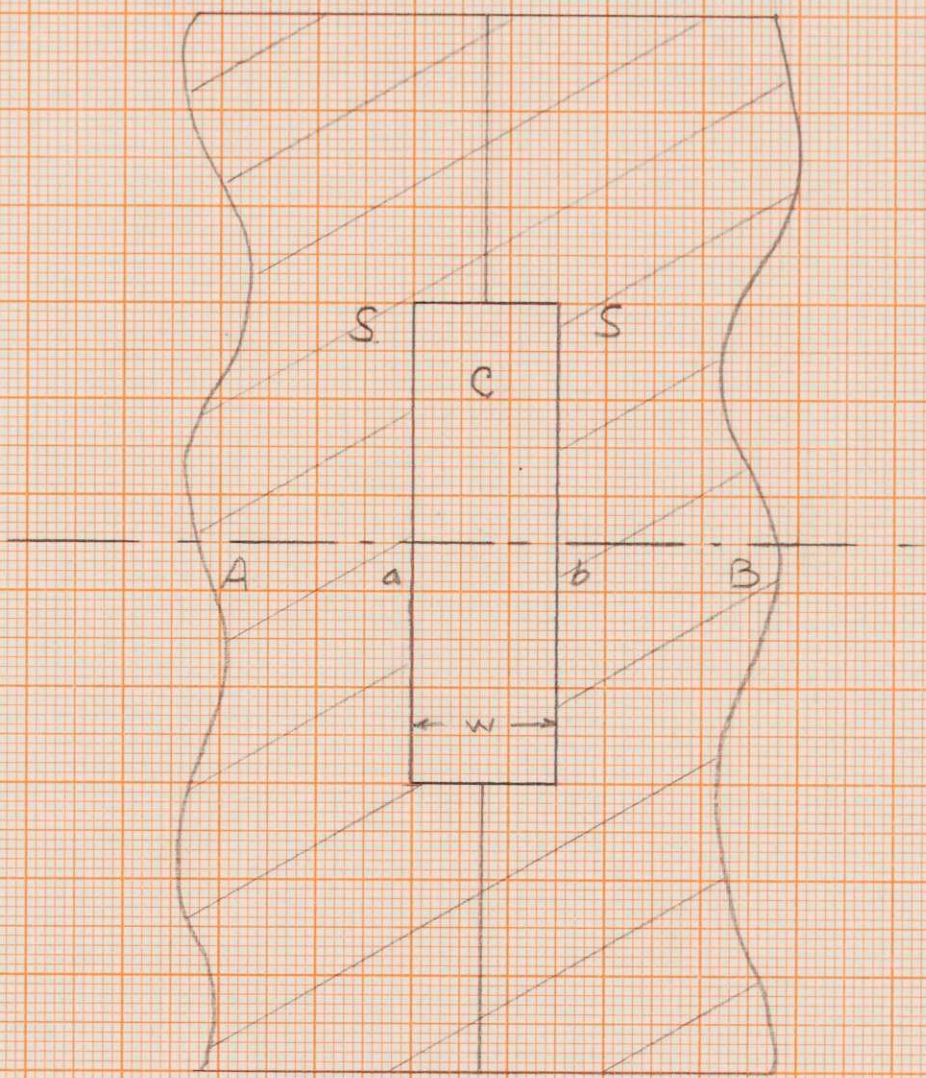
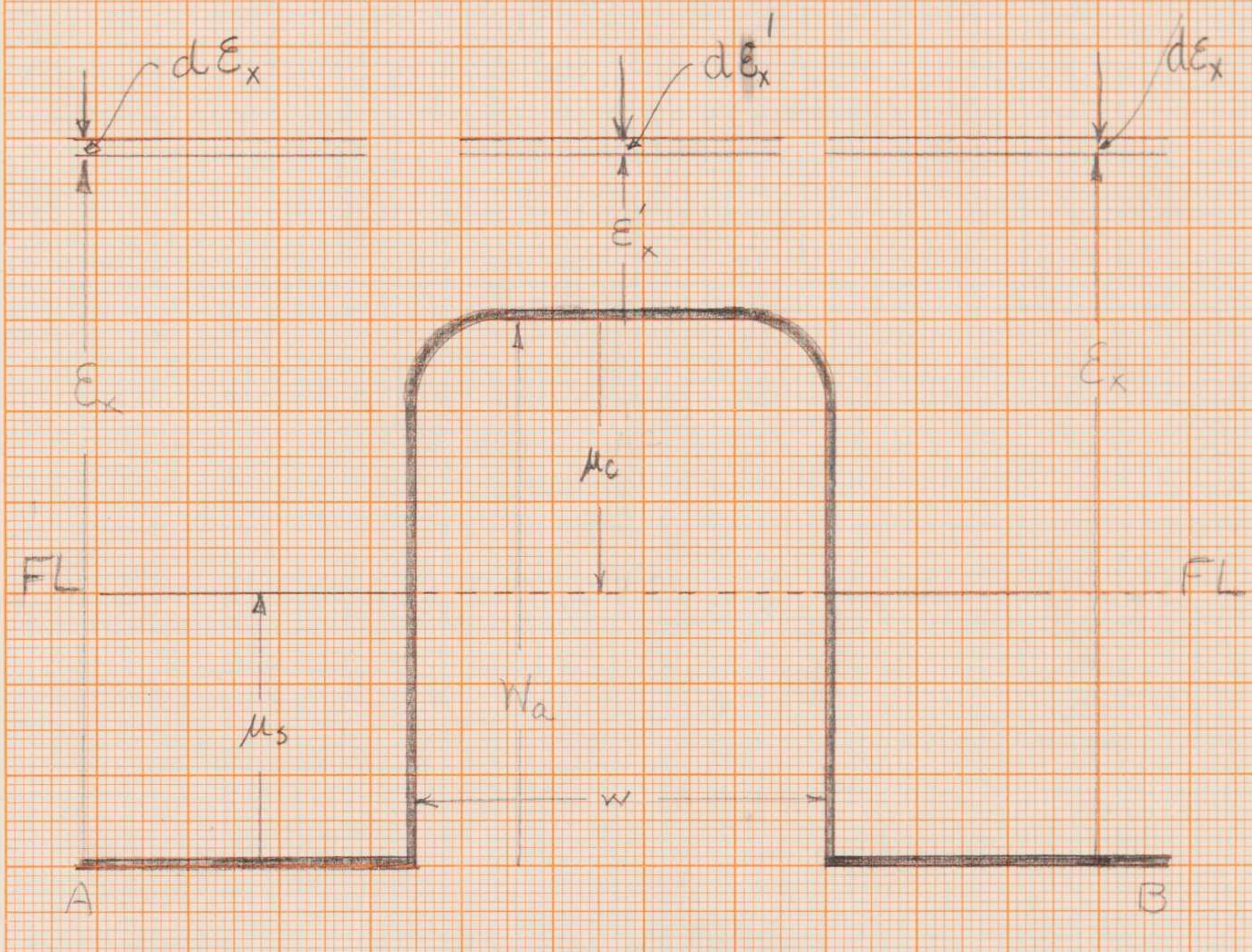


Fig 2




S
S
C
A
a
b
B
w



$d\mathcal{E}_x$
$d\mathcal{E}_x'$
$d\mathcal{E}_x$
$\mathcal{E}_x$
$\mathcal{E}_x'$
$\mathcal{E}_x$
μ_c
FL
FL
μ_s
W_a
w
A
B

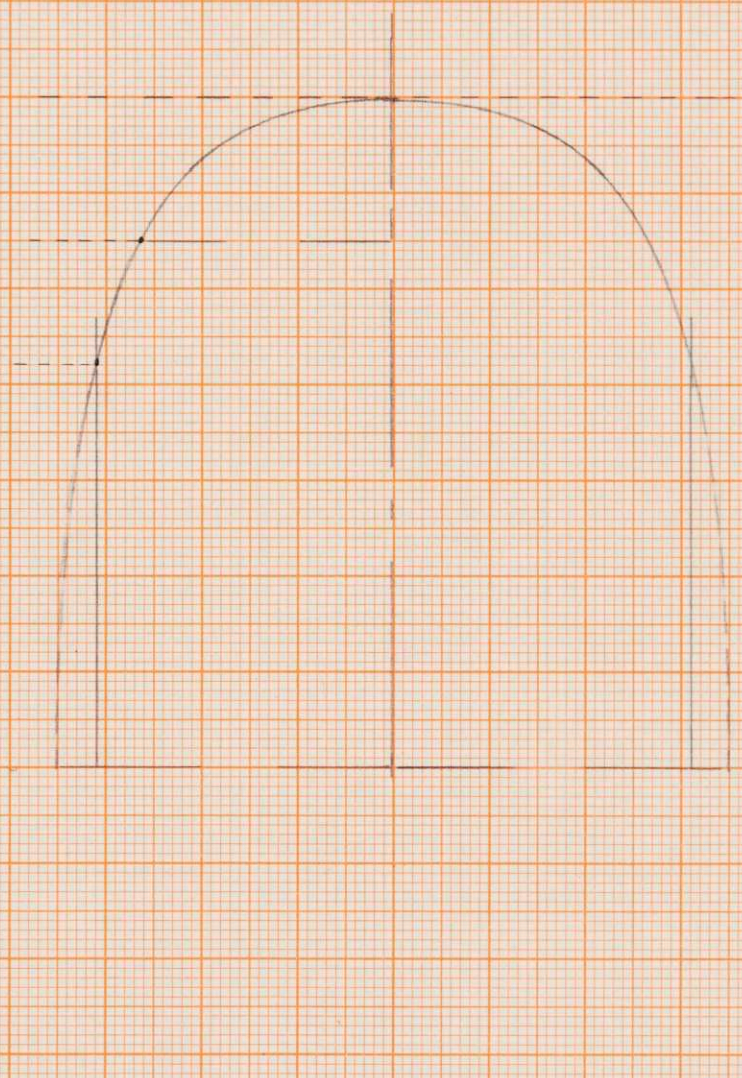


Fig 3

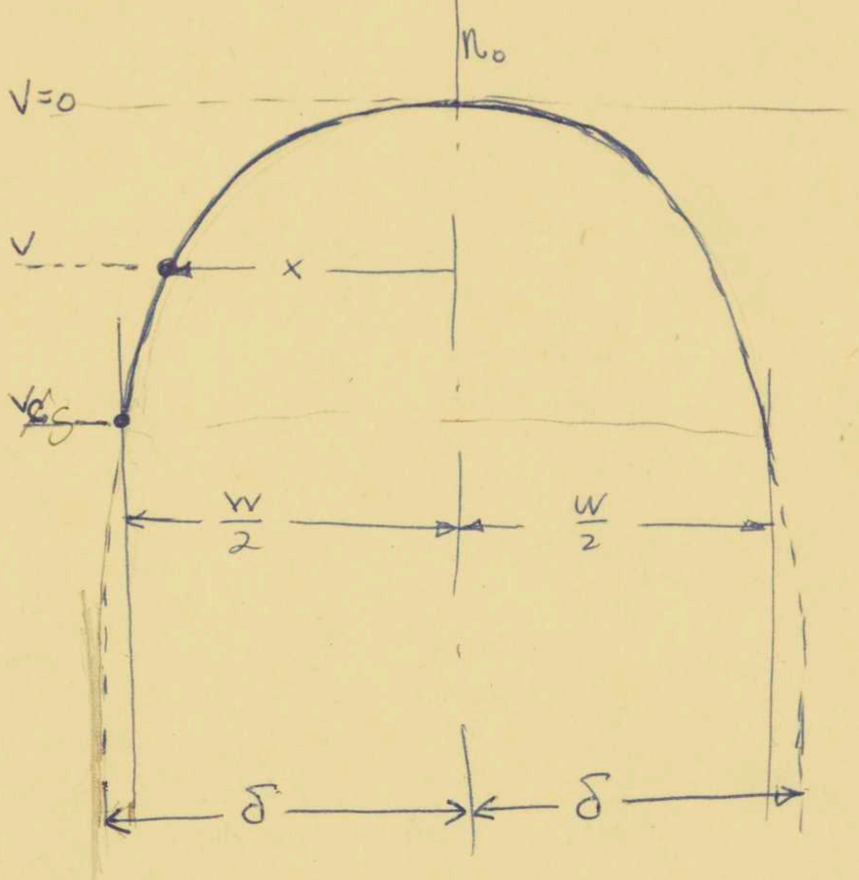


Fig 5a,b

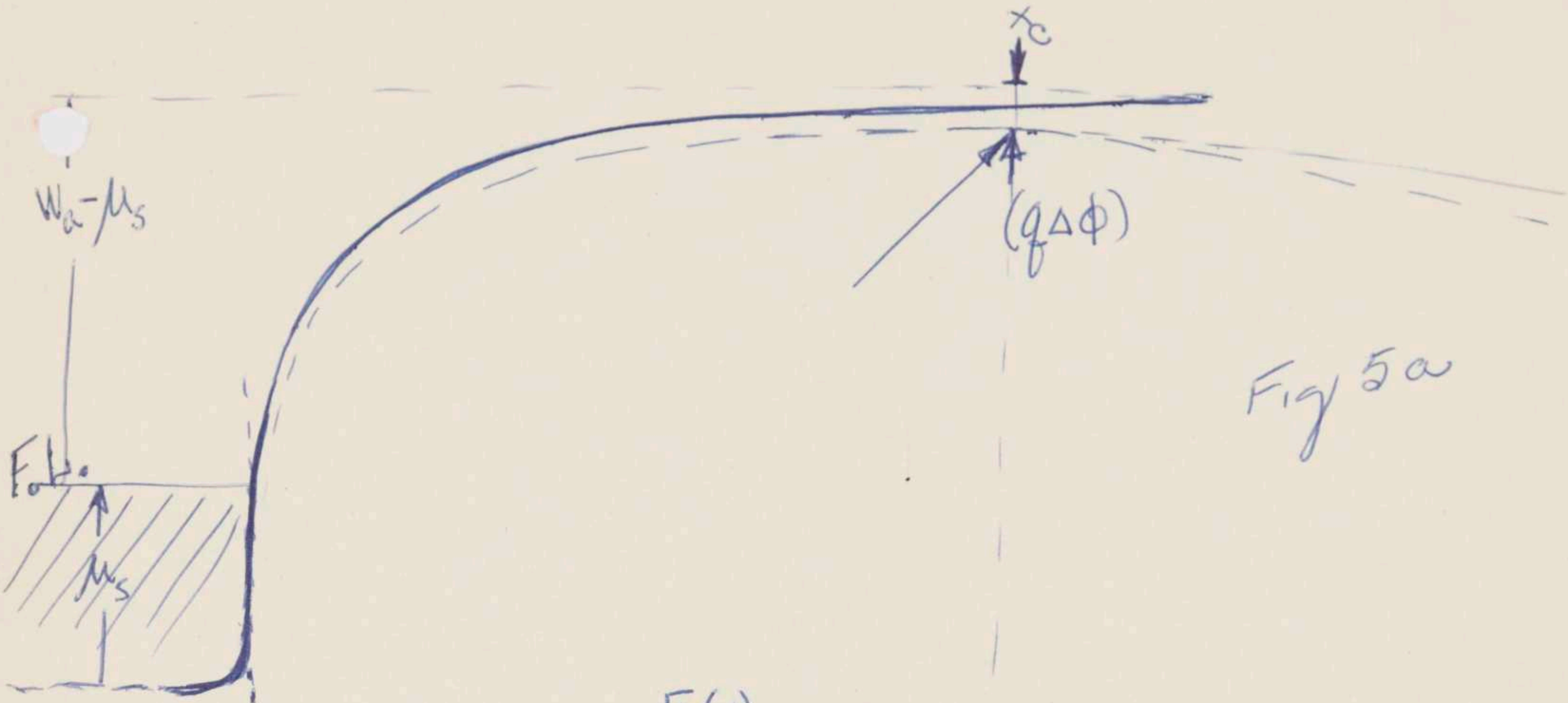


Fig 5a

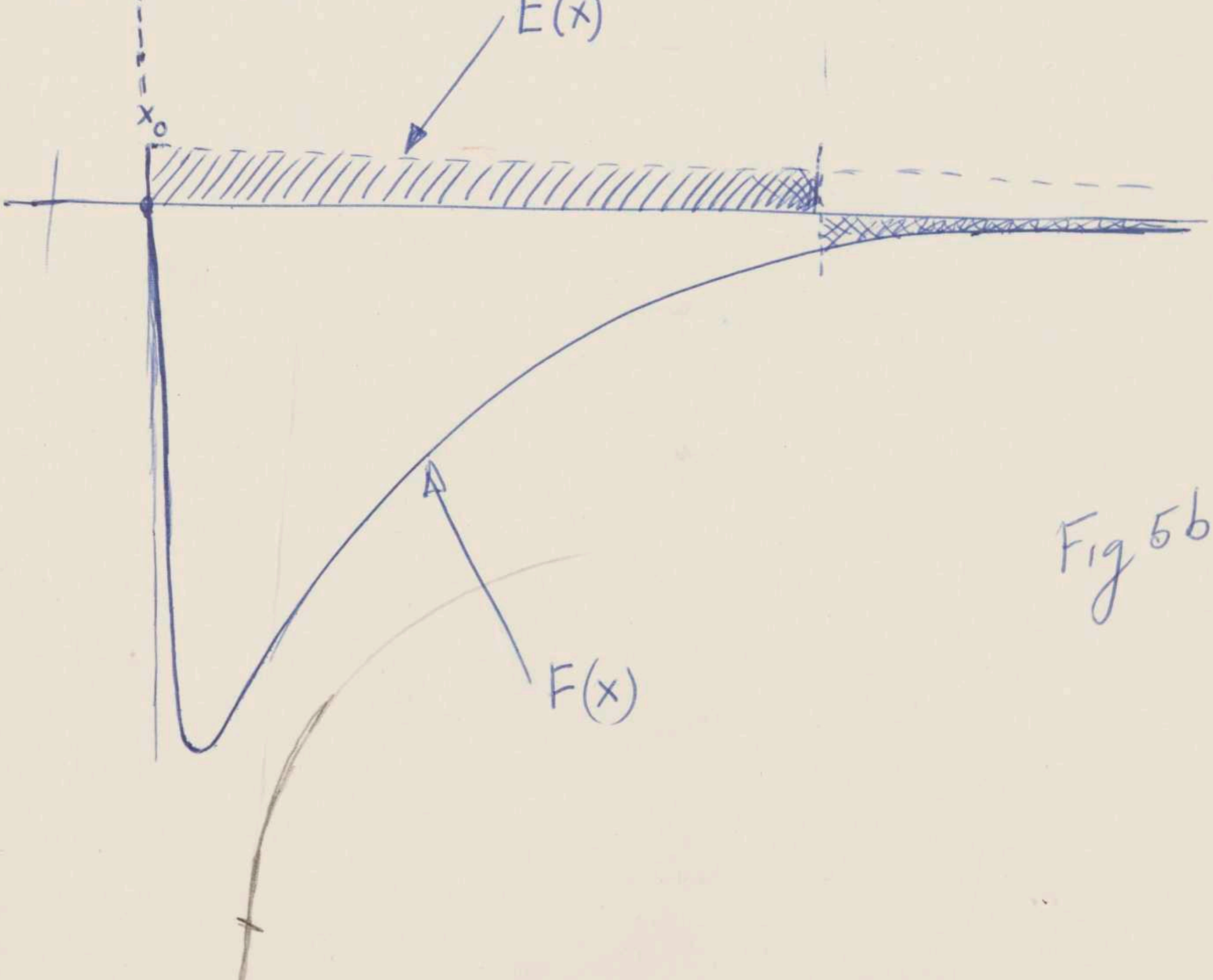


Fig 5b

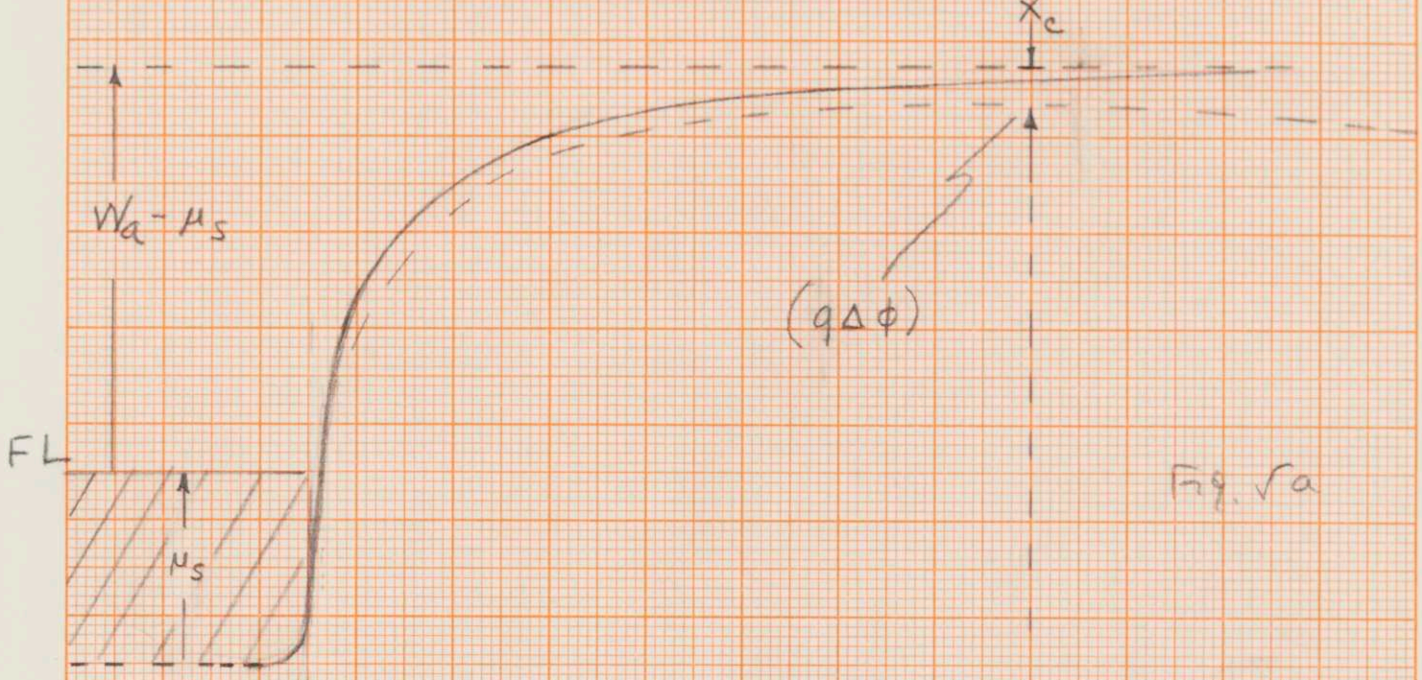


Fig. 5a

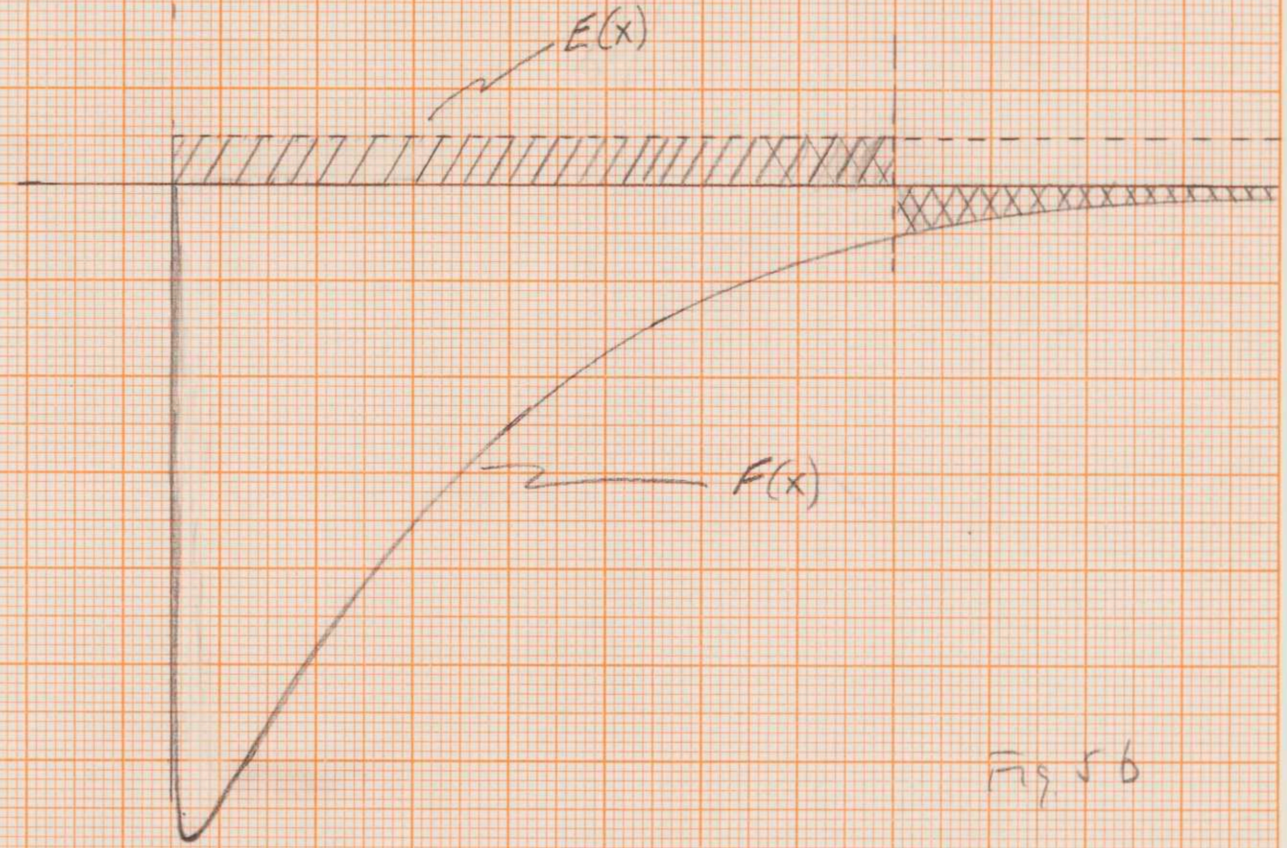
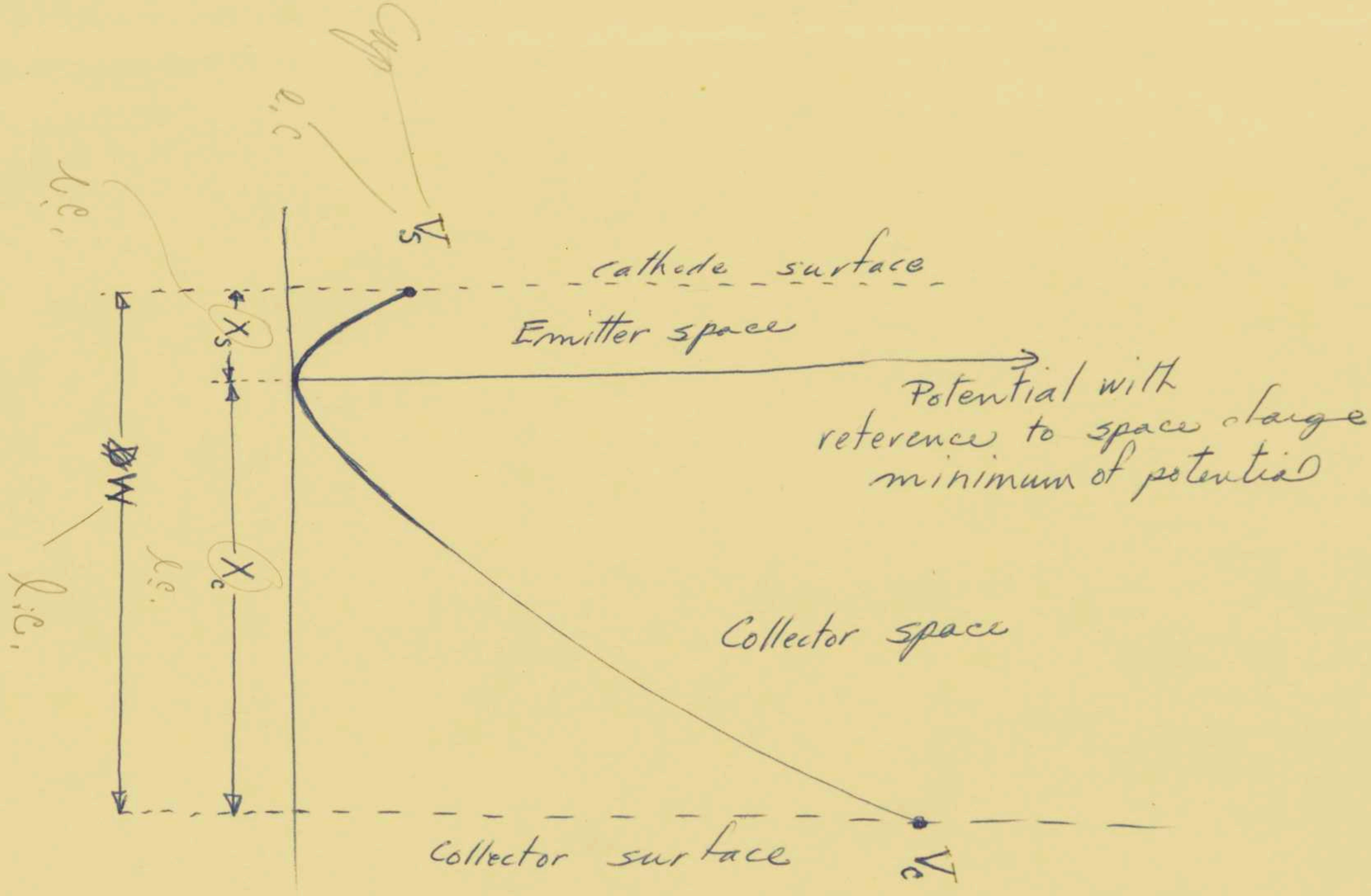


Fig. 5b



V_s
cathode surface
X_s
Emitter space
Potential with reference to space charge minimum of potential
W
X_c
Collector space
Collector surface
V_c

Fig 7

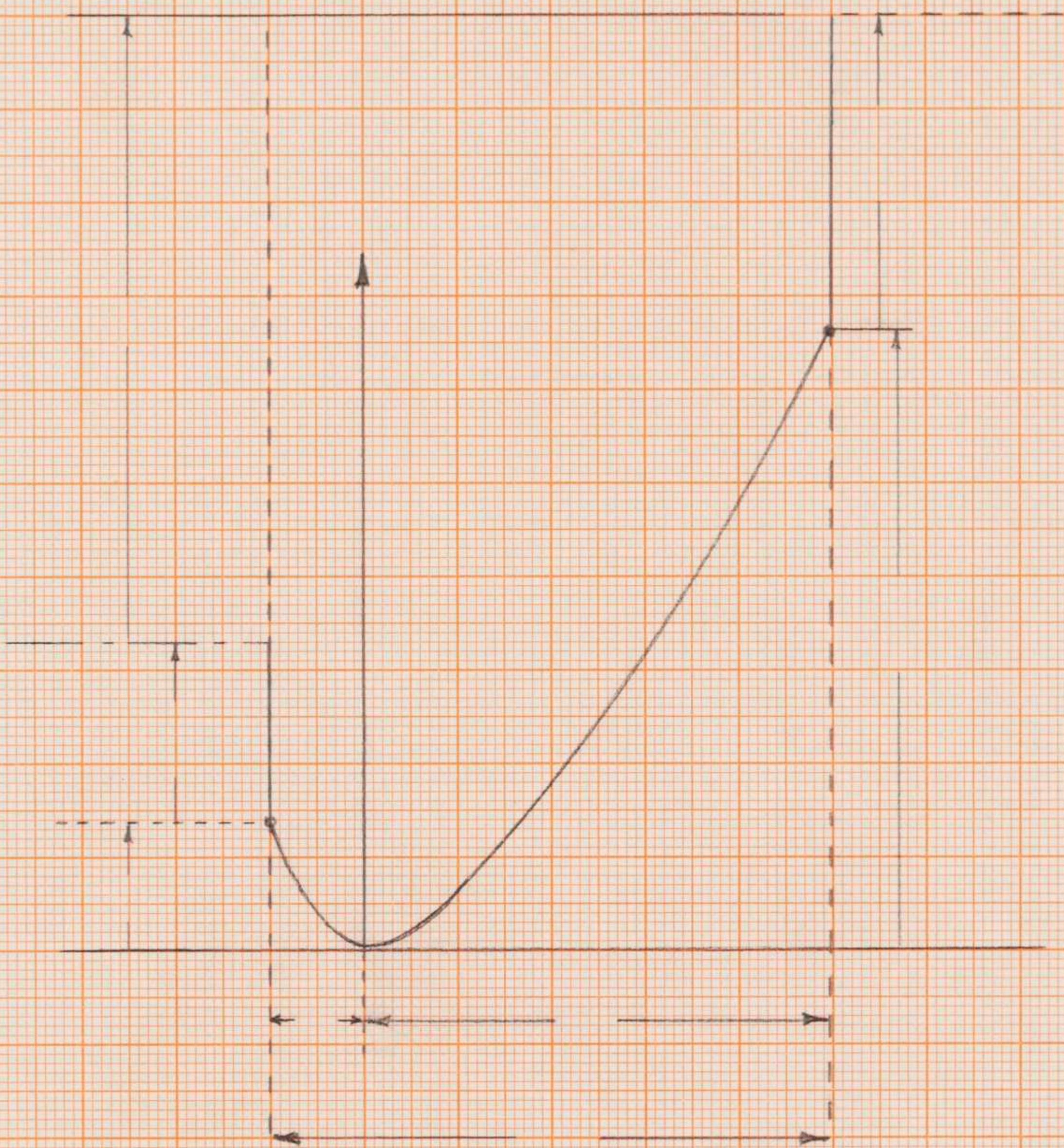


Fig 7 p. 51 si 82

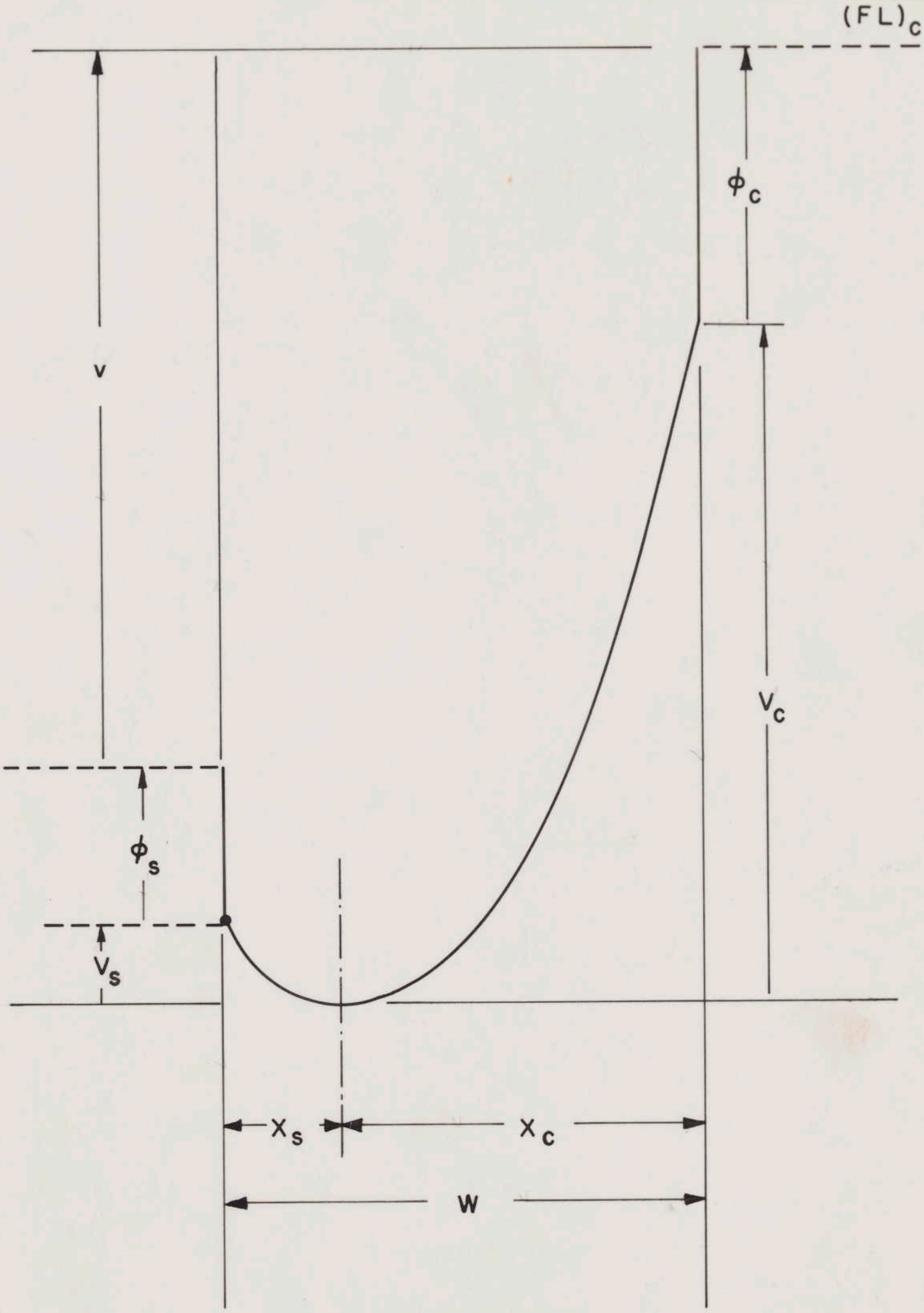
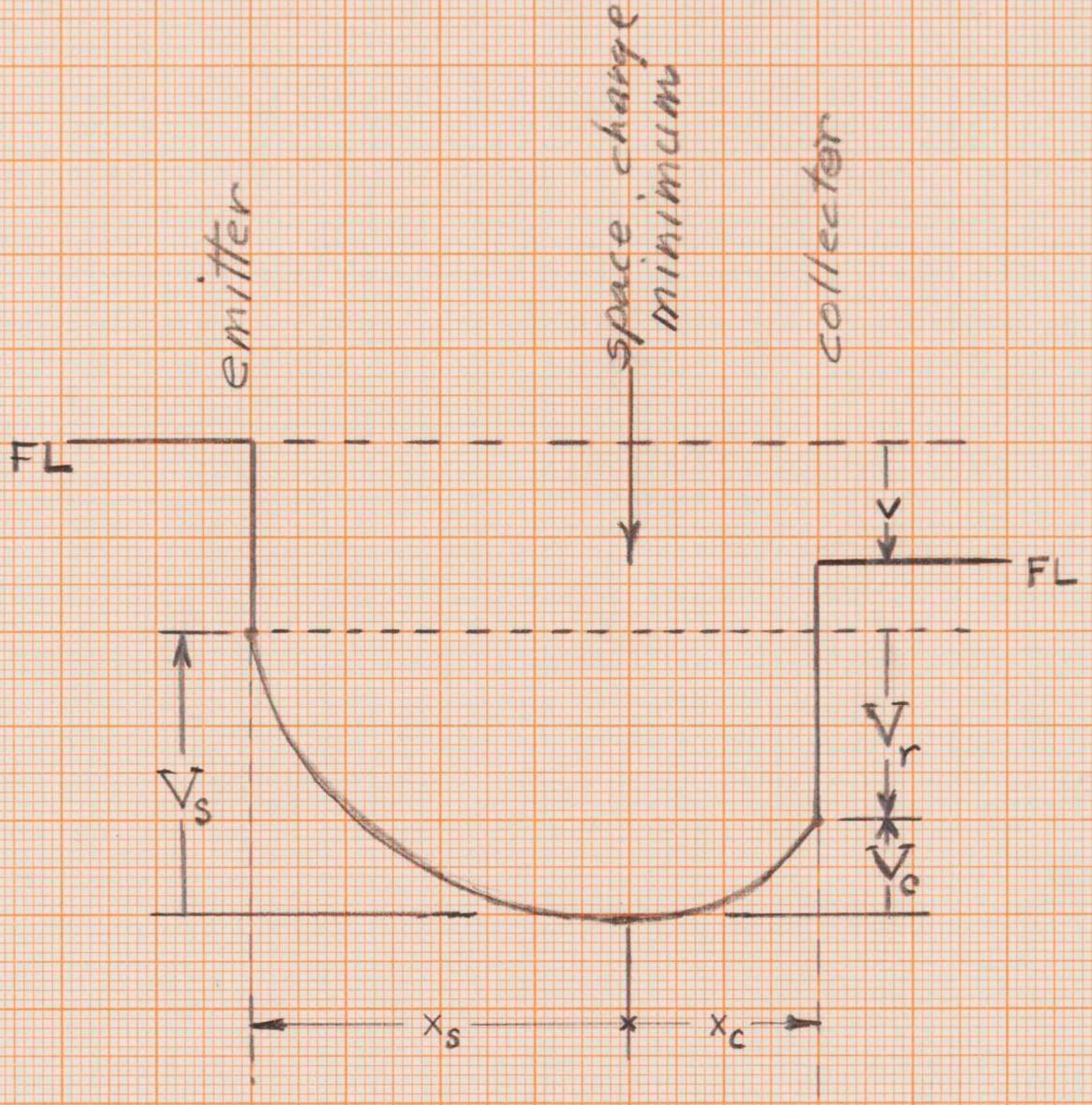


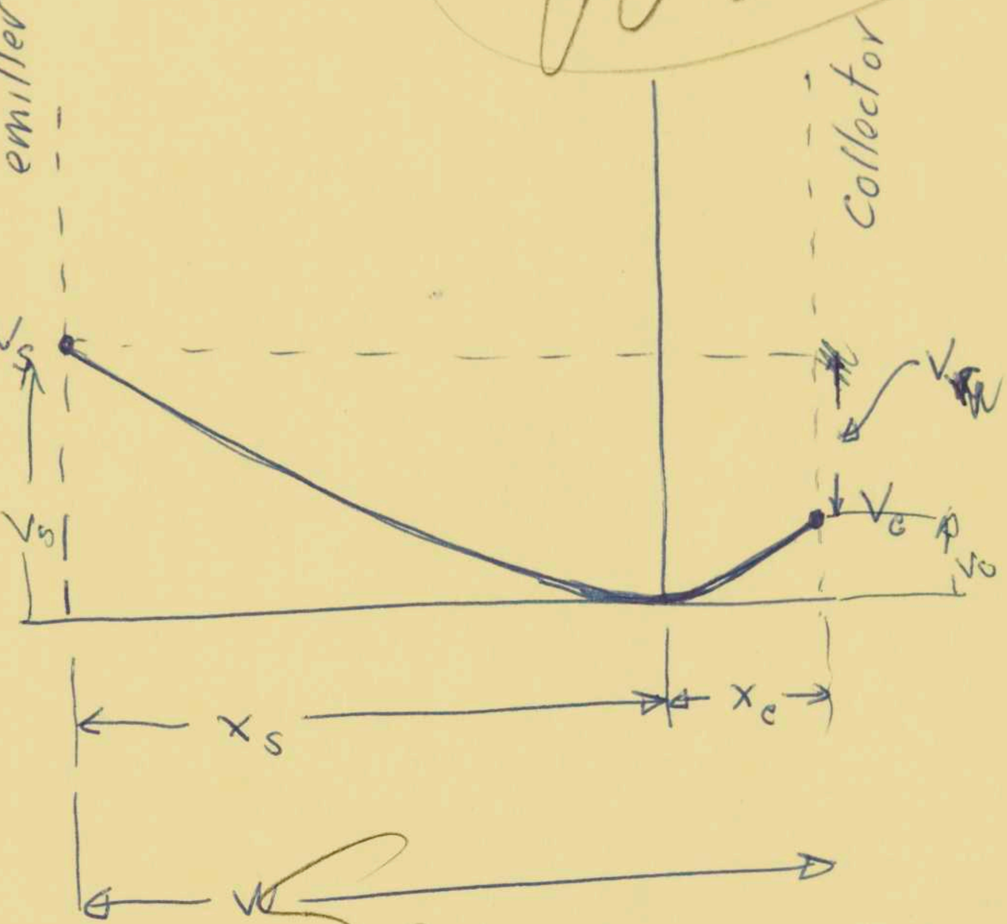
Fig 8



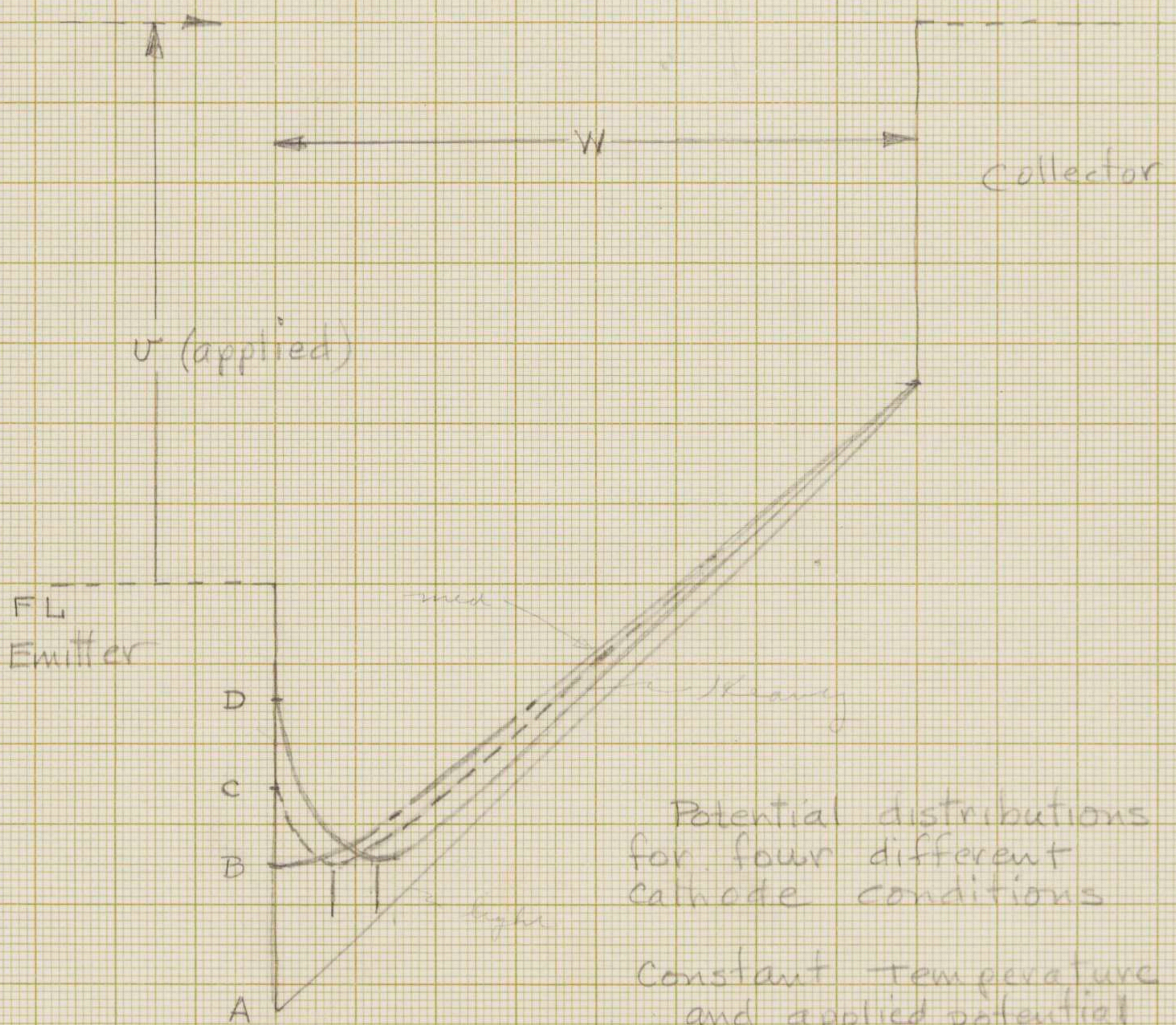
Potential distribution with space charge and a retarding potential V_r.

Fig 8

Fig 8



See other drawings

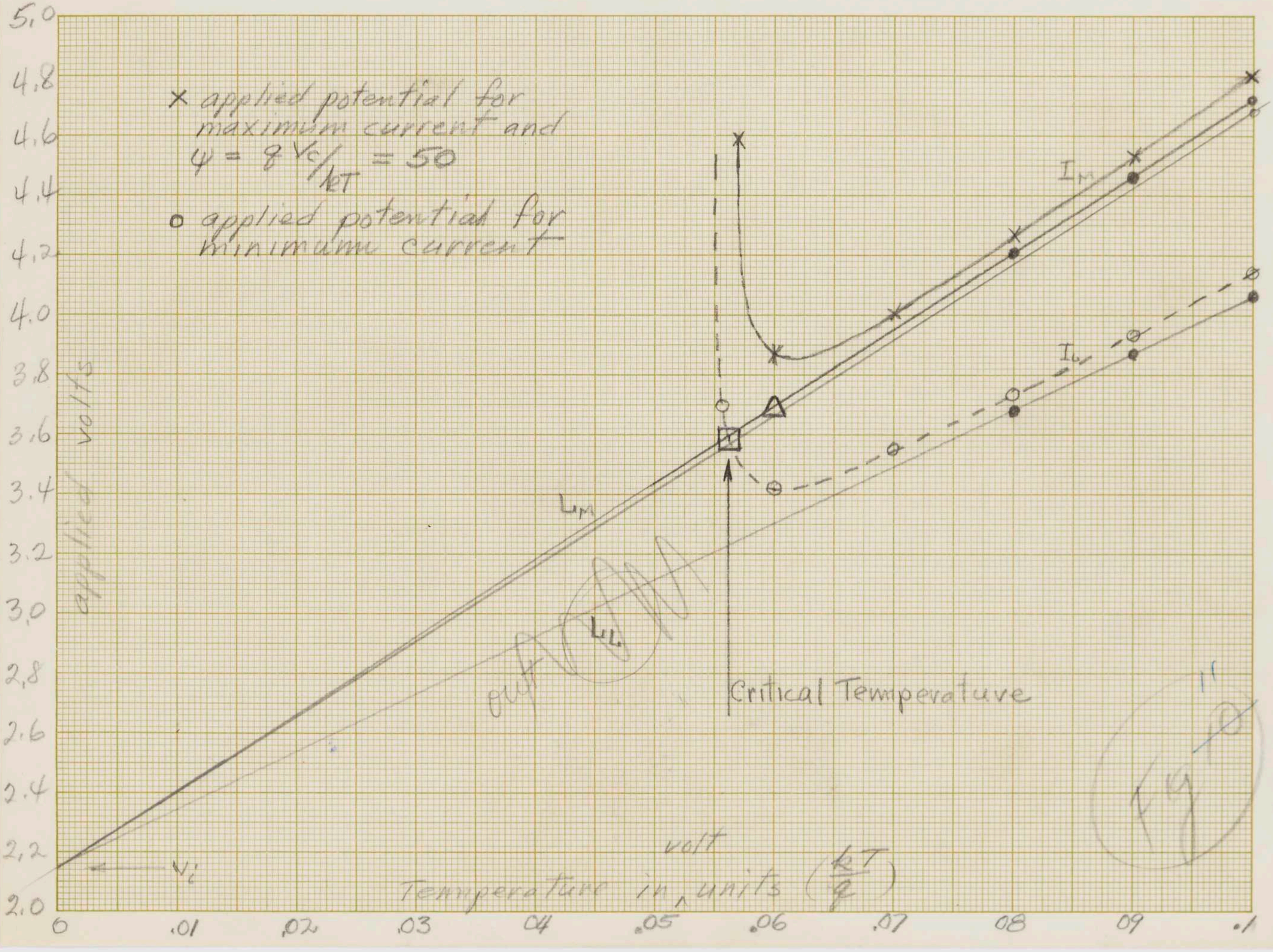


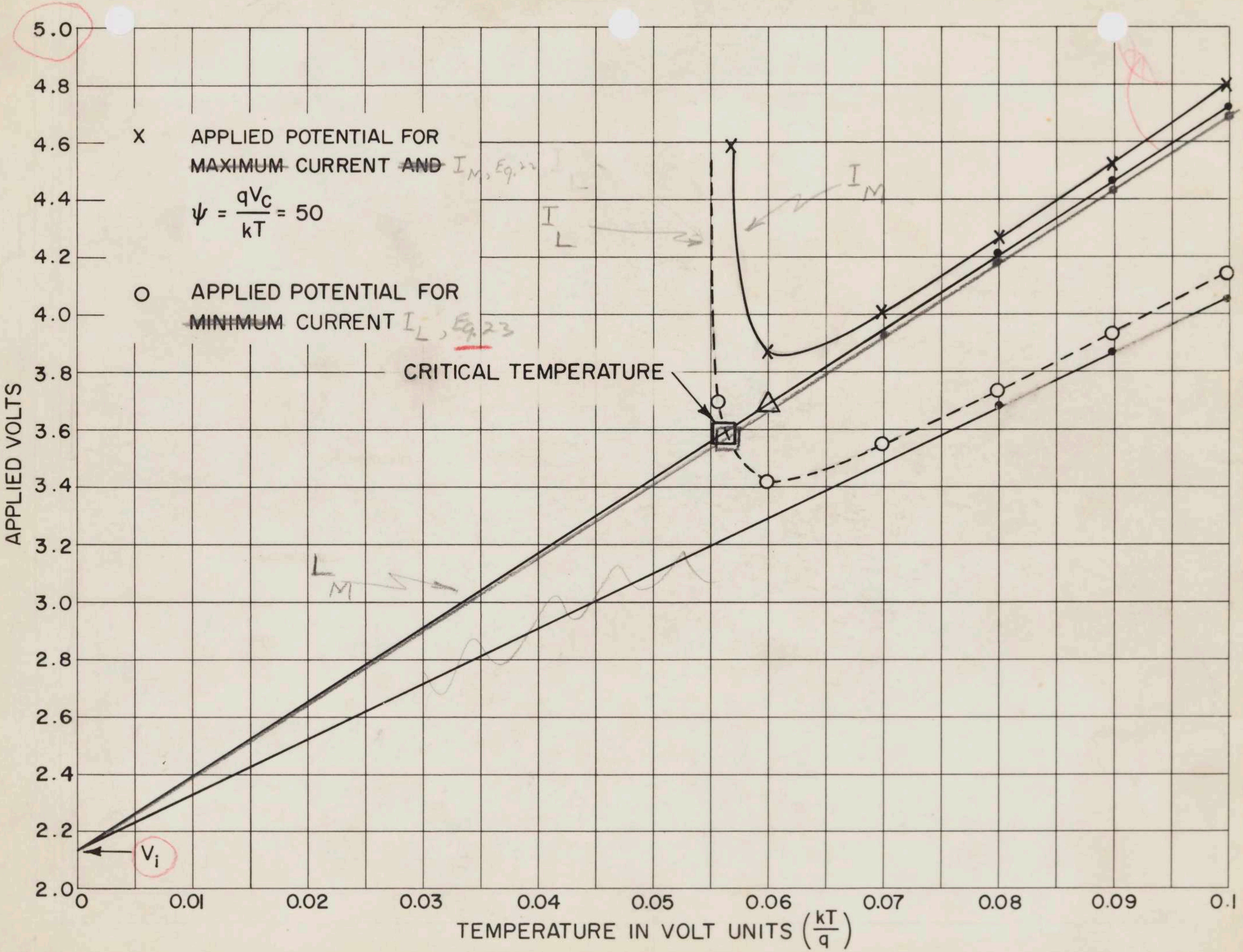
Potential distributions for four different cathode conditions

Constant temperature and applied potential

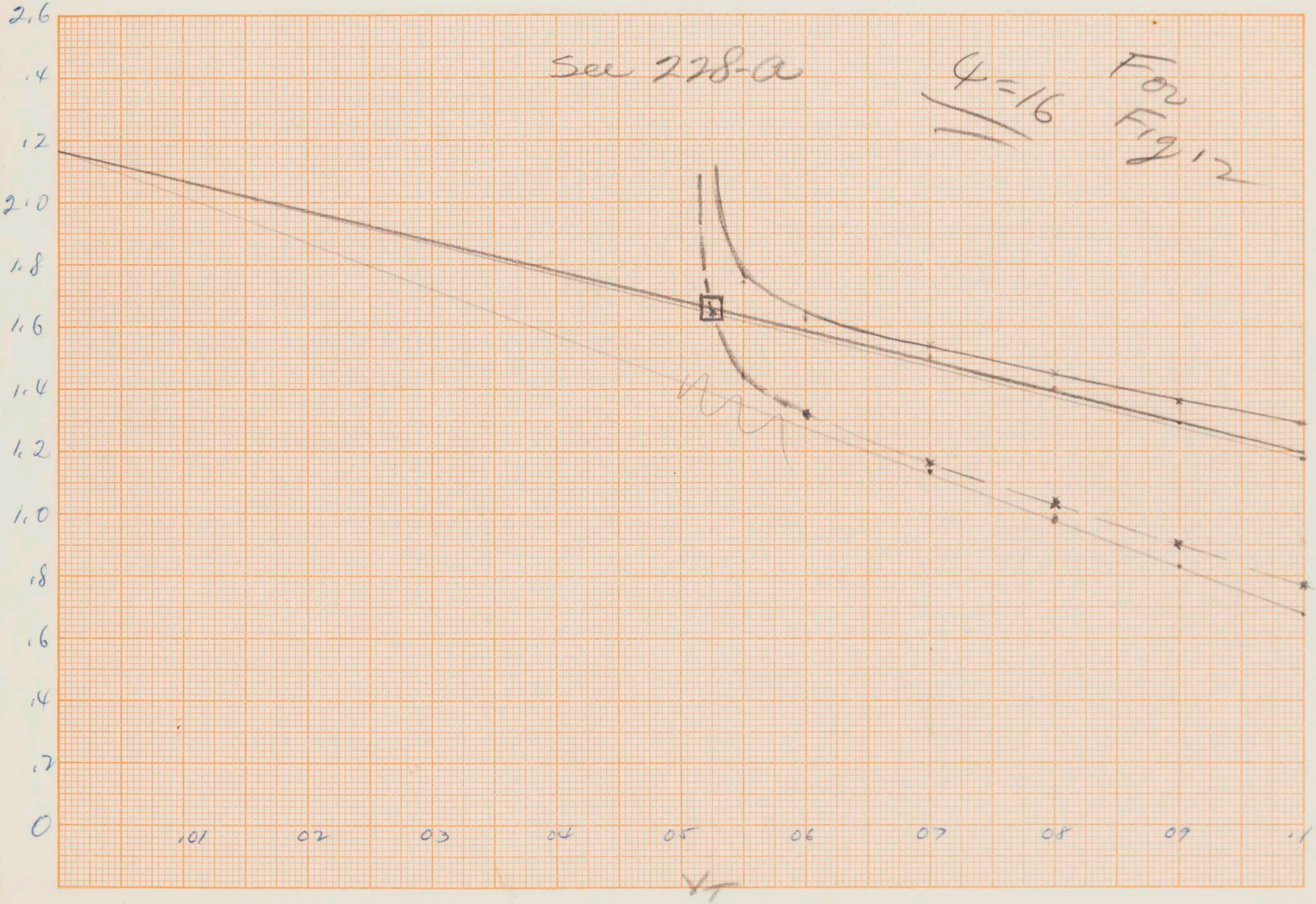
Sec 46

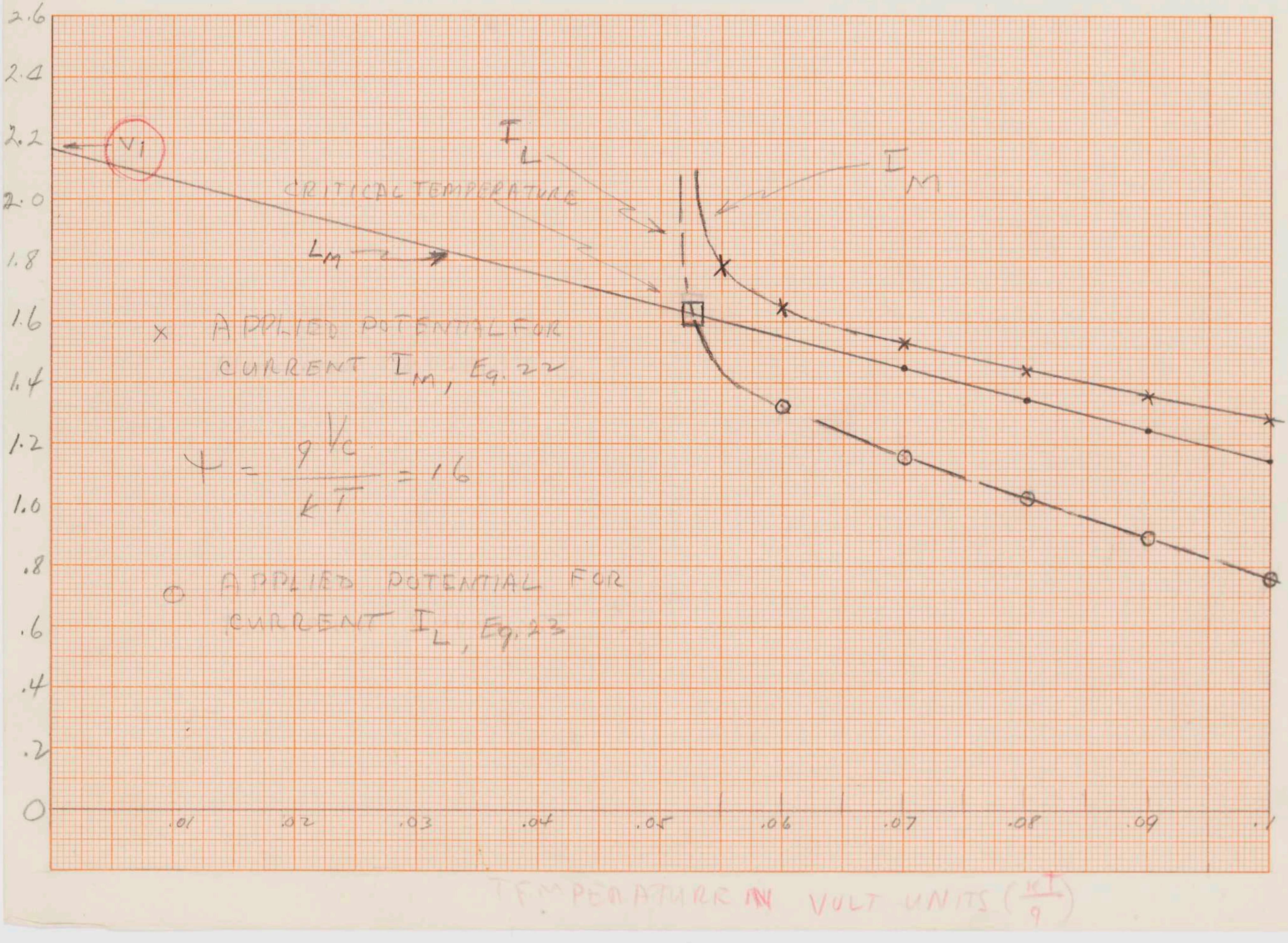
Fig 10


× applied potential for maximum current and $\psi = q V_c / kT = 50$
o applied potential for minimum current
I_M
I_L
L_M
L_L
Critical Temperature
V_i
applied volts
Temperature in volt units $\left(\frac{kT}{q}\right)$
5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
Fig 11



APPLIED VOLTS
5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
TEMPERATURE IN VOLT UNITS (kT/q)
X APPLIED POTENTIAL FOR MAXIMUM CURRENT AND I_M, Eq. 22
$\psi = \frac{qV_C}{kT} = 50$
O APPLIED POTENTIAL FOR MINIMUM CURRENT I_L, Eq. 23
CRITICAL TEMPERATURE
I_M
I_L
L_M
V_i


See 228-a
ψ=16
For Fig 12
2.6
.4
.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
Vr


2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
V1
I_L
I_M
CRITICAL TEMPERATURE
L_M
× APPLIED POTENTIAL FOR CURRENT I_M, Eq. 22
$\psi = \frac{q V_c}{kT} = 16$
⊙ APPLIED POTENTIAL FOR CURRENT I_L, Eq. 23
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
TEMPERATURE IN VOLT UNITS ($\frac{kT}{q}$)

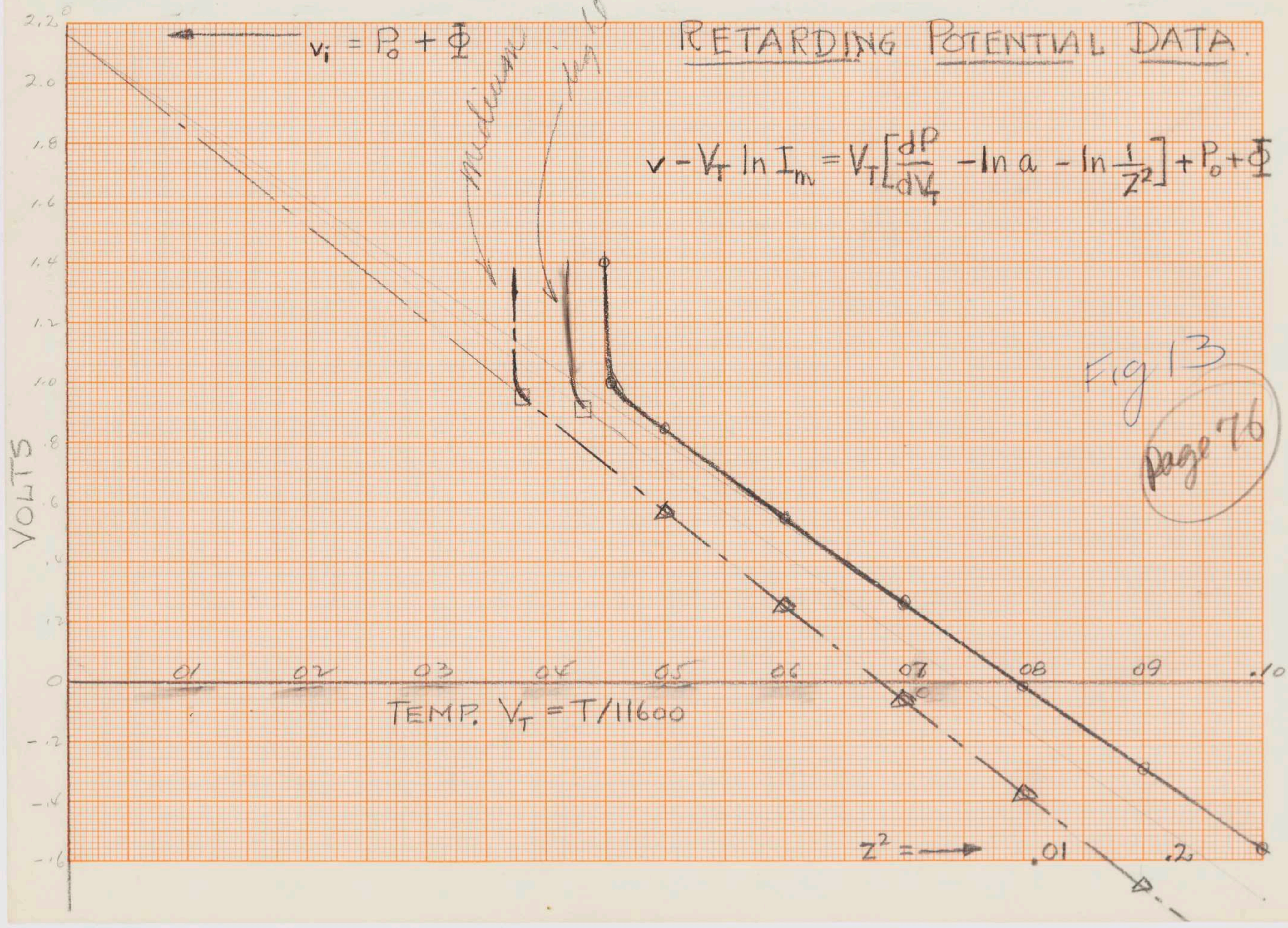
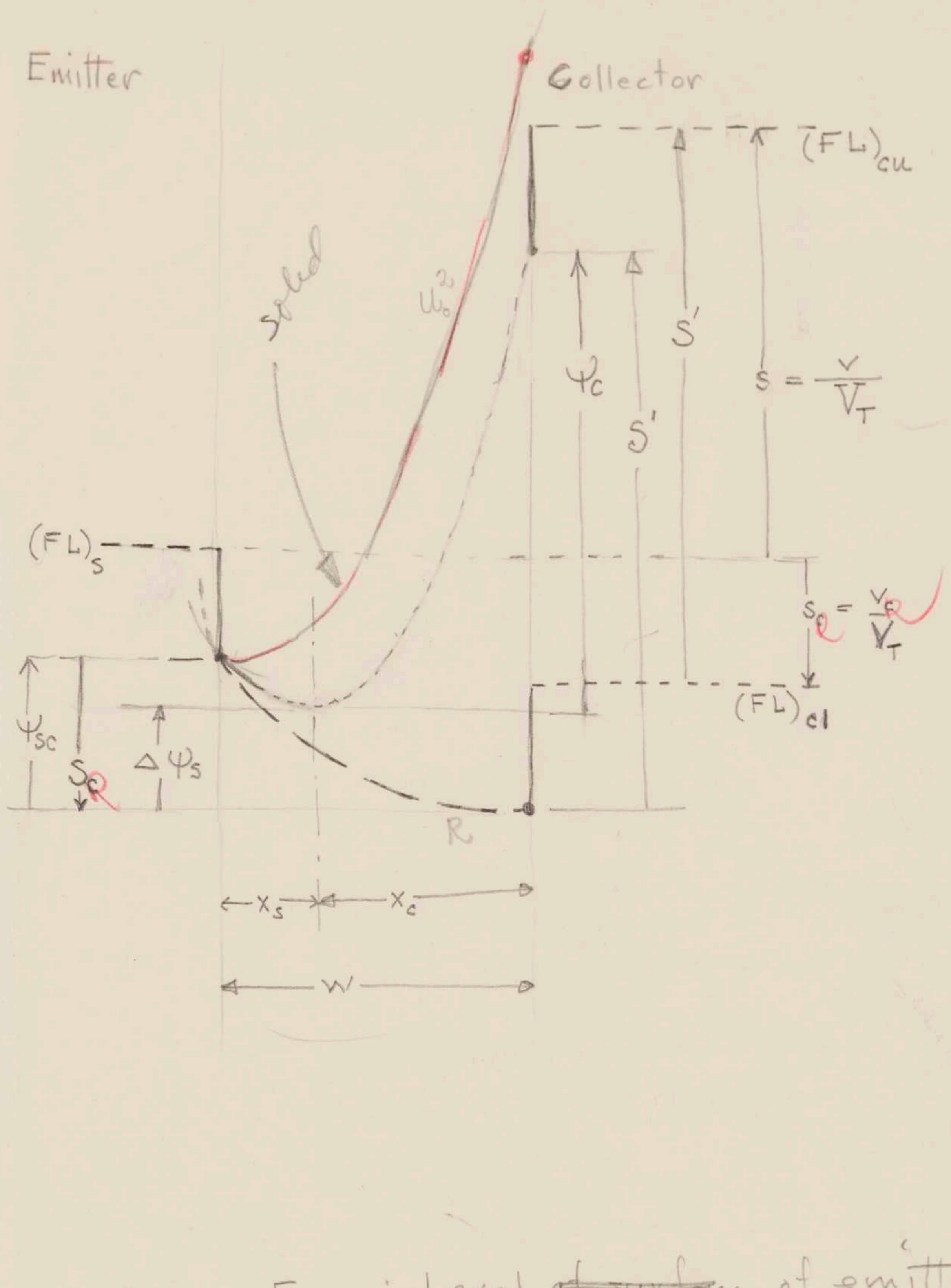

RETARDING POTENTIAL DATA.
$v_i = P_o + \Phi$
$v - V_T \ln I_m = V_T\left[\frac{dP}{dV_T} - \ln a - \ln\frac{1}{Z^2}\right] + P_o + \Phi$
medium
big
Fig 13
page 76
VOLTS
TEMP. $V_T = T/11600$
$Z^2 =$ → .01 .2
2.2 2.0 1.8 1.6 1.4 1.2 1.0 .8 .6 .4 .2 0 -.2 -.4 -.6
.01 .02 .03 .04 .05 .06 .07 .08 .09 .10

Fig 14



$(FL)_s$ = Fermi Level ~~at surface~~ of emitter

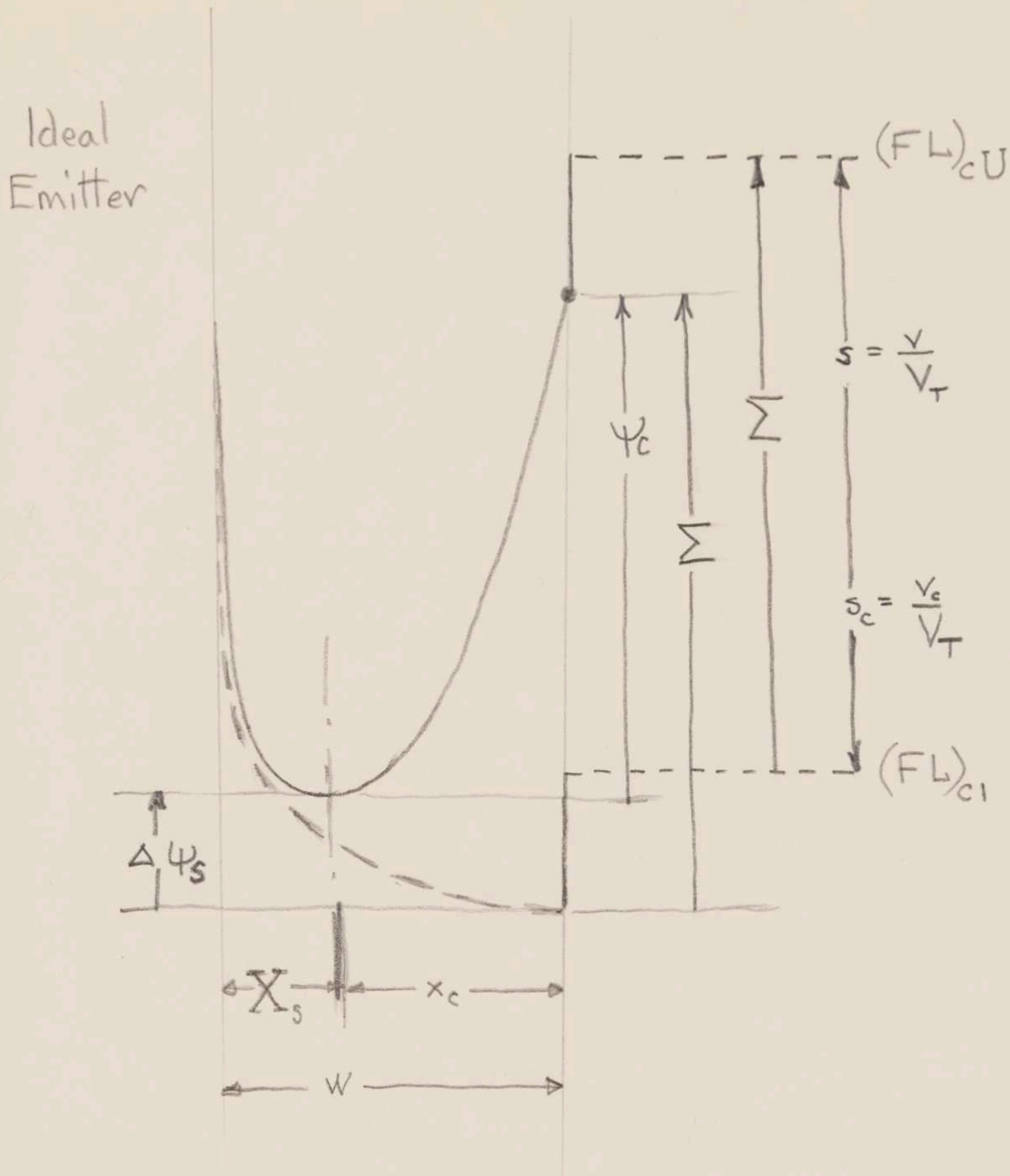
$(FL)_{cl}$ = " " ~~at surface~~ " collector

when zero field is at collector and $u^2 = 1$

$(FL)_{cu}$ = Fermi Level at collector when $(I/I_R) = u^2$

Fig 15

see p90



$(FL)_s$ = Fermi-Level of ideal emitter indetermenent

$(FL)_{C1}$ = Ferm Low of collector with zero field and $U^2 = 1$

$(FL)_{CU}$ = Fermi Lev' of collector when $(I_M / I_m) = U^2$

$(FL)_S$ = Fermi Level of Ideal Emitter
is indeterminent and therefore
not shown

(FL)

Fig 15

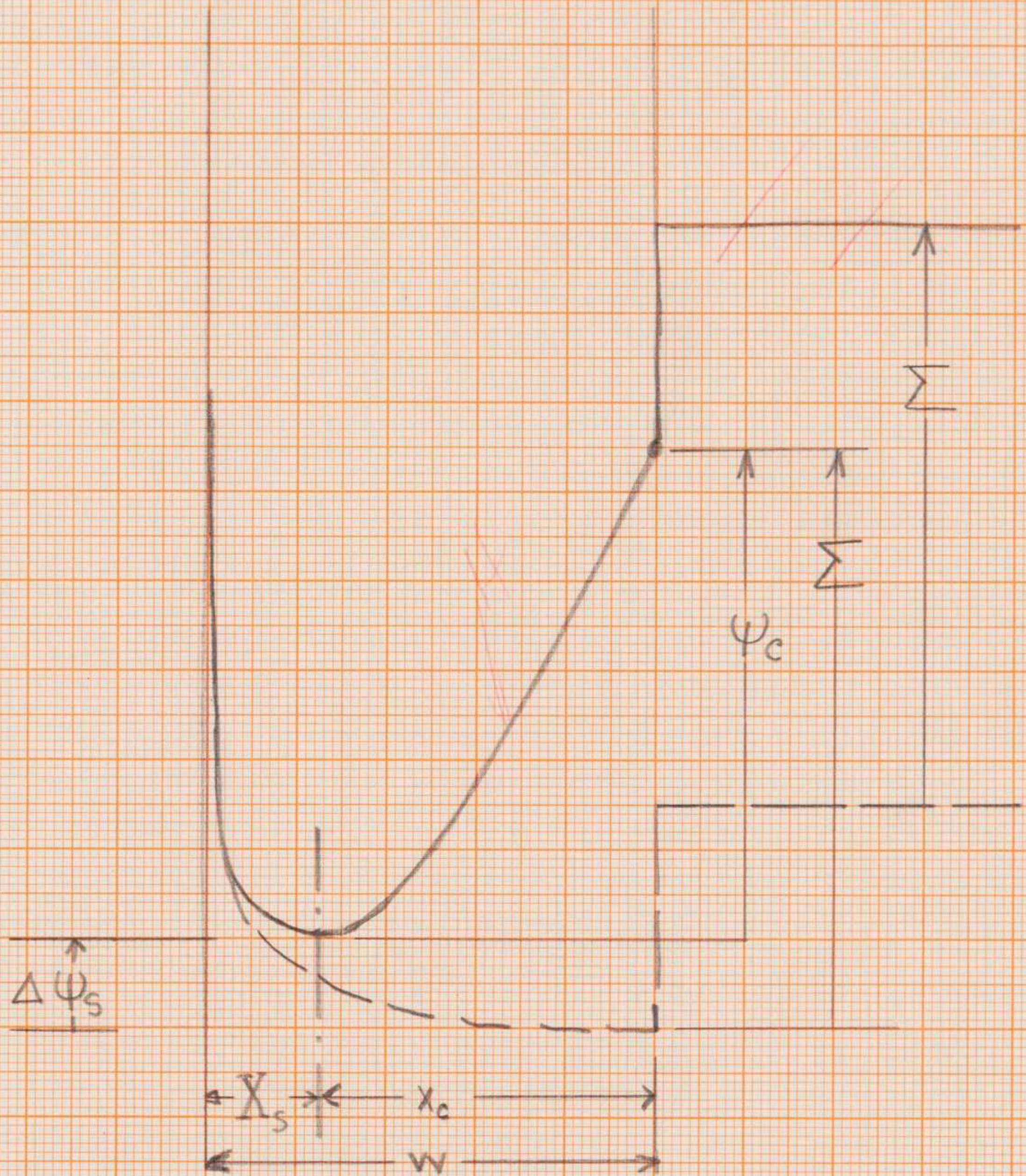
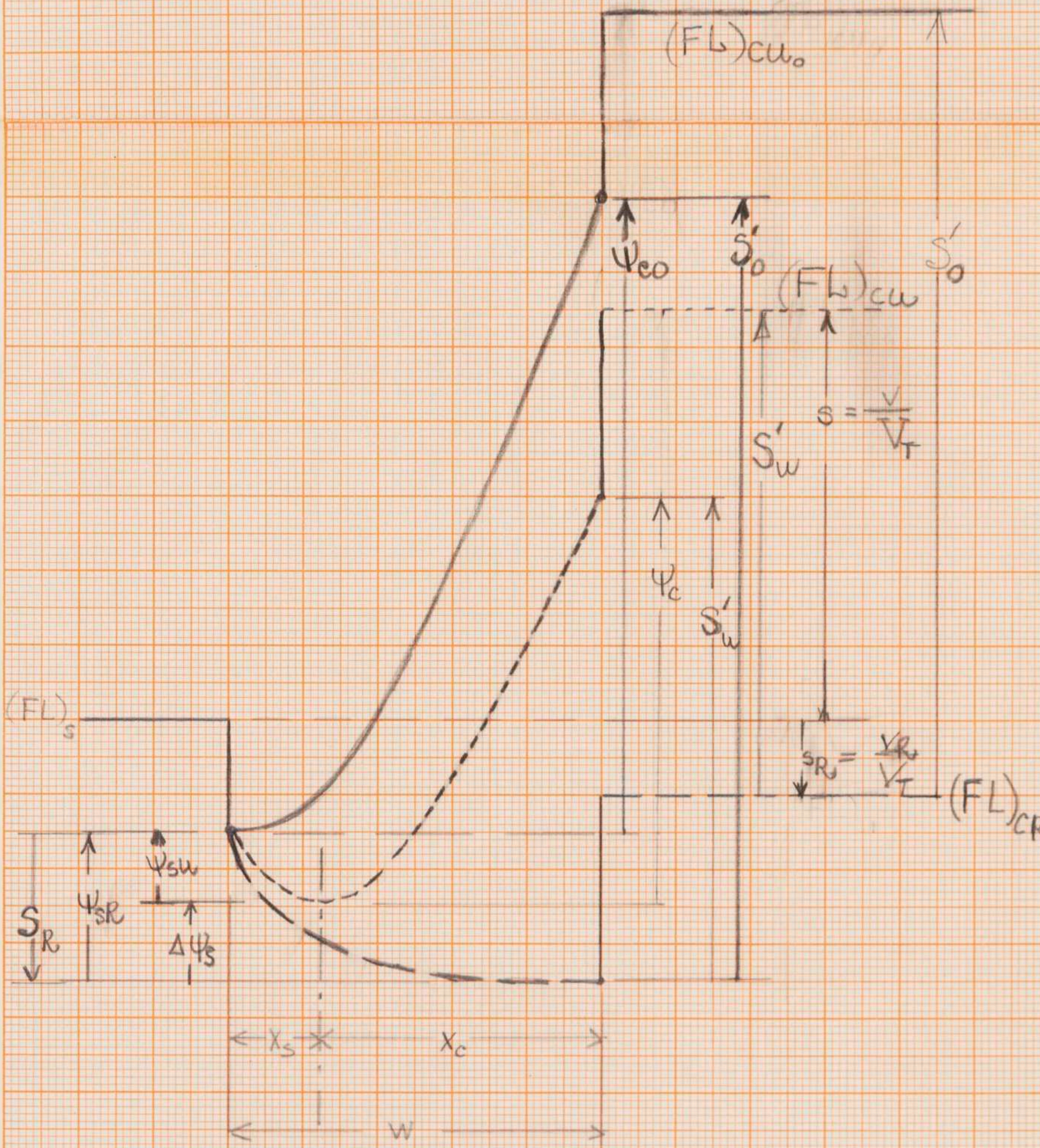


Fig 14 seif 57



$(FL)_S$ = Fermi Level of emitter

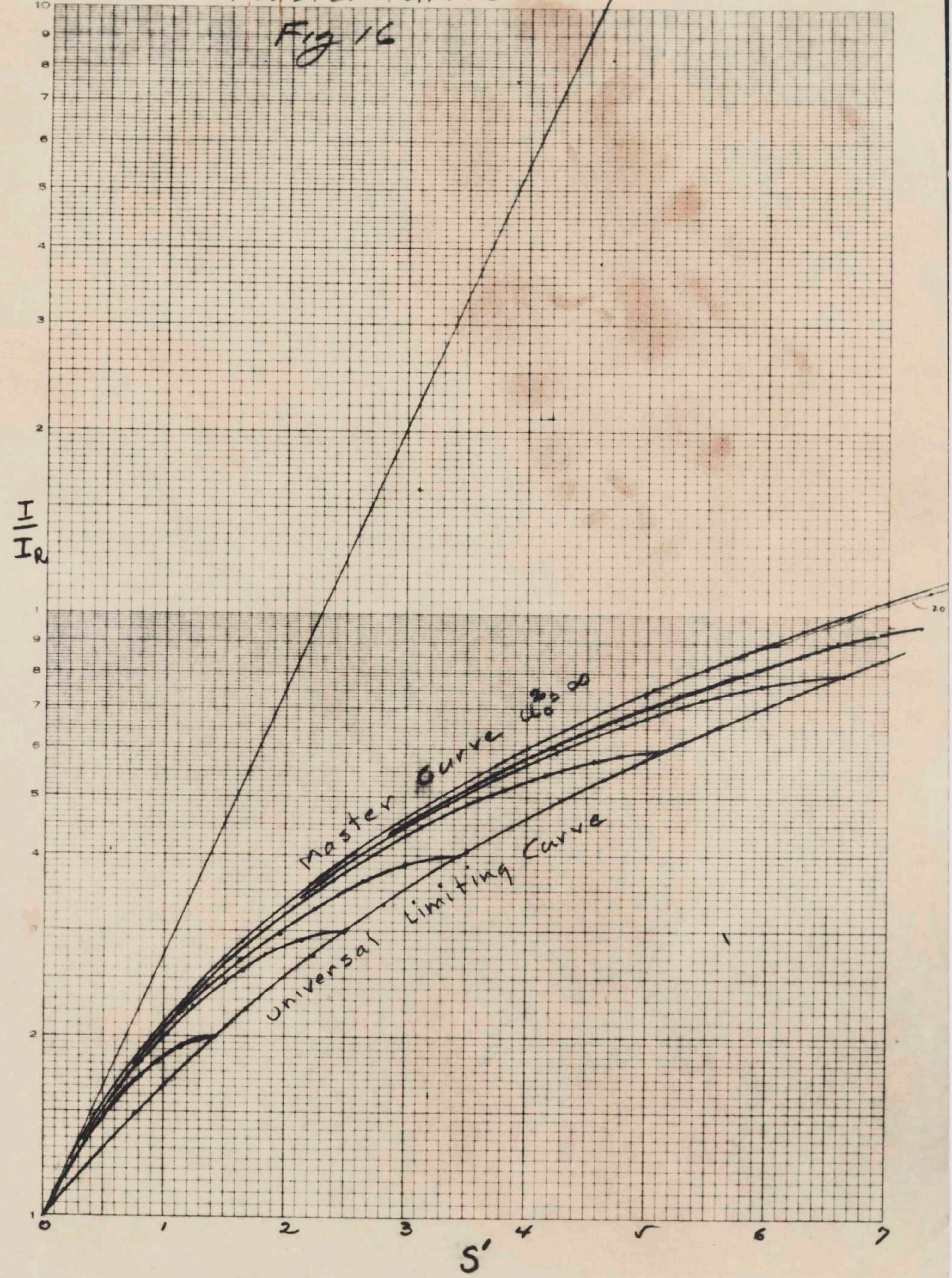
$(FL)_{CR}$ = Fermi Level of collector when zero field is at collector and $u^2 = 1$

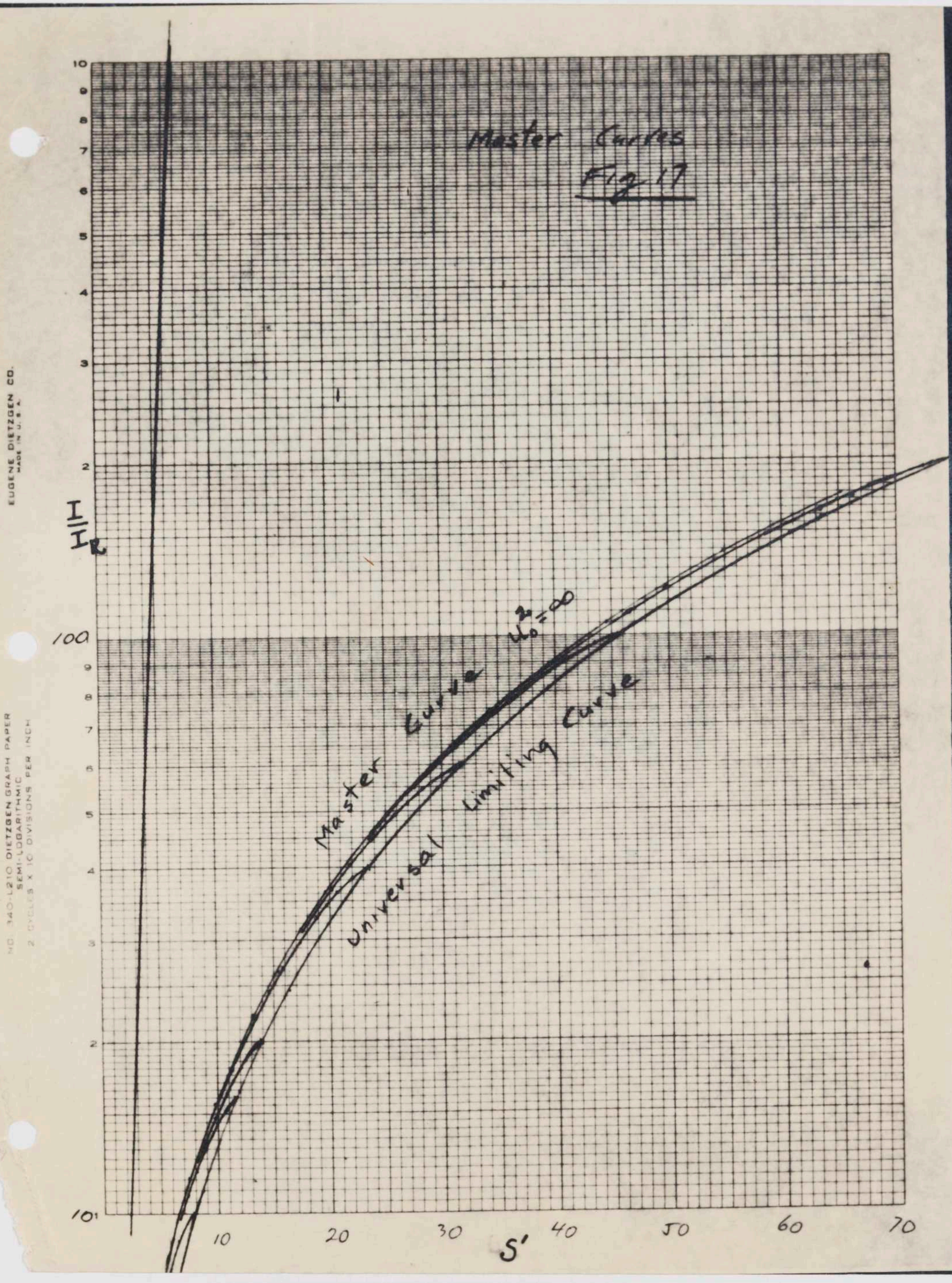
$(FL)_{cu}$ = Fermi Level of collector when $(I/I_R) = u^2$

$(FL)_{cu_0}$ = Fermi level of collector when $(I/I_R) = u_0^2$ and zero field is at emitter.

Master Curves

Fig 16





Master Curves
Fig 17
Master Curve $u_0^2 = \infty$
Universal Limiting Curve
$\frac{I}{I_R}$
S'
10
20
30
40
50
60
70
100
10¹
EUGENE DIETZGEN CO.
MADE IN U. S. A.
NO. 340-L210 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
2 CYCLES X 10 DIVISIONS PER INCH

Fig 16

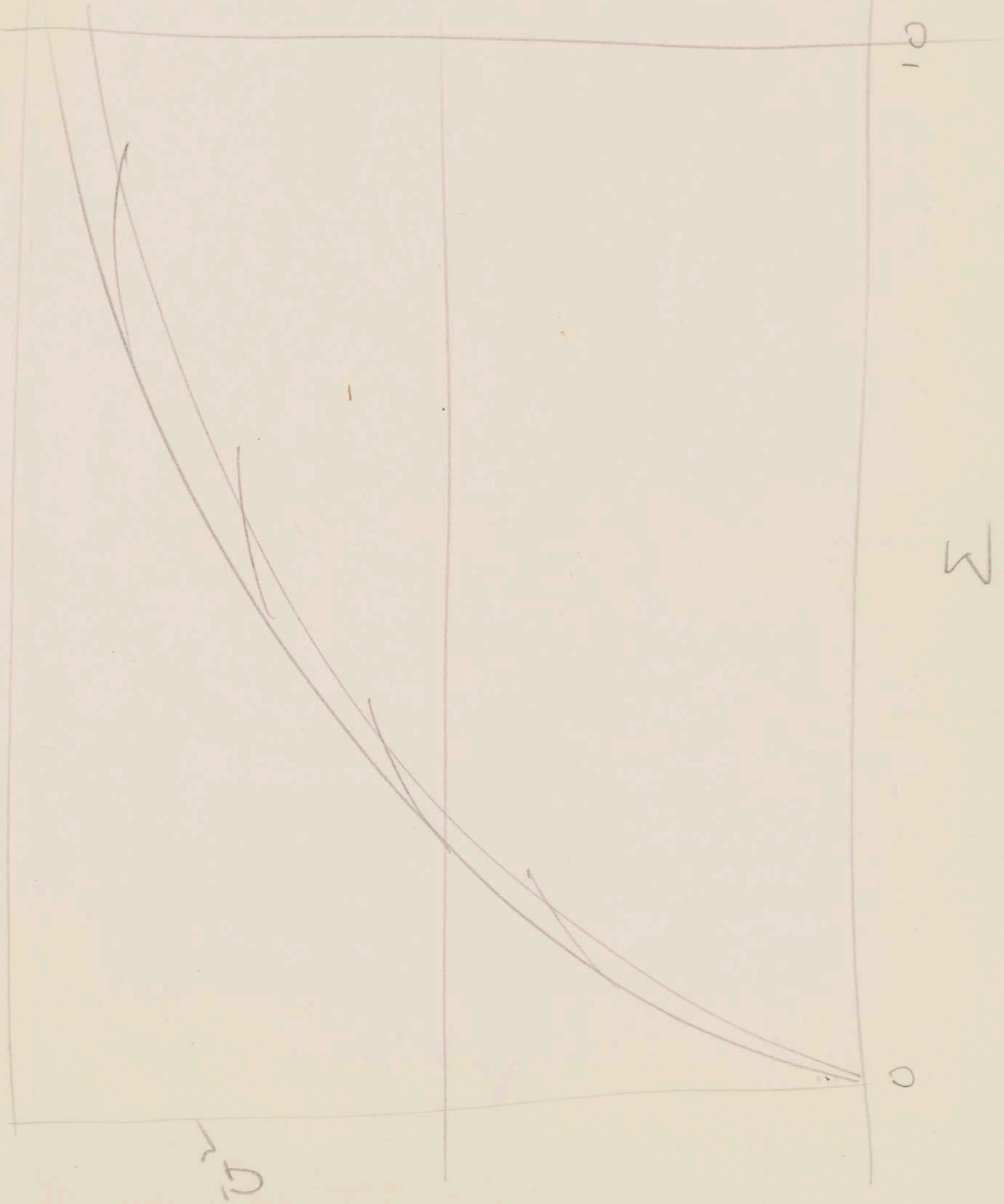
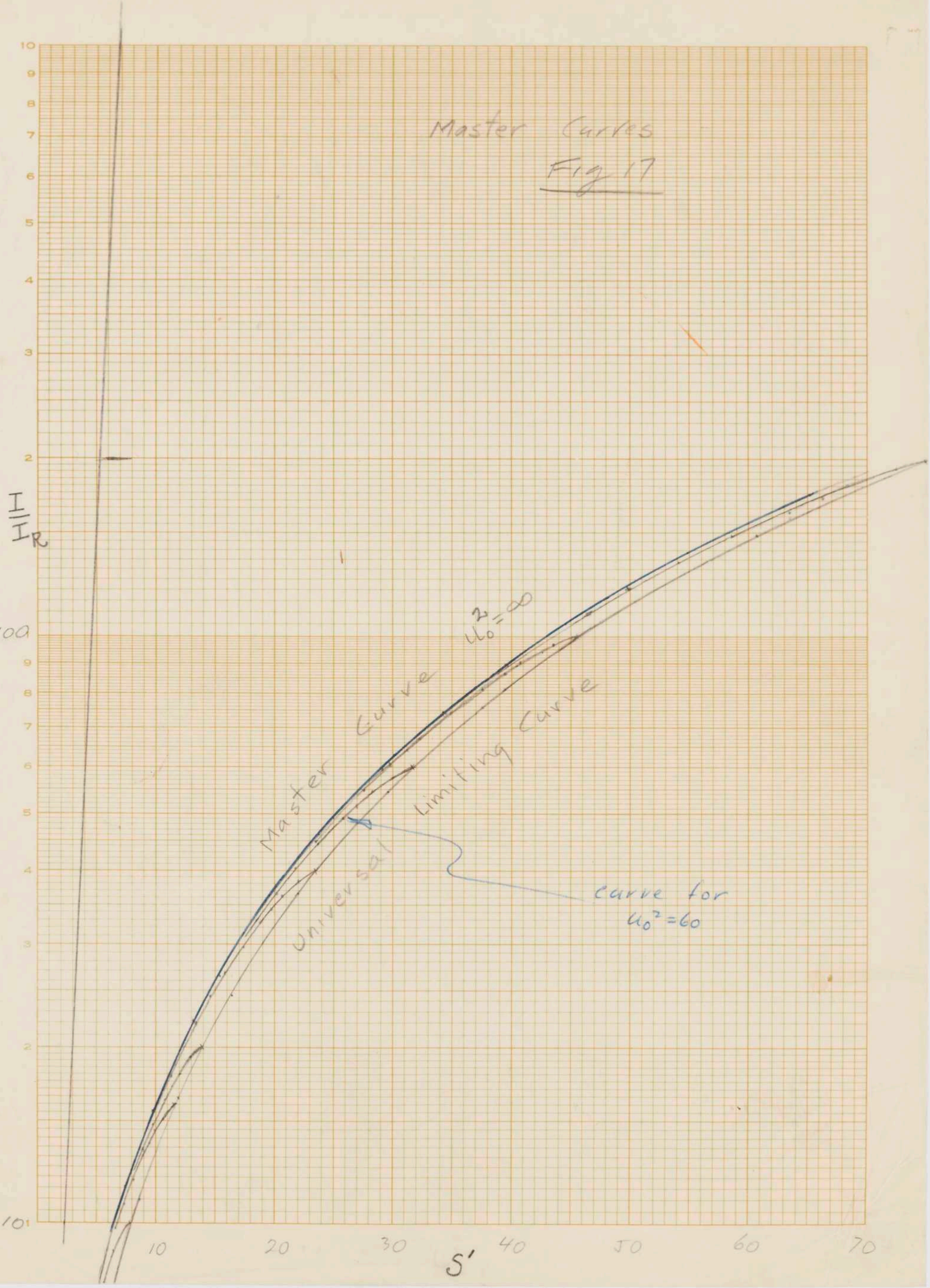


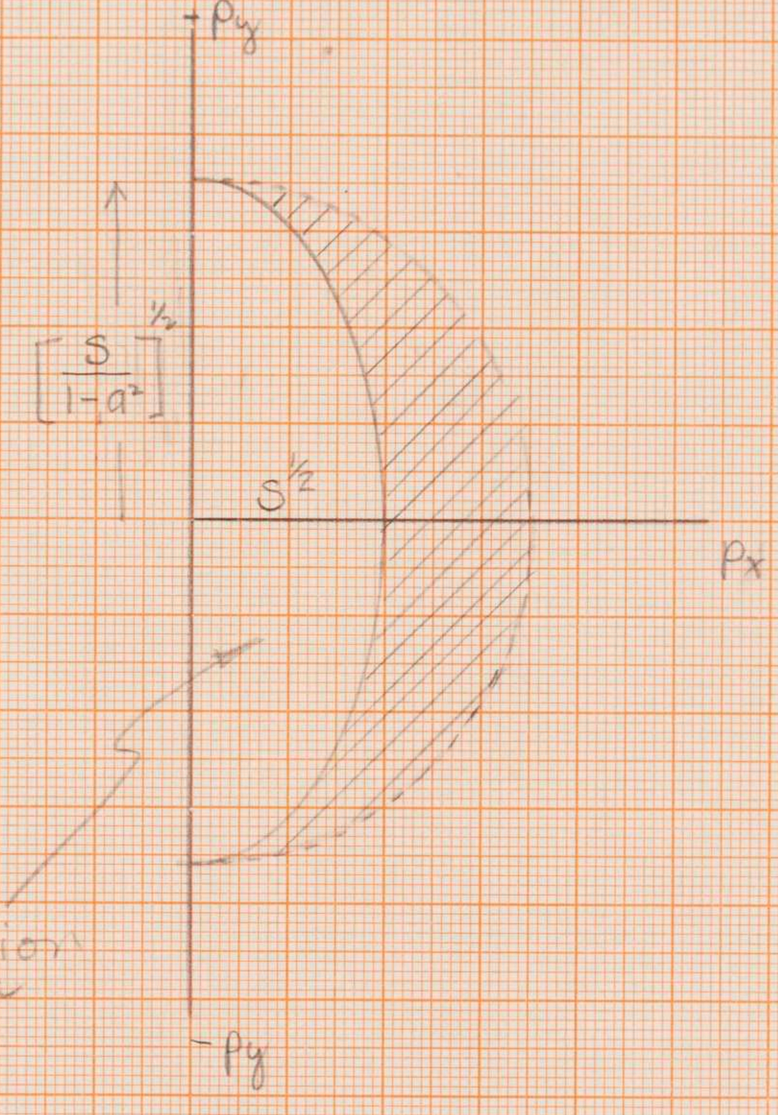
Fig 17


Master Curves
Fig 17
I/I_R
S'
Master Curve $u_0^2 = \infty$
Universal Limiting Curve
curve for $u_0^2 = 60$
10
20
30
40
50
60
70
100
101

Master Curves

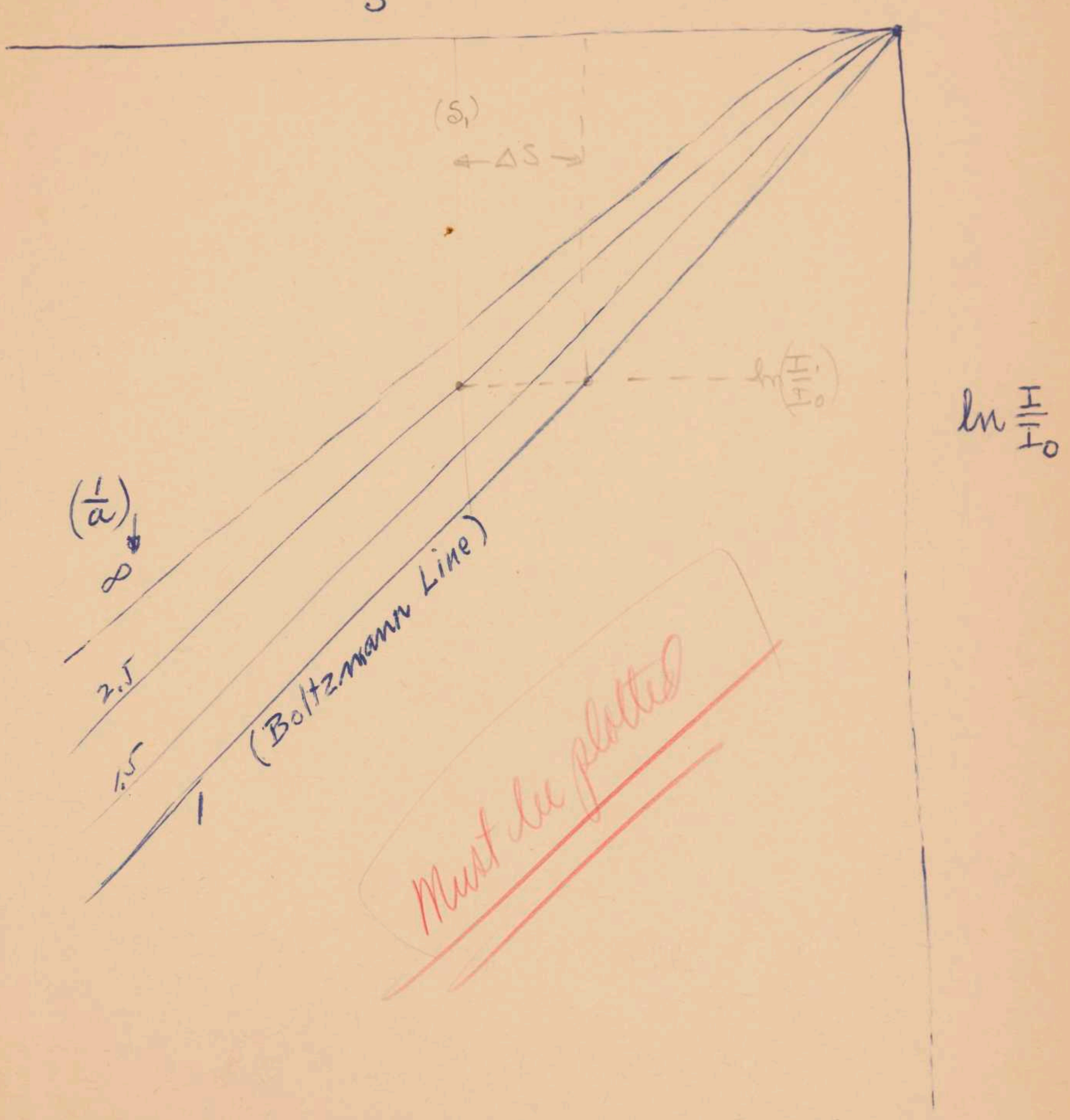
Fig 16

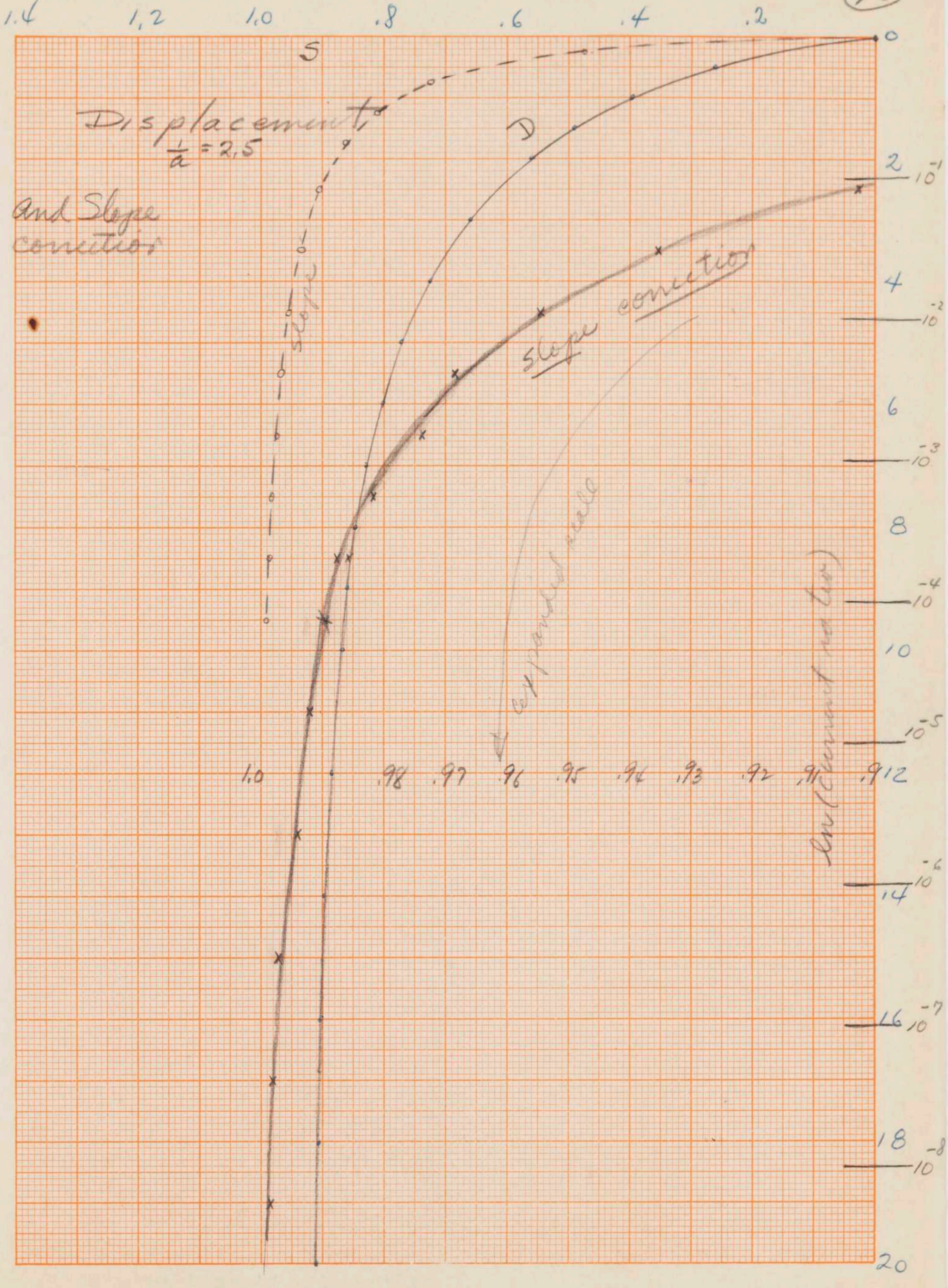
Fig 18



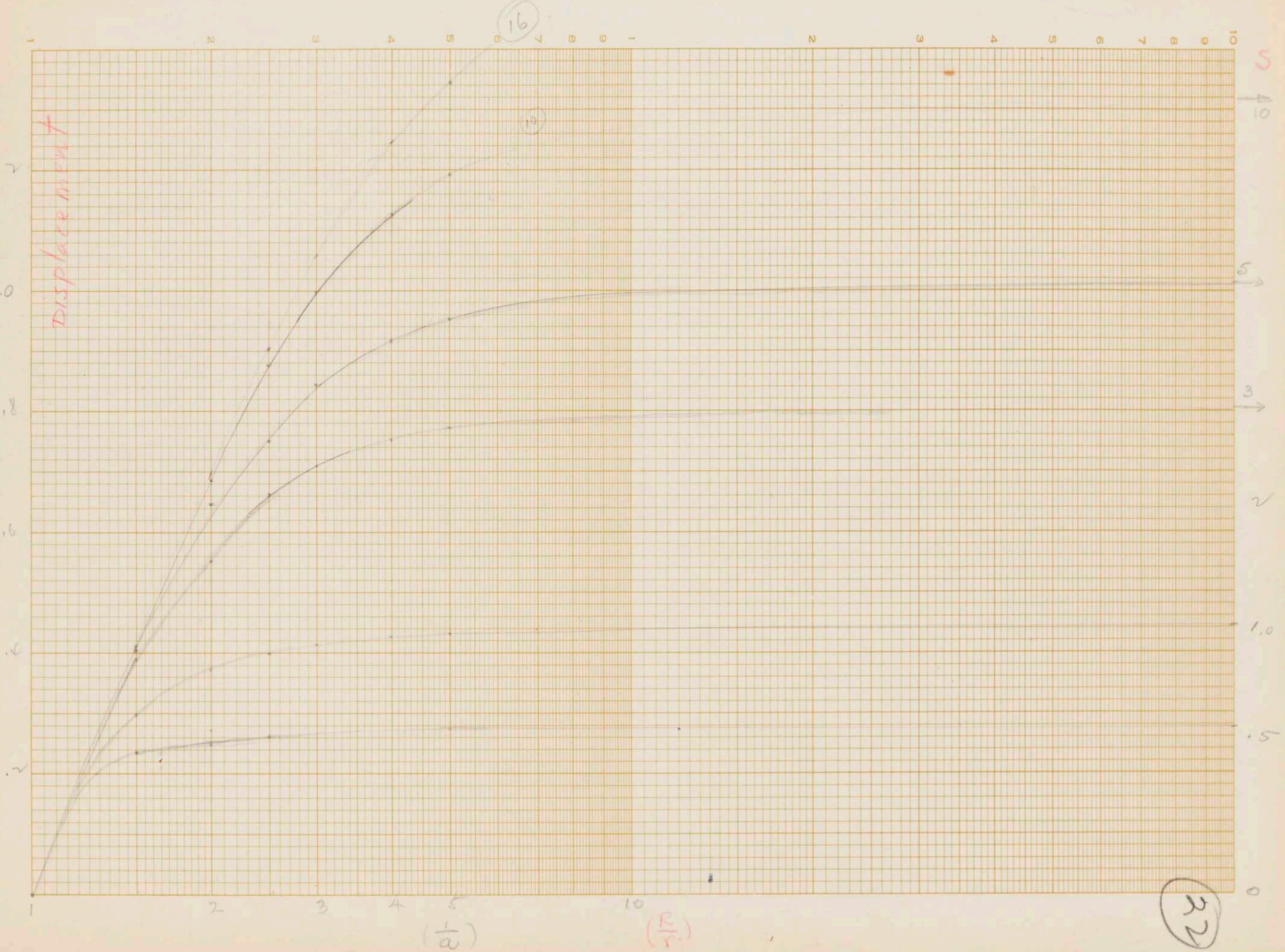
Momentum space diagram of exclusion area used to formulate Eq 60-4. for (1/a) = 1,5 1,2

Fig 19



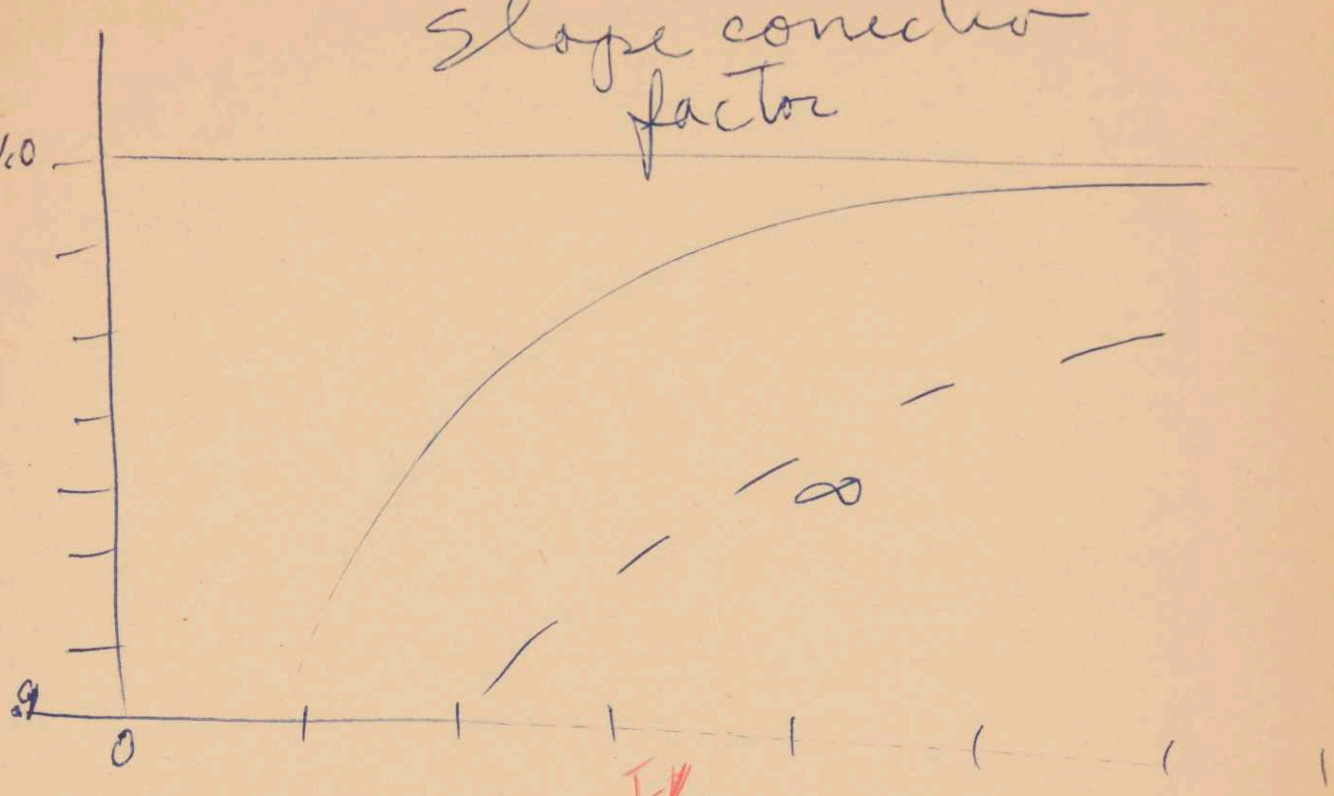

1.4
1.2
1.0
.8
.6
.4
.2
0
S
D
Displacement
$\frac{1}{a} = 2.5$
and Slope correction
slope
slope correction
expanded scale
2
4
6
8
10
12
14
16
18
20
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
1.0
.98
.97
.96
.95
.94
.93
.92
.91
.912
ln (current ratio)


Σ
1.0
.8
.6
.4
.2
0
Displacement
2.5
2.0
1.5
1.0
δ
2
4
6
8
10
12
14
16
18
20
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}



32

Fig 20



$\ln \frac{I}{I_0}$

also $\log_{10}$ scale

Fig 21

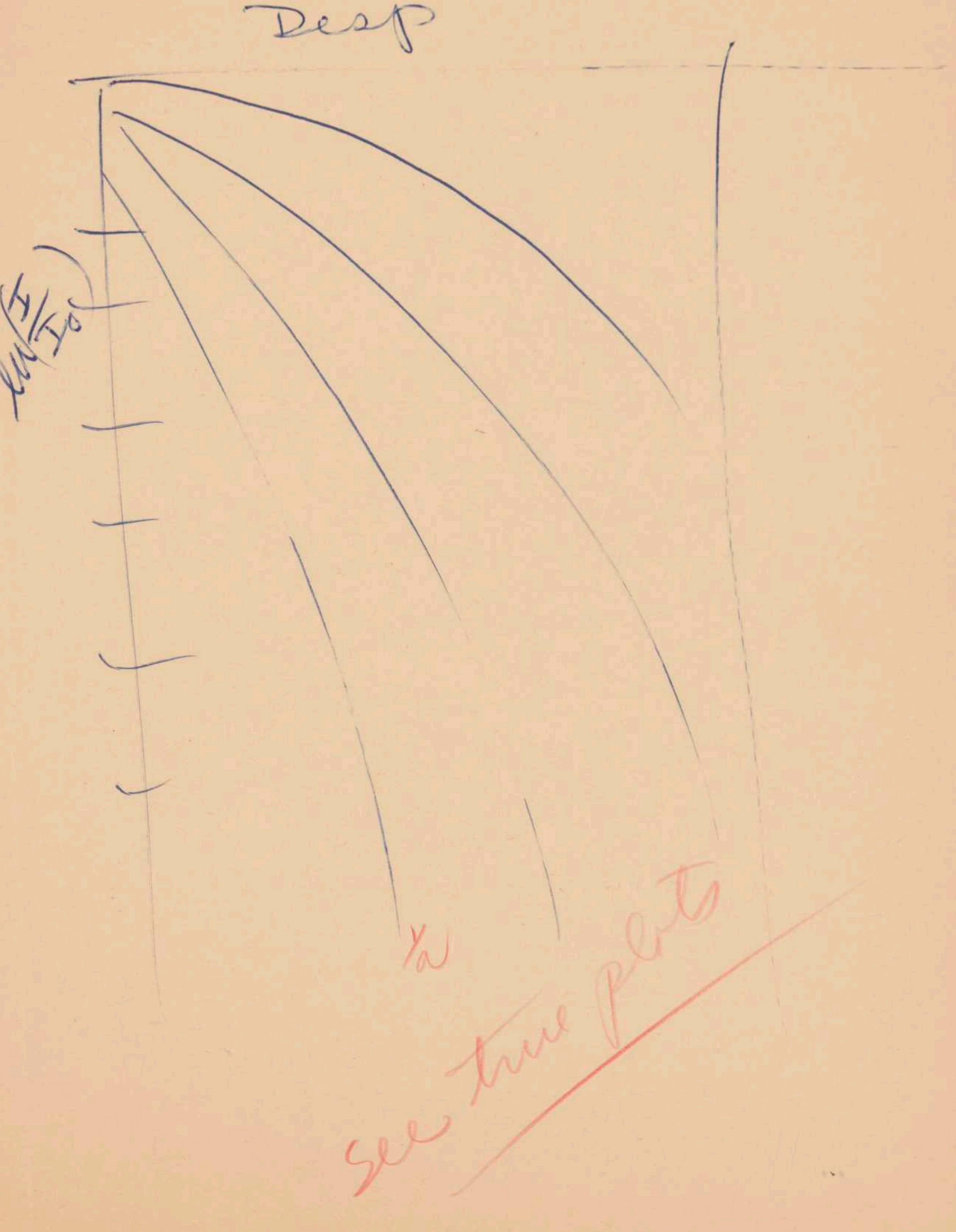
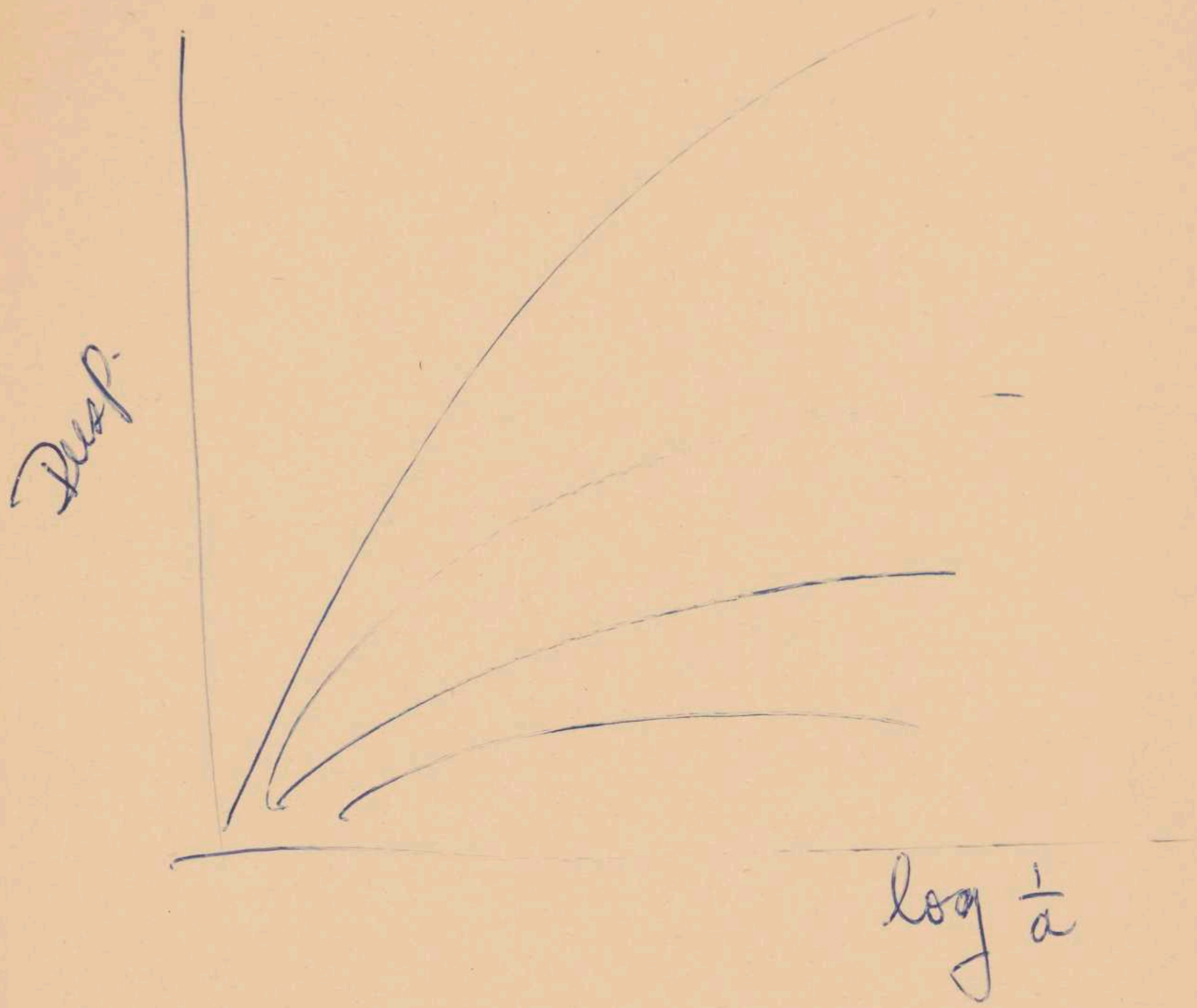
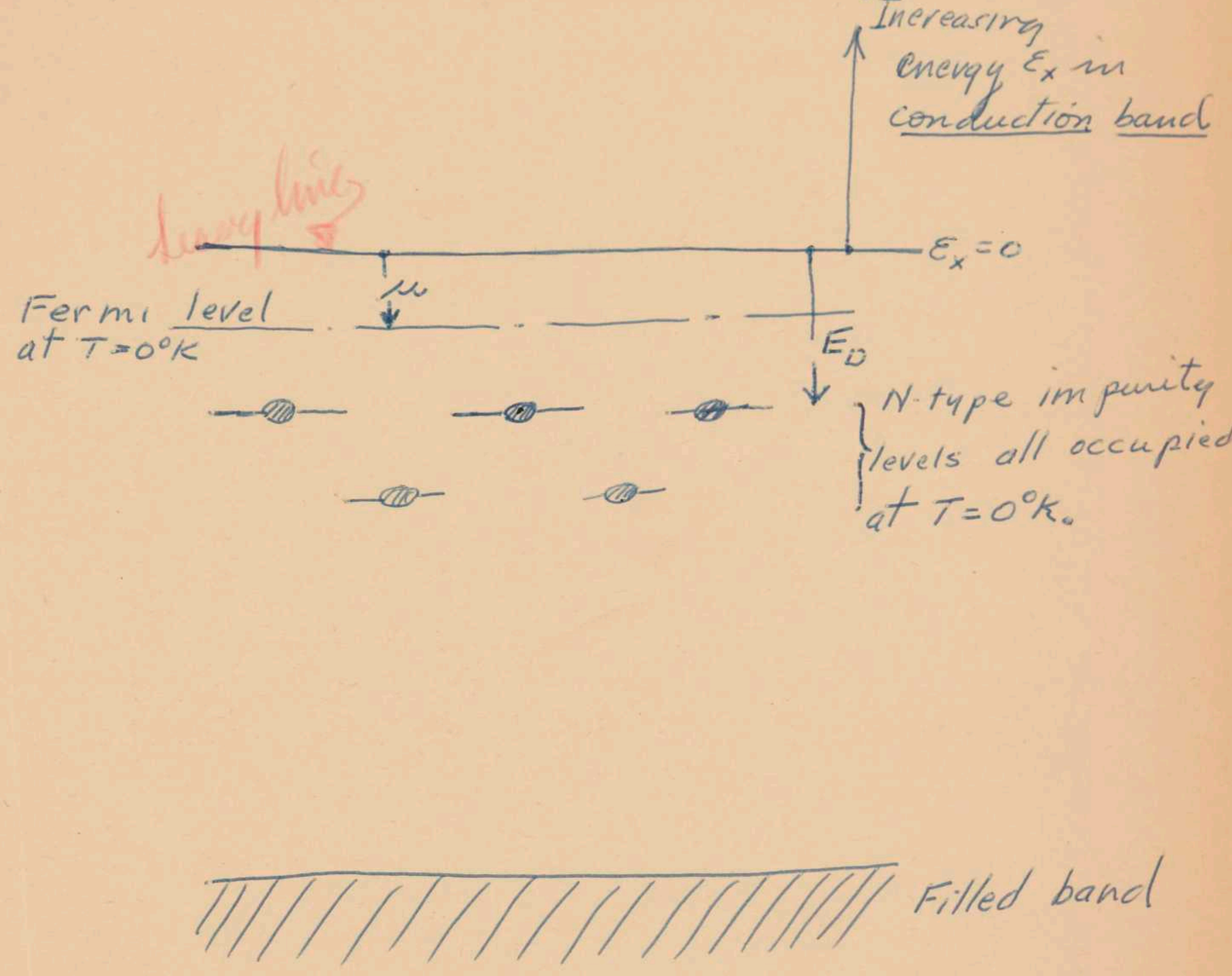


Fig 22



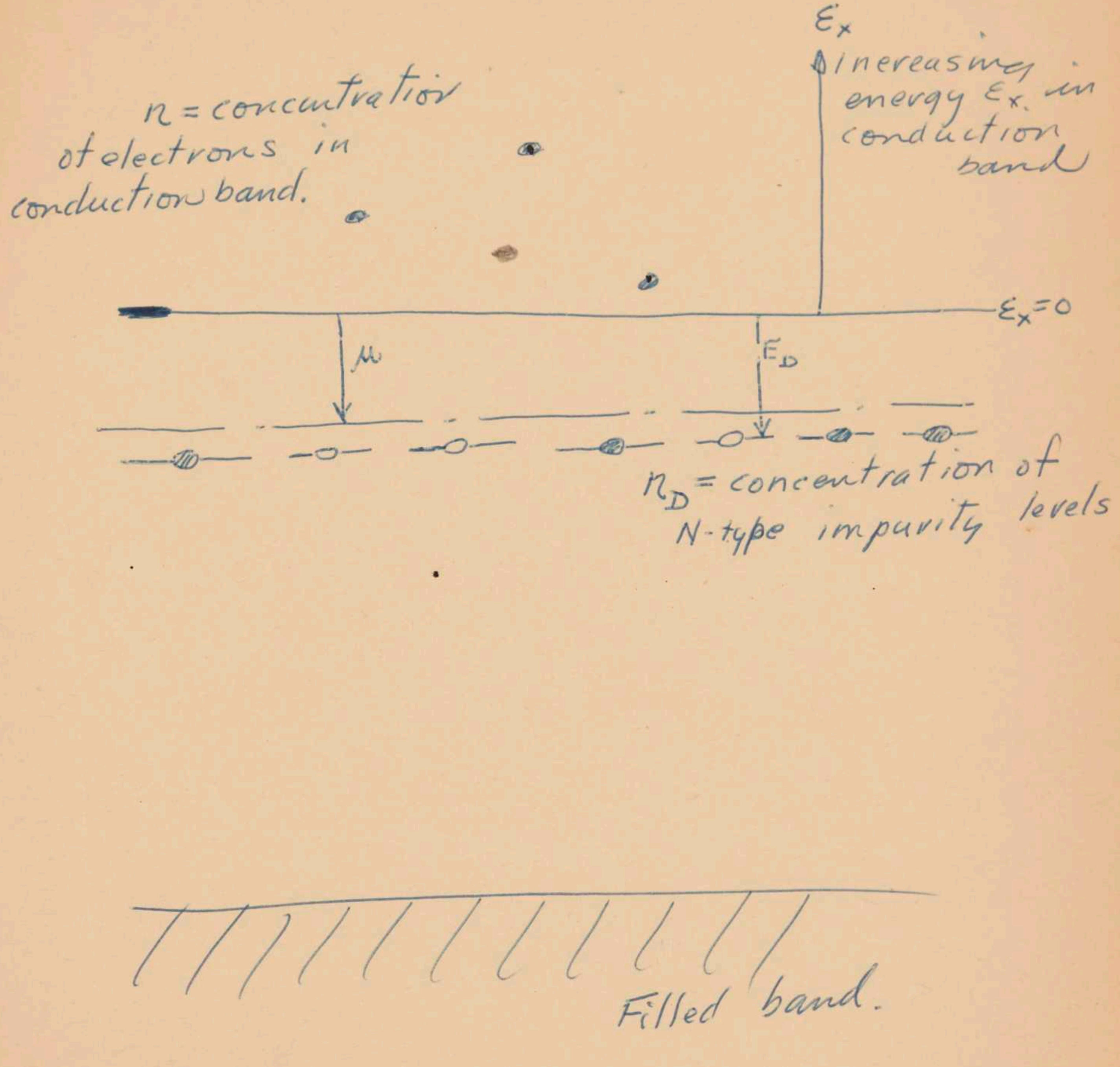
See true plots

Fig 25



Increasing energy ϵ_x in conduction band
ϵ_x
$\epsilon_x = 0$
Energy line
μ
Fermi level at $T = 0°K$
E_D
N-type impurity levels all occupied at $T = 0°K$.
Filled band

Fig 26



$\mathcal{E}_x$
increasing energy $\mathcal{E}_x$ in conduction band
n = concentration of electrons in conduction band.
$\mathcal{E}_x = 0$
μ
E_D
n_D = concentration of N-type impurity levels
Filled band.

Fig 27

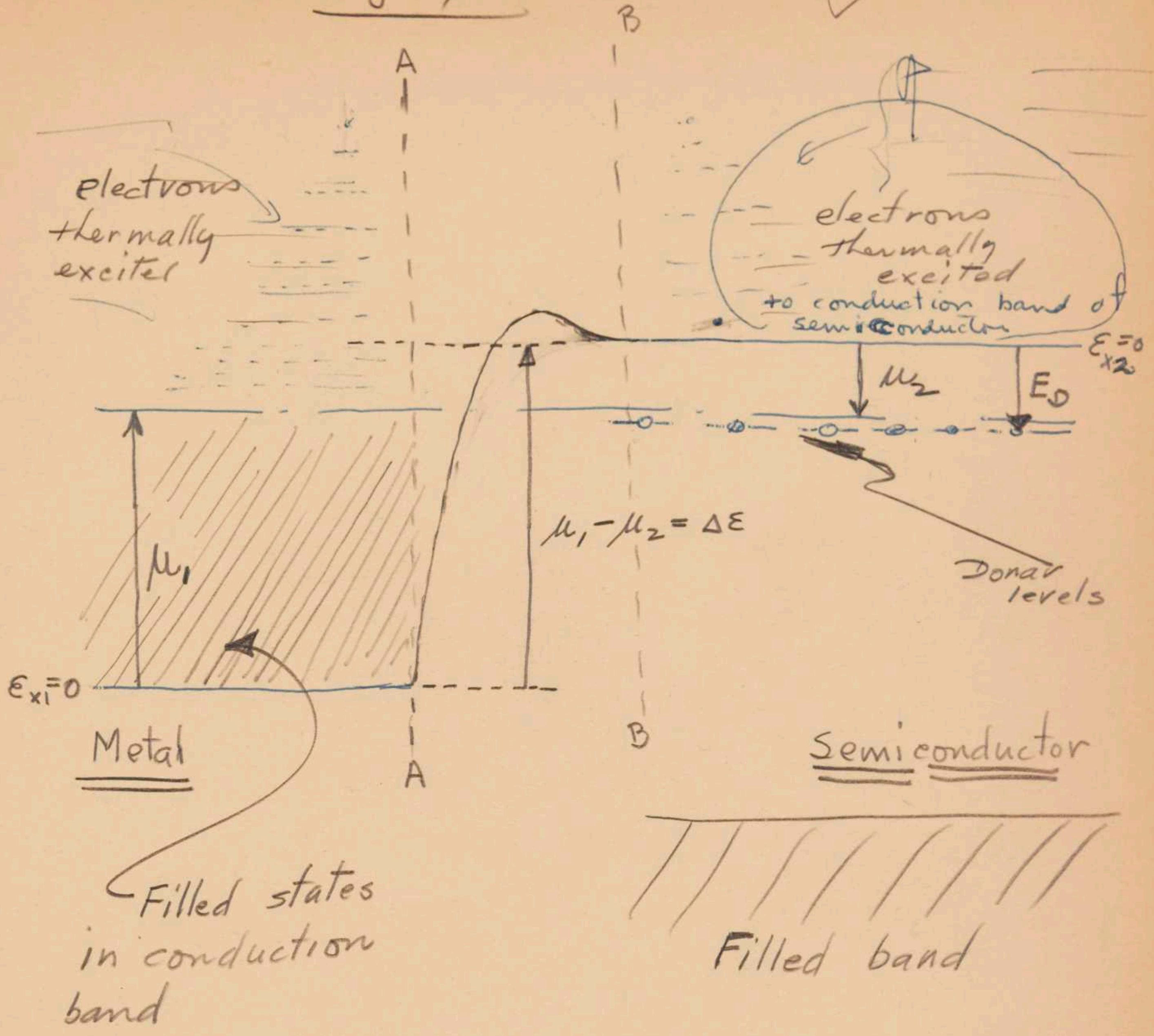
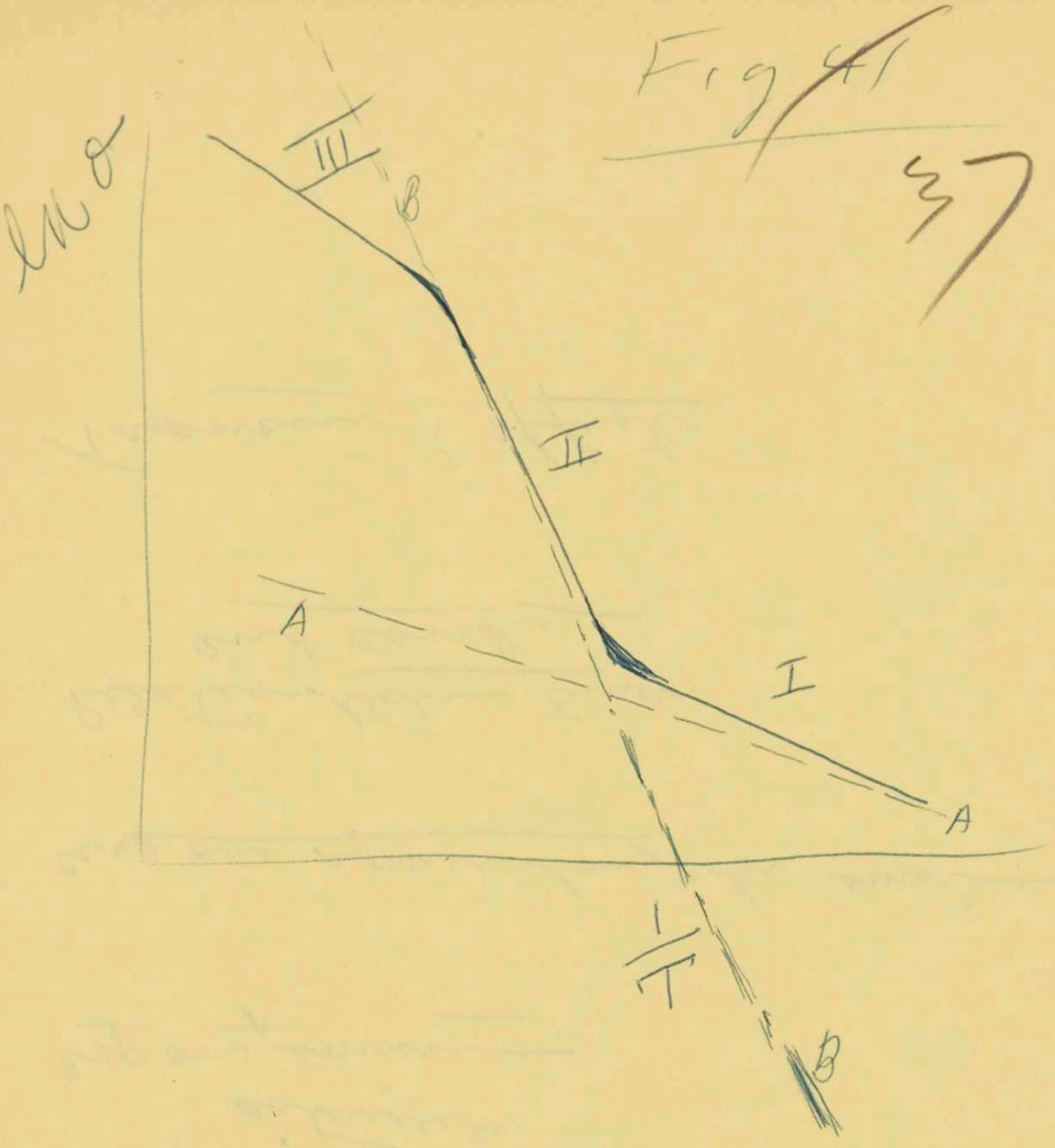

A
B
electrons thermally excited
electrons thermally excited to conduction band of semiconductor
$\mathcal{E}_{x2}=0$
μ_2
E_D
$\mu_1 - \mu_2 = \Delta\mathcal{E}$
Donar levels
μ_1
$\mathcal{E}_{x1}=0$
Metal
Semiconductor
Filled states in conduction band
Filled band

Fig 41

37



Outline

add gen remarks. about inf about coating
gamma from cond meas.
Support of Hall effect on direct measure of mob.

Exper on cond. ∠ conc[illegible] on two only
Difficulty of act.
Loosjes & Vink som[illegible]
Hannay method

Look up Froman Phys Rev 96 1479 (1954)

Exp on saturated emission

exp on space charge lim emission.

Relation betw Emission and cond.

Transient effects.

Fig 45

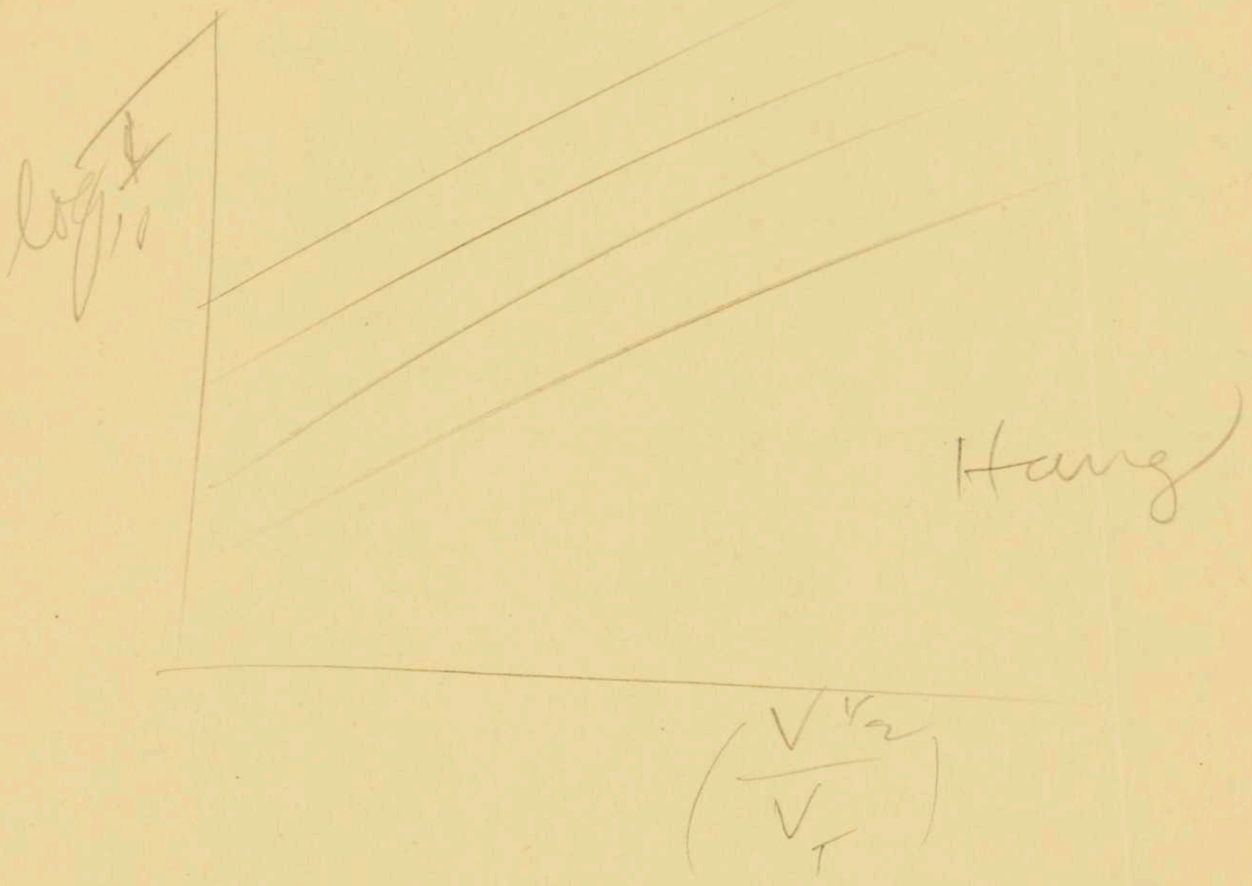


Fig 46

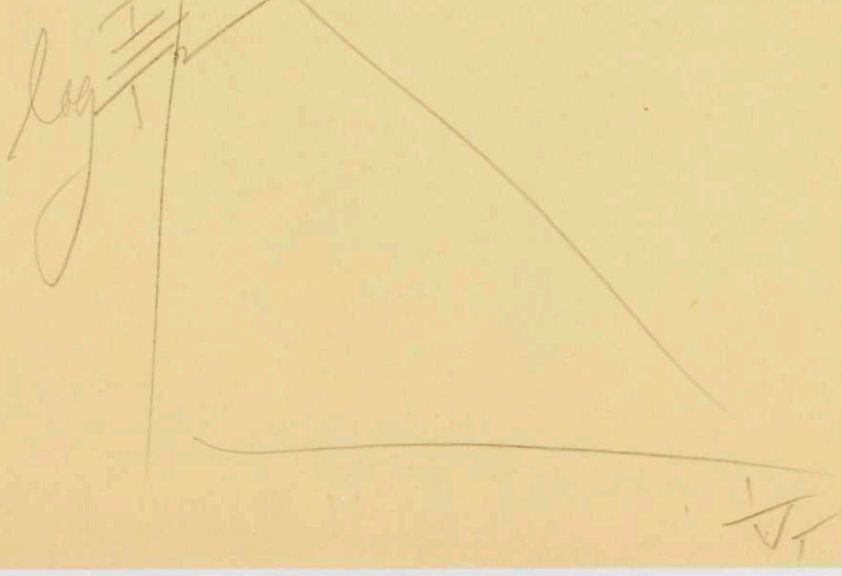


Fig 47

Copy Fig 14 of Nergaard
RCA Rev. 13 464 (1952)
Fig on 483

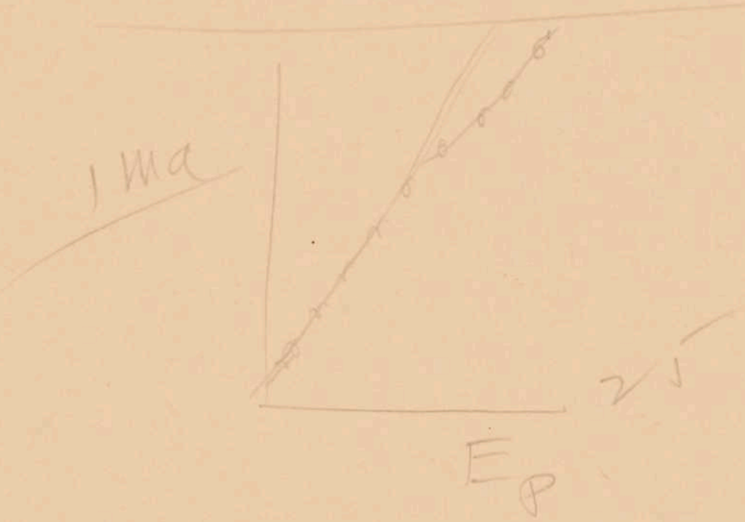


Fig 49

Copy Hannay Mc & W.
Fig 9

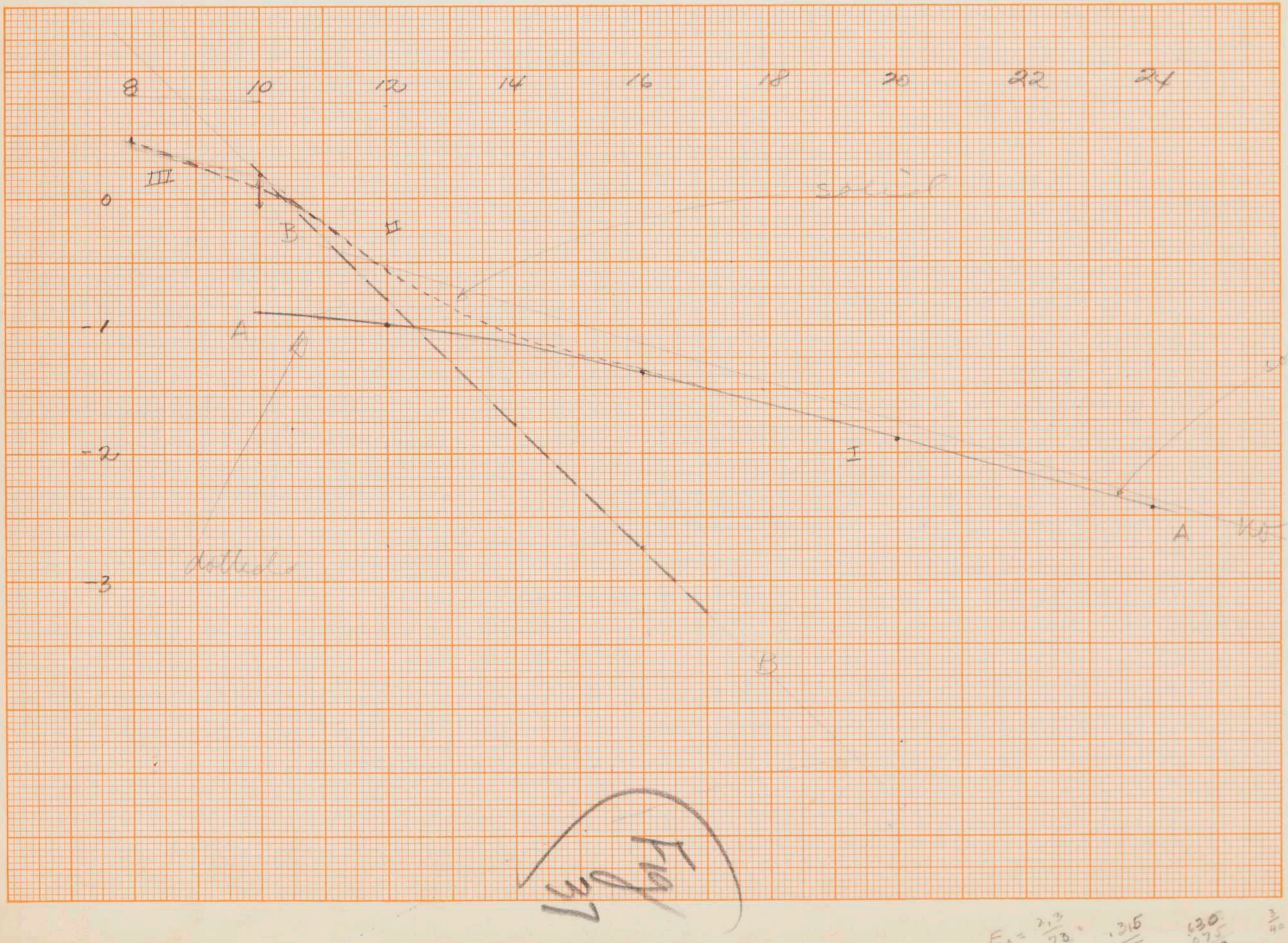
Fig 50

16.0 / 10.7 / 5.3 — 2.3/5.3 = .43 III

1.14 − .12 / .94

16 / 11.9 / 4.1 — 4.6/4.1 = 1.14

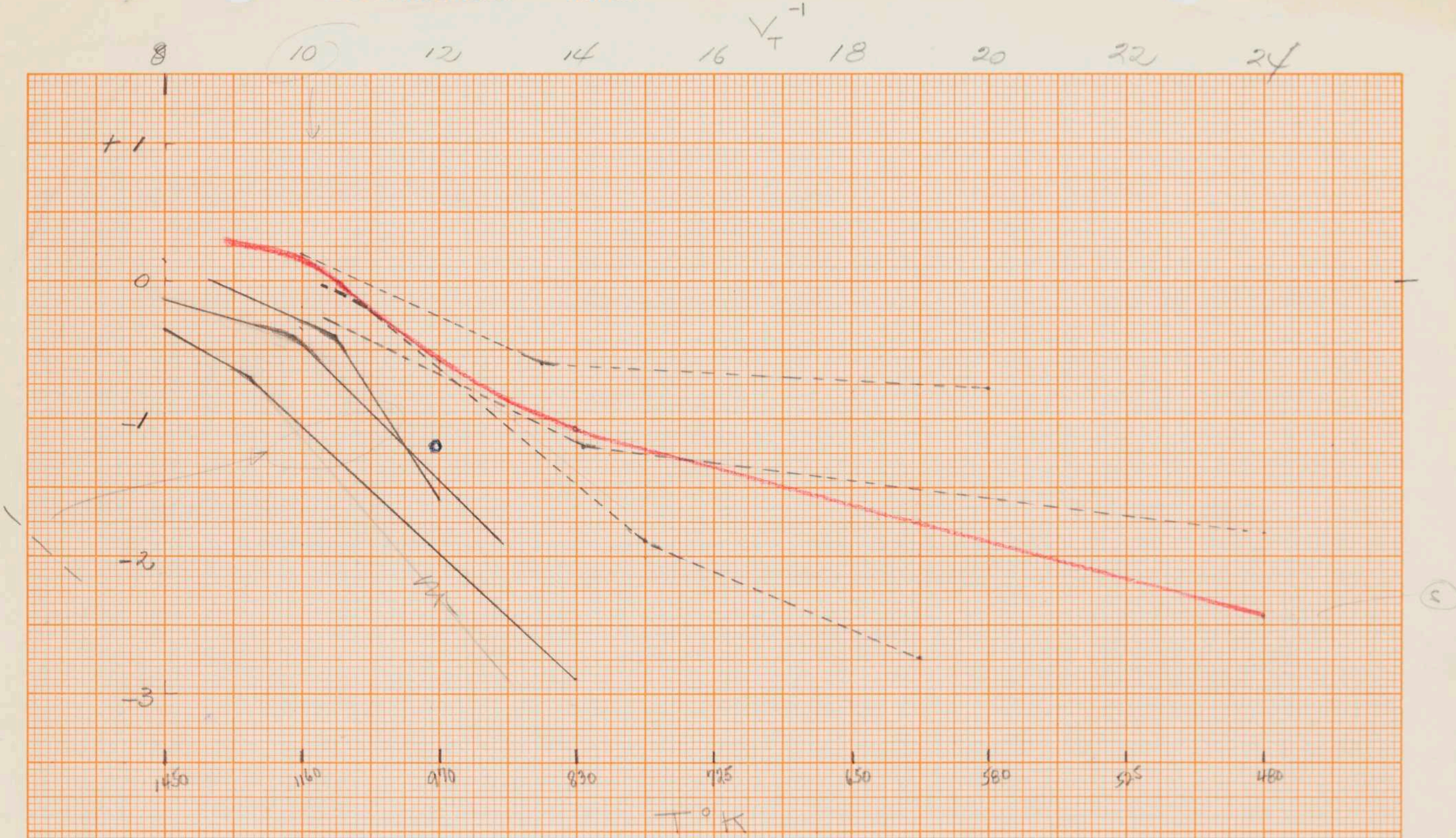
16 / 10.5 / 5.5 — 4.6/5.5 = .84 } = app act

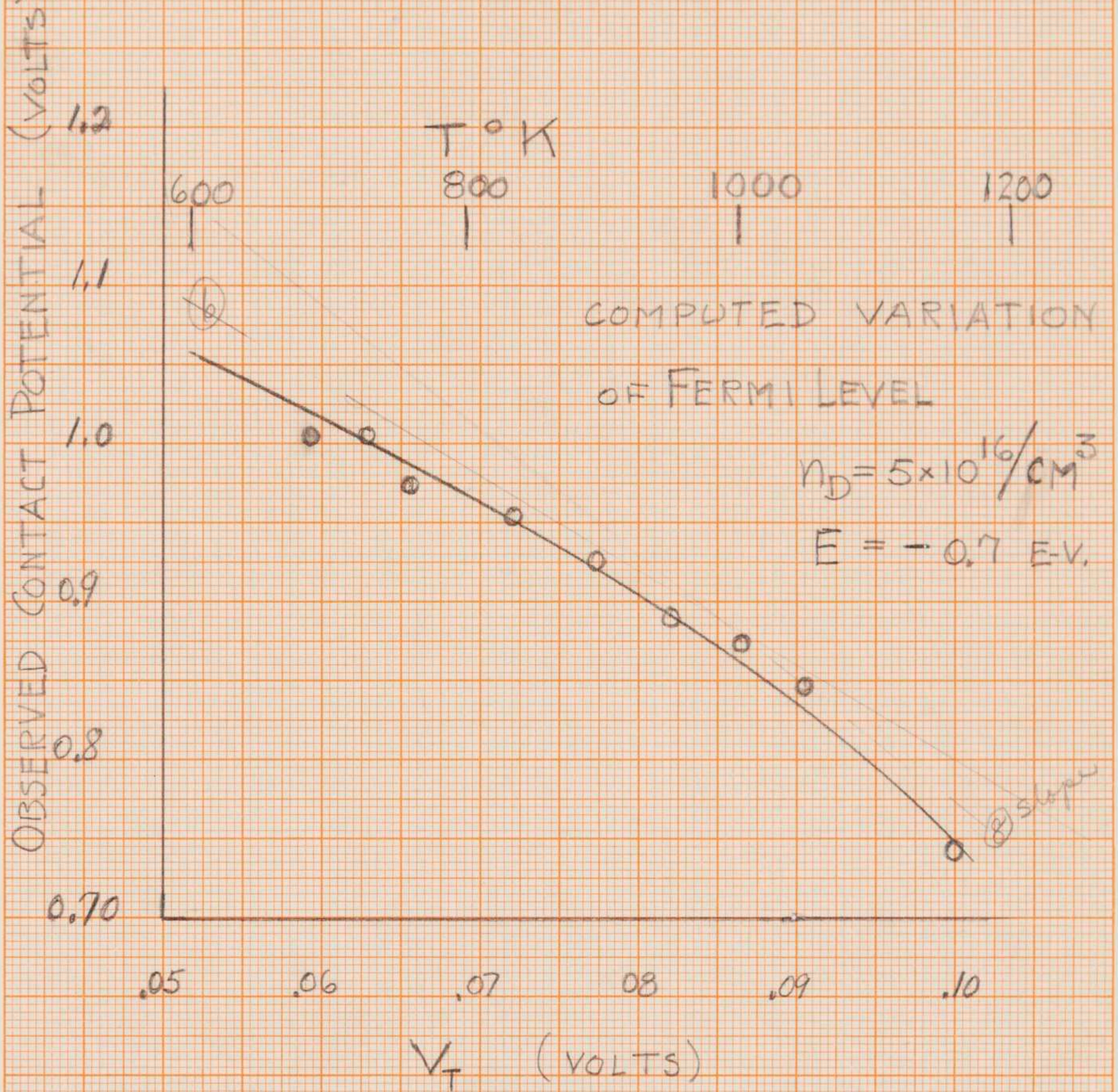


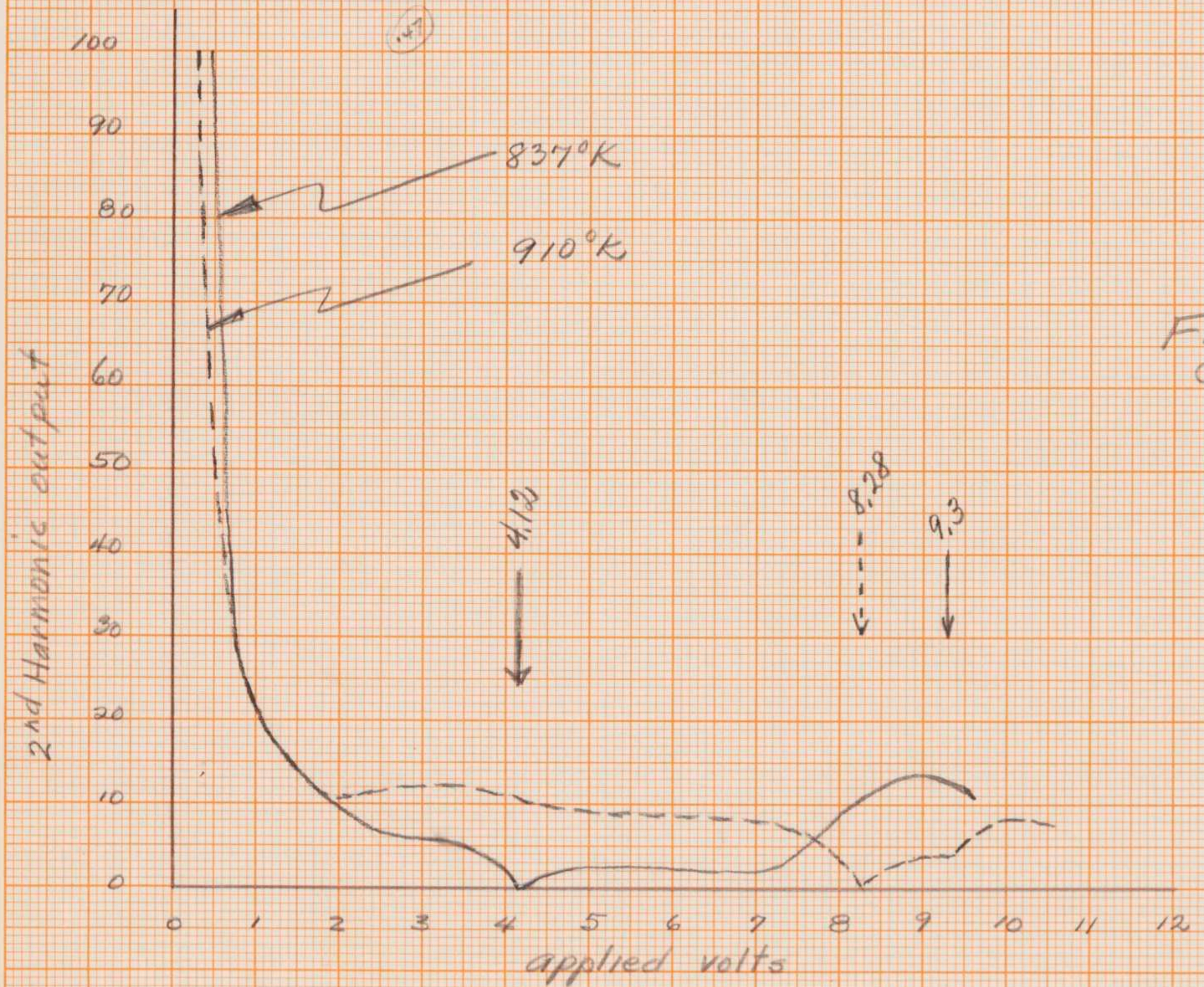
2.45 / 17.1 / 7.4

$E_A = \frac{2.3}{73} = .315$ .630 / .075 / .700   3/40 =

K+E 10 X 10 TO THE 1/2 INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.




OBSERVED CONTACT POTENTIAL (VOLTS)
1.2
1.1
1.0
0.9
0.8
0.70
T °K
600
800
1000
1200
COMPUTED VARIATION
OF FERMI LEVEL
$n_D = 5 \times 10^{16}/CM^3$
E = -0.7 E-V.
slope
.05
.06
.07
.08
.09
.10
V_T (VOLTS)



837°K
910°K
4.12
8.28
9.3
2nd Harmonic output
applied volts
0
10
20
30
40
50
60
70
80
90
100
1
2
3
4
5
6
7
8
9
10
11
12

Fig ~~54~~ 53

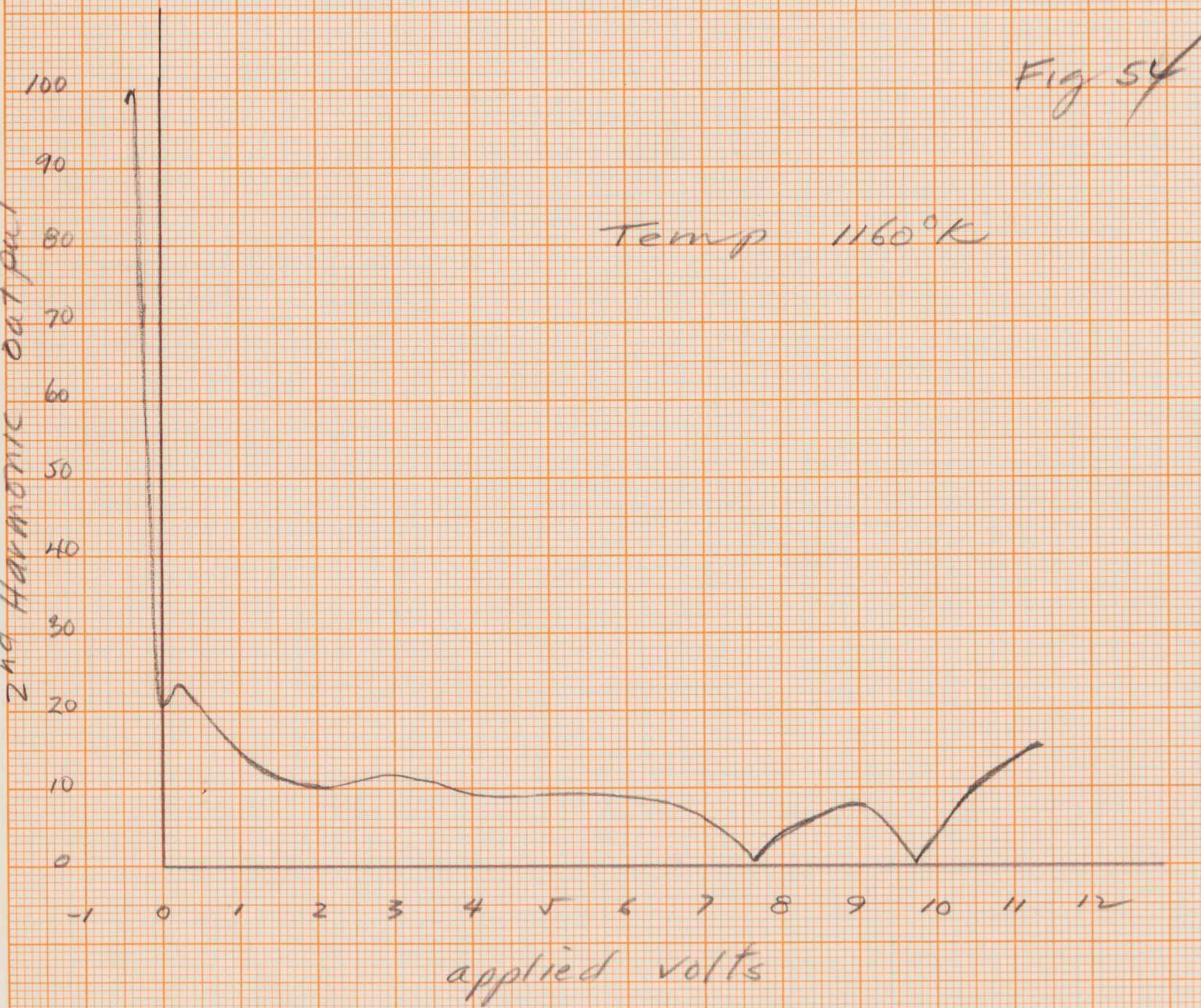
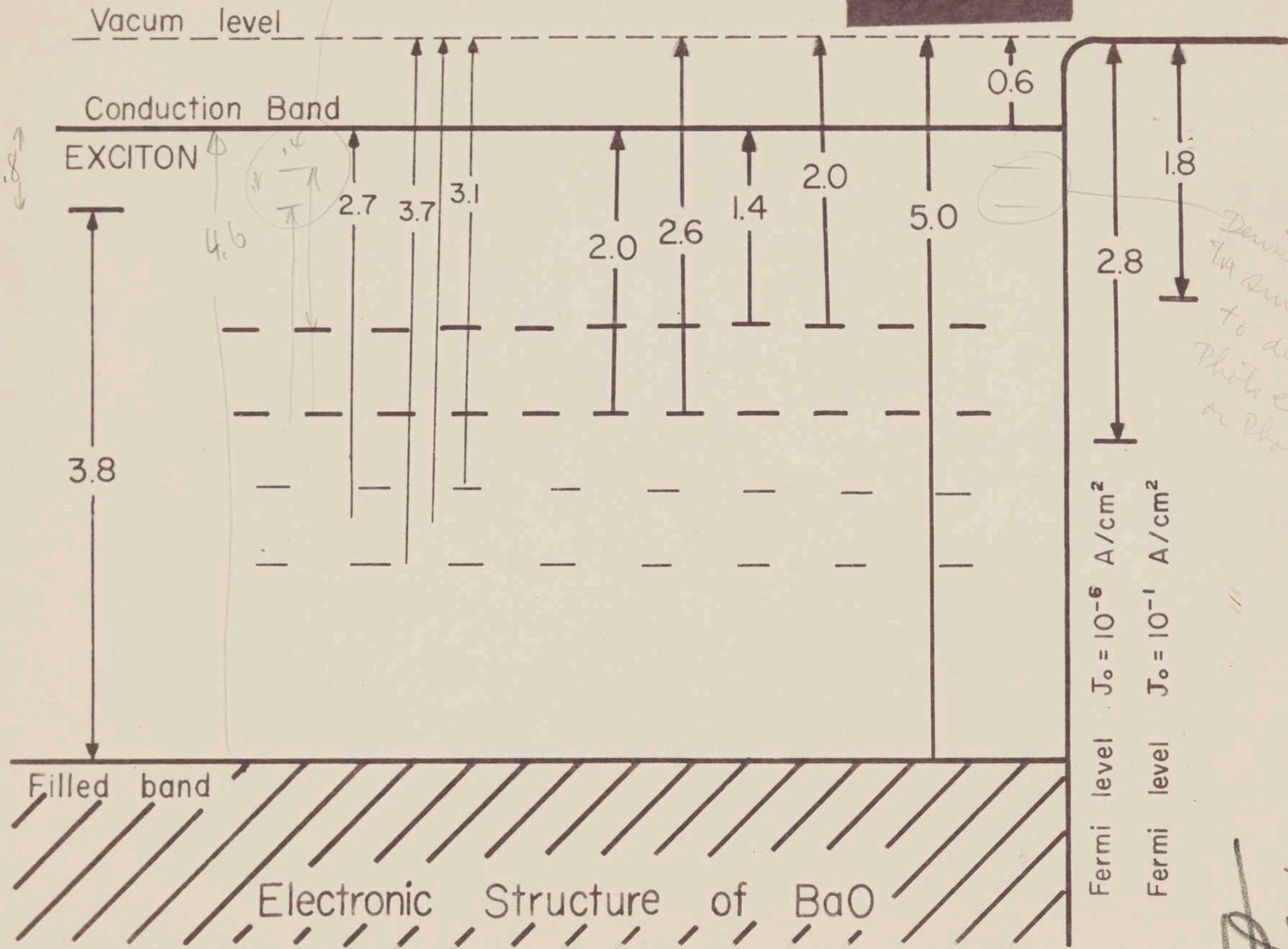


Fig 54
Temp 1160°K
2nd Harmonic output
100
90
80
70
60
50
40
30
20
10
0
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
applied volts

0



Electronic Structure of BaO

Fig 30

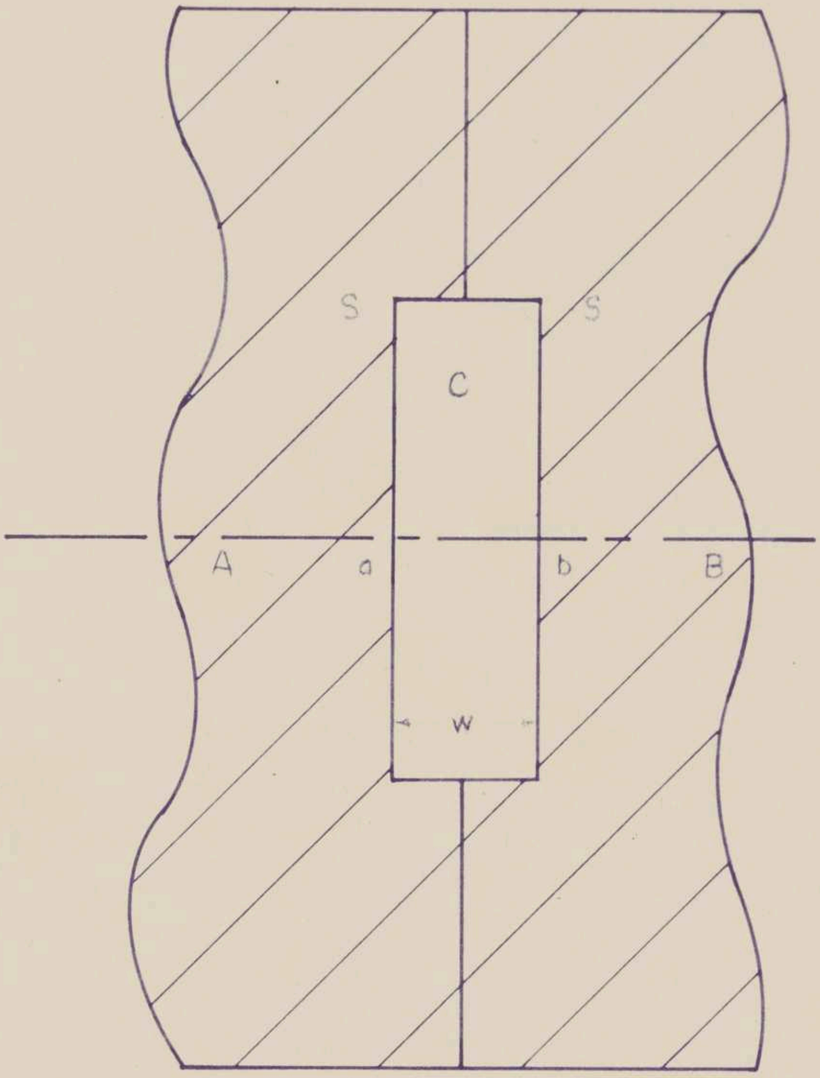


Fig. 1

Cross section of pill-box cavity.

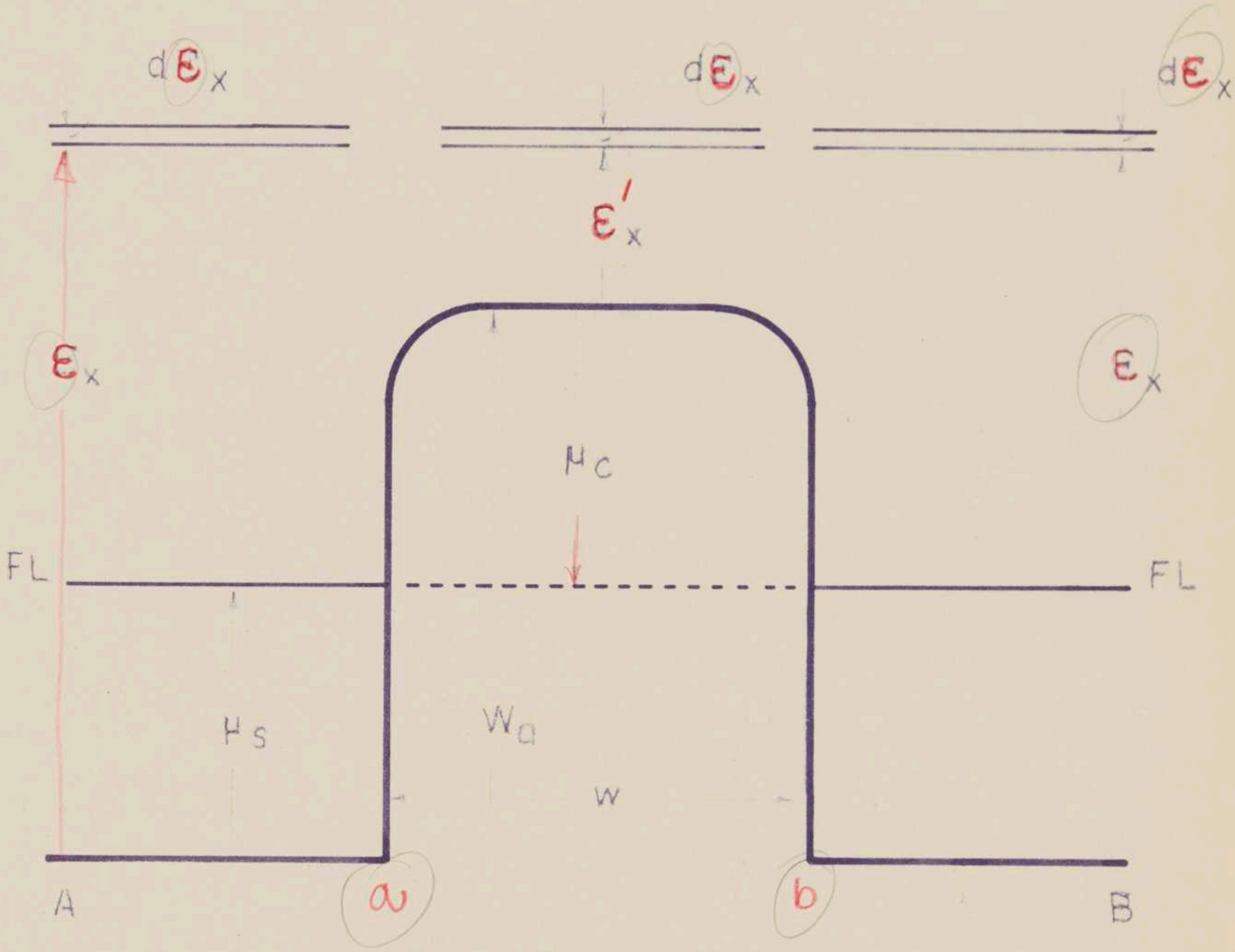


Fig. 2

Potential energy diagram for an electron in the "pill box" cavity problem.

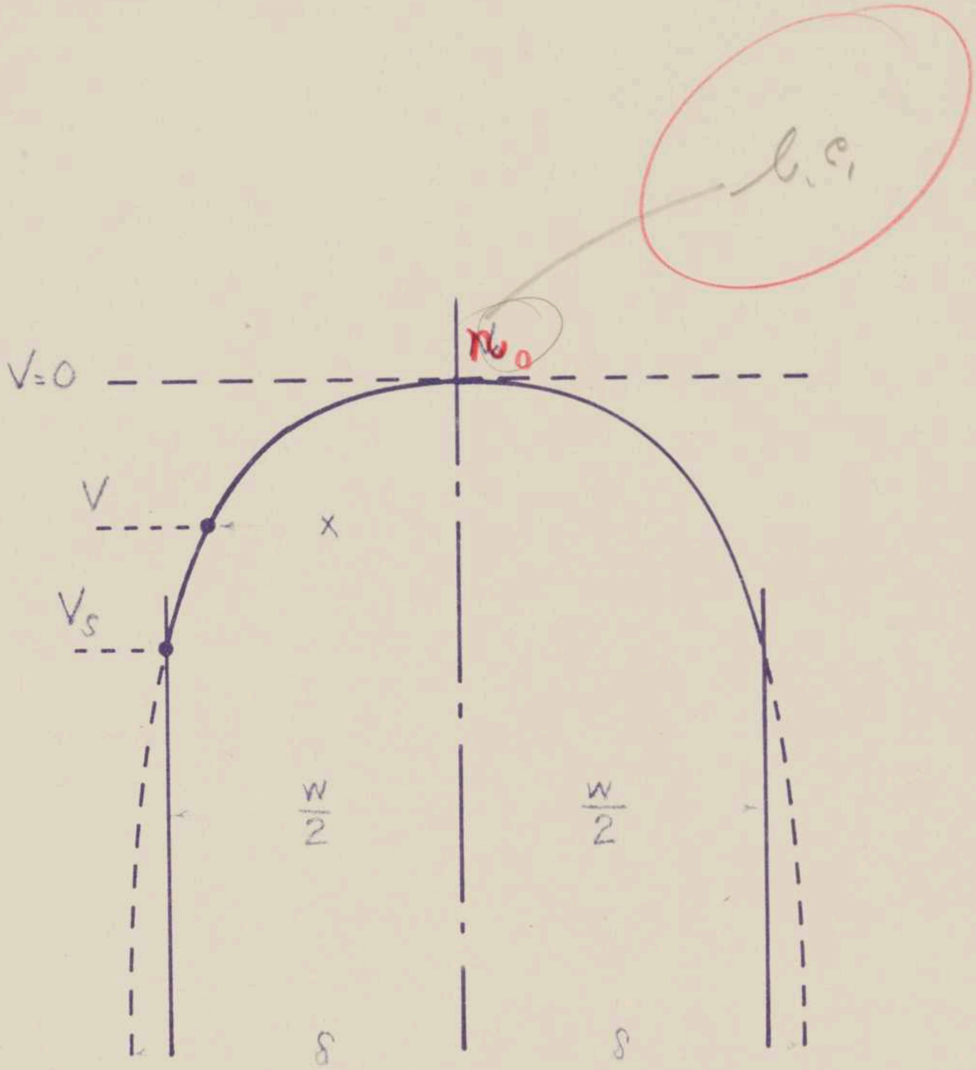
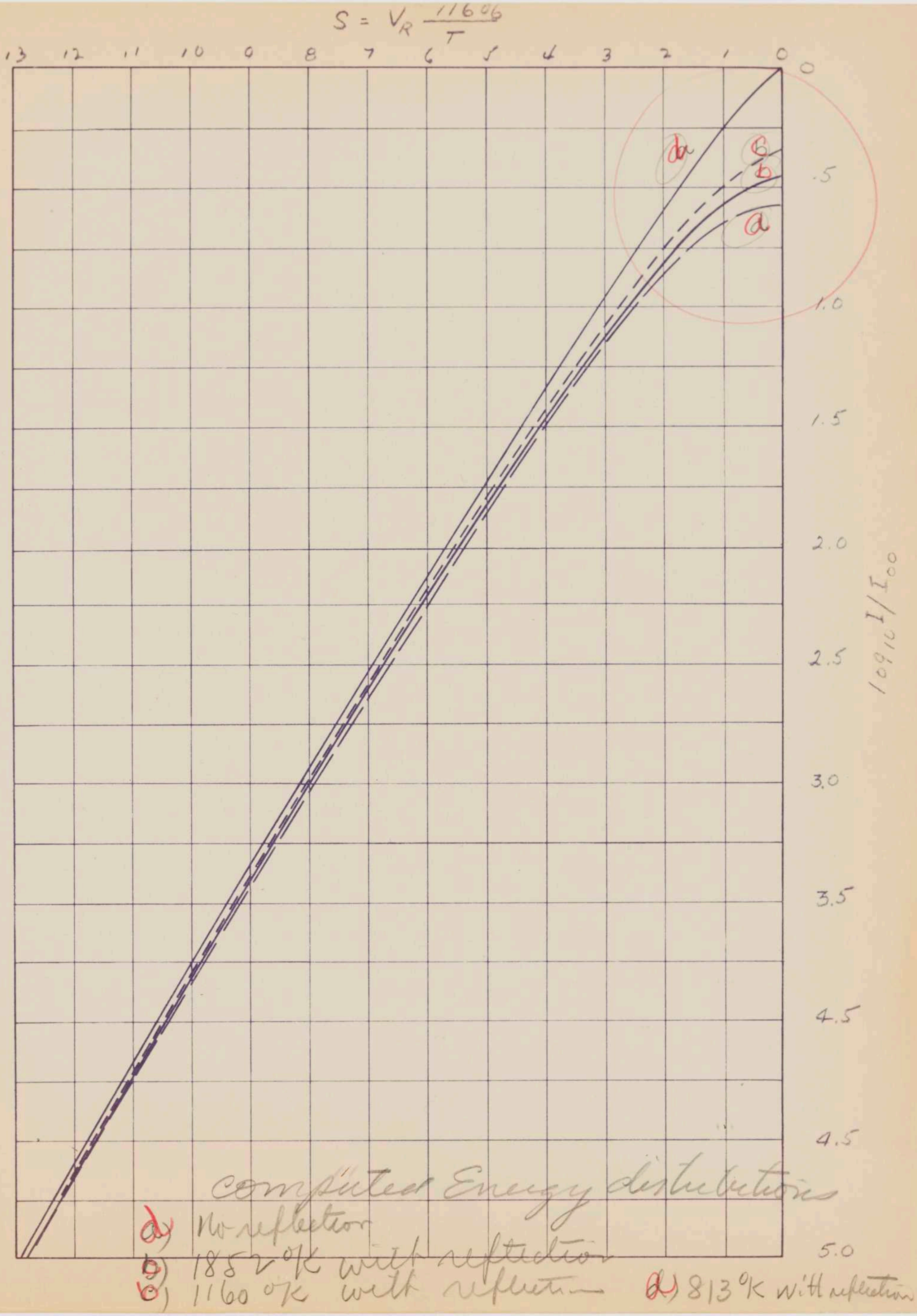
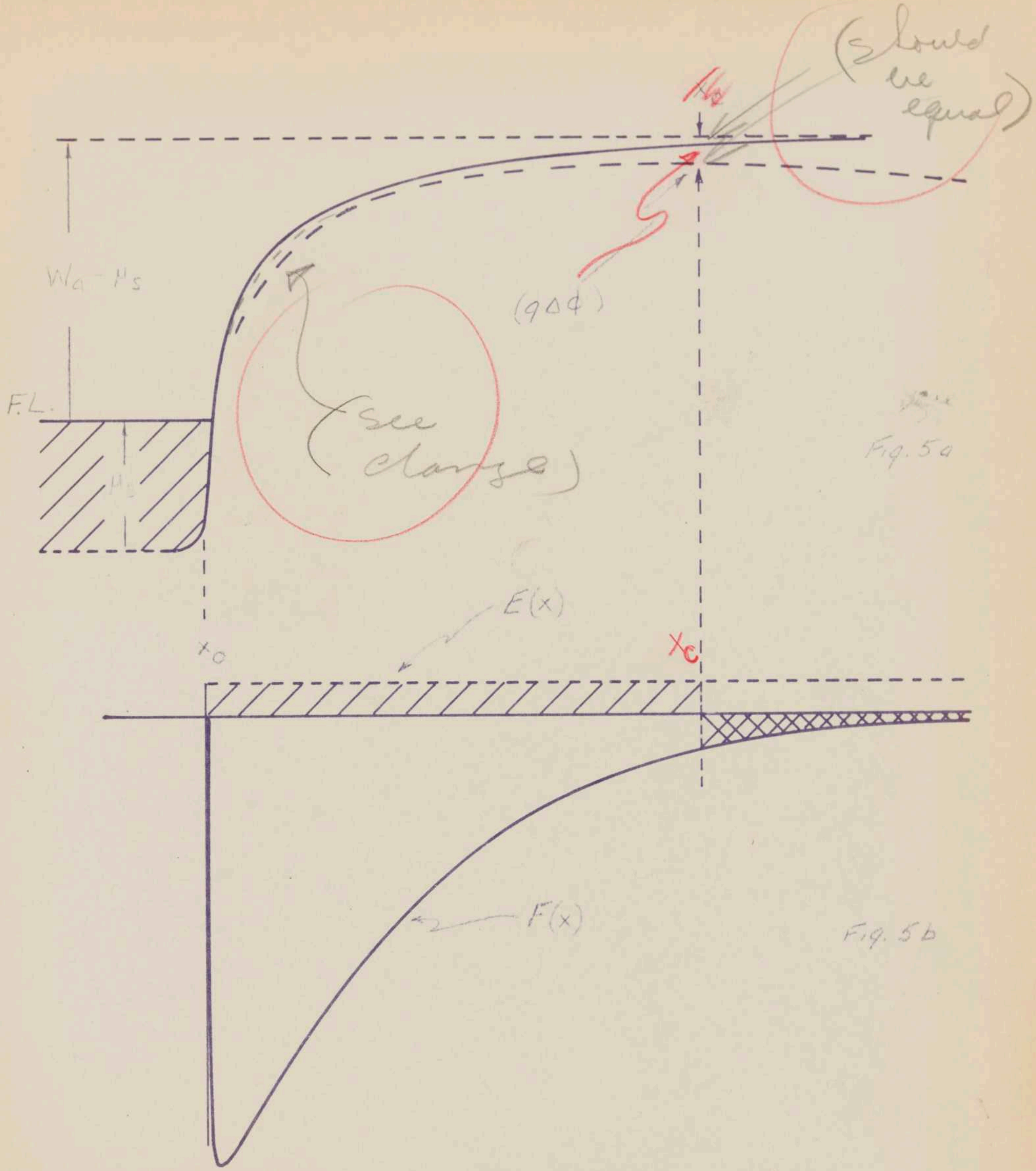


Fig. 3

Electrostatic potential in a cavity with space charge present.

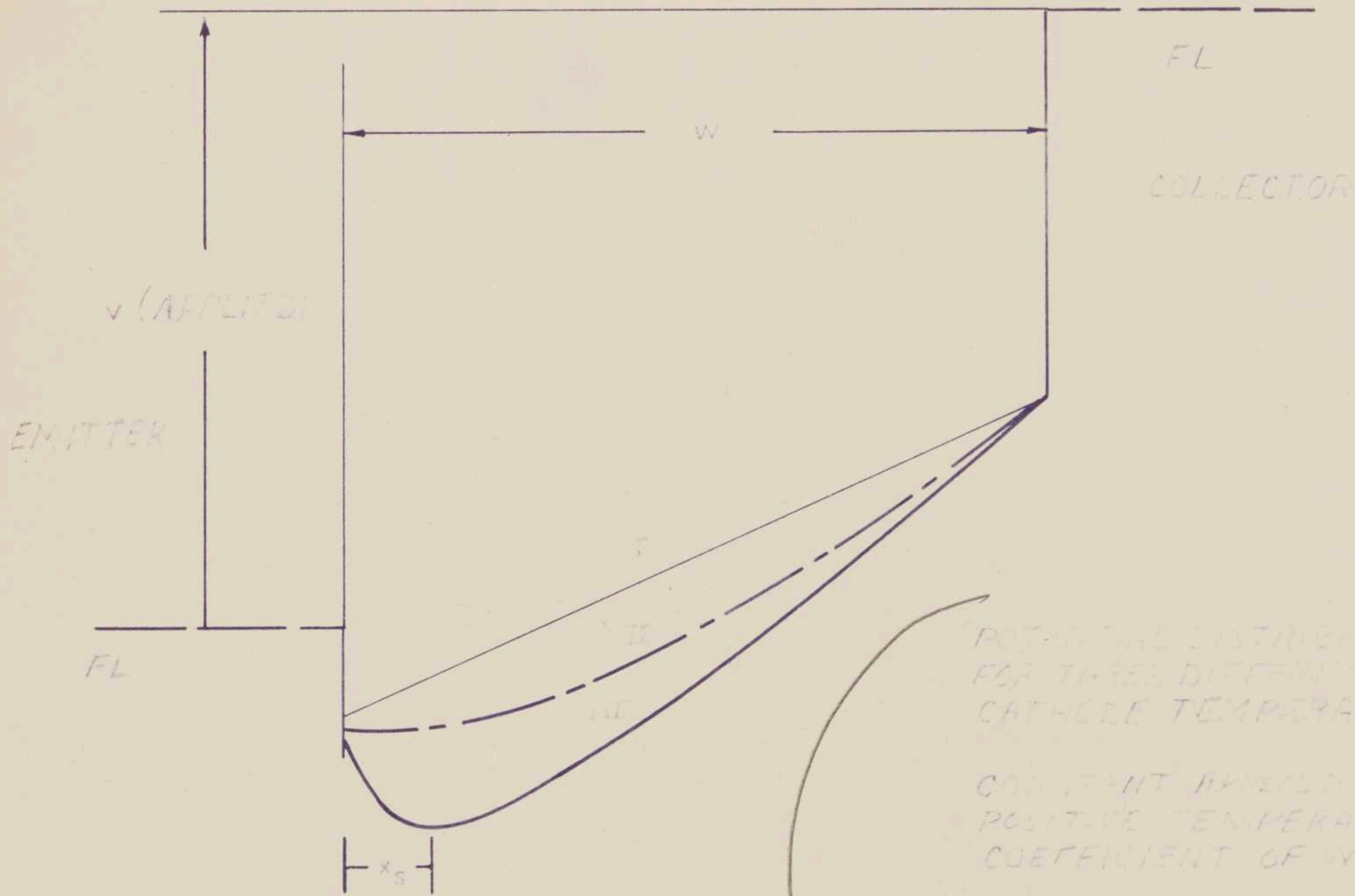


$S = V_R \frac{11606}{T}$
13 12 11 10 9 8 7 6 5 4 3 2 1 0
0 .5 1.0 1.5 2.0 2.5 3.0 3.5 4.5 4.5 5.0
$\log_{10} I/I_{00}$
a b c d
computed Energy distribution
a) No reflection
b) 1852°K with reflection
c) 1160°K with reflection
d) 813°K with reflection



5a) Motive function for an electron as it leaves a conducting surface

5b) Motive intensity for an electron.



POTENTIAL DISTRIBUTIONS FOR THREE DIFFERENT CATHODE TEMPERATURES

CONSTANT ANODE POTENTIAL POSITIVE TEMPERATURE COEFFICIENT OF WORK-FUNCTION

I No space charge
II Zero field at emitter
III With space charge minimum;

Fig 6a

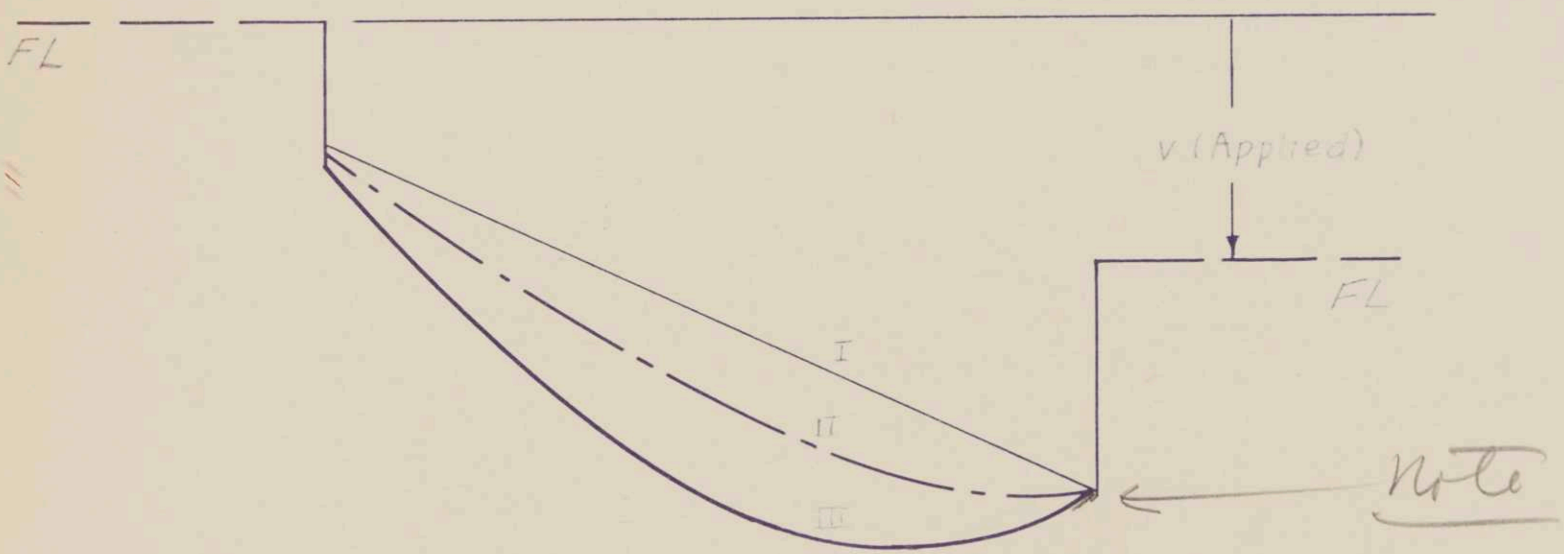


Fig. 65

Potential distributions with three temperatures

I No space charge
II Zero field at the collector
III With space charge minimum.

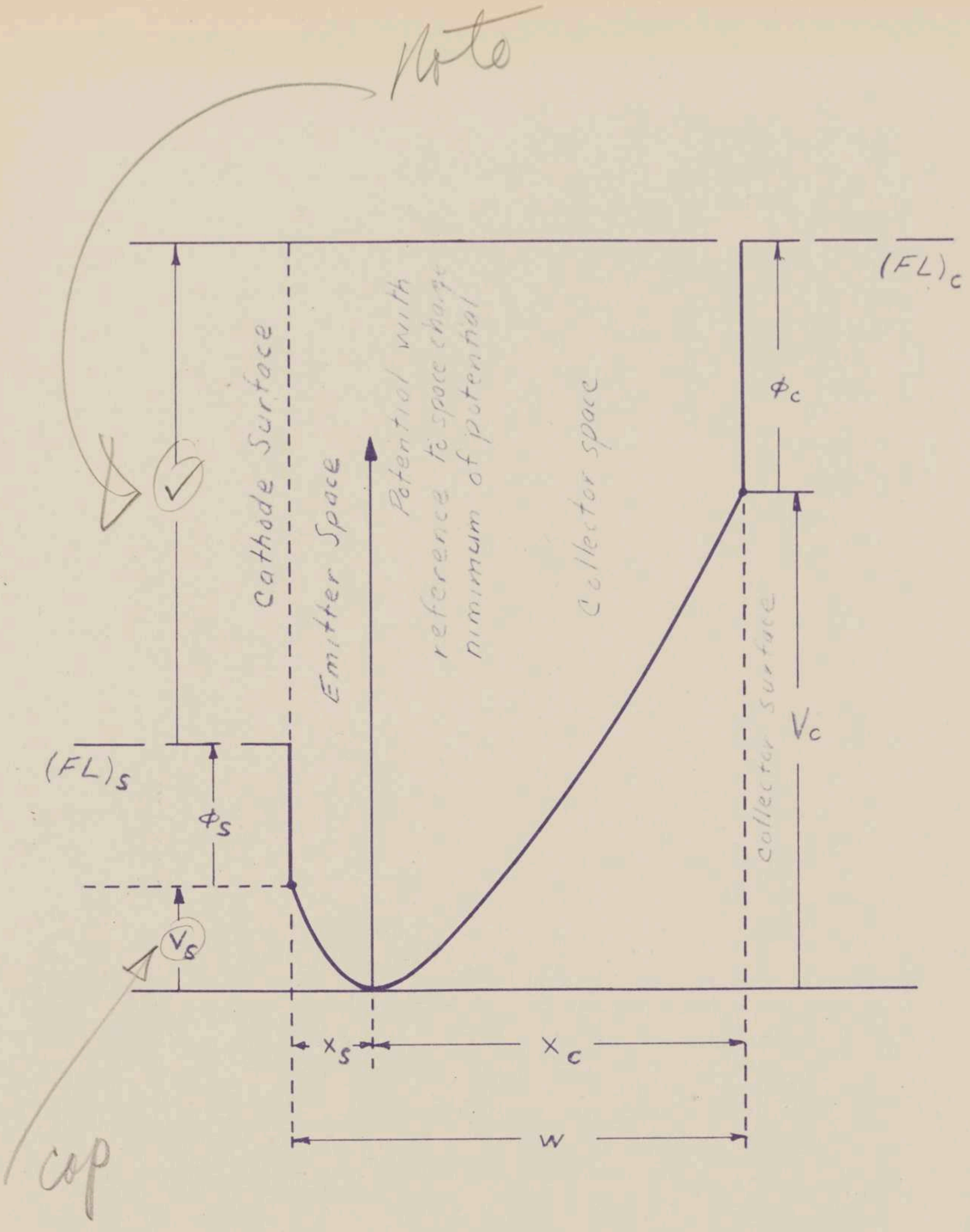


Fig. 7

Electrostatic potential with a space charge minimum between the emitter and collector with applied accelerating potential

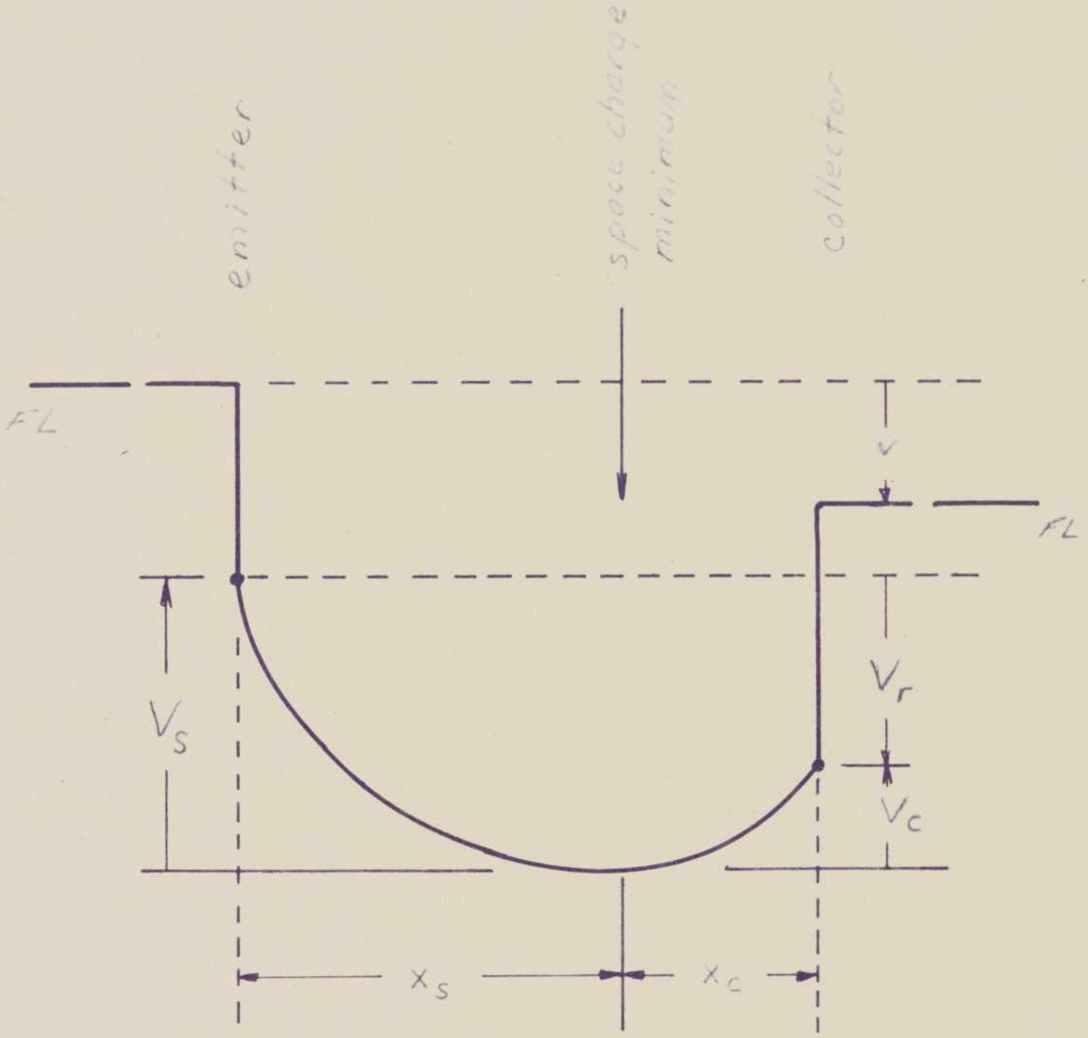


Fig. 8

electrostatic potential with a space charge minimum between the emitter and the collector for an applied retarding potential.

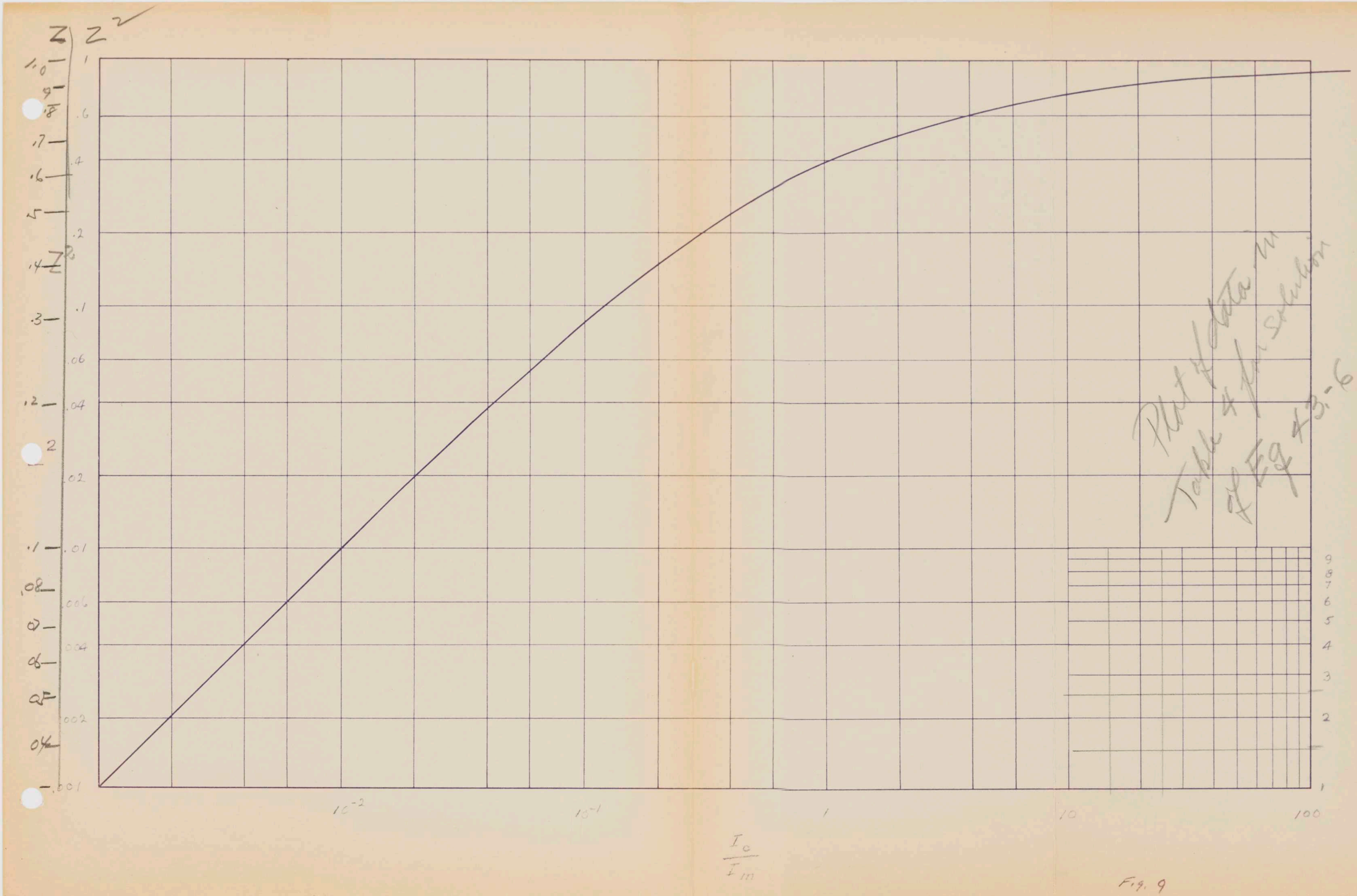
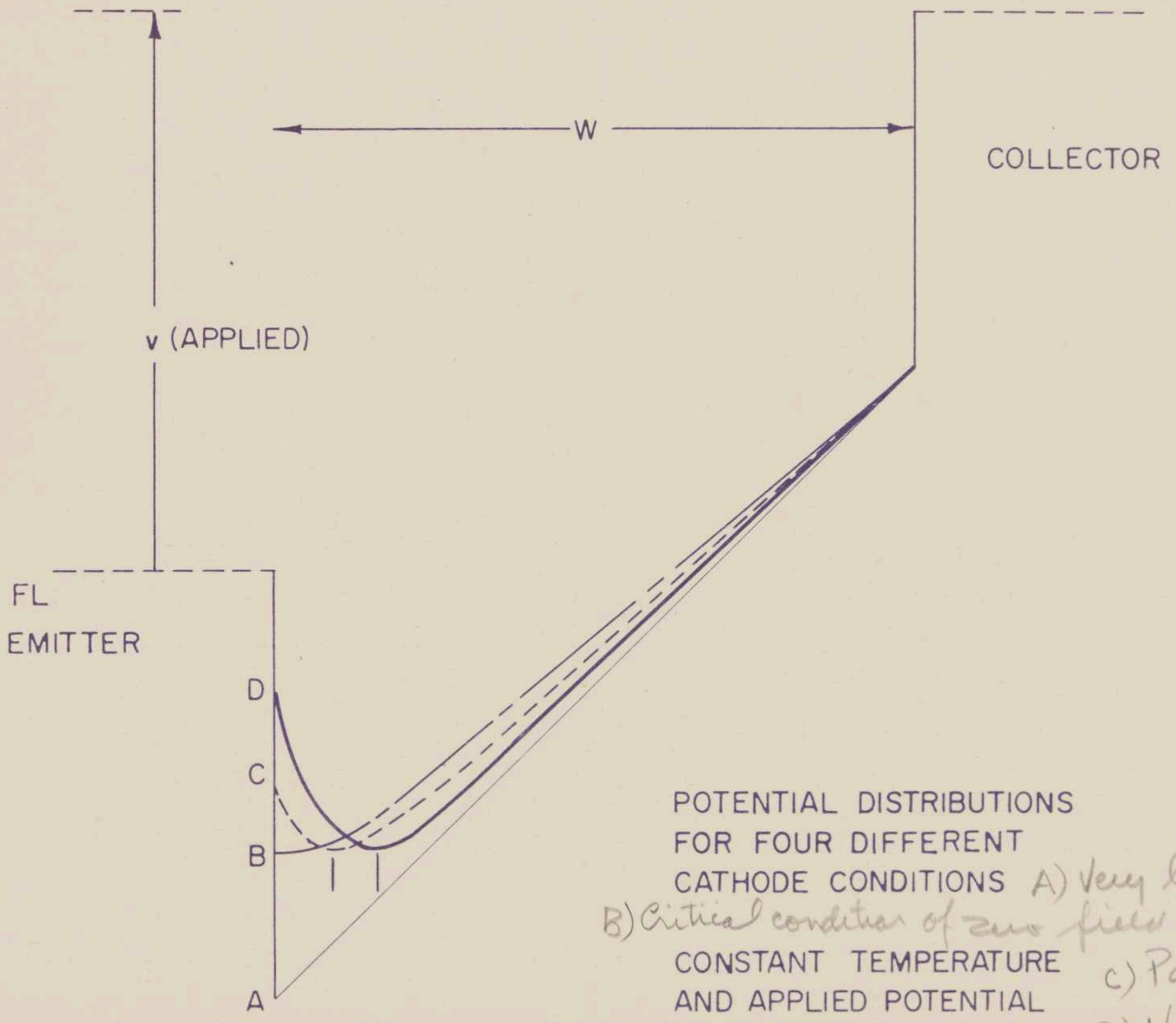
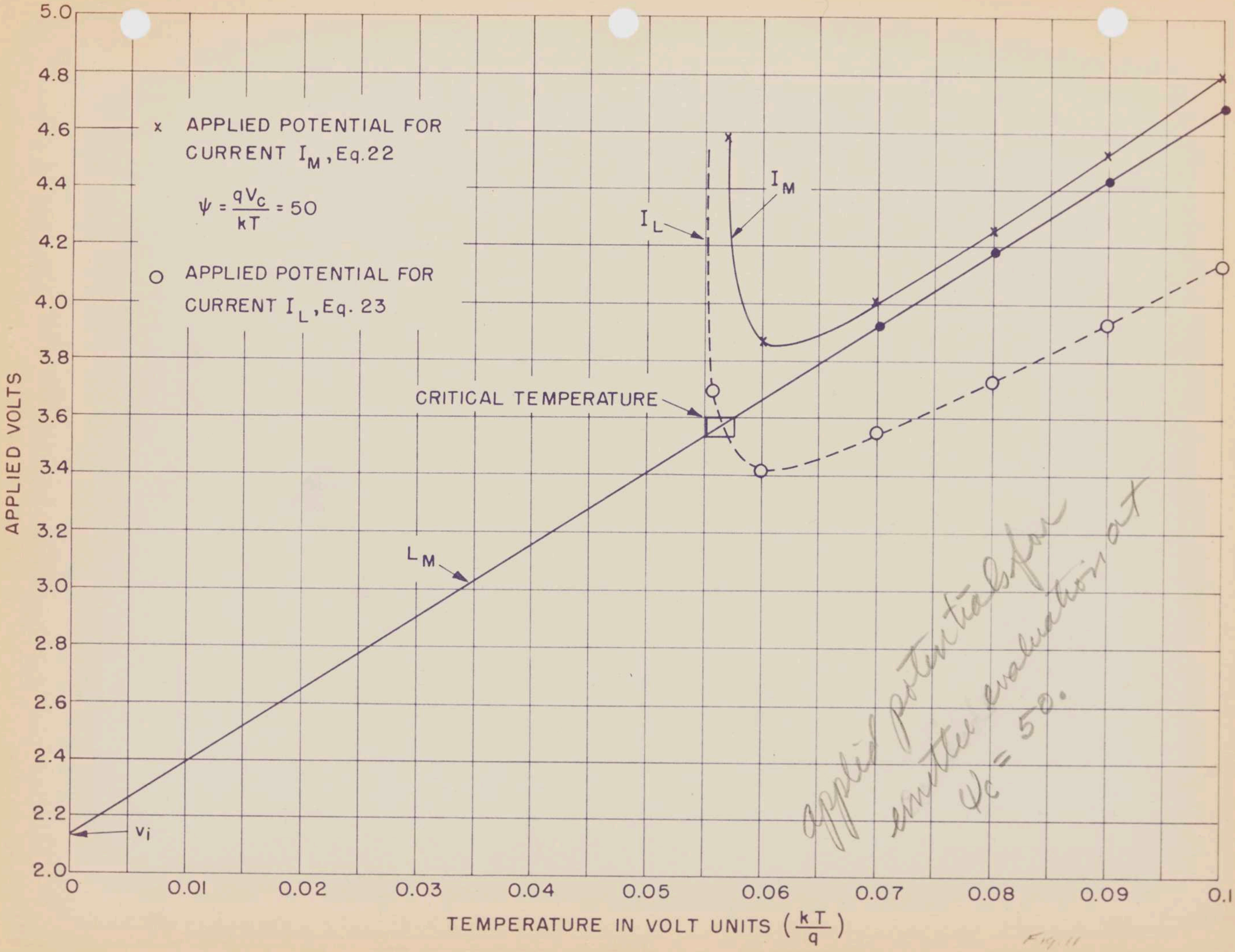

Z
Z²
Plot of data in Table 4 for solution of Eq 43-6
10^{-2}
10^{-1}
1
10
100
$\frac{I_0}{I_m}$

Fig. 9

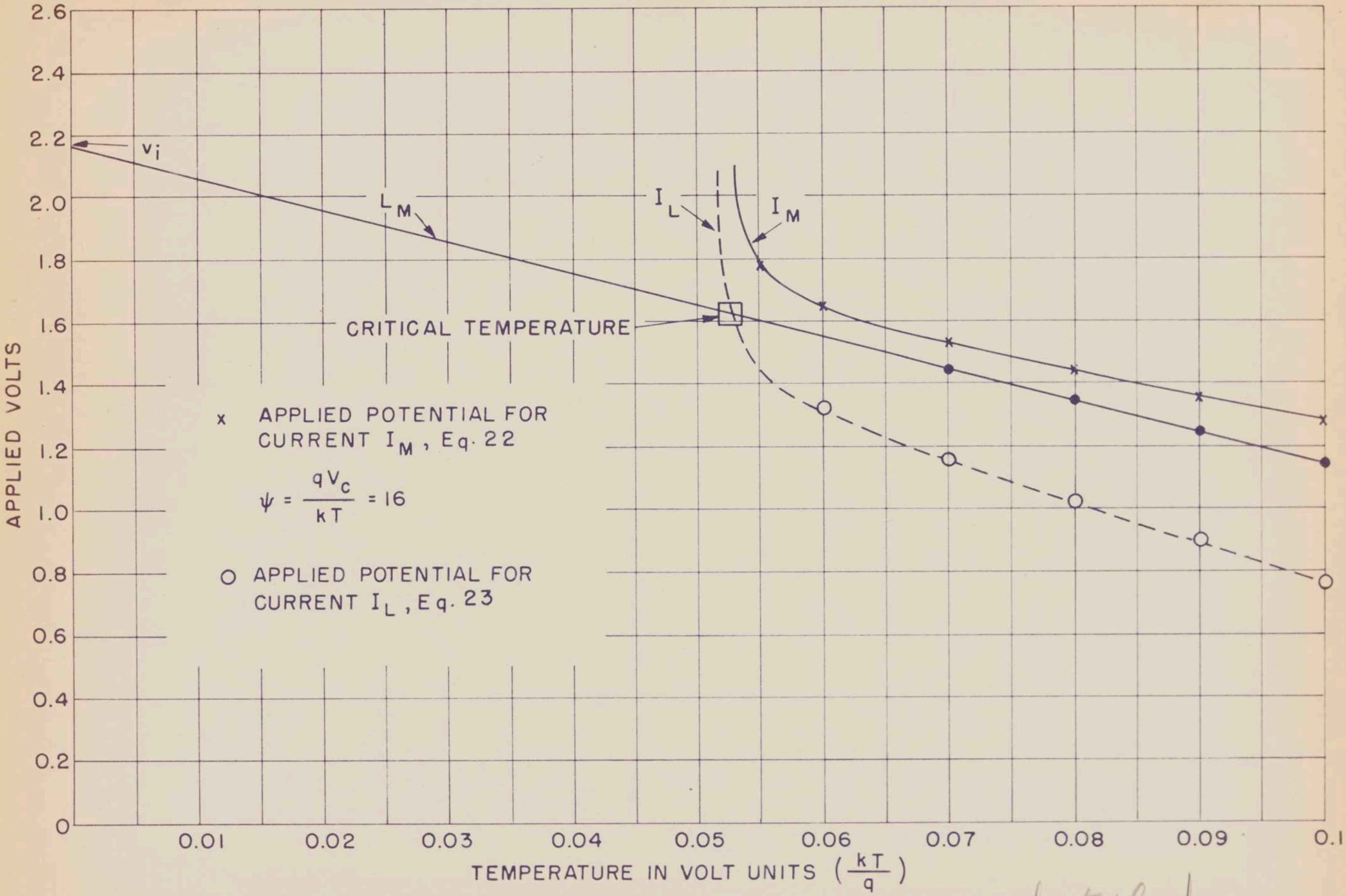


POTENTIAL DISTRIBUTIONS
FOR FOUR DIFFERENT
CATHODE CONDITIONS A) Very low emission
B) Critical condition of zero field at emitter
CONSTANT TEMPERATURE C) Partial activation
AND APPLIED POTENTIAL
D) Highest activation

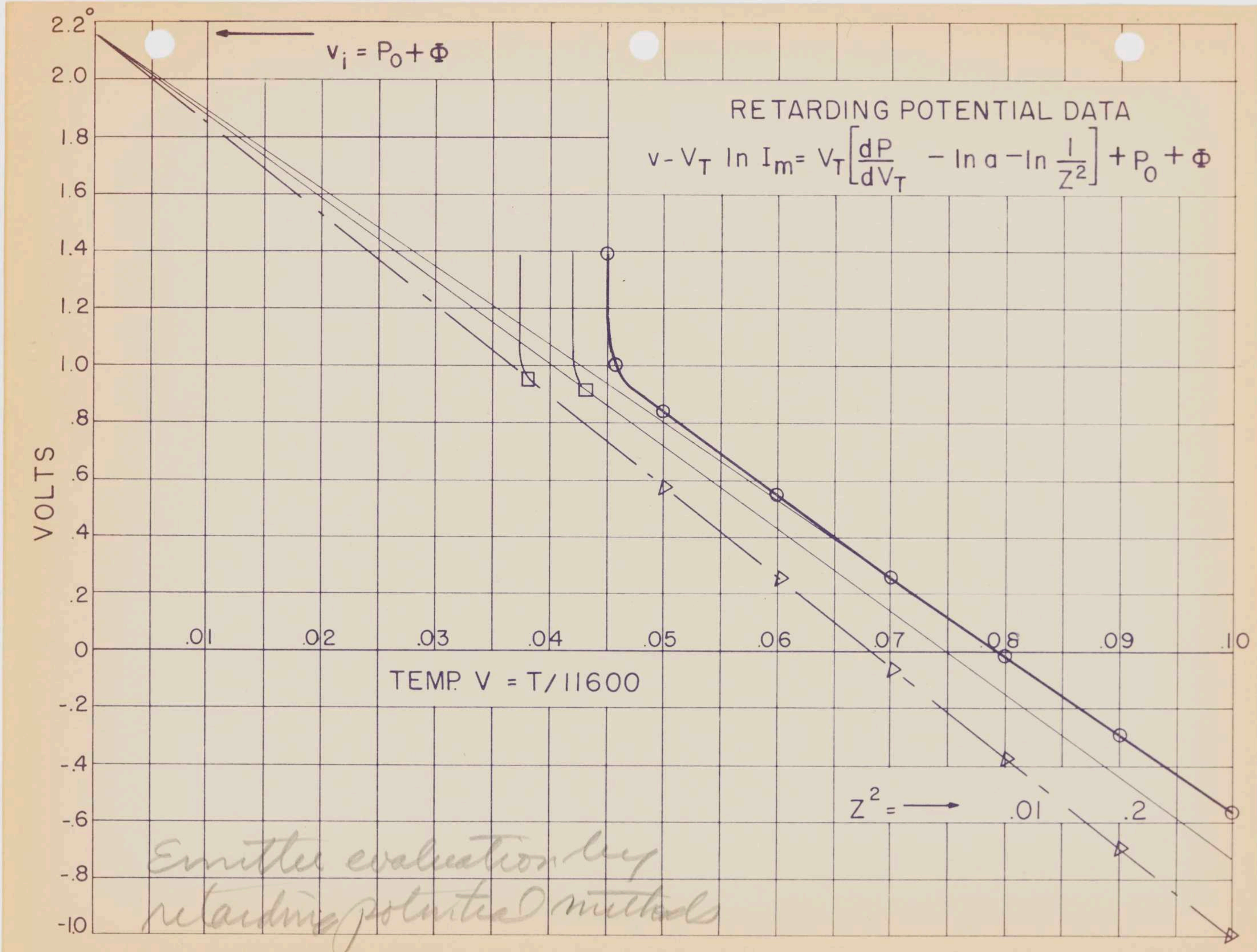
Fig. 10



APPLIED POTENTIAL FOR CURRENT I_M, Eq.22
$\psi = \frac{qV_c}{kT} = 50$
APPLIED POTENTIAL FOR CURRENT I_L, Eq. 23
I_M
I_L
CRITICAL TEMPERATURE
L_M
v_i
APPLIED VOLTS
TEMPERATURE IN VOLT UNITS $\left(\frac{kT}{q}\right)$
5.0
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
2.4
2.2
2.0
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
applied potentials for emitter evaluation at $\psi_c = 50$.
Fig. 11



applied potentials for emitter evaluation at $\psi=16$



RETARDING POTENTIAL DATA
$v - V_T \ln I_m = V_T\left[\frac{dP}{dV_T} - \ln a - \ln \frac{1}{Z^2}\right] + P_0 + \Phi$
$v_i = P_0 + \Phi$
VOLTS
2.2°
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
-.2
-.4
-.6
-.8
-1.0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.10
TEMP. V = T/11600
$Z^2 =$ → .01 .2
Emitter evaluation by
retarding potential methods

Fig 13

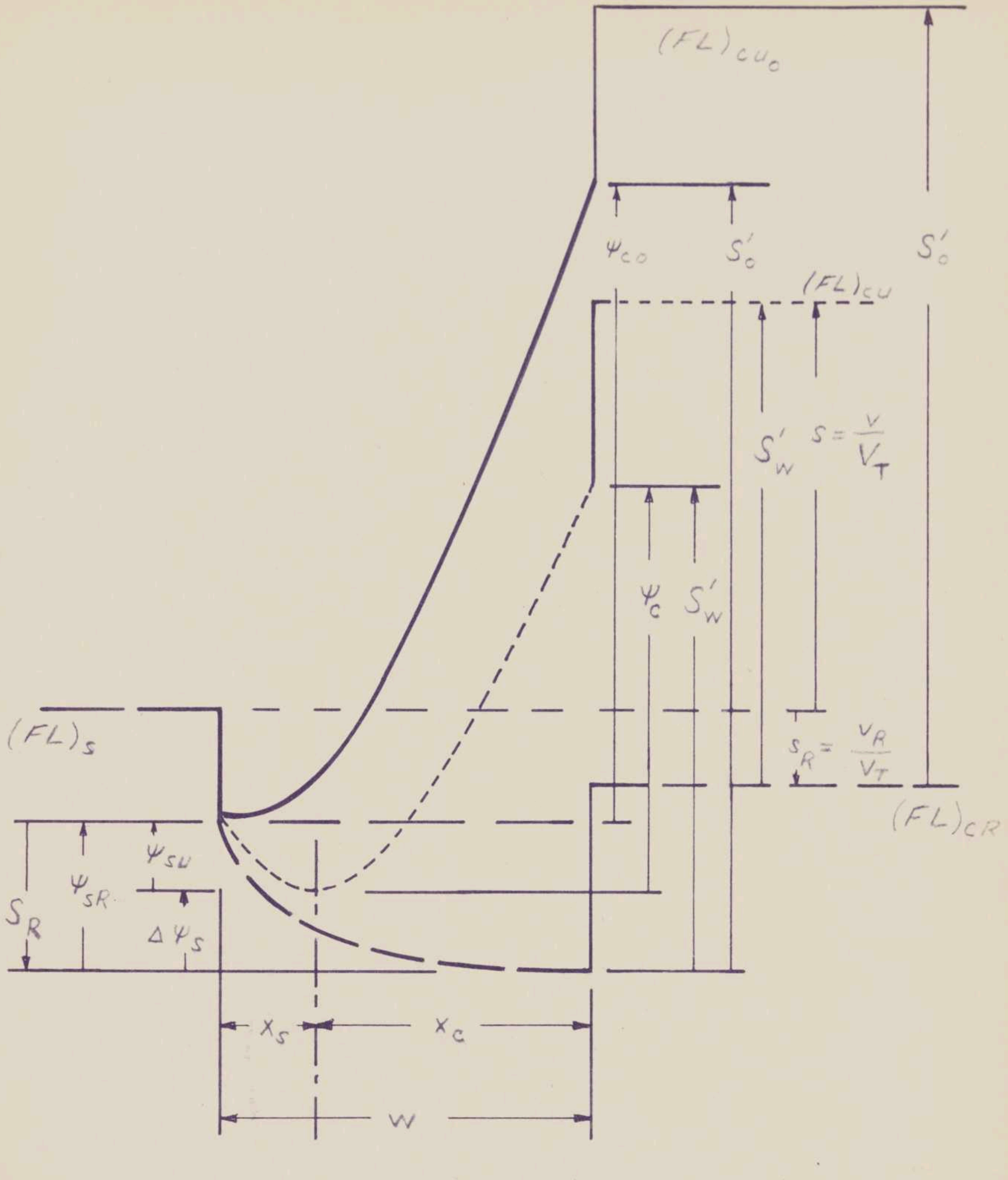


Fig. 14 graphical illustration of symbols related to theory of the Universal limiting curve.

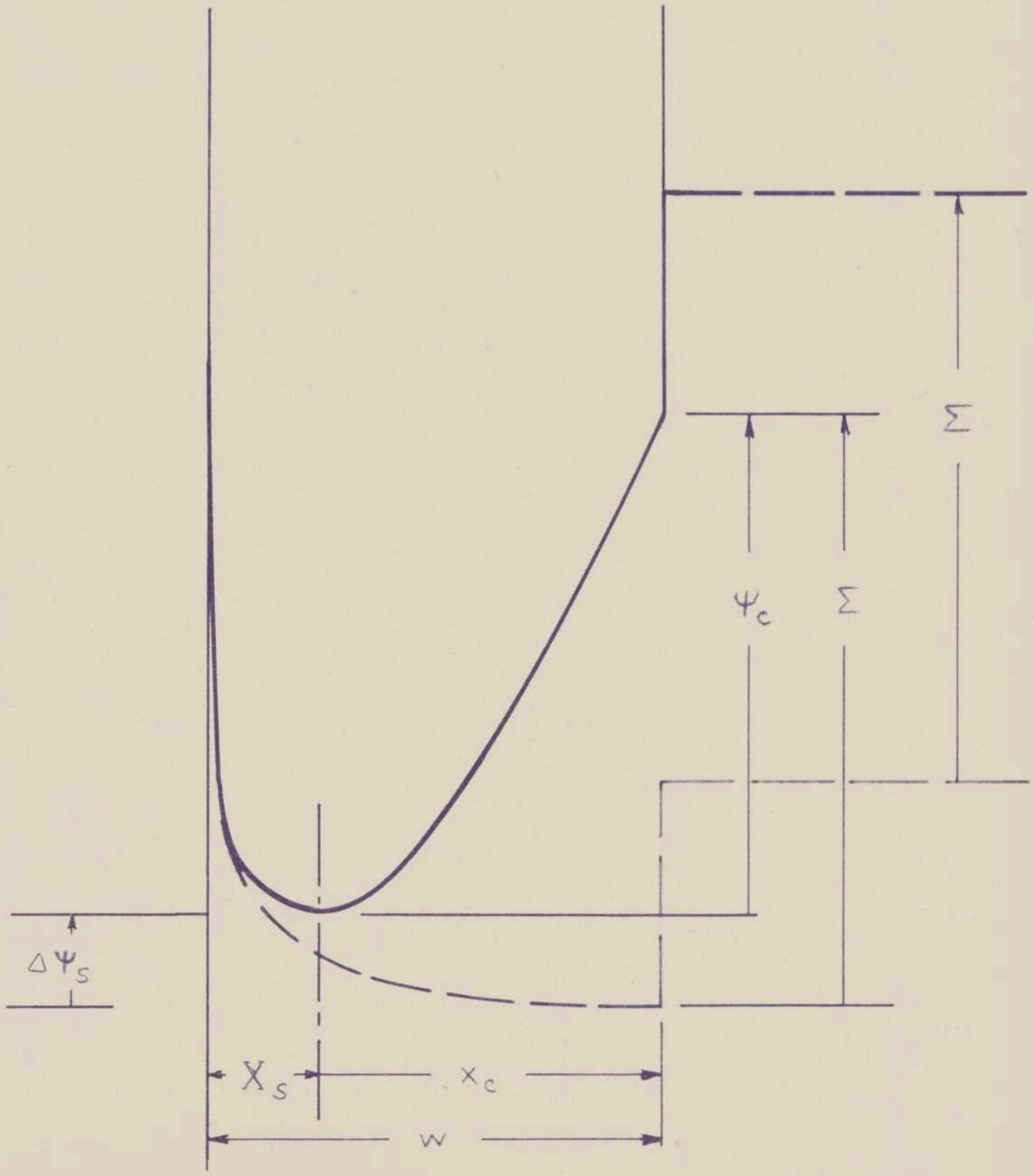
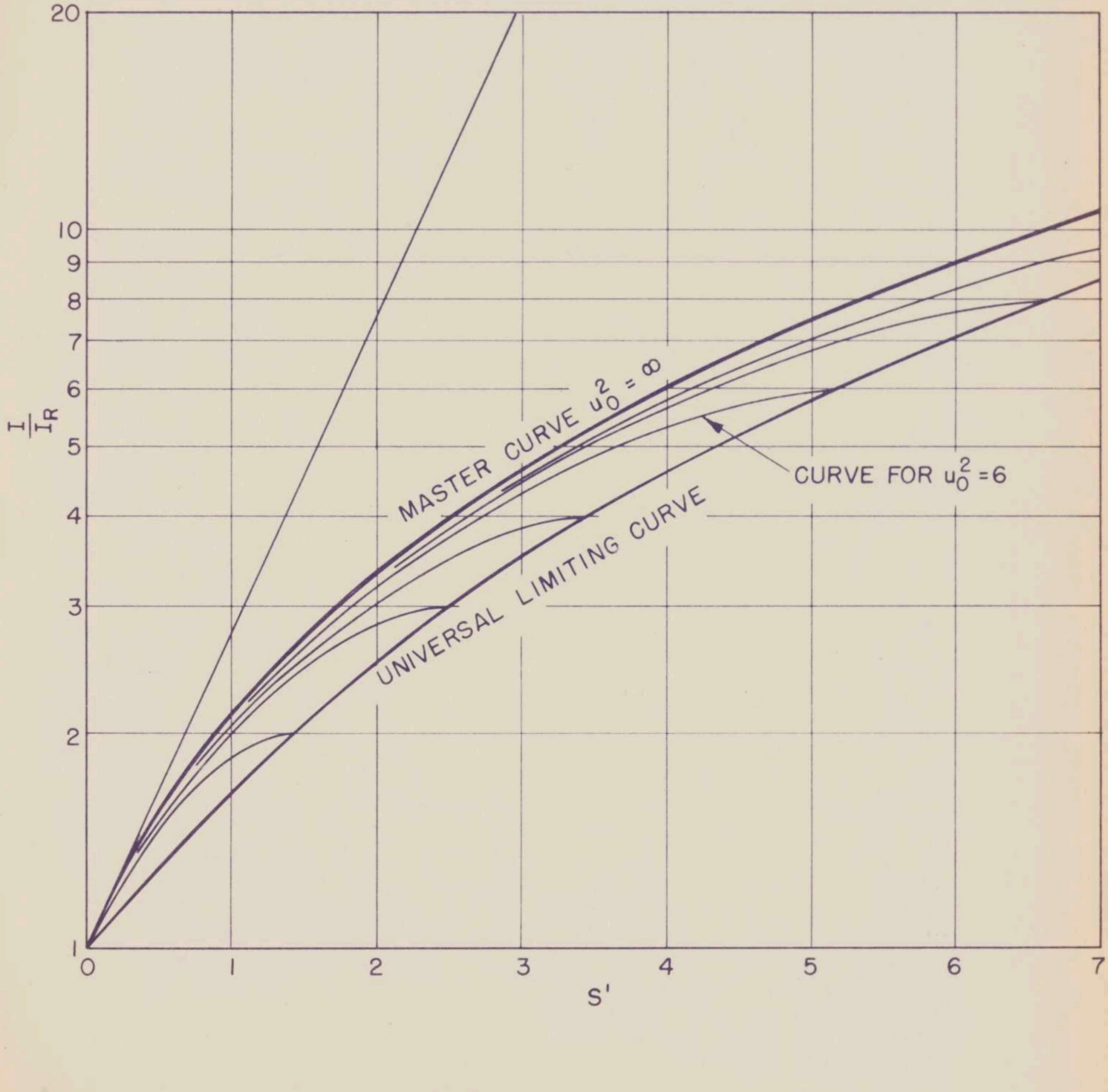


Fig. 15

Potential distribution for an emitter of unlimited emission.



Master curves for selected values of u_0 from 2 to 8 and the limiting curves.

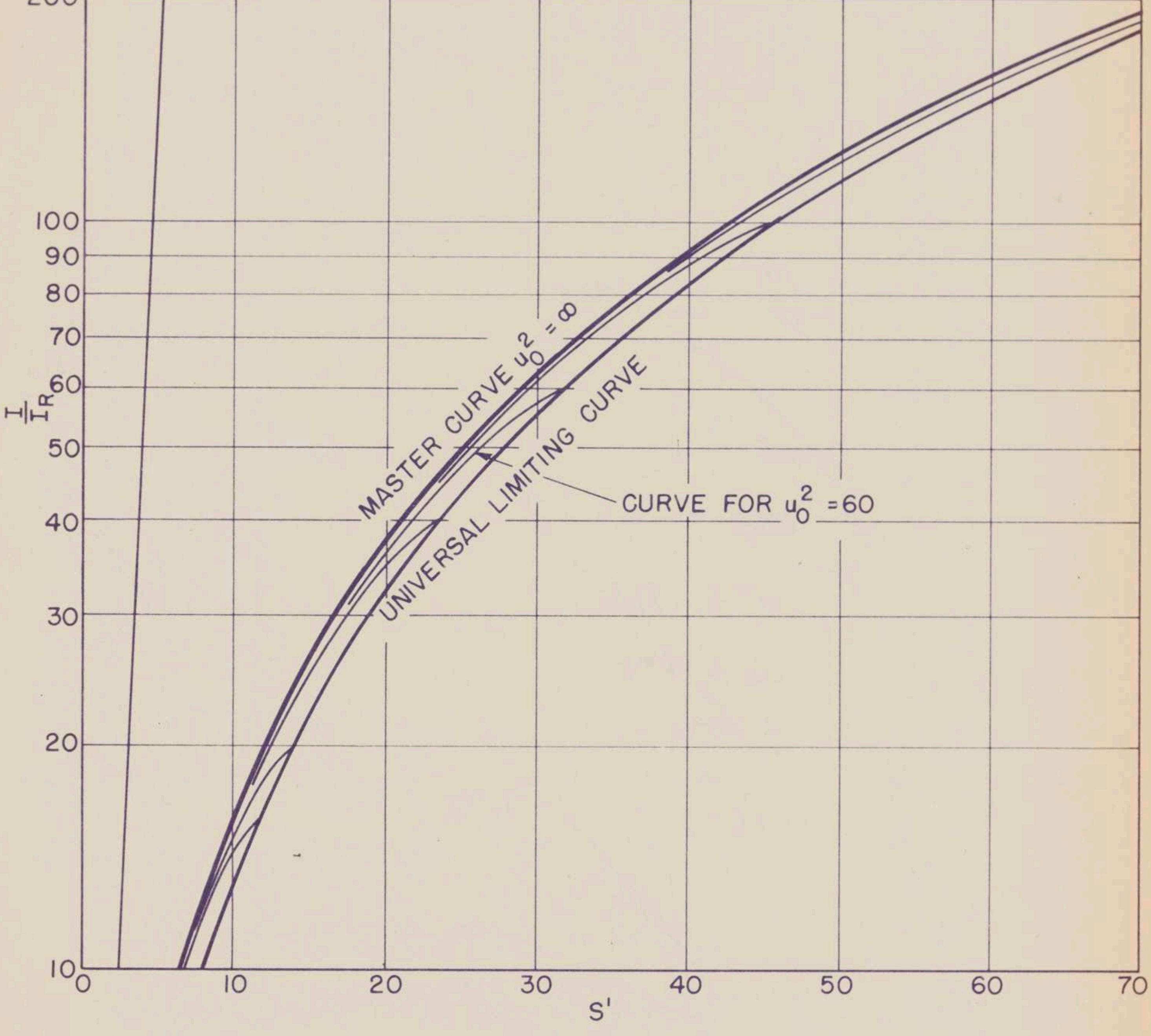


Fig. 17

Master curves for selected limiting values of u_0 from 16 to 200 and the limiting curves.

$(1.83)^2 = \frac{1}{1-a^2}$

3.35

$.298 = 1-a^2$

$a^2 = .702$

$a = .837$

$\frac{1}{a} = 1.2$

$\left(\frac{1}{.305}\right)^{1/2} = 2.77$

$(2.77)^{1/2} =$

1.67

1.77

1.3

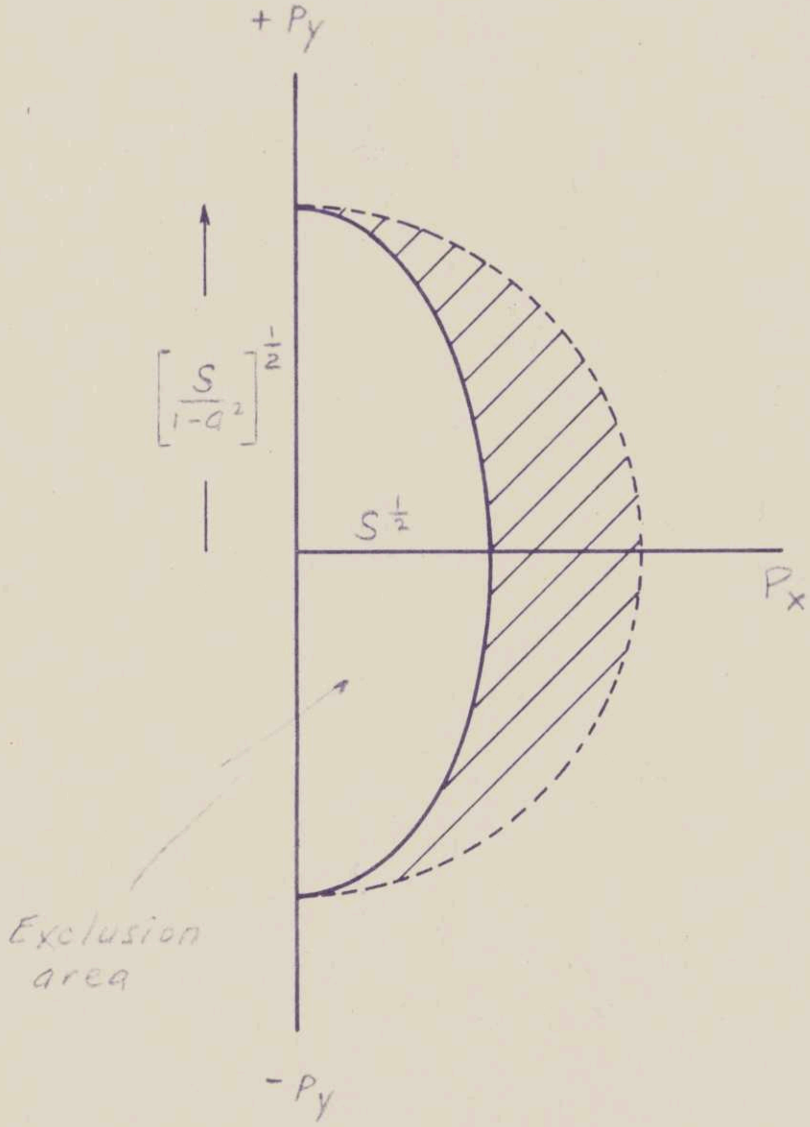
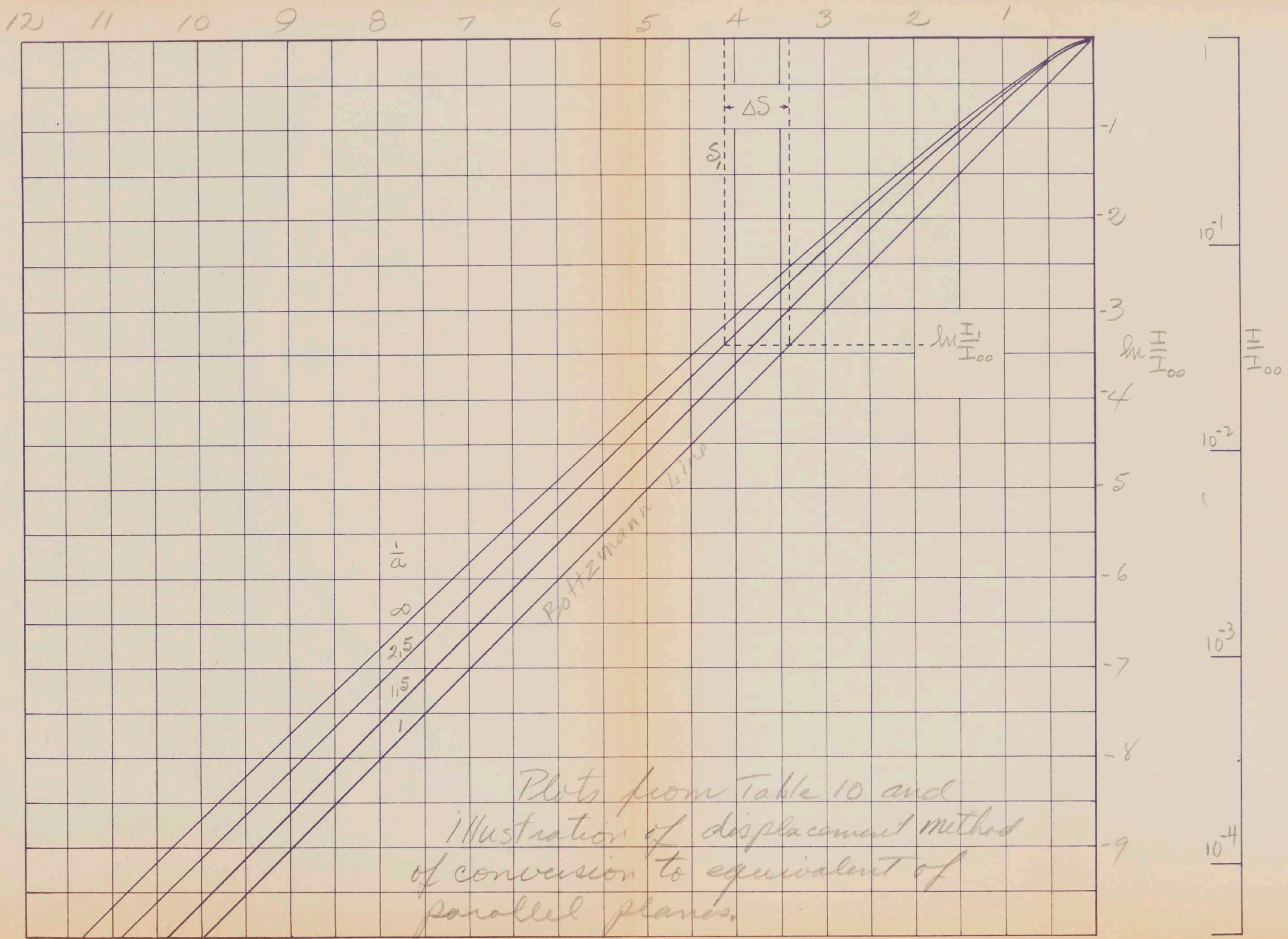


Fig. 18

Momentum space illustration of exclusion area for cylinders of (l/a) ratio of 1.2 as used in Eq. 60-4.



Plots from Table 10 and illustration of displacement method of conversion to equivalent of parallel planes.

Fig. 19

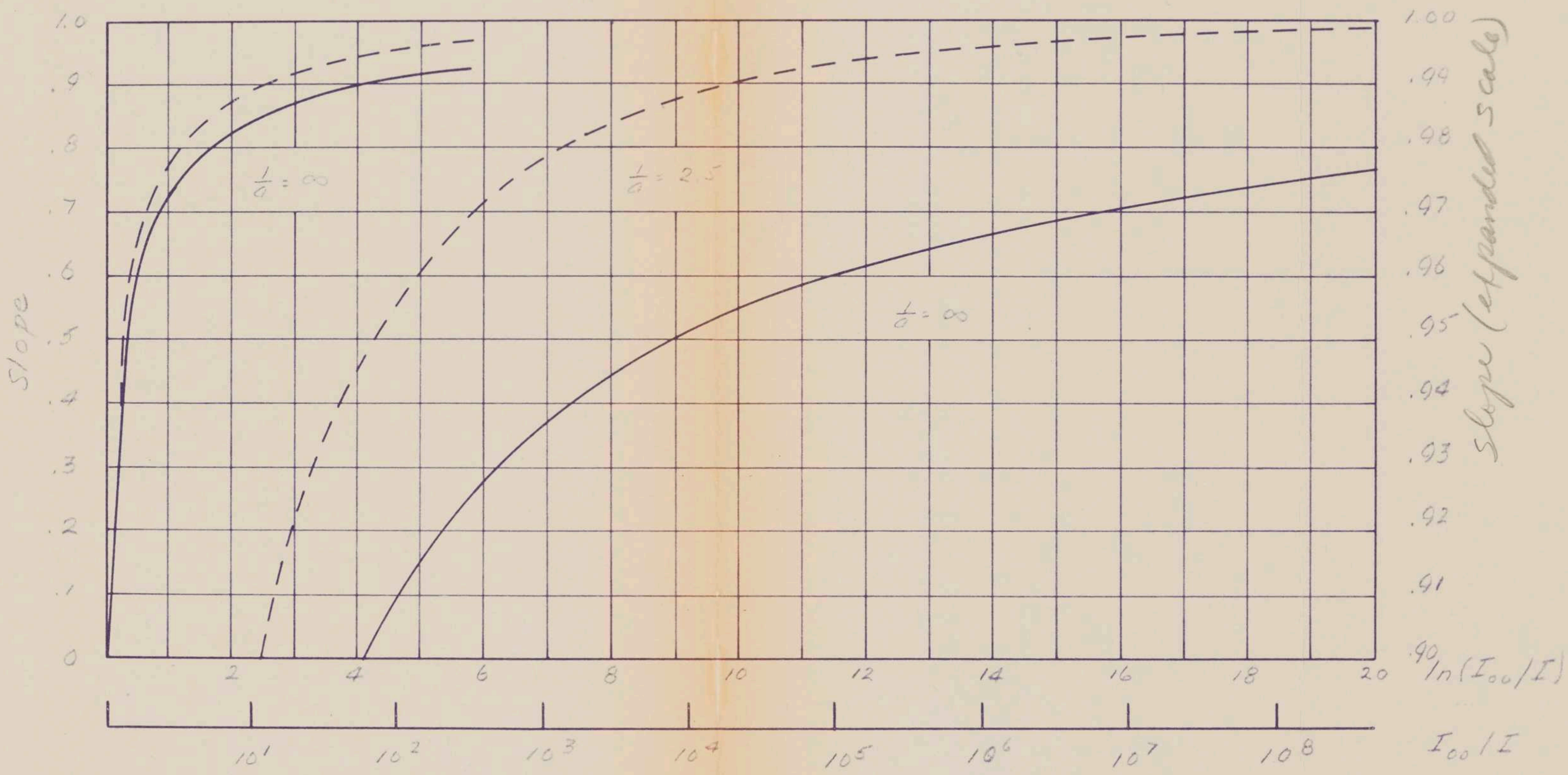


Fig. 20

Slope correction factor from table 10

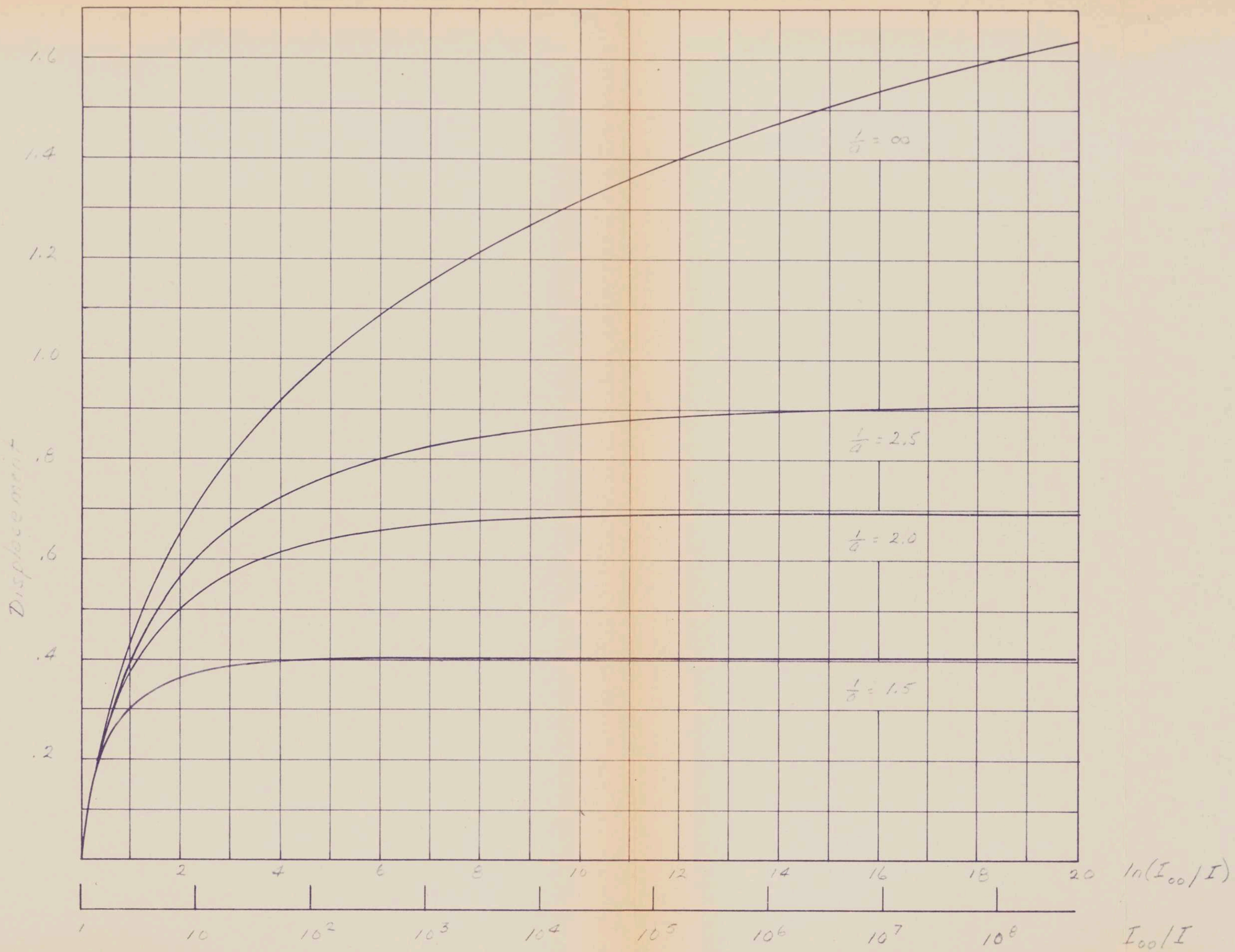


Fig. 21 Displacement for correction to equivalent of parallel planes from Table 10.

21

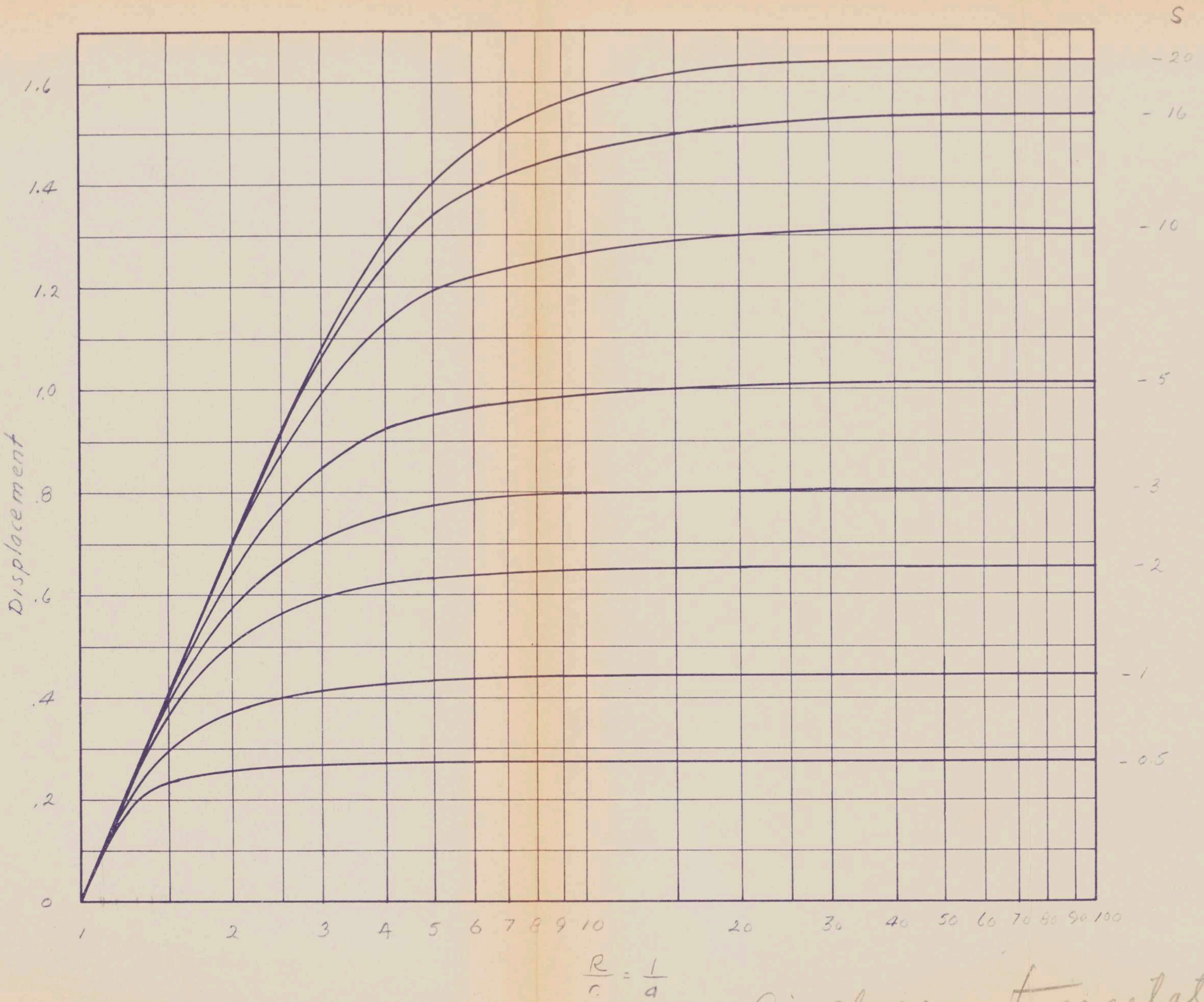


Fig. 22

Displacement as related to shift in space charge minimum.

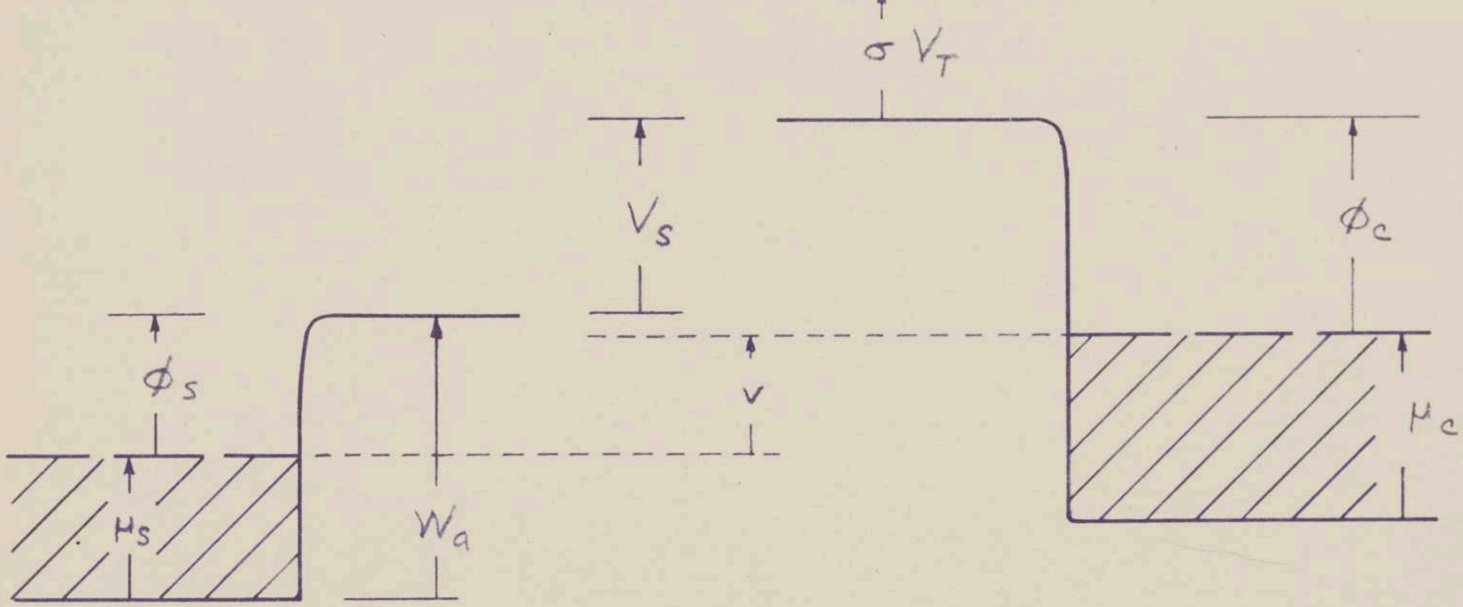


Fig. 23

Symbols used for multiple reflection theory with retarding potentials.

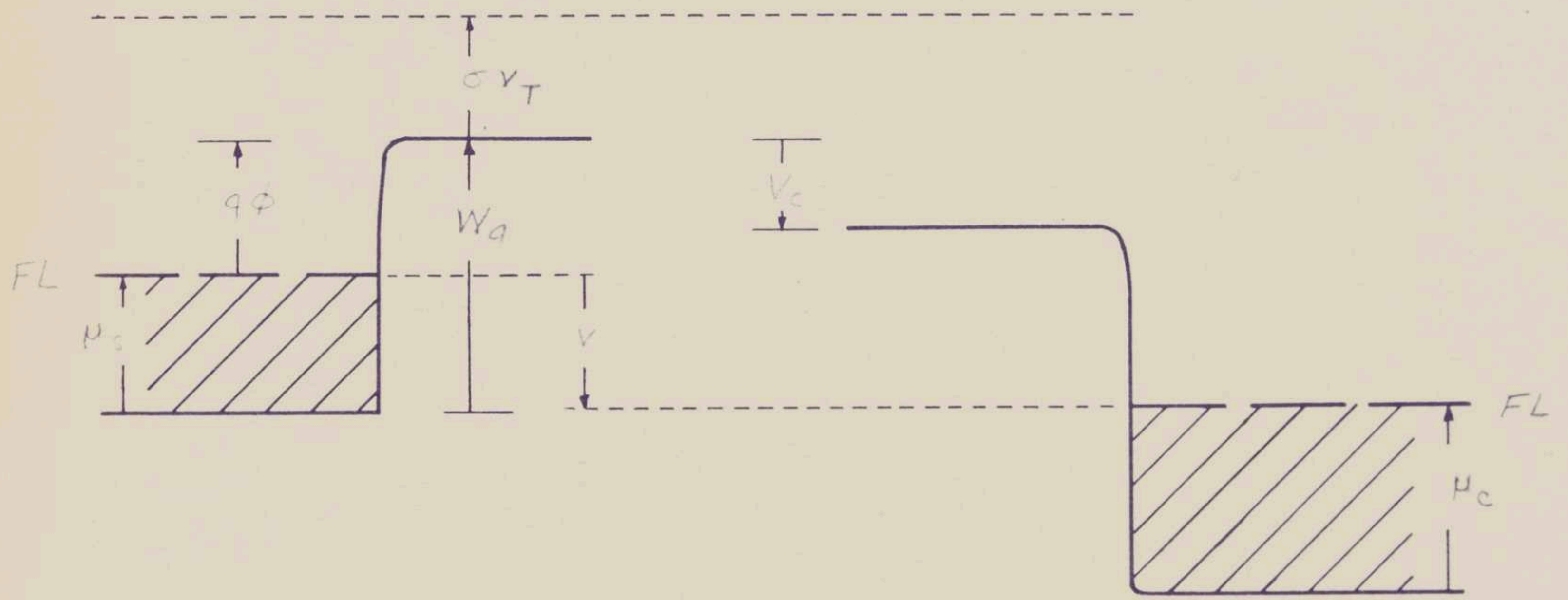


Fig 24

Symbols used for multiple reflection theory with accelerating potentials.

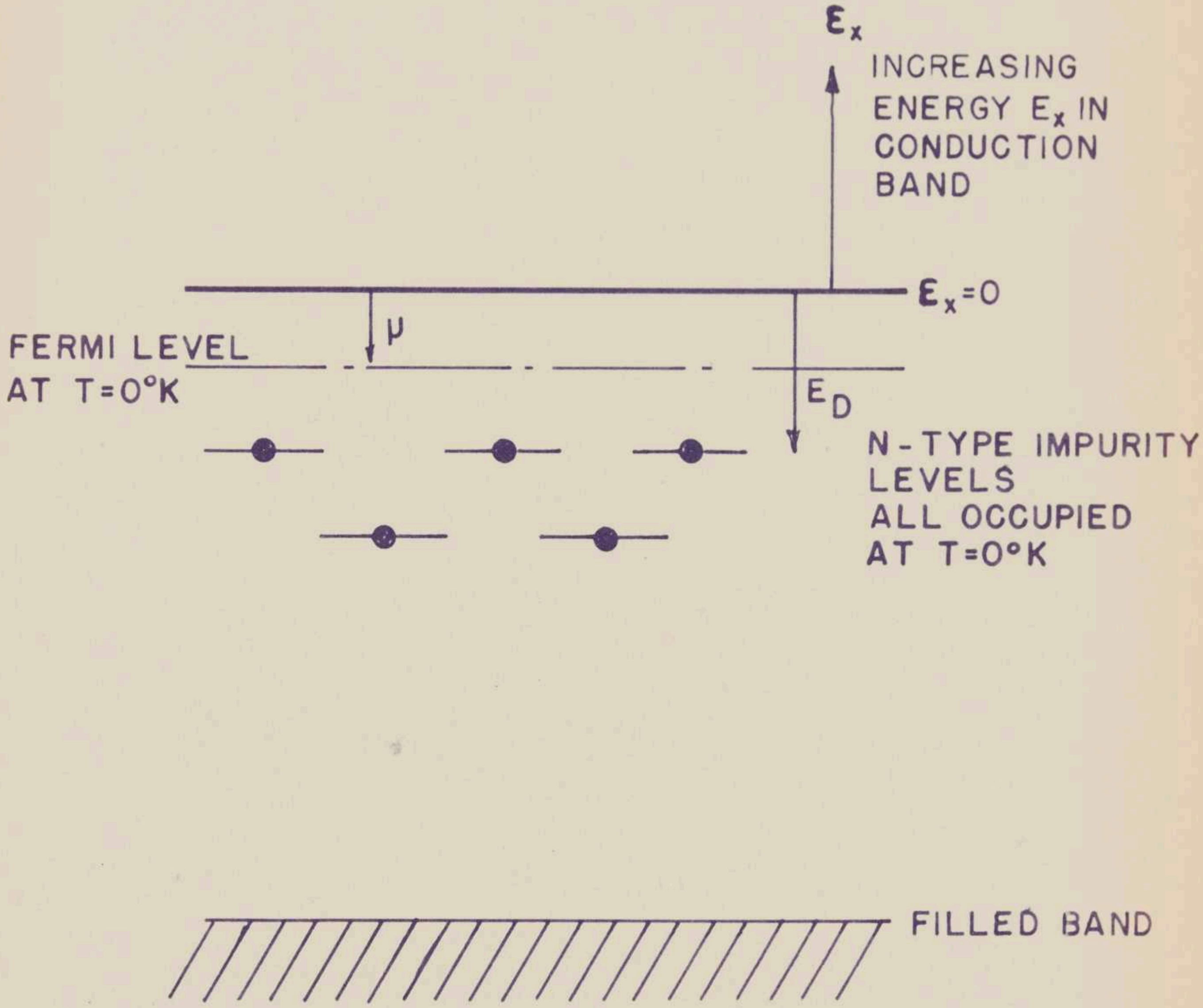


FIG. 25

Energy states in a semiconductor.

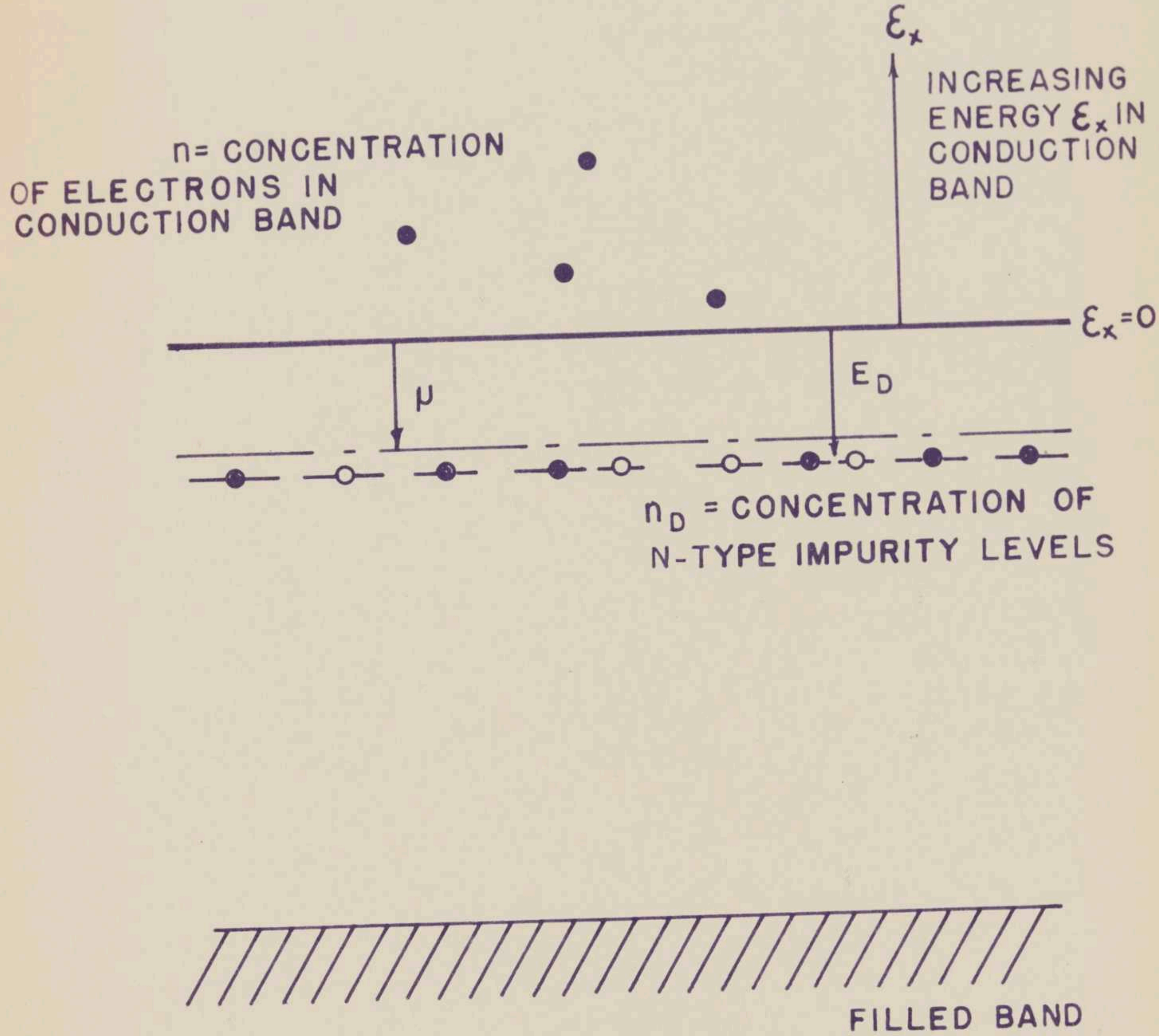


FIG. 26

an N-type semiconductor at a high temperature.

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Fig 28

The application of space-charge theory and the displacement method to evaluate an emitter in a concentric cylindrical diode.

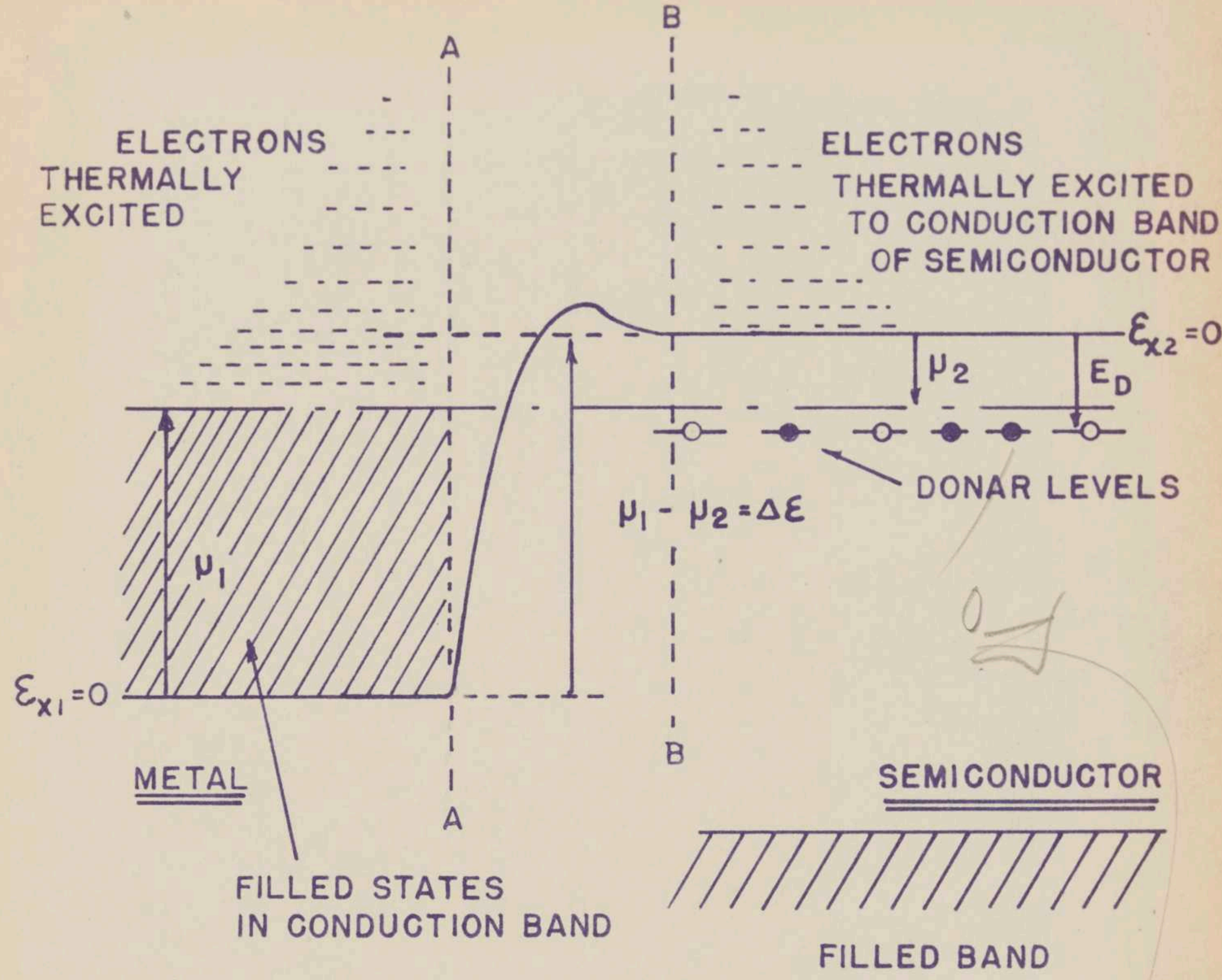


FIG. 27

a contact between a semiconductor and a metal.

Work sheet for fig

S	1.0	$\frac{1}{a}$ 1.5	2.5	∞
0	0	0	0	0
.5	.5	.26	.24	.22
1.0		.70	.60	.56
1.5		1.16	1.01	.94
2.0		1.63	1.44	1.34
3		2.61 ✓	2.34	2.19
4		3.60	3.27	3.08
5		4.60	4.23	3.99
6		5.60	5.20	4.91
7			6.17	5.84
8			7.15	6.78
9			8.14	7.73
10			9.13	8.68
12			11.11	10.60
14			13.10	12.53
16			15.10	14.46
18				16.41
20	20	19.60 ✓	19.10	18.36
	(a)	(c)	(d)	(b)

For Fig 17

Copy from table 10

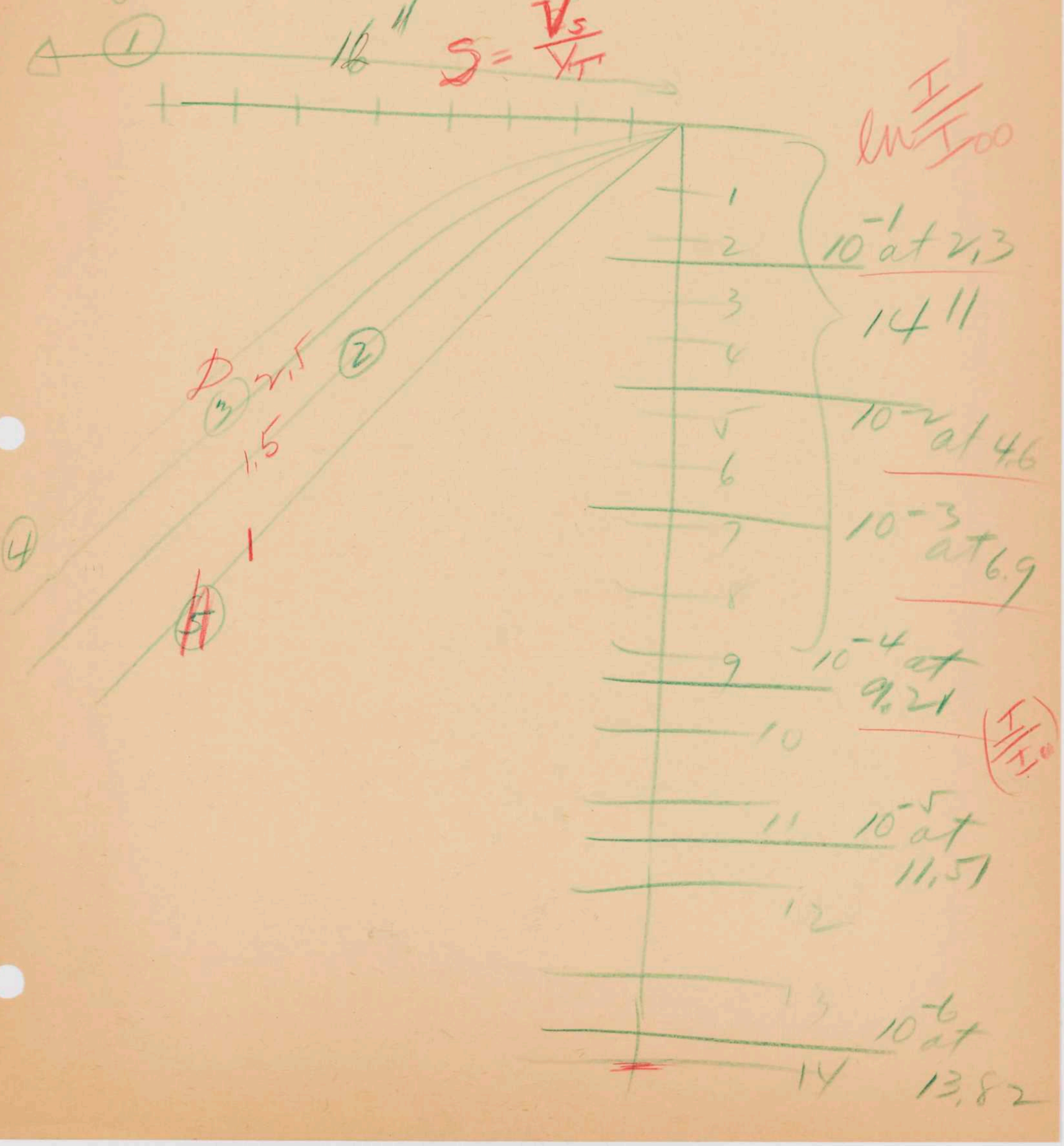
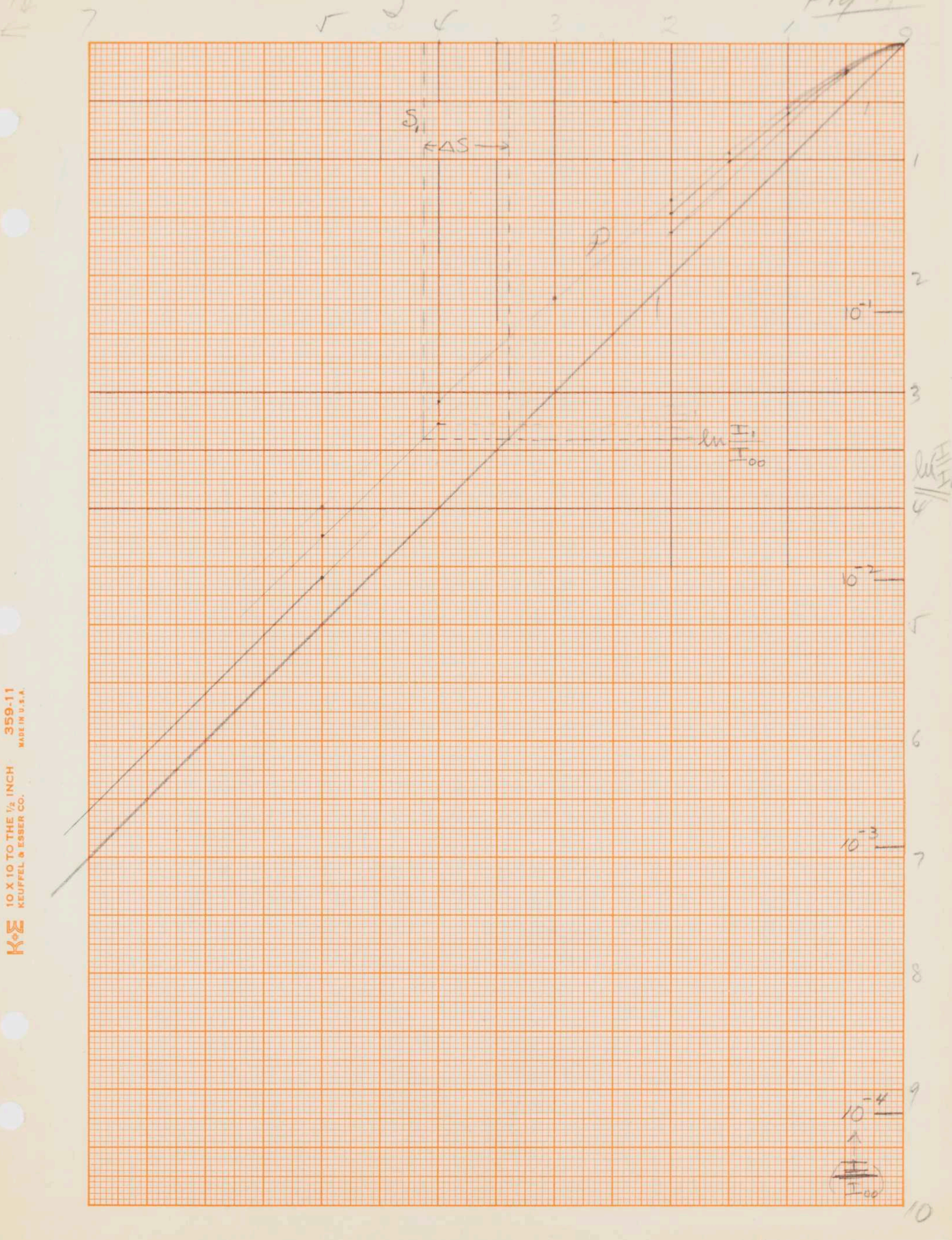


Fig 19


S
S₁
ΔS
P
$\ln \frac{I_1}{I_{00}}$
10^{-1}
10^{-2}
10^{-3}
10^{-4}
$\ln\left(\frac{I}{I_{00}}\right)$
$\frac{I}{I_{00}}$

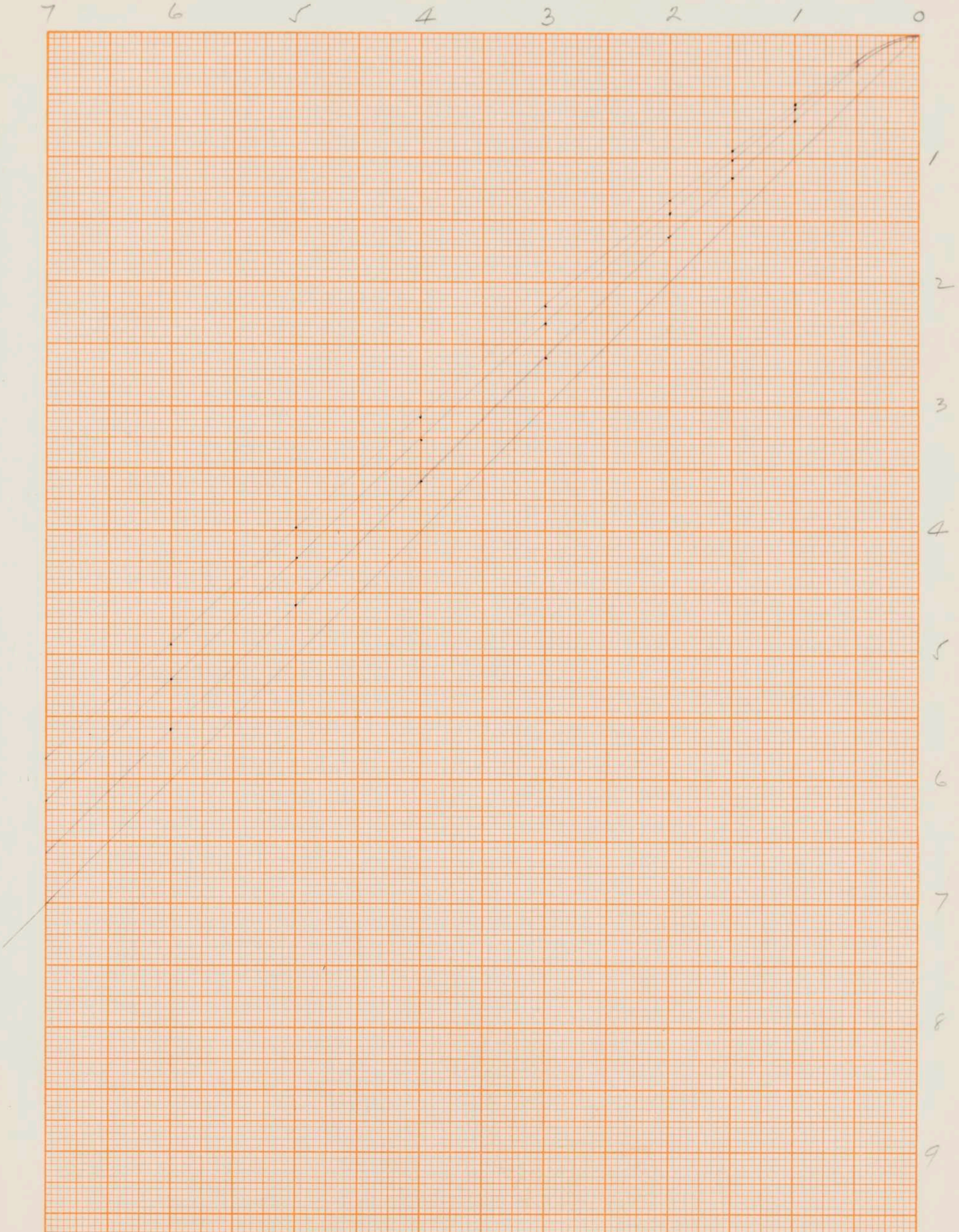


Fig. 19 -1

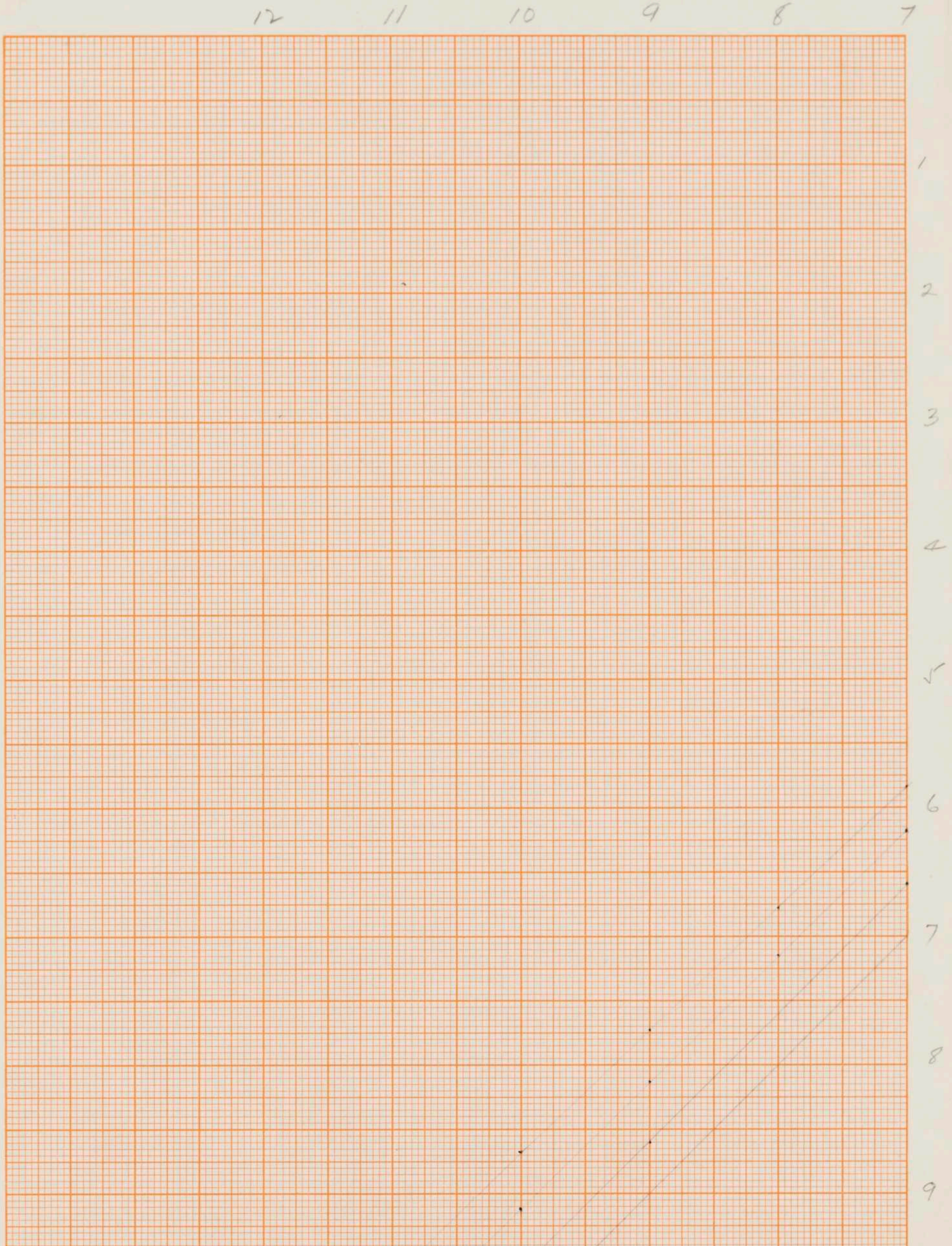


Fig 19-2