

Slonimsky's Multiplying Device: Cylinder Developments and Calculation Methods

Dimitry Zlatopolski

Introduction

Selig Slonimsky's multiplying device, invented in Russia in 1844, is described in [1–5]. It was an oblong, low box measuring $40 \times 33 \times 5$ cm (fig. 1).

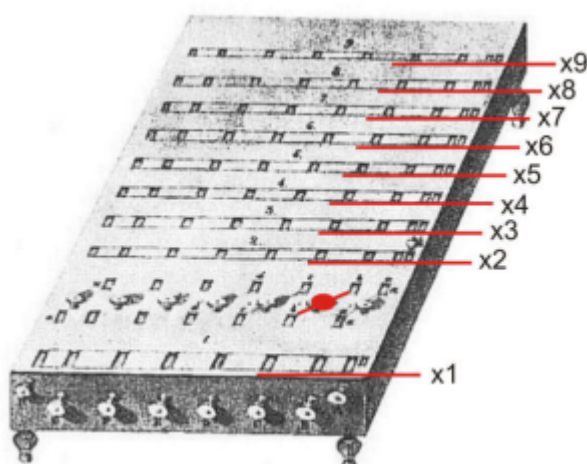


Fig. 1 [2]

Inside the box were 8 cylinders (Slonimsky in [5] designated them from right to left: A, B, C, D, E, F, G, H). All the cylinders had rows of digits and letters on them. The cylinders could be rotated by handles on the front wall of the device, and cylinders B, C, D, E, F, G, in addition, – moved along their axis by handles located between rows 1 and 2. One of the last cylinders is shown in fig. 2.

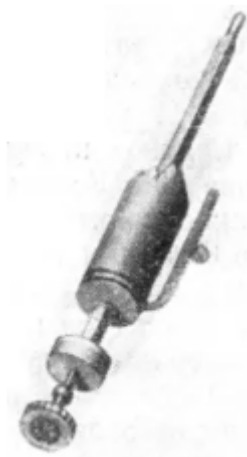


Fig. 2 [1]

The holes in the closest row displayed the multiplicand, and the eight farthest rows displayed the digits of its product by 2, 3, ..., 9.

Between rows 1 and 2, the holes were located diagonally.

This article describes the developments of cylinders and a detailed calculation methods on this device.

Developments of cylinders

The developments of all eight cylinders (from left to right) – H, G, F, E, D, C, B, A) can be divided into three parts (fig. 3):

- 1) part with digits;
- 2) row 1;
- 3) pointer part (the digits and letters of this part were displayed in diagonally located holes between the “main” rows 1 and 2; the rows of the pointer part will be referred to hereinafter as “pointer row 1” and “pointer row 2”).

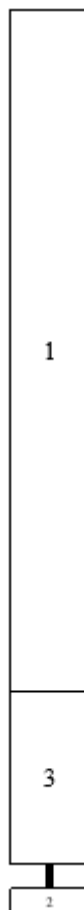


Fig. 3

Cylinder A development (enlarged)

1	2	3	4	5	6	7	8	9	0
2	4	6	8	0	2	4	6	8	0
3	6	9	2	5	8	1	4	7	0
4	8	2	6	0	4	8	2	6	0
5	0	5	0	5	0	5	0	5	0
6	2	8	4	0	6	2	8	4	0
7	4	1	8	5	2	9	6	3	0
8	6	4	2	0	8	6	4	2	0
d ³	d ⁶	d ⁵	b ⁵	c ⁴	d ³	a ³	b ²	a ¹	a ¹
9	8	7	6	5	4	3	2	1	0

Fig. 4

Cylinder B, C, D, E, F, G development

- part with digits (fragments):

011190000	...	423331122
112200119		332662733
233312220		643333144
344323341		856674334
455444133		977784447
667755441		088997188
778866771		199908889
901889994		744499933
1112299907		853363331
223300118		966774433
334411229		077885566
445522330		188996677
566634441		290007888
667744550		300118899
900177884		066673331
111888885		077774441
222299996		188885553
333300007		299996666
444411118		300007777
555522229		411118888
666633330		512228999
900044445		288884441
111177773		399995555
122218883		490006666
223388994		500116677
334499905		611127778
444400004		622229999
555511117		733339999
900033330		500003333
011144440		601115554
111246671		711126667
222277772		722227777
933378889		833337888
333488993		933348889
444499994		944449999
800014448		899996666
000144558		922236667
111155559		933337777
112255669		033447788
222266660		044448888
333367770		143338999
333277771		153339999
900033334		144447777
000033336		144447777
011134446		243337888
111144447		253338888
111244557		353348889
222255558		366669999
222255550		366669999
900022224		466668888
900022226		466668888
900022229		466668888
901122334		566778889
111133335		577779999
111133335		577779999

Fig. 5 (56 rows, 40 columns)

Calculation methods

Let's look at an example of multiplying the number 9785.

By rotating the front handle of cylinder A, it was turned to a position in which the last digit of the multiplicand 5 was displayed in the hole of row 1. At the same time, the “code” c^4 was displayed in the hole of the pointer row 1 (see fig. 6 and fig. 9)¹.

Pointer row 1								c^4
Pointer row 2								
Row 1								5
Cylinder	H	G	F	E	D	C	A	

Fig. 9

This code, like other codes that were displayed in other holes of the pointer row 1, “spoke” about what actions should be performed in the place on the left. These actions are as follows.

Cylinder B (tens place) was rotated by means of the front handle to a position where $\frac{c}{8}$ was displayed in the hole in row 1 (8 is the penultimate digit of the multiplicand, c is the letter from the code on the right) – see fig. 10.

Pointer row 1								c^4
Pointer row 2								
Row 1							$\frac{c}{8}$	5
Cylinder	H	G	F	E	D	C	B	A

Fig. 10

After this, the extreme right upper handle of the pointer part of the device was rotated (clockwise or counterclockwise) until the same code c^4 was displayed in the hole of pointer row 2 (shaded in fig. 10). In this case, cylinder B was shifted along the axis forward or backward to a position in which the tens digits of the sought products were displayed in rows 2, 3, ..., 9 (see fig. 11²).

¹ Other holes in the pointer rows displayed some values remaining after previous calculations.

² Fig. 11 shows the right part of the development with digits.

2 3 3 3 1 2 2 2
 3 3 4 4 2 2 3 3
 4 5 5 5 3 4 4 4
 5 6 6 7 4 5 5 6
 7 7 7 8 6 6 6 7
 8 8 9 9 7 7 8 8
 9 9 9 0 8 8 8 9
 4 4 5 5 2 2 3 3
 5 5 5 6 3 3 3 4
 6 6 7 7 4 4 5 5
 7 7 8 8 5 5 6 6
 8 8 9 9 6 6 7 7
 9 0 0 0 7 8 8 8
 0 0 1 1 8 8 9 9
 6 6 6 7 3 3 3 4
 7 7 7 7 4 4 4 4
 8 8 8 8 5 5 5 5
 9 9 9 9 6 6 6 6
 0 0 0 0 7 7 7 7
 1 1 1 1 8 8 8 8
 1 2 2 2 8 9 9 9
 8 8 8 8 4 4 4 4
 9 9 9 9 5 5 5 5
 9 0 0 0 5 6 6 6
 0 0 1 1 6 6 7 7
 1 1 1 2 7 7 7 8
 2 2 2 2 8 8 8 8
 3 3 3 3 9 9 9 9
 0 0 0 0 5 5 5 5
 0 1 1 1 5 6 6 6
 1 1 1 2 6 6 6 7
 2 2 2 2 7 7 7 7
 2 3 3 3 7 8 8 8
 3 3 3 4 8 8 8 9
 4 4 4 4 9 9 9 9
 2 2 2 2 6 6 6 6
 2 2 2 3 6 6 6 7
 3 3 3 3 7 7 7 7
 3 3 4 4 7 7 8 8
 4 4 4 4 8 8 8 8
 4 5 5 5 8 9 9 9
 5 5 5 5 9 9 9 9
 4 4 4 4 7 7 7 7
 4 4 4 4 7 7 7 7
 4 5 5 5 7 8 8 8
 5 5 5 5 8 8 8 8
 5 5 5 6 8 8 8 9
 6 6 6 6 9 9 9 9
 6 6 6 6 9 9 9 9
 6 6 6 6 8 8 8 8
 6 6 6 6 8 8 8 8
 6 6 6 6 8 8 8 8
 6 6 7 7 8 8 9 9
 7 7 7 7 9 9 9 9
 7 7 7 7 9 9 9 9
 7 7 7 7 9 9 9 9

Fig. 11

At the same time (!) the code a^7 for the next hundreds place was displayed in the hole of pointer row 1 (see fig. 12).

Pointer row 1							a^7	c^4
Pointer row 2							c^4	
Row 1							$\frac{c}{8}$	5
Cylinder	H	G	F	E	D	C	B	A

Fig. 12

This automation was ensured by the fact that:

- 1) digits in the tens place and others on the development are arranged every 7 lines; it is at this distance from each other that the holes for displaying the result are located on the upper part of the device body in rows 2, 3, ..., 9;
- 2) the values a^7 and c^4 in the development in fig. 5 in the column corresponding to $\frac{c}{8}$, are 7 lines apart from each other (see fig. 12) and the same distance between the holes of the pointer rows 1 and 2.

$d^6 d^6 d^6 d^6 d^7 d^7 d^7$
 $d^6 d^6 d^6 d^6 d^7 d^7 d^7$
 $d^6 a^7 a^7 a^7 d^7 d^7 d^7$
 $a^7 a^7 a^7 a^7 d^7 d^7 d^7$
 $b^7 b^7 b^7 b^7 d^7 d^7 d^7$
 $b^7 c^7 c^7 c^7 d^7 d^7 d^7$
 $c^7 c^7 c^7 d^7 d^7 d^7$
 $a^1 b^1 c^1 d^1 a^1 b^1 c^1 d^1$
 $a^2 c^2 d^2 d^2 a^2 b^2 c^2 d^2$
 $a^3 b^3 c^3 d^3 a^3 b^3 c^3 d^3$
 $a^4 b^4 c^4 d^4 a^4 b^4 c^4 d^4$
 $a^5 b^5 c^5 d^5 a^5 b^5 c^5 d^5$
 $a^6 b^6 c^6 d^6 a^6 b^6 c^6 d^6$
 $a^7 b^7 c^7 d^7 a^7 b^7 c^7 d^7$

Fig. 13

The cylinders C, D and E were set in the required positions in a similar manner³, and cylinders F, G and H were set to the position where row 1 indicated $\frac{a}{0}$ and pointer row 2 – a1.

After all the actions, the situation was as in fig. 14.

³ The calculations ended when the value a1 appeared in the pointer row 1.

Pointer row 1		a ¹	a ¹	a ¹	d ⁷	c ⁶	a ⁷	c ⁴	
Pointer row 2		a ¹	a ¹	d ⁷	c ⁶	a ⁷	c ⁴		
Row 1	$\frac{a}{0}$	$\frac{a}{0}$	$\frac{a}{0}$	$\frac{d}{0}$	$\frac{c}{9}$	$\frac{a}{7}$	$\frac{c}{8}$	5	
Cylinder		H	G	F	E	D	C	B	A

Fig. 14

Calculation results on the device are shown in fig. 15:

0	0	0	8	8	0	6	5
0	0	0	7	8	2	8	0
0	0	0	6	8	4	9	5
0	0	0	5	8	7	1	0
0	0	0	4	8	9	2	5
0	0	0	3	9	1	4	0
0	0	0	2	9	3	5	5
0	0	0	1	9	5	7	0
	a^1	a^1	a^1	d^7	c^6	a^7	c^4
	a^1	a^1	d^7	c^6	a^7	c^4	
$\frac{a}{0}$	$\frac{a}{0}$	$\frac{a}{0}$	$\frac{d}{0}$	$\frac{c}{9}$	$\frac{a}{7}$	$\frac{c}{8}$	5

Fig. 15

In conclusion, we note that Slonimsky's device made it possible to determine the products of numbers no greater than 1,666,666.

It admire the fact that Selig Slonimsky, having placed several thousand numbers and letters on cylinders, created a device in which the products of a number by 2, 3, ..., 9 are determined so quickly and easily.

References

- 1 *Weiss, Stephan*. Slonimsky's Multiplying Device, an impressive Example for Applied Mathematics, Journal of the Oughtred Society Vol. 20, No.1, 2011. For unabridged version see <http://www.mechrech.info/publikat/SloniMultE.pdf>
- 2 *Weiss, Stephan*. Successors of Slonimsky's Multiplying Device 1844
<http://www.mechrech.info/publikat/JoffeFilipowski.pdf>
- 3 *Anonymous*. Selig Slonimski und sein Recheninstrument. Leipziger Illustrierte Zeitung, Vol. V, No. 110, 1845, pp. 90–92.
- 4 *Apokin, I. A., Maystrov L.E.* Development of computing machines. M., 1974 (Russian)
- 5 *Slonimsky Selig*. Description of a new numeral instrument invented by Selig Slonimsky... . SPb., 1845 (Russian)

Aug. 2025