Ada Lovelace

1815 –1852

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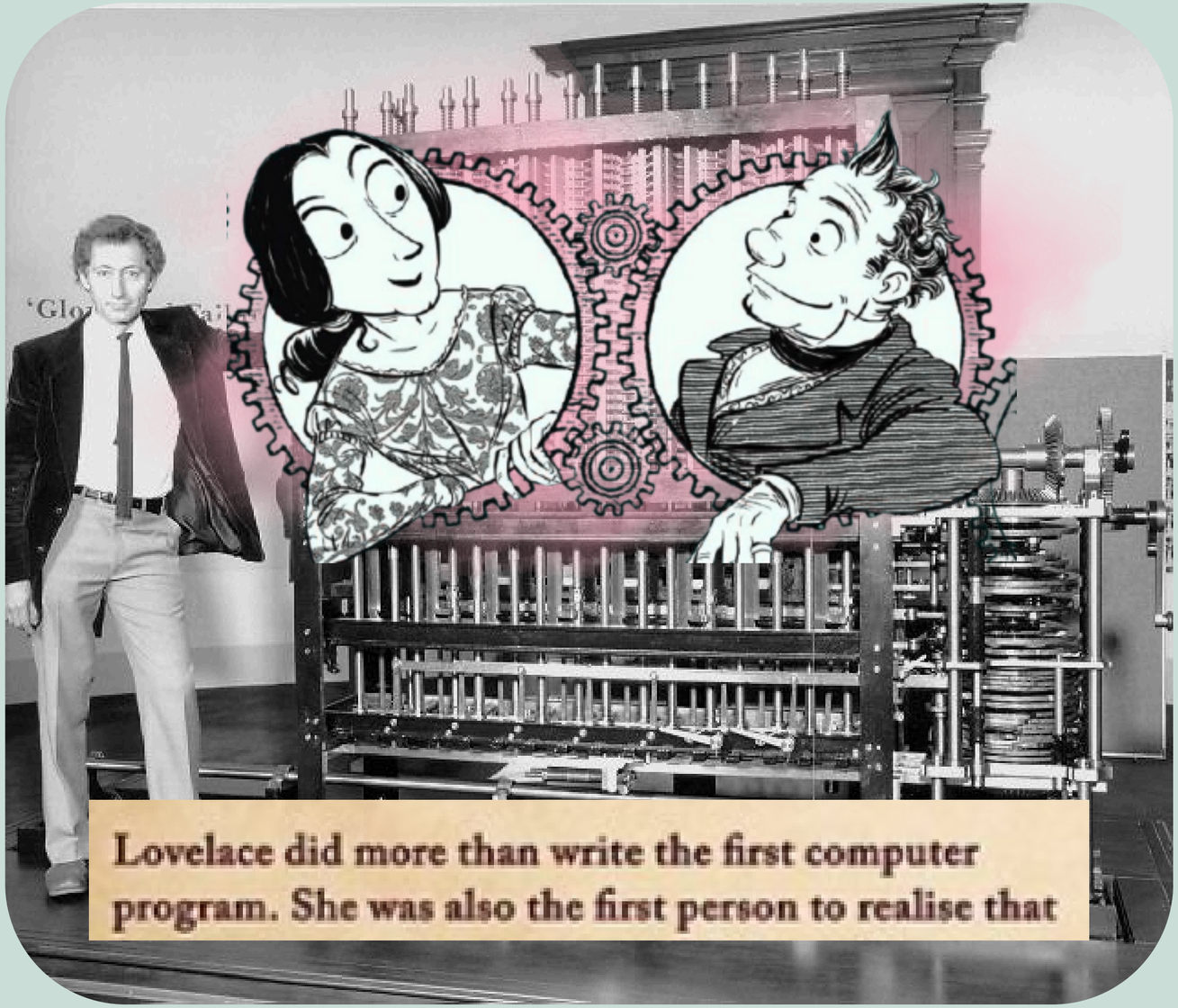
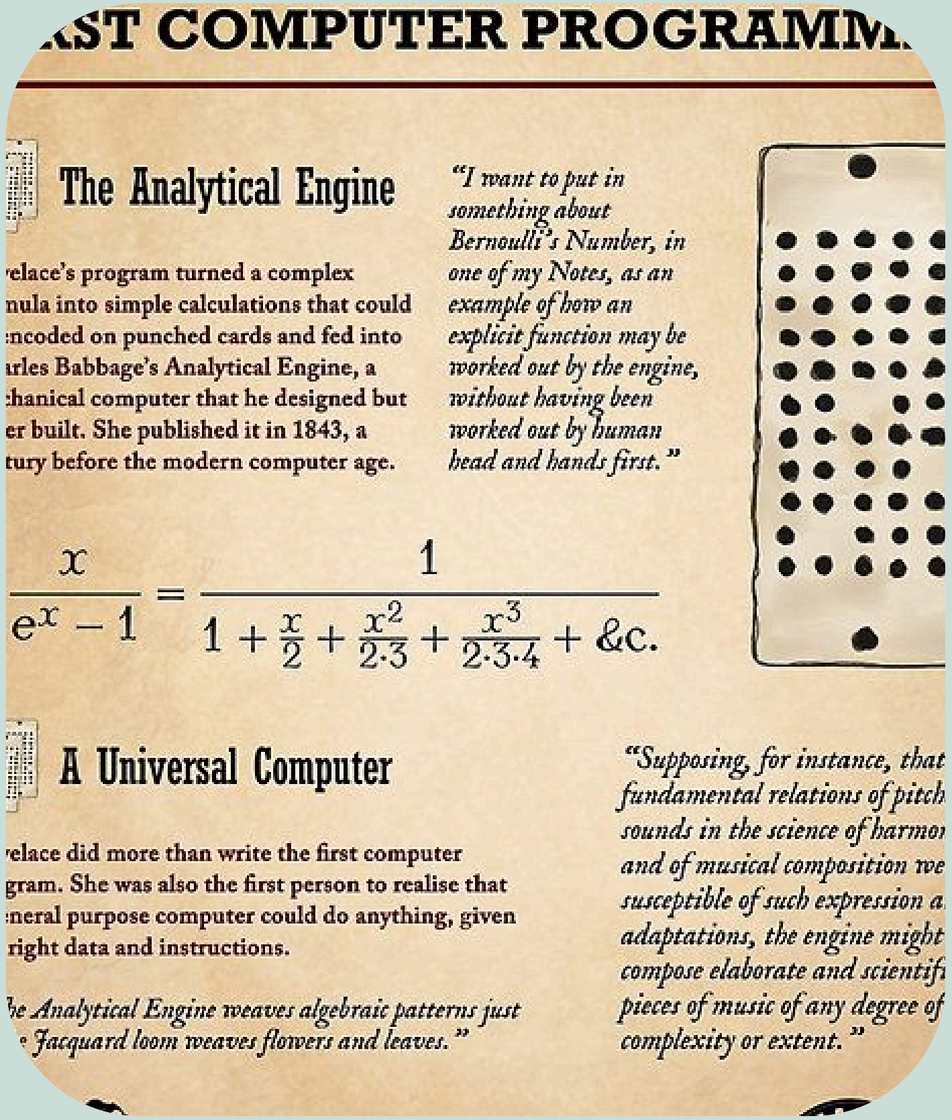

Lovelace did more than write the first computer program. She was also the first person to realise that


ST COMPUTER PROGRAMM
The Analytical Engine
velace's program turned a complex
nula into simple calculations that could
ncoded on punched cards and fed into
rles Babbage's Analytical Engine, a
hanical computer that he designed but
er built. She published it in 1843, a
tury before the modern computer age.
"I want to put in something about Bernoulli's Number, in one of my Notes, as an example of how an explicit function may be worked out by the engine, without having been worked out by human head and hands first."
$\frac{x}{e^x - 1} = \frac{1}{1 + \frac{x}{2} + \frac{x^2}{2 \cdot 3} + \frac{x^3}{2 \cdot 3 \cdot 4} + \&c.}$
A Universal Computer
velace did more than write the first computer
gram. She was also the first person to realise that
neral purpose computer could do anything, given
right data and instructions.
"Supposing, for instance, that fundamental relations of pitch sounds in the science of harmo and of musical composition we susceptible of such expression a adaptations, the engine might compose elaborate and scientifi pieces of music of any degree of complexity or extent."
he Analytical Engine weaves algebraic patterns just
Jacquard loom weaves flowers and leaves."

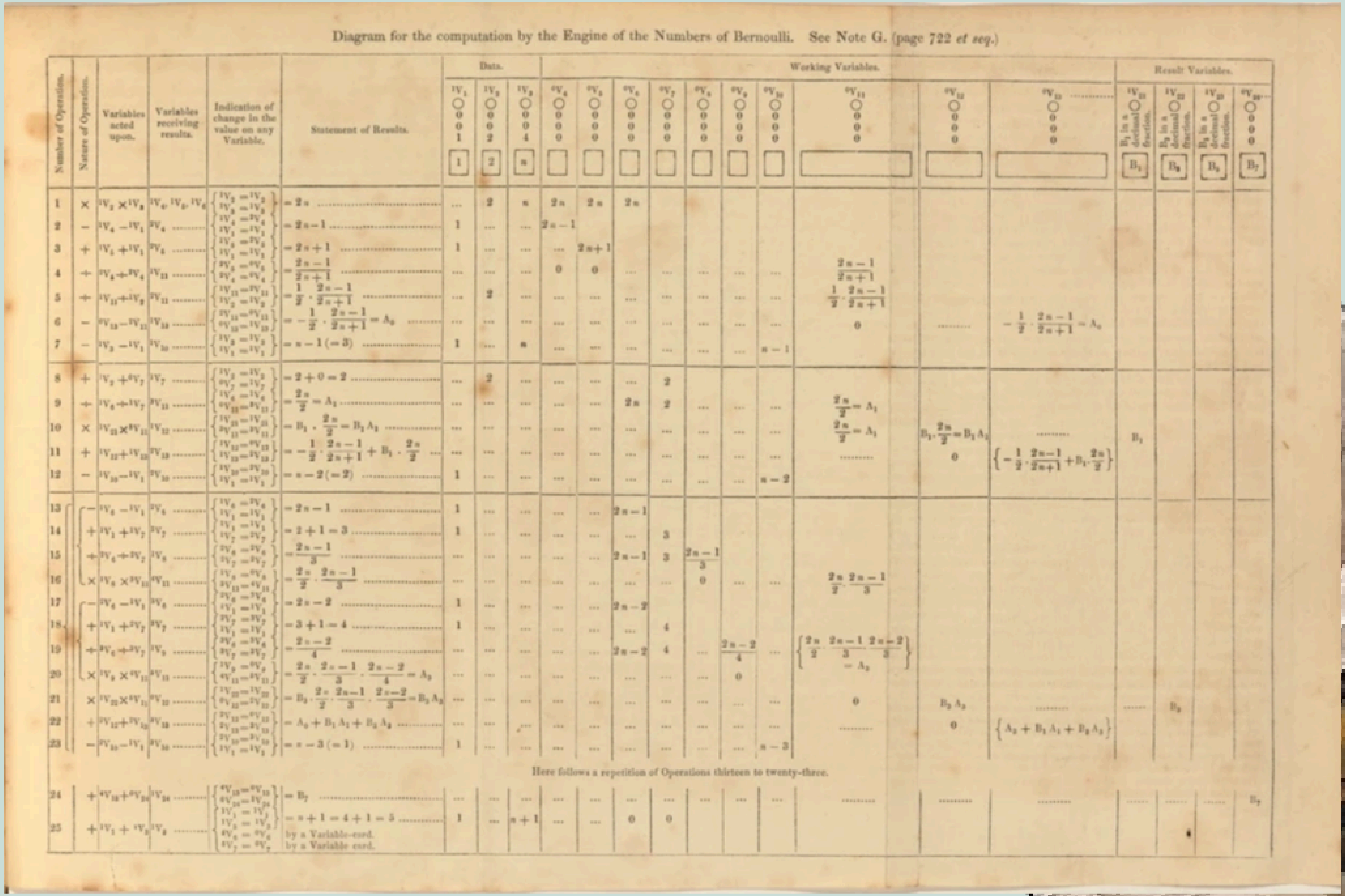


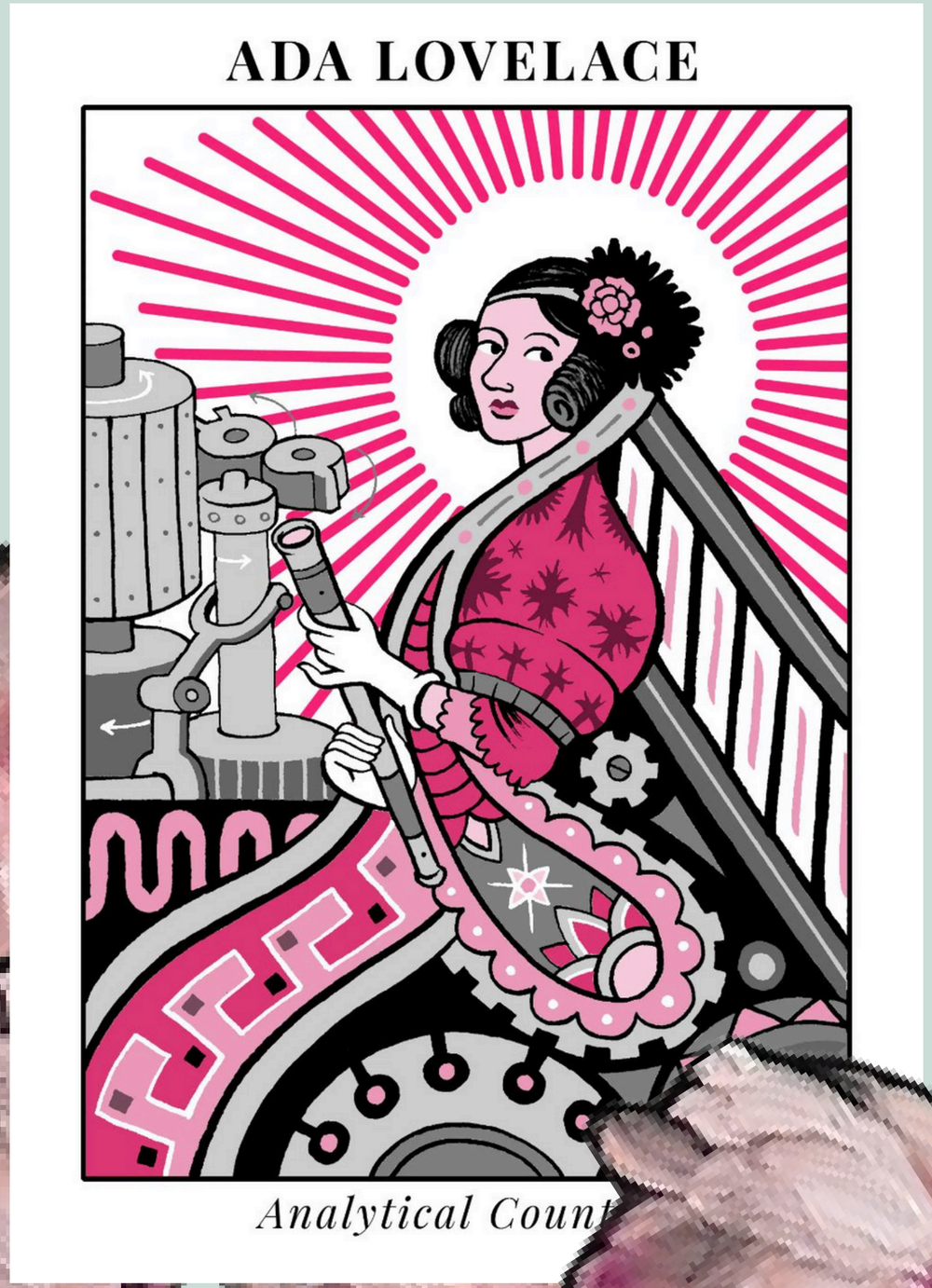
Diagram for the computation by the Engine of the Numbers of Bernoulli. See Note G. (page 722 *et seq.*)

Number of Operation.	Nature of Operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.
1	×	$^1V_2 \times {}^1V_3$	$^1V_4, {}^1V_5, {}^1V_6$	$\{^1V_2 = {}^1V_2;\ {}^1V_3 = {}^1V_3\}$	$= 2n$
2	−	$^1V_4 - {}^1V_1$	$^2V_4$	$\{^1V_4 = {}^2V_4;\ {}^1V_1 = {}^1V_1\}$	$= 2n - 1$
3	+	$^1V_5 + {}^1V_1$	$^2V_5$	$\{^1V_5 = {}^2V_5;\ {}^1V_1 = {}^1V_1\}$	$= 2n + 1$
4	÷	$^2V_5 \div {}^2V_4$	$^1V_{11}$	$\{^2V_5 = {}^0V_5;\ {}^2V_4 = {}^0V_4\}$	$= \frac{2n-1}{2n+1}$
5	÷	$^1V_{11} \div {}^1V_2$	$^2V_{11}$	$\{^1V_{11} = {}^2V_{11};\ {}^1V_2 = {}^1V_2\}$	$= \frac{1}{2} \cdot \frac{2n-1}{2n+1}$
6	−	$^0V_{13} - {}^2V_{11}$	$^1V_{13}$	$\{^2V_{11} = {}^0V_{11};\ {}^0V_{13} = {}^1V_{13}\}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} = A_0$
7	−	$^1V_3 - {}^1V_1$	$^1V_{10}$	$\{^1V_3 = {}^1V_3;\ {}^1V_1 = {}^1V_1\}$	$= n - 1 \ (= 3)$
8	+	$^1V_2 + {}^0V_7$	$^1V_7$	$\{^1V_2 = {}^1V_2;\ {}^0V_7 = {}^1V_7\}$	$= 2 + 0 = 2$
9	÷	$^1V_6 \div {}^1V_7$	$^3V_{11}$	$\{^1V_6 = {}^1V_6;\ {}^0V_{11} = {}^3V_{11}\}$	$= \frac{2n}{2} = A_1$
10	×	$^1V_{21} \times {}^3V_{11}$	$^1V_{12}$	$\{^1V_{21} = {}^1V_{21};\ {}^3V_{11} = {}^3V_{11}\}$	$= B_1 \cdot \frac{2n}{2} = B_1 A_1$
11	+	$^1V_{12} + {}^1V_{13}$	$^2V_{13}$	$\{^1V_{12} = {}^0V_{12};\ {}^1V_{13} = {}^2V_{13}\}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} + B_1 \cdot \frac{2n}{2}$
12	−	$^1V_{10} - {}^1V_1$	$^2V_{10}$	$\{^1V_{10} = {}^2V_{10};\ {}^1V_1 = {}^1V_1\}$	$= n - 2 \ (= 2)$
13	−	$^1V_6 - {}^1V_1$	$^2V_6$	$\{^1V_6 = {}^2V_6;\ {}^1V_1 = {}^1V_1\}$	$= 2n - 1$
14	+	$^1V_1 + {}^1V_7$	$^2V_7$	$\{^1V_1 = {}^1V_1;\ {}^1V_7 = {}^2V_7\}$	$= 2 + 1 = 3$
15	÷	$^2V_6 \div {}^2V_7$	$^1V_8$	$\{^2V_6 = {}^2V_6;\ {}^2V_7 = {}^2V_7\}$	$= \frac{2n-1}{3}$
16	×	$^1V_8 \times {}^3V_{11}$	$^4V_{11}$	$\{^1V_8 = {}^0V_8;\ {}^3V_{11} = {}^4V_{11}\}$	$= \frac{2n}{2} \cdot \frac{2n-1}{3}$
17	−	$^2V_6 - {}^1V_1$	$^3V_6$	$\{^2V_6 = {}^3V_6;\ {}^1V_1 = {}^1V_1\}$	$= 2n - 2$
18	+	$^1V_1 + {}^2V_7$	$^3V_7$	$\{^2V_7 = {}^3V_7;\ {}^1V_1 = {}^1V_1\}$	$= 3 + 1 = 4$
19	÷	$^3V_6 \div {}^3V_7$	$^1V_9$	$\{^3V_6 = {}^3V_6;\ {}^3V_7 = {}^3V_7\}$	$= \frac{2n-2}{4}$
20	×	$^1V_9 \times {}^4V_{11}$	$^5V_{11}$	$\{^1V_9 = {}^0V_9;\ {}^4V_{11} = {}^5V_{11}\}$	$= \frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{4} = A_3$
21	×	$^1V_{22} \times {}^5V_{11}$	$^0V_{12}$	$\{^1V_{22} = {}^1V_{22};\ {}^0V_{12} = {}^2V_{12}\}$	$= B_3 \cdot \frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{3} = B_3 A_3$
22	+	$^2V_{12} + {}^2V_{13}$	$^3V_{13}$	$\{^2V_{12} = {}^0V_{12};\ {}^2V_{13} = {}^3V_{13}\}$	$= A_0 + B_1 A_1 + B_3 A_3$
23	−	$^2V_{10} - {}^1V_1$	$^3V_{10}$	$\{^2V_{10} = {}^3V_{10};\ {}^1V_1 = {}^1V_1\}$	$= n - 3 \ (= 1)$

Here follows a repetition of Operations thirteen to twenty-three.

Number of Operation.	Nature of Operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.
24	+	$^4V_{13} + {}^0V_{24}$	$^1V_{24}$	$\{^4V_{13} = {}^0V_{13};\ {}^0V_{24} = {}^1V_{24}\}$	$= B_7$
25	+	$^1V_1 + {}^1V_3$	$^1V_3$	$\{^1V_1 = {}^1V_1;\ {}^1V_3 = {}^1V_3;\ {}^5V_6 = {}^0V_6;\ {}^5V_7 = {}^0V_7\}$	$= n + 1 = 4 + 1 = 5$ by a Variable-card. by a Variable card.

Note G © Magdalen College Libraries and Archives, Daubeny 90.A.11



★ 1852

Thank you for your attention