THE ARITHMETIC LESSON.

CHAPTER XIX.

MR. BABBAGE AND THE CALCULATING MACHINE.

CONTRIVANCES to assist the mind in the ordinary process of arithmetic have been known from a very early age. The *abacus* of the ancients was one of these, and something like it is commonly in use in our infant schools. The original abacus is said to have been invented by the philosopher Pythagoras, but some have considered that this was nothing more than the ordinary multiplication table of modern times. The abacus used by the Greeks was a frame, across which a few wires were stretched, with beads of different colours strung on each. The numerical value of each bead was arranged by its colour and position on the frame. The abacus of the Romans was a very similar

contrivance, pins running in grooves being substituted for beads on wires. The Chinese have used an instrument of this description from a very ancient period, and it is still frequently employed by them in arithmetical calculations. The Chinese abacus is constructed like that of the Greeks, the brass wires being further divided by a cross piece stretching from side to side. On the upper part of each wire two beads are strung, and five on the lower division. The positions of the beads determine their respective values.

The great mathematician Napier, inventor of logarithms, contrived an instrument of more pretensions and utility for ordinary calculation. To this instrument the name of "Napier's Bones" was given, from the circumstance that it might be constructed of bone, wood, or any other convenient material. Five oblong pieces were each partitioned into nine little squares, each square being subdivided by a diagonal line. The numbers of the multiplication table were written in these squares, the units in the right hand corner of each, and the tens in the left. The pieces were ranged side by side, in an order dependent on the elements of the calculation to be ascertained. The answer was found at the intersection of a perpendicular and a horizontal line, in much the same manner as in some of the arithmetical tables now in use. The principle is also commonly employed for the measuring rules used by carpenters, excise officers, &c., and has given rise to the saying that "for a few shillings persons may put into their pockets a hundred times as much calculating power as they carry in their heads."

The first great step towards the invention of this high-class calculating machine was that originated in France by the celebrated Pascal. This eminent man was remarkable in his early years for an extraordinary predilection for mathematical studies. His father held an official position, in the duties of which arithmetical calculation formed an important part. Young Pascal, we are told, conceived the idea of trying to shorten the mental processes involved by means of a machine. "It consisted of a series of wheels, carrying cylindrical barrels, on which were engraved the ten numerals, from 0 to 9. One wheel was for units,

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