

232 AN INTRODUCTION TO AUTOMATIC COMPUTERS

<u>Year</u>	<u>Country</u>	<u>Developer</u>	<u>Development</u>
?	Near East	?	Notched Sticks, Knotted Strings
?	Far East	?	Abacus
960	France	Gerbert	Moorish Calculating Ideas
1580?	Scotland	Napier	Napier's Bones (Logarithms)
1632?	England	Oughtred	Slide Rule
1642	France	Pascal	Number Wheel and Ratchet
1666	England?	Moreland	Multiplication by Repeated Addition
1671	Germany	Leibnitz	Stepped Cylinder (Calculus)
1745	France	Jacques	Loom Controlled by Punched Cards
1770	Germany	Hahn	First Dependable Four-Process Calculator (using Leibnitz Cylinder)
1786	Germany	Müller	Idea for a Difference Engine
1812	England	Babbage	Models of Automatic "Analytical" Engines
1814	Germany	Hermann	Planimeter
1820	France	Thomas	Crank Machine using Leibnitz Cylinder
1850	Germany	Mannheim	Improved Slide Rule
1851	Switzerland	Schilt	Keyboard Machine with Springs and Ratchet
1853	Sweden	Scheutz	Difference Engine
1854	England	Boole	"Laws of Thought" (Boolean Algebra)
1857	U. S. A.	Hill	First Key Driven Machine
1863	Sweden	Wiberg	Difference Engine
1869	U. S. A.	Sinclair	Tabular Freight Computer
1872	U. S. A.	Baldwin	First Reversible Four-Process Calculator (no keyboard)
1872	U. S. A.	Barbour	Model of a Direct Multiplying Machine
1878	U. S. A.	Verea	First model of widely used Direct Multiplying Method
1878	England	Kelvin	Mechanical Integrator
1878	Germany	Ohdner	Retractable Teeth System like Baldwin's
1884	U. S. A.	Felt	Simple Key-Driven Reciprocating Machine ("Comptometer")
1885	U. S. A.	Grant	Crank Operated Reciprocating Adding Machine (also Difference Engine)
1886	Germany	Selling	Direct Multiplying Machine similar to Vereas
1886	U. S. A.	Burroughs	Listing Calculator with Keyboard

FIG. 34. A Chronology of Computing Developments

<u>Year</u>	<u>Country</u>	<u>Developer</u>	<u>Development</u>
1889	France	Bollee	Difference Engine with Direct Multiplication
1897	Germany	Steiger	"Millionaire Machine" like Bollee's
1901	U. S. A.	Hopkins	Ten-Key Adding Machines ("Standard")
1902	U. S. A.	Rechnitzer	Multiplication-Division Machine
1902	U. S. A.	Baldwin	Improved Carry Mechanism for Baldwin Machine
1906	U. S. A.	DeForrest and others	Vacuum Tube
1908	U. S. A.	Hopkins	Burroughs-Bookkeeping Machine
1911	U. S. A.	Monroe, Baldwin	Modified Baldwin Machine
1911	U. S. A.	Herman, Coxhead	Mercedes-Euclid Machine
1212	U. S. A.	Sundstrand	Improved Ten-Key Adding Machine
1913	Switzerland	Jahnz	Improved Rechnitzer Machine
1919	U. S. A.	Eccles, Jordan	Flip-flop circuit
1920	Spain	Torres y Quevedo	Electro-Mechanical Typewriter-Controlled Machine with Comparison Division
1920	U. S. A.	Monroe, Baldwin	First fully automatic "Monroe" Machine
1929	U. S. A.	G. E. Co.	A. C. Network Analyzer
1931	U. S. A.	Bush	Mechanical Differential Analyzer
1936	U. S. A.	Turing	Ph.D. Thesis at Princeton
1938	U. S. A.	Philbrick	Operational Amplifier
1944	U. S. A.	Aiken and IBM	Harvard Mark I—first automatic computer type-machine
1947	U. S. A.	Eckert, Mauchly	ENIAC—first high-speed electronic automatic computer
1948	U. S. A.	Bardeen, Brattain, Schockley	Transistor
1949	England	Wilkes	EDSAC—first stored program computer
1949	U. S. A.	IBM	CPC—first commercially available automatic computer-type machine
1950	U. S. A.	Forrester, Taylor, Everett, Youtz	Whirlwind I—a semibasic type of automatic computer (M. I. T.)
1951	U. S. A.	Remington Rand	UNIVAC I—first large scale general purpose commercially available automatic computer
1952	U. S. A.	Mauchly, Eckert, Von Neumann	EDVAC—a basic type of automatic computer (U. of Pennsylvania)
1952	U. S. A.	Von Neumann, Goldstine, Burks	IAS—a basic type of automatic computer (Princeton)
1955	U. S. A.	IBM	702—first commercially available automatic computer with variable block and variable word length

FIG. 34. (Continued)