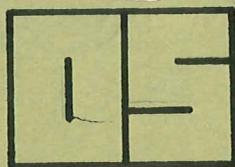


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GRUNDARTANGI

GEOPHYSICAL SURVEYS
By Halina Guðmundsson

ORKUSTOFNUN
Raforkudeild

G R U N D A R T A N G I

Geophysical surveys

by

Halina Gudmundsson

June 1975

OS-ROD 7527

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INTRODUCTION

This investigation has been done for Jarðkönnumardeild (J.K.D.), which requested ROD to handle the geophysical measurements in order to find out the thickness and velocity of the layers up to the bedrock in Hvalfjörður-area.

The result of these measurements were supposed to answer the question whether it is likely to find groundwater in this area and where it is most likely to look for it.

GEOLOGY

The area around Lake Eiðisvatn down to the shore at Grundartangi is covered by overburden (peat), underneath there is silt ranging in thickness. From the boreholes which were drilled at Grundartangi is known that the lower part of the silt is consolidated and hard (tillite), but the upper part is looser. The bedrock is Tertiary basalt (the approximately age is 3.3 million years). The rock seems to be quite watertight, as all holes and fractures in basalt are filled with secondary minerals.

GEOPHYSICS SURVEY

In the end of June 1975 a seismic refraction survey was carried out at the approximately south-south-west of the Eiðisvatn Lake (see location map), mainly for detecting the thickness of the secons layer, its velocity and depth to the basaltic bedrock. There were taken several profiles on two main lines, I and II (approximately parallel to each other) both in direction SW-NE ; on line I were taken 8 profiles (No. 1, 2, 3, 4, 5, 6, 7, 11) and on line II 3 profiles (No. 8, 9, 10), each about 100 m long. All of them were shot from both ends of the profile (see time-distance graphs, figures ...).

The final result after calculating the field refraction materials is shown on the figure no. 1. Profile no. 1 from NE-SW gives information that the basaltic bedrock is not constant in its shape, but has step like form. Therefore, in same places (profile 1,2) the bedrock lies straight under overburden, what appears on time distance graphs as two layers case.

While moving along profile I south-westwards the layer between bedrock and overburden appears with variety thickness with the tendency of getting deeper to SW direction (see figure no. ...)

On profile number 1-2 there are only overburden and bedrock under it
" " " 3 the second layer appears (silt) about 6 m thick
" " " 4-7 gets deeper up to 10 m
and gets deeper towards SW up to approximately 20-24 cm
on profile number 11 - 11 *

These differences in thickness of the second layer between following profiles can be explained by step-like structure of the bedrock which the second layer repeats.

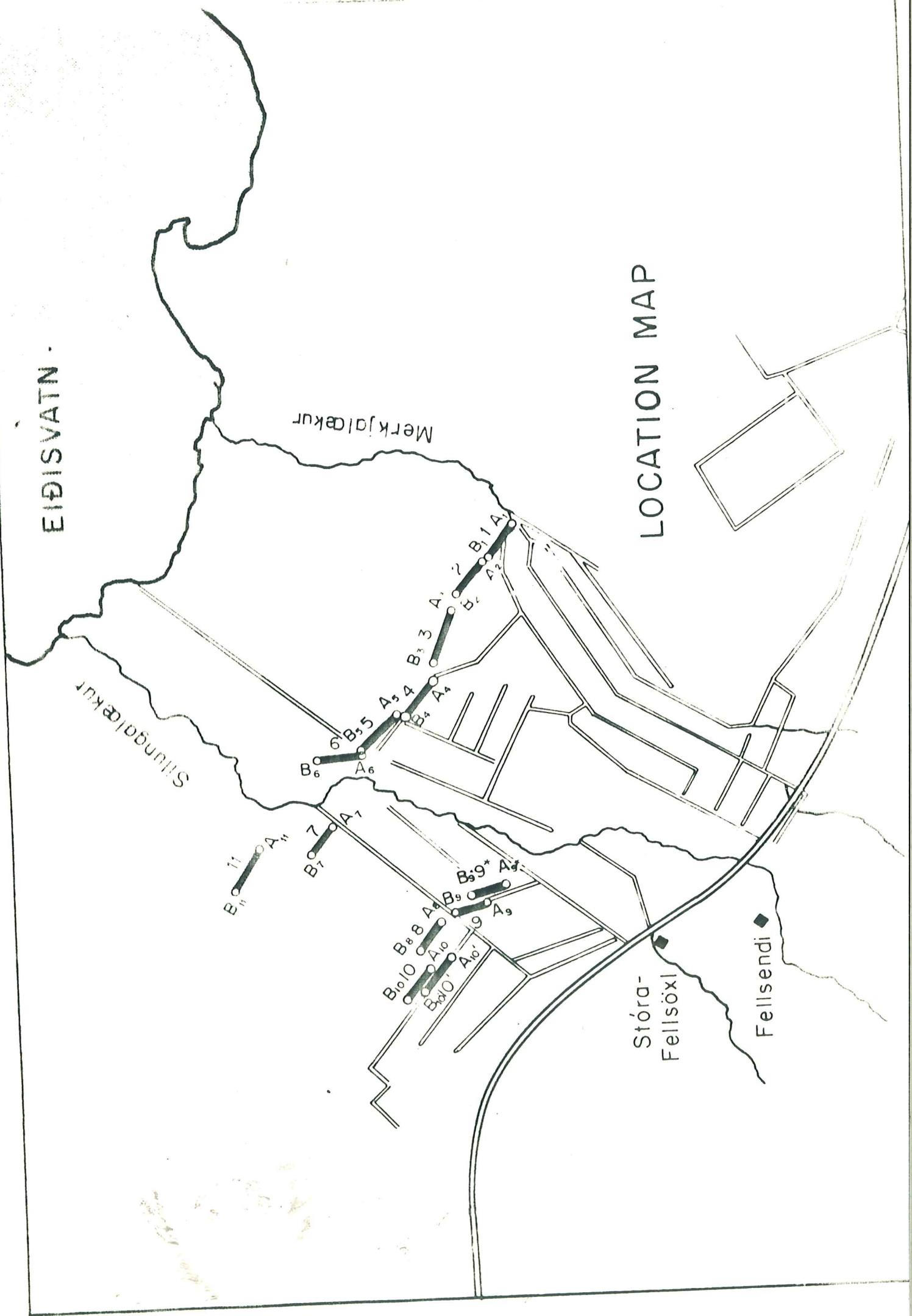
This second layer was expected to be a collector of groundwater. Refraction seismic shows that the velocity of this layer is approx. 20-30 km/s. which is typical for hard silt and therefore rather unlikely to be a collection of water. It is possible that there is a gravel in the lowest part of silt layer which could be filled with water, but refraction seismic cannot give so detailed an answer.

calculated velocities and depths to bedrock
in the geological sections I and II

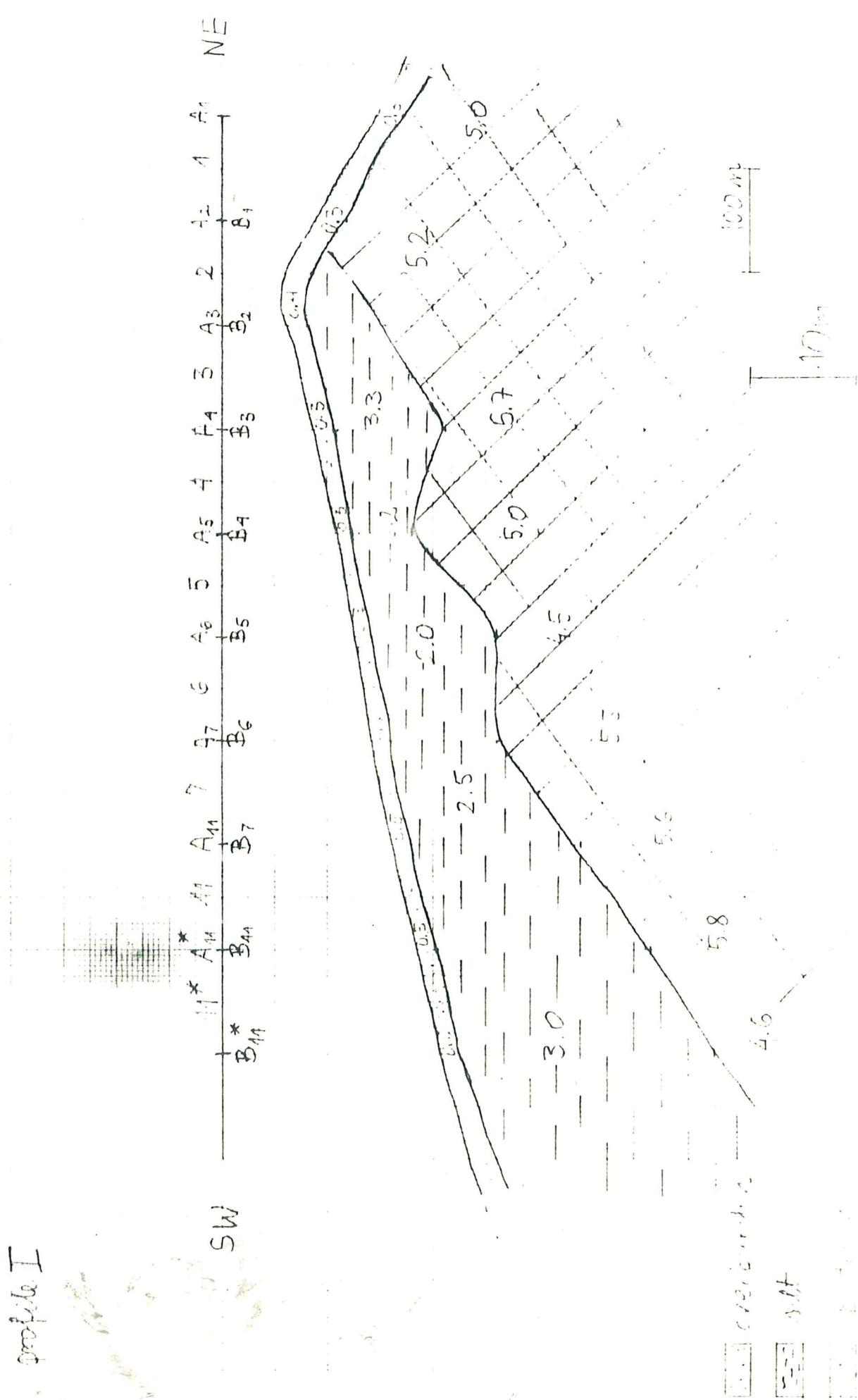
		v_1 m/ms	v_2	v_3	h_1	h_2 m
I	A ₁	0,3	5,0		2,1	
	B ₁	0,3	5,2		4,2	
	A ₂	0,3	4,4		1,4	
	B ₂	0,6	4,3		1,3	
	A ₃	0,3	3,2		1,6	
	B ₃	0,3	3,2		1,0	
	A ₄	0,4	3,3	5,7	2,0	12,6
	B ₄	0,3	2,2	4,2	1,1	7,2
	A ₅	0,4	2,1	5,6	1,4	6,3
	B ₅	0,3	1,8	4,4	1,3	6,6
	A ₆	0,4	2,3	4,5	1,0	18,8
	B ₆	0,7	2,3	5,5	5,1	12,0
	A ₇	0,4	2,7		1,3	
	B ₇	0,3	2,4	6,0	2,0	8,7
	B ₇ '	0,8	5,0		6,0	
	B ₇ ''	0,5	4,5		3,6	
	A ₁₁	0,6	2,6	5,5	1,2	2,8
	B ₁₁	0,4	2,5	4,0	1,3	10,7
	A ₁₁ *	0,6	3,4	5,5	1,3	3,3
	B ₁₁ *	0,6	3,0	4,6	1,3	2,4
II	A _g	0,6	3,1	6,6	1,2	7,4
	B _g	1,6	2,9	5,1	2,4	12,0
	A _g *	1,3	2,7	5,5	4,5	22,8
	B _g *	1,5	3,0	4,3	4,3	7,2
	A _g **	1,2	2,9	4,7	4,2	16,4
	B _g **	1,3	3,0	4,6	3,7	17,0
	A ₈	0,4	2,9		2,8	
	B ₈	0,3	3,3		2,3	
	B ₁₀		3,2			
	A ₁₀	0,3	1,7	3,1	1,0	7,2
	A ₁₀ '	0,6	3,0		3,2	
	A ₁₀ ''	0,3	2,3	5,5	2,2	9,0

EIDSVATN

LOCATION MAP



PROFIL DE TERRAIN



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I A₁-B₁

Fig. 4

$$A'_1 \quad V_4 = 0.3$$

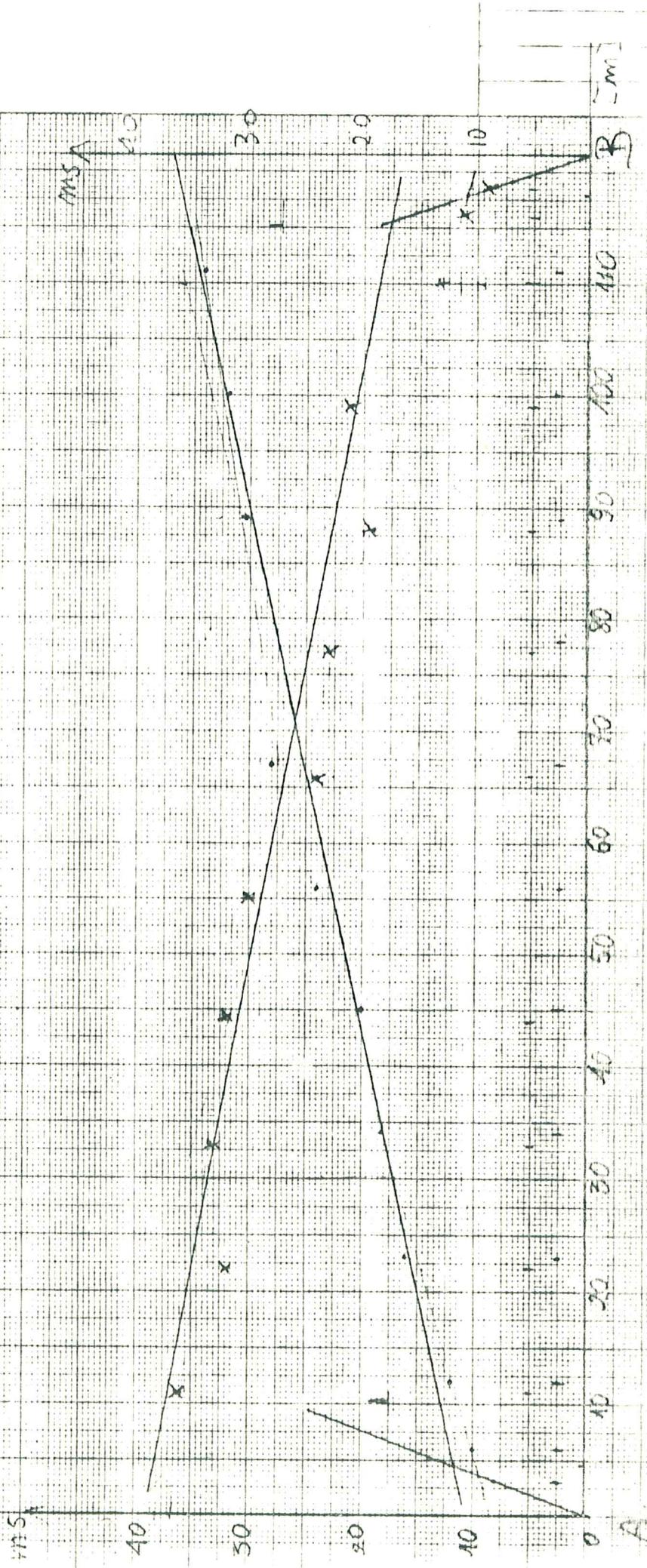
$$V_2 = 5.0$$

$$h_1 = 2.1$$

$$F \quad V_4 = 0.3$$

$$V_2 = 5.0$$

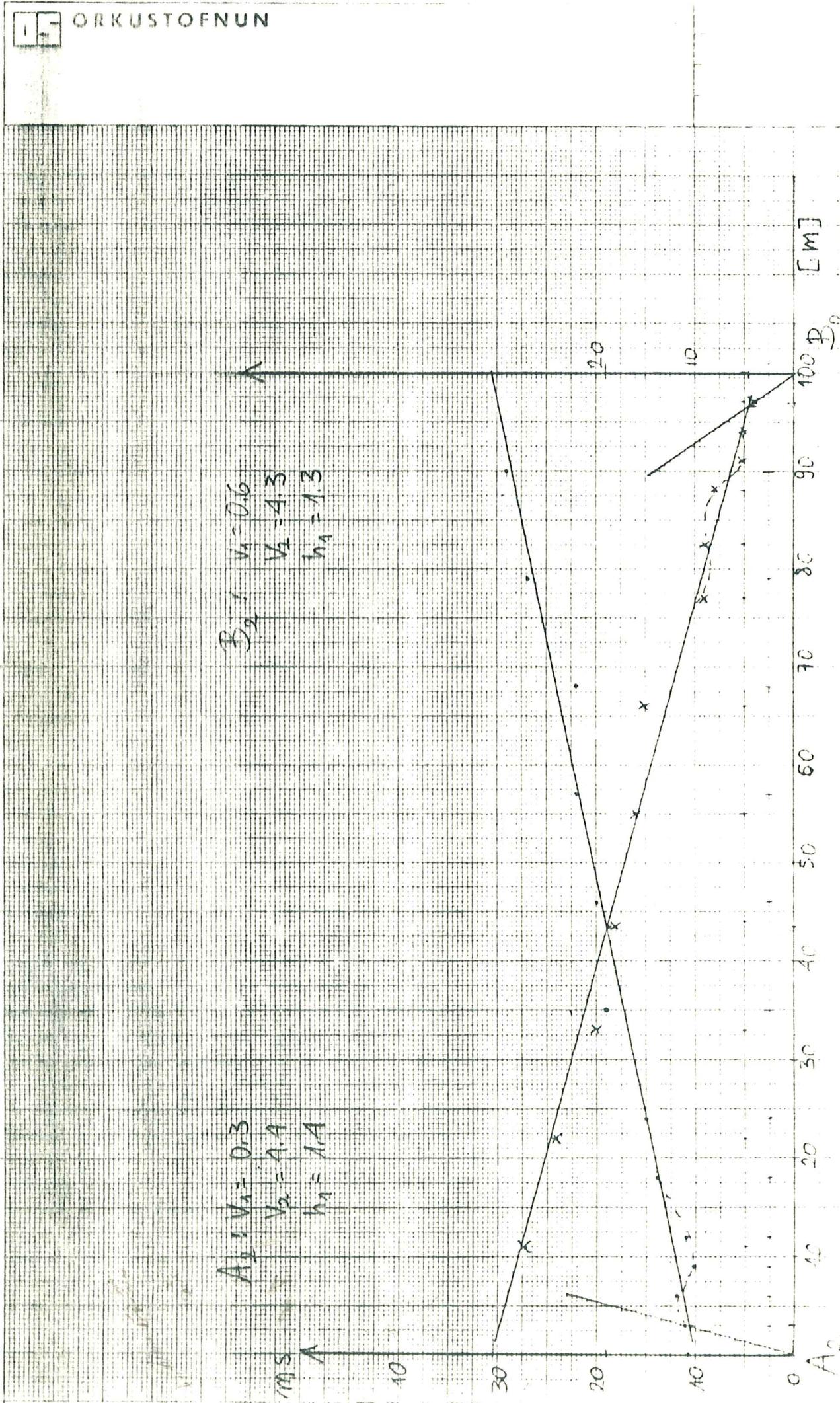
$$h_1 = 4.2$$



I 2 A₂-B₂

* 3,3,3,3,6,6,11

Fig. 5



$\int A_3 - B_3$

Fig. 6

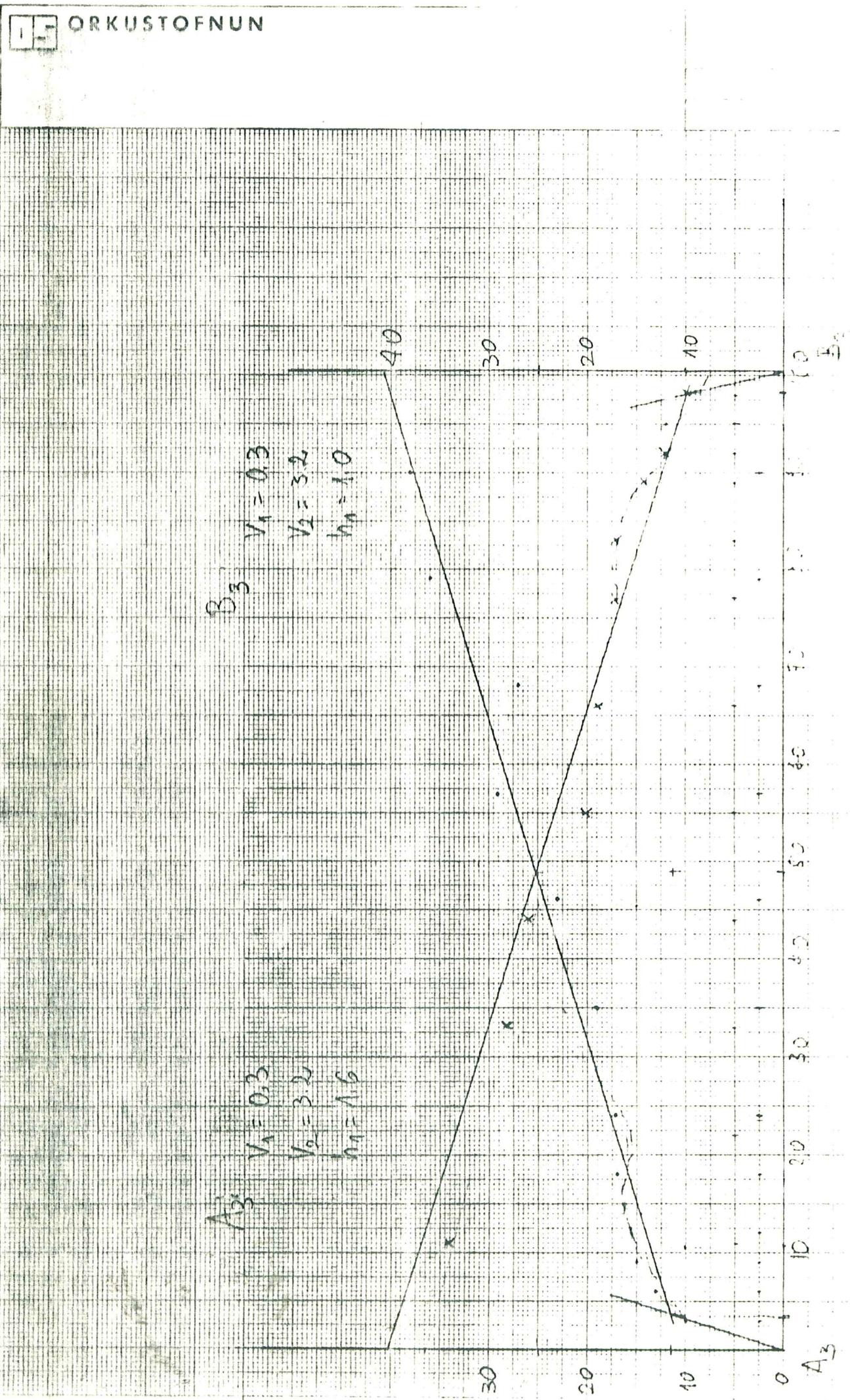


Fig. 7

1 A A₄ - B₄

3 3 3 6 6 4

A₄: V₁ = 0.4

V₂ = 3.3

V₃ = 5.7

V₄ = 2.0

V₅ = 19.6

B₄: V₁ = 0.3

V₂ = 2.2

V₃ = 4.8

V₄ = 1.1

V₅ = 1.2

M.S.

M.S.

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A₄

10C B₄

10C

8C

6C

4C

2C

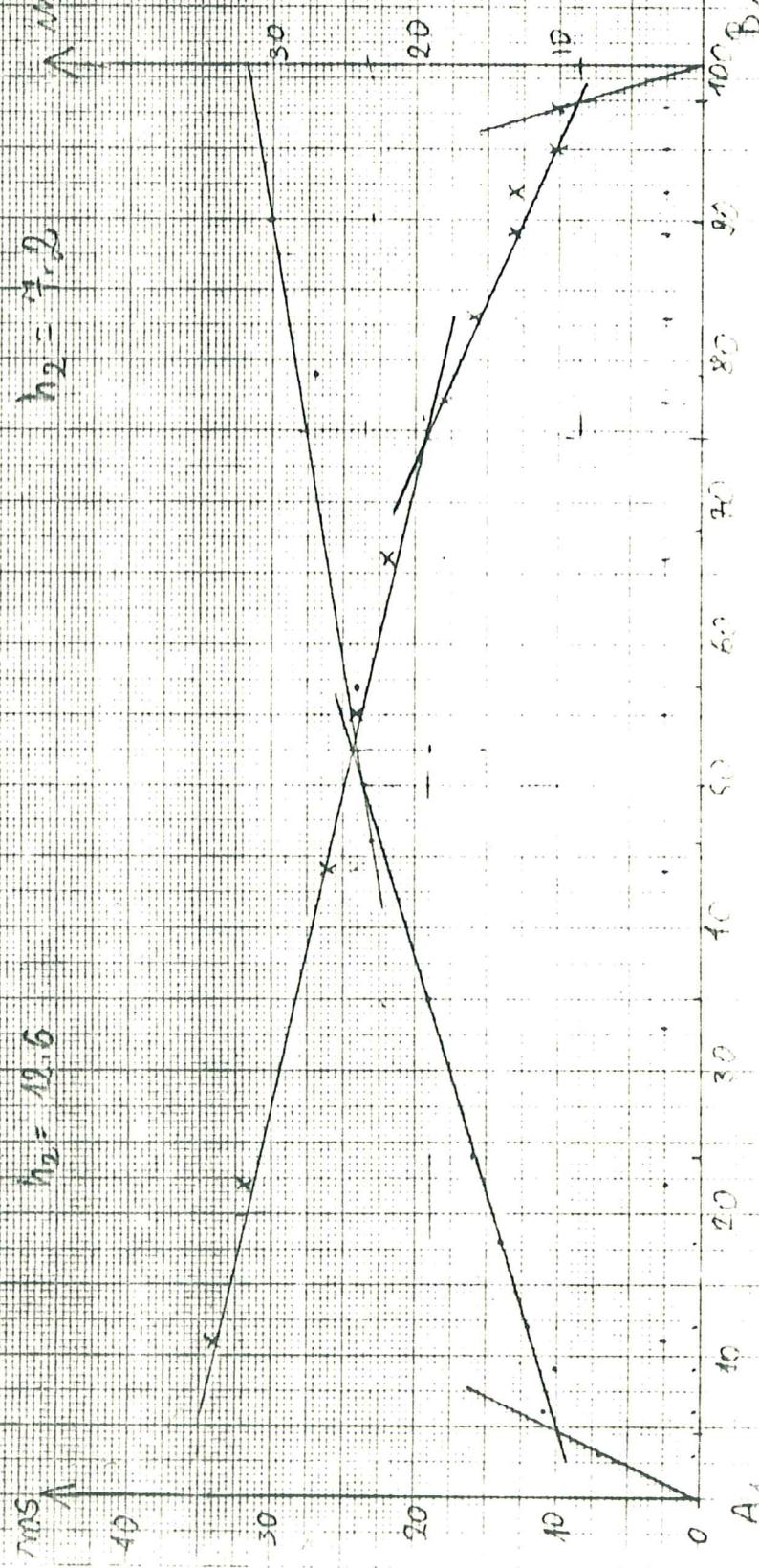
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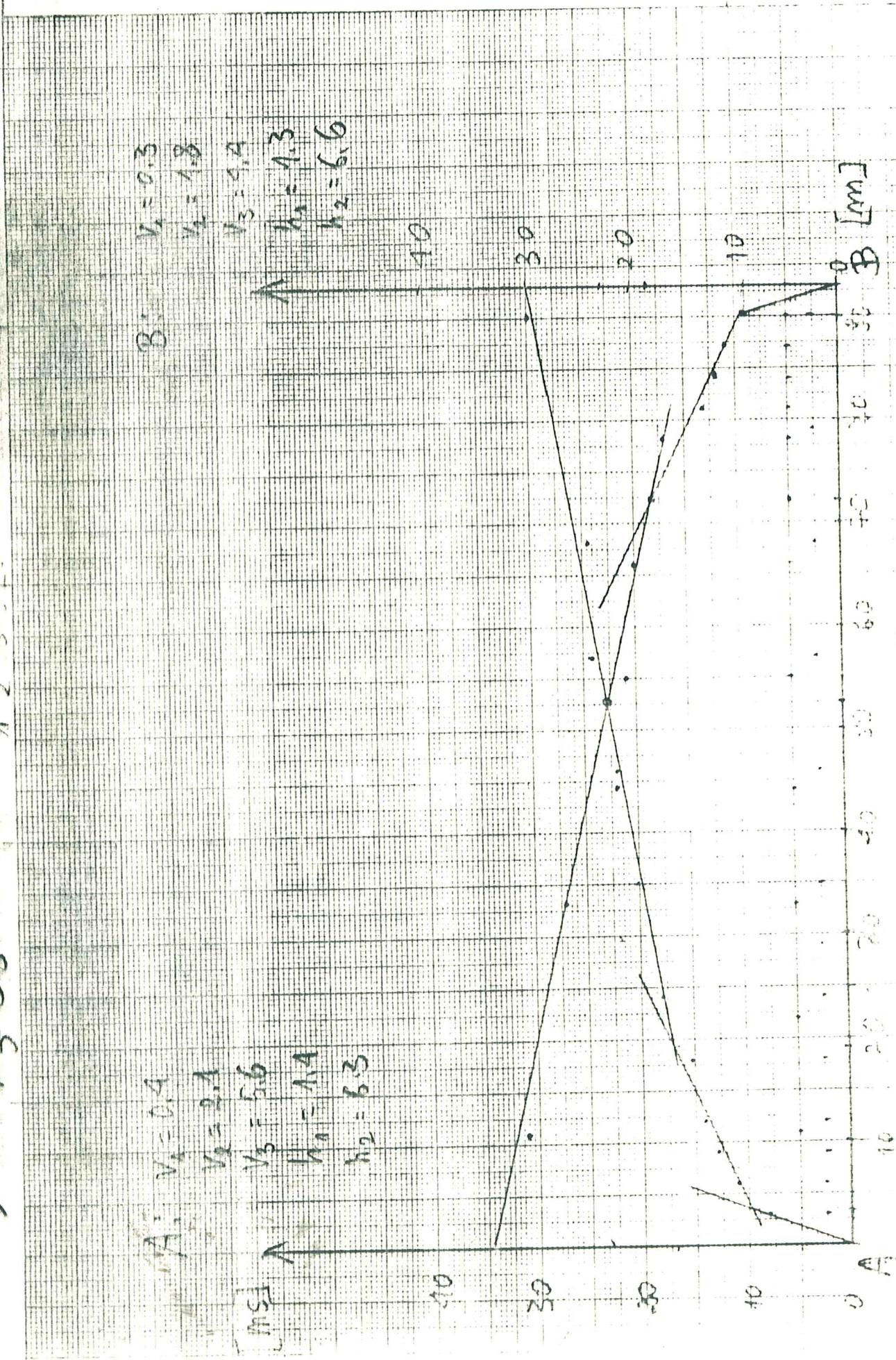
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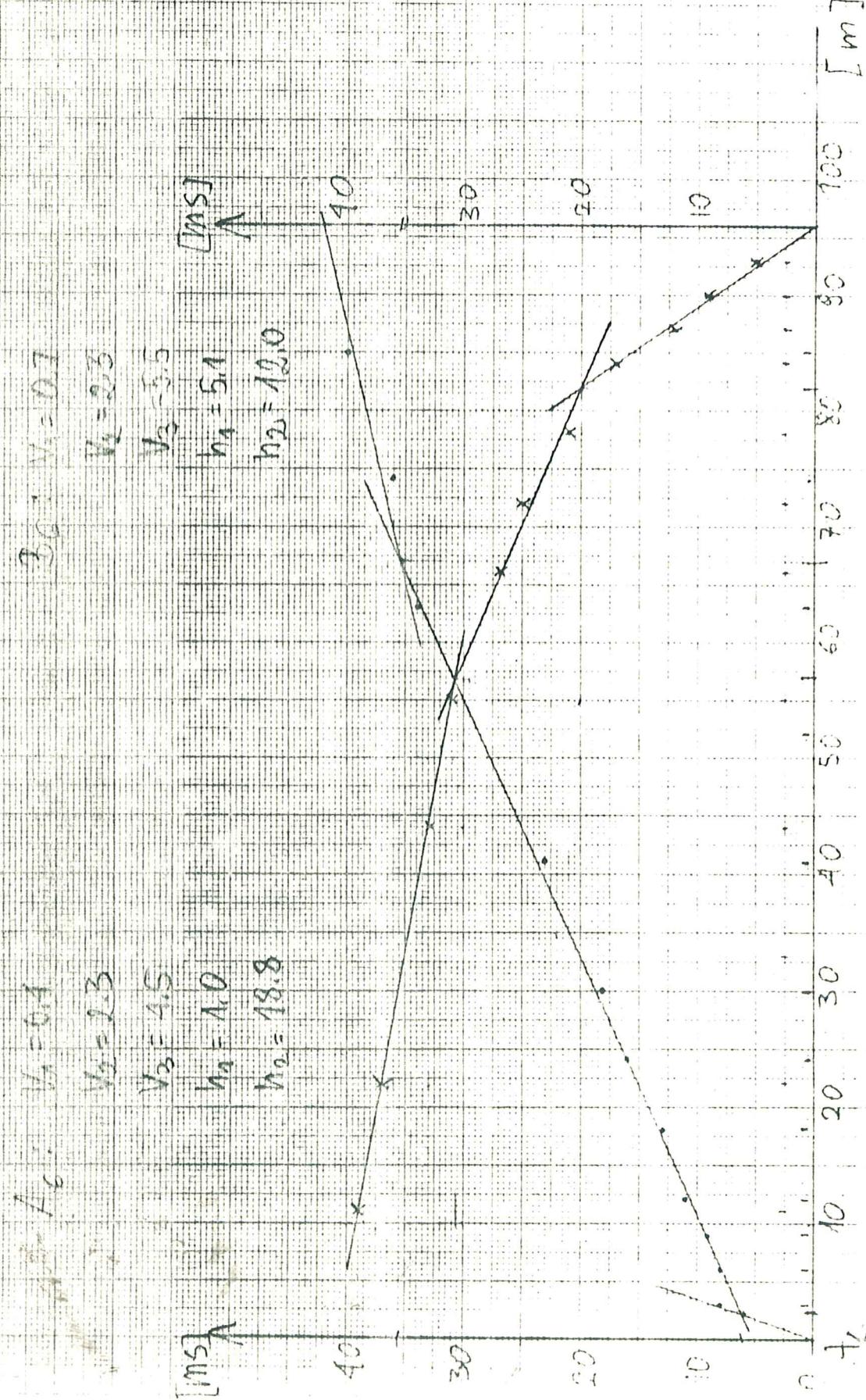
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I 6A₆-B₆

Fig. 9

x 3 3 3 6 6 6, H

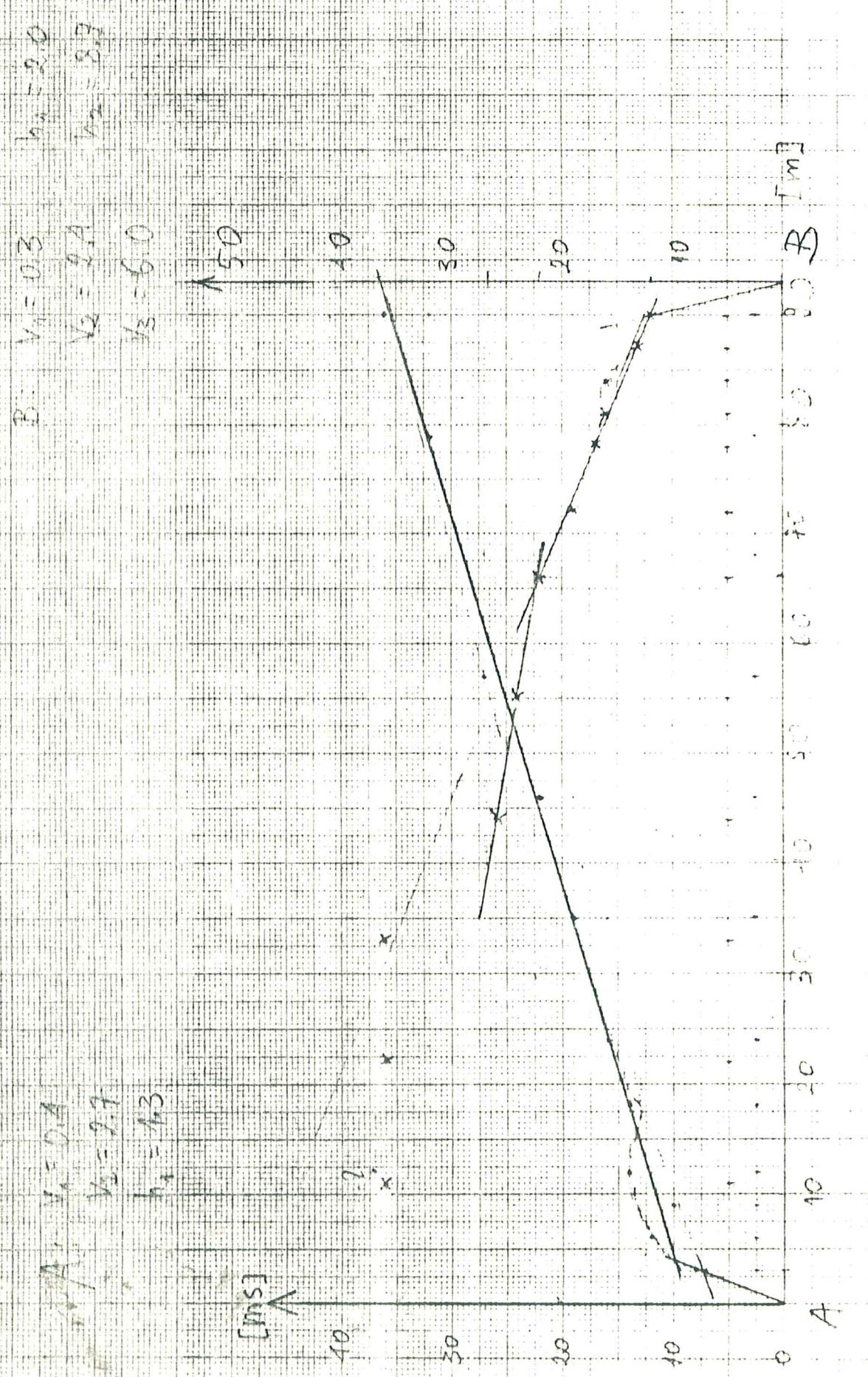


T A B

x 3 3 3,6 6 4

Fig. 10

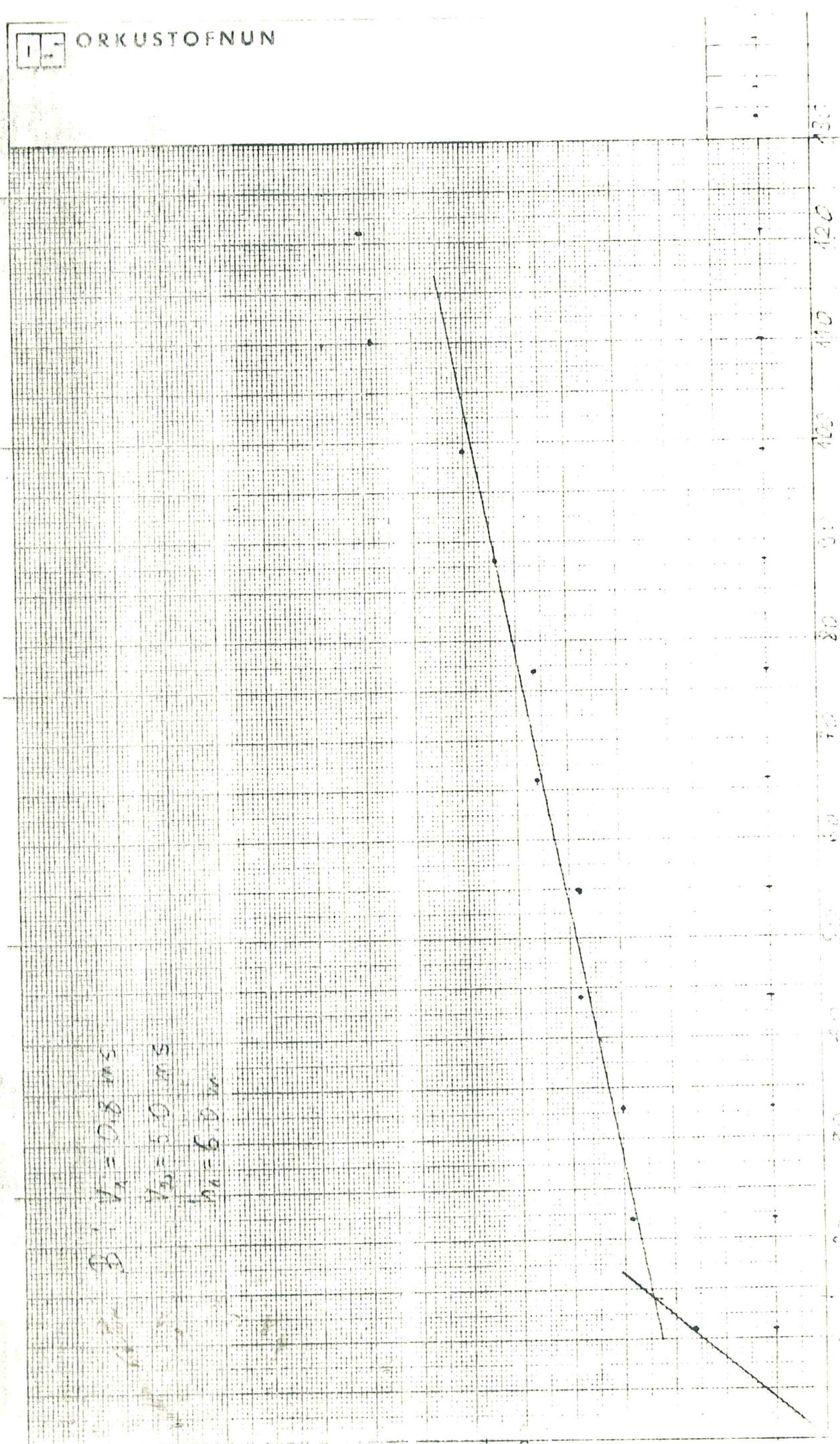
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Fig. 11

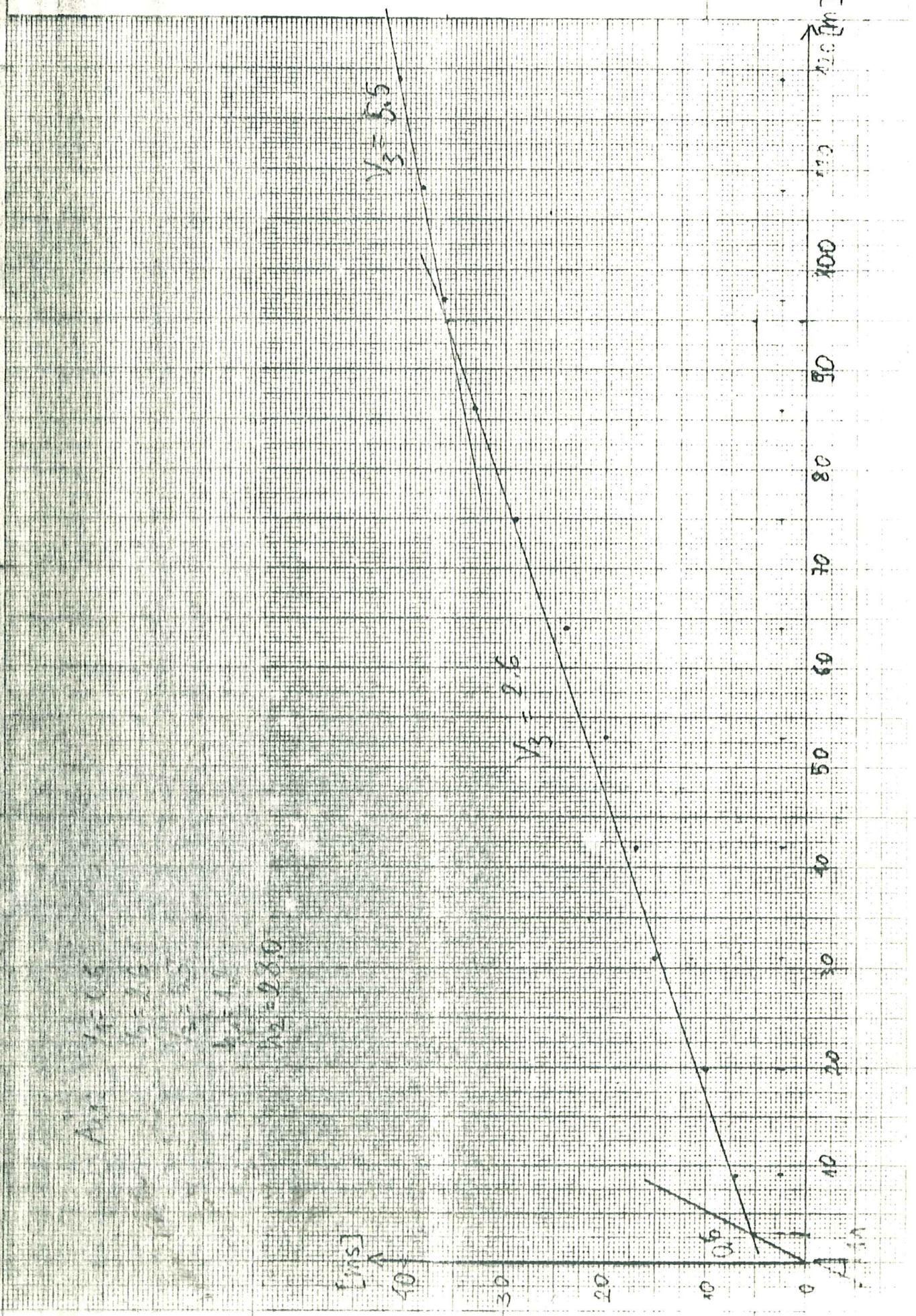
$$\begin{aligned} \text{1: } V_1 &= 24.8 \text{ m.s}^{-1} \\ V_2 &= 50 \text{ m.s}^{-1} \\ V_3 &= 6.0 \text{ m.s}^{-1} \end{aligned}$$



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Fig. 13

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Fig. 14

(x) 3-6-11, n.



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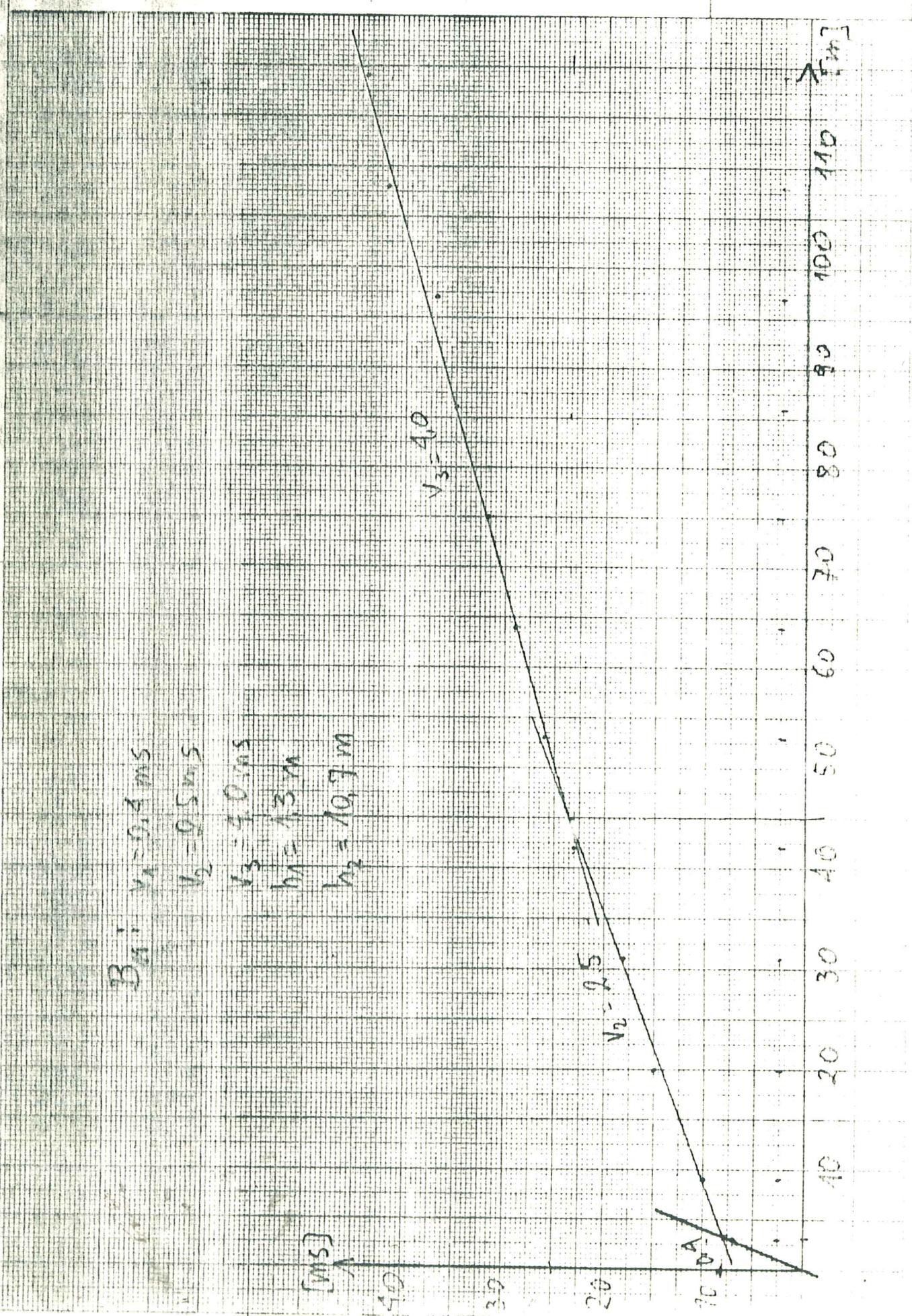
$$B_3: \quad V_1 = 0,4 \text{ m/s}$$

$$V_2 = 0,5 \text{ m/s}$$

$$V_3 = 1,0 \text{ m/s}$$

$$h_1 = 1,3 \text{ m}$$

$$h_2 = 10,9 \text{ m}$$



T 11 * A

Fig. 15

x 30 40 50 60 70 80 90 100 110

• 47 47

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$$V_1 = 0.6$$

$$V_2 = 3.4$$

$$V_3 = 5.5$$

$$h_1 = 1.3$$

$$h_2 = 3.3$$

$$V_2 = 3.4$$

$$V_3 = 5.5$$

7m

10 30 50 70 90 110 130 150 170

10 12 14 16 18 20 22 24

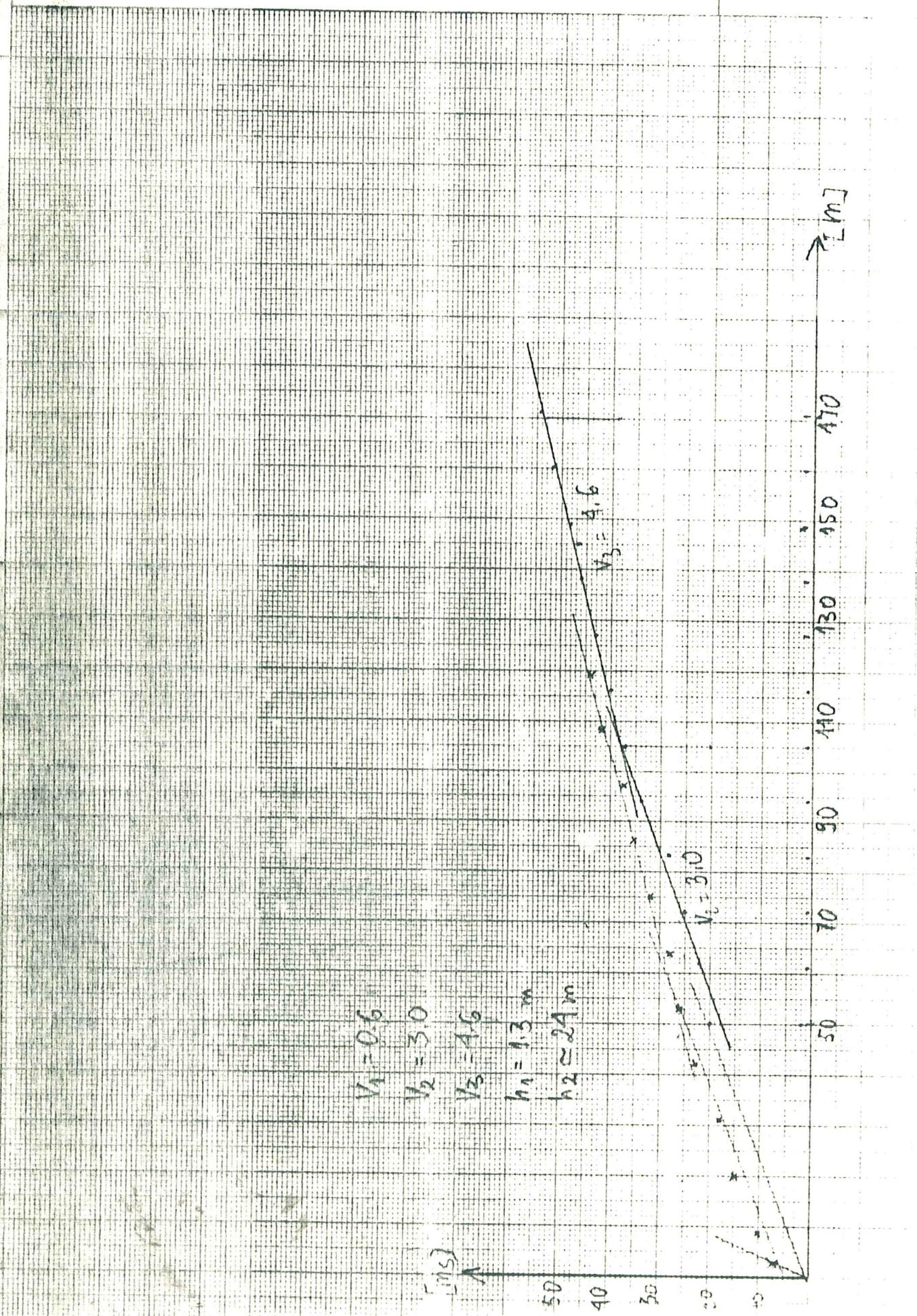
0.5 / 1



Fig. 16

~~x 50, M~~

T M*B



~~A₃~~

~~A₂~~

~~A₃-B₂~~

geophones are in ditch

Fig. 17



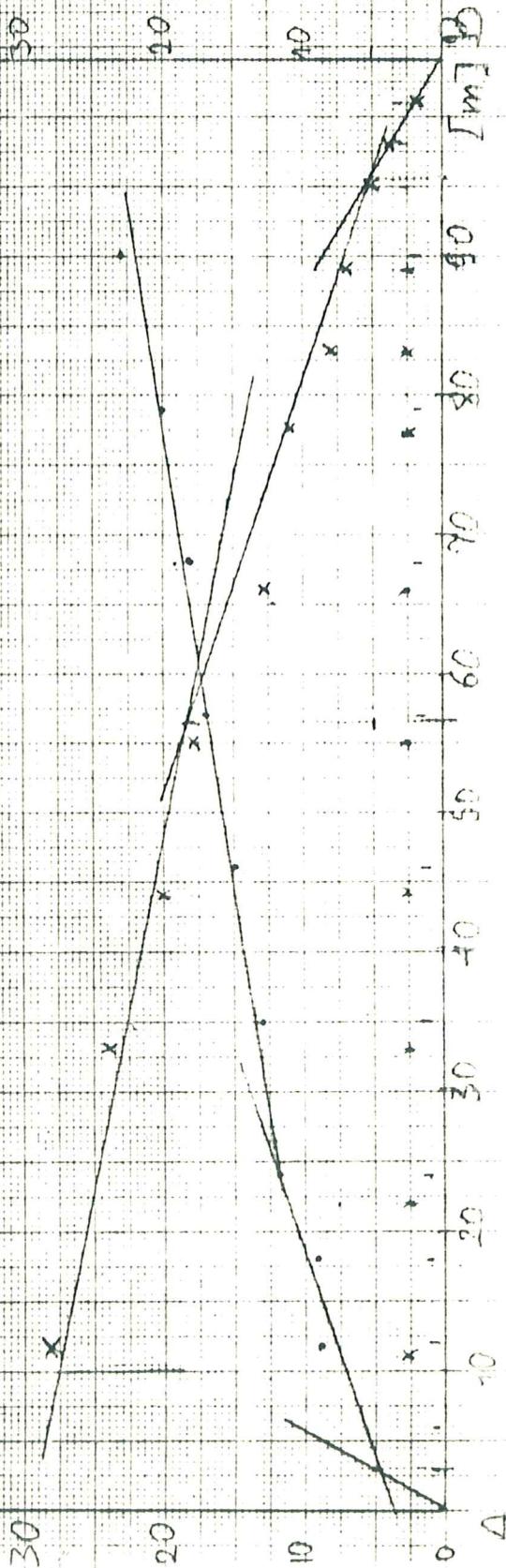
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$$A_3: \quad V_1 = 0.5 \\ V_2 = 2.4$$

$$V_3 = 6.6 \\ h_1 = 1.2 \\ h_2 = 4.4$$

m S

to



$$\overline{A}^* - \overline{B}_g^*$$

$$C_{5,4,4}$$

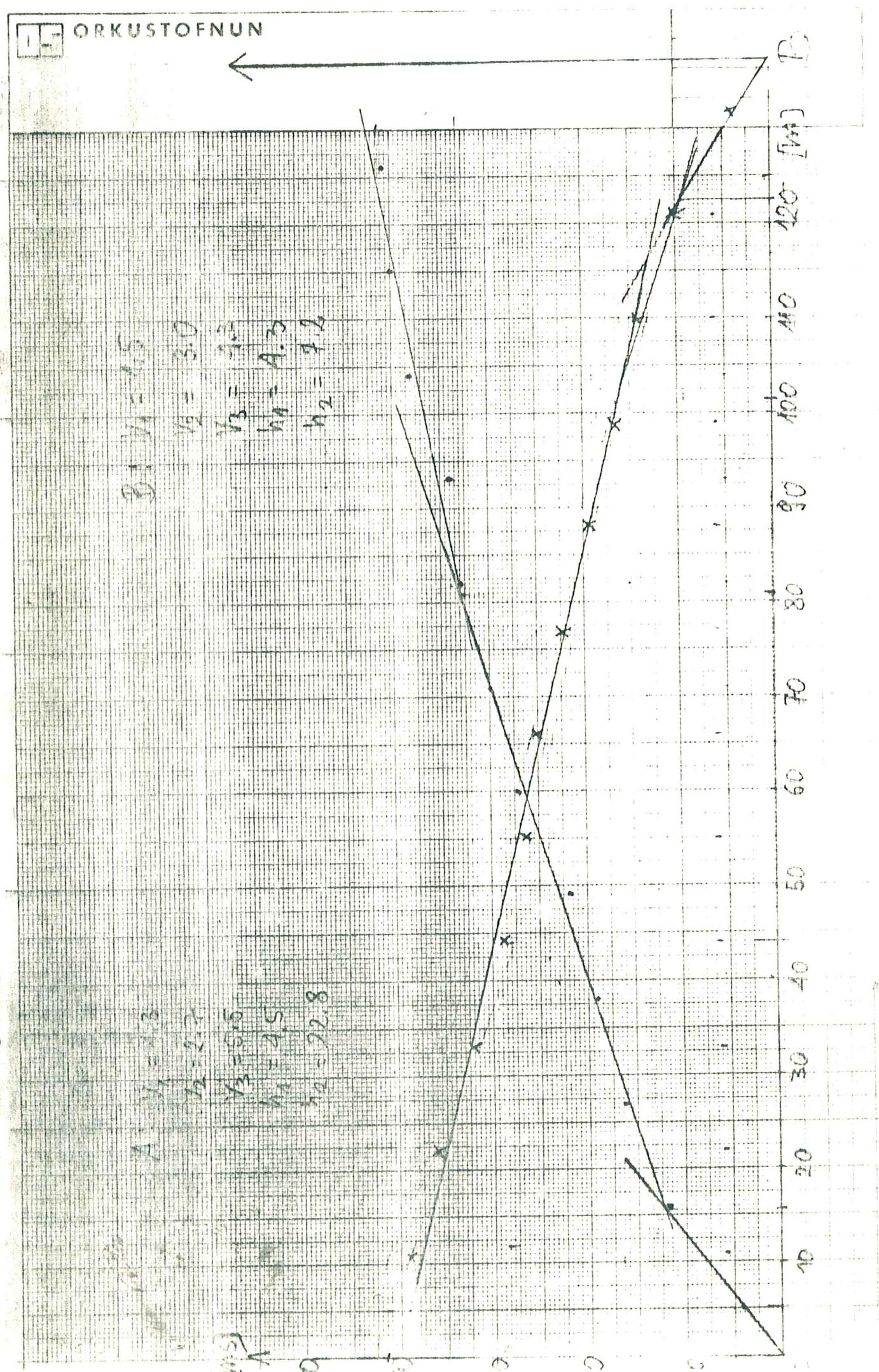
$$C_{2,1,1}$$

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C

C

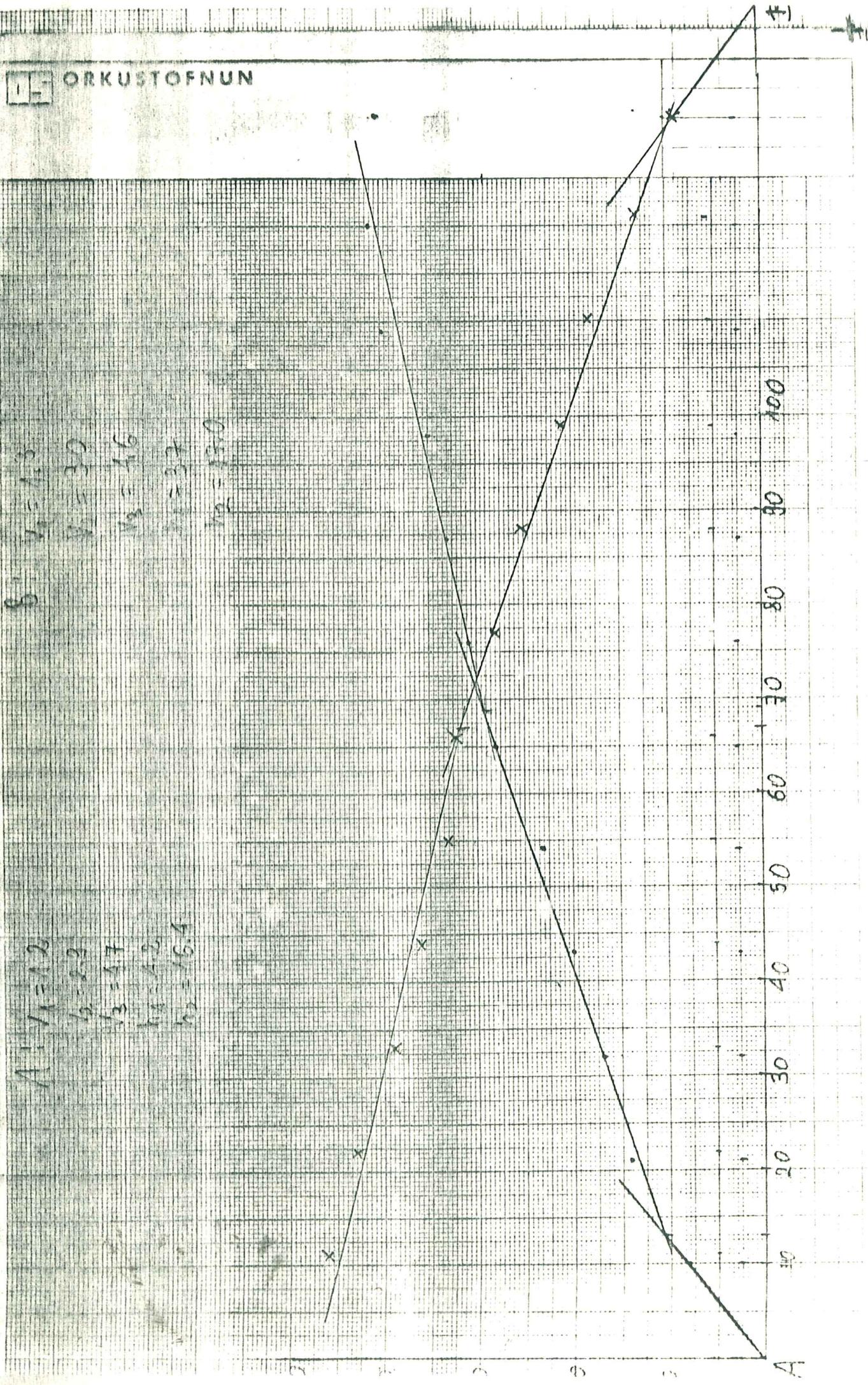
Fig. 18



$\bar{A} \times 10, \bar{B} \times 10$

$\bar{A} g^* A_g g^* - B g^* B_g$

Fig. 19

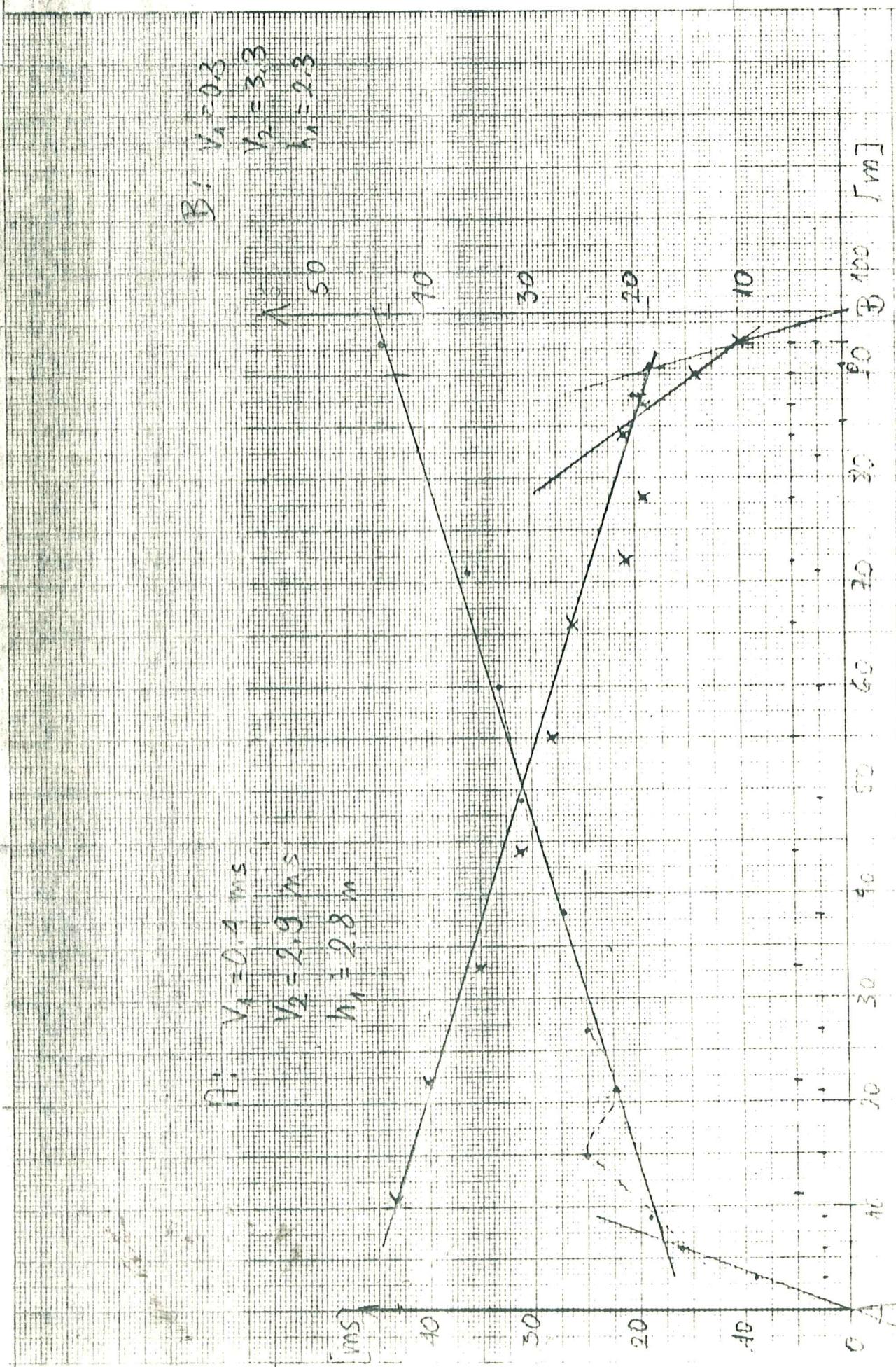


II 8A_g-B_g

Fig. 20

B₁: $V_1 = 0.4 \text{ m/s}$
 $V_2 = 2.9 \text{ m/s}$
 $h_1 = 2.3 \text{ m}$

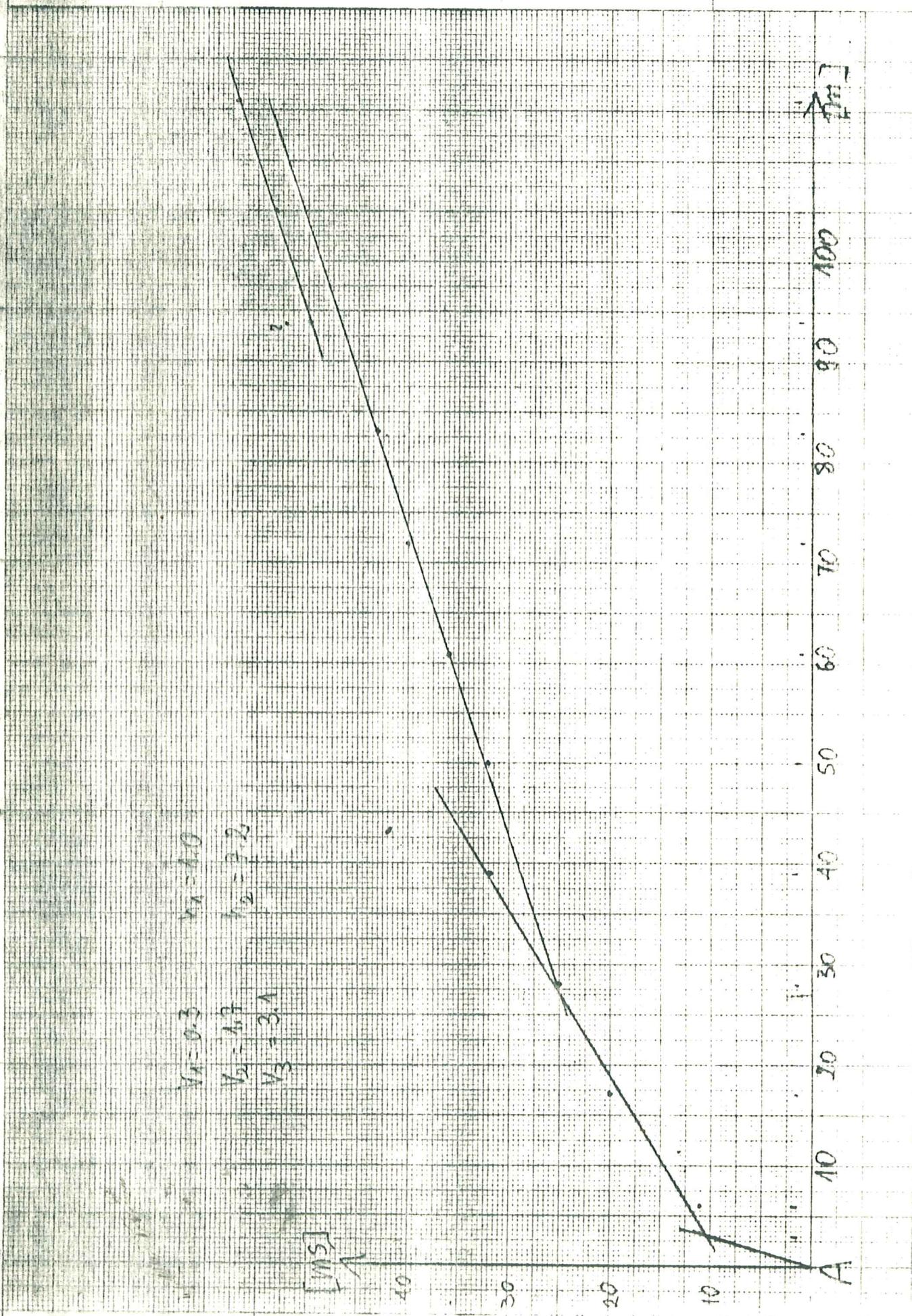
B₂: $V_1 = 0.3$
 $V_2 = 3.3$
 $h_1 = 2.3$



II 10A

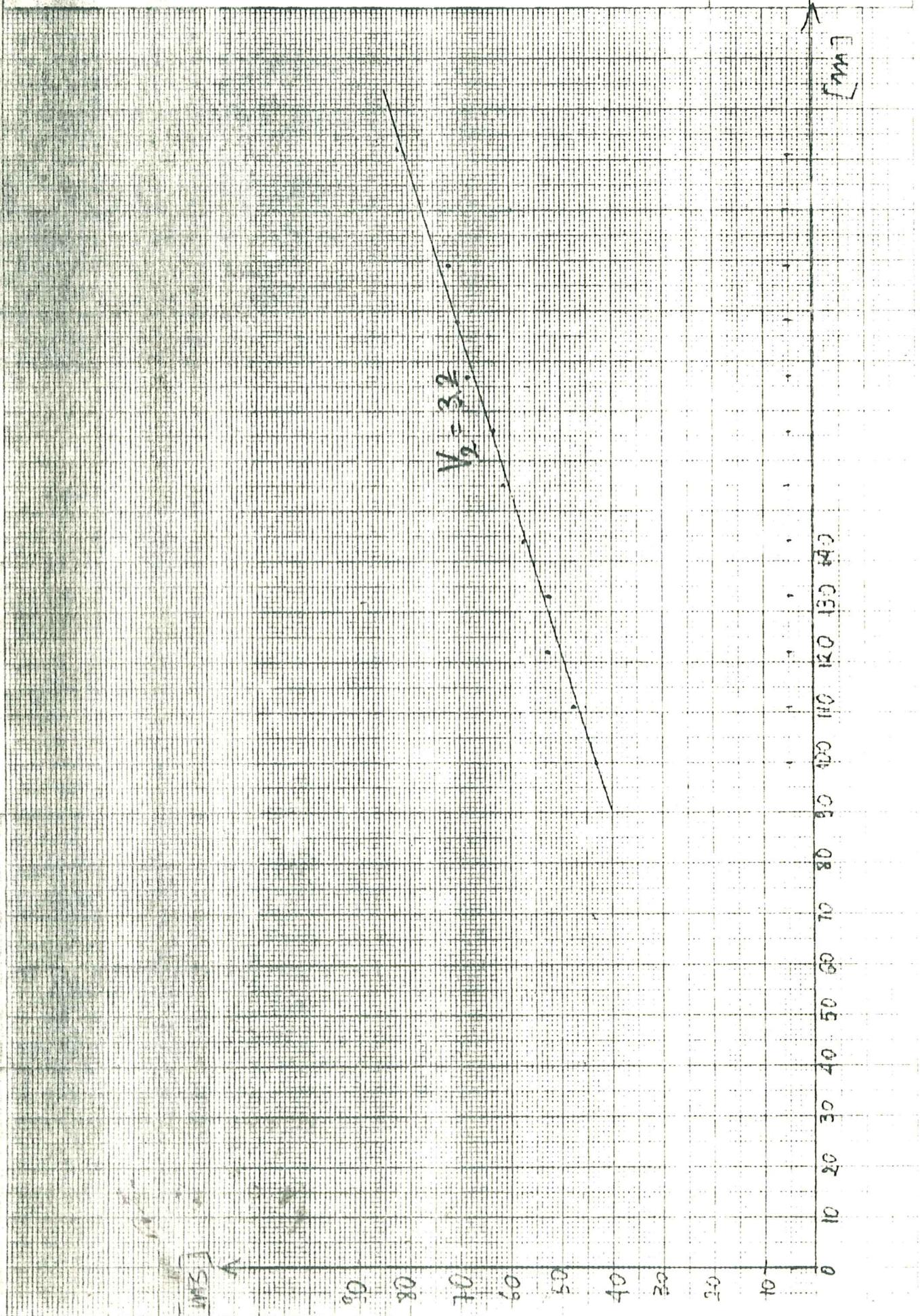
Fig. 21

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100M 100M

Fig. 22



T 10A'

(150 110 =

Hg. 23



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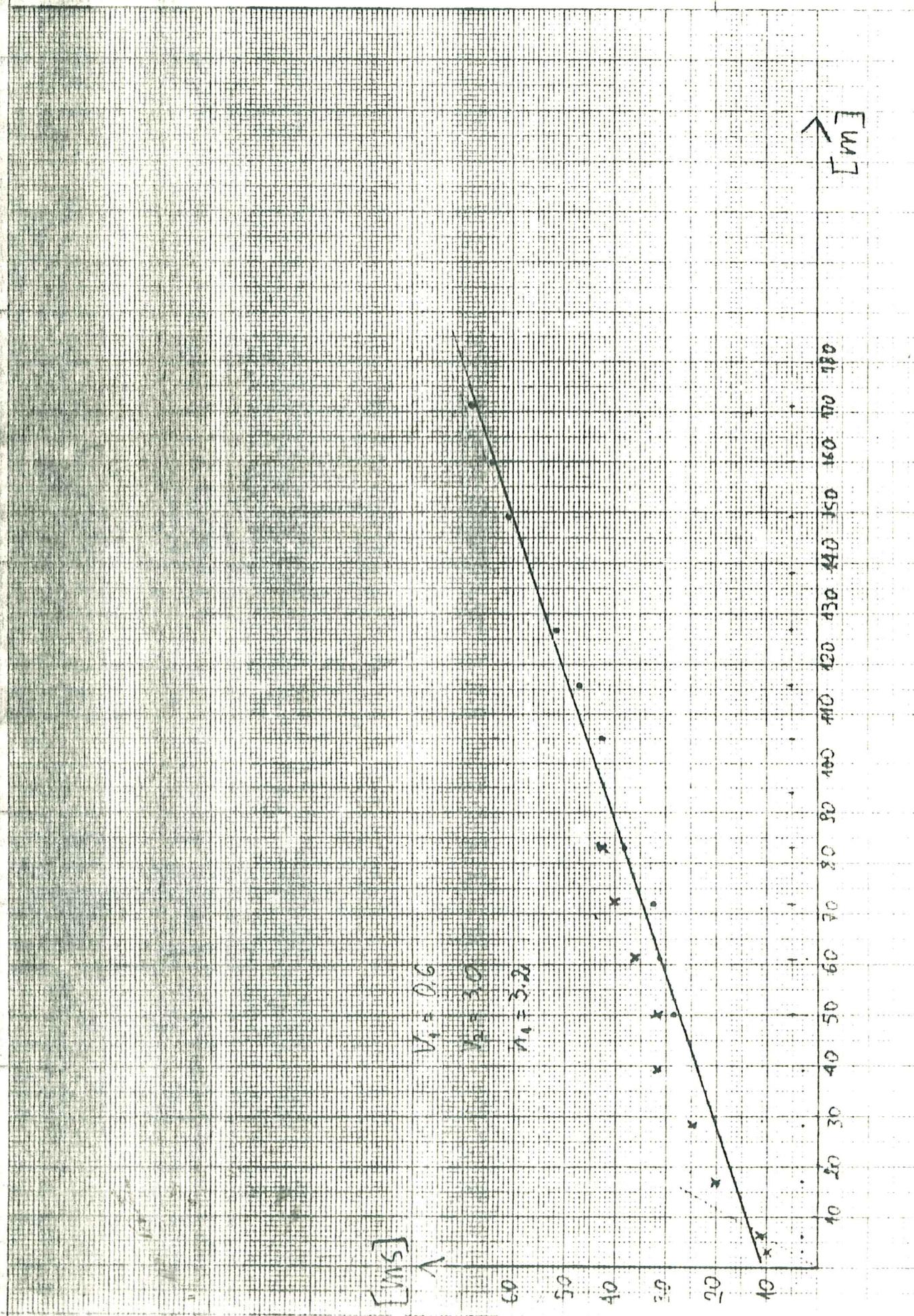


Fig. 24

II/10A^u 30.11.11