Educational.

THE LOGARITHMIC SLIDE.*

To those who have acquired a knowledge of the capabilities of the logarithmic slide, it is ever a matter of surprise and regret that an instrument combining such unexampled rapidity, ease, and accuracy in performing all ordinary business calculations should be so little known. By its assistance the drudgery of computation is avoided, and the time and trouble expended on mere arithmetical workings proved to be a waste of effort; in short, its aid mentally may be safely compared with the advantages derived from mechanical appliances in diminishing the wear and tear of manual labour. The intellect is freed from the distraction of tedious processes, for the statement of each question, the operation and the result, are simultaneous and apparent in their connection. The laws that govern its operation are few and simple and easily understood; a preliminary knowledge of decimals being all that is required, and the curiosity of the uninitiated may be stimulated by learning, that on an instrument as portable as a pocketbook we have the whole gamut of numbers; and that whether, as a means for self-instruction or advancement, for unsurpassed utility in business, or for profitable amusement, its study is well rewarded in its capabilities for varied application. Scientific men estimate its value, the man of business appreciates its utility, and it will be well for the practical mechanic and engineer when he learns how to employ it intelligently, instead of carrying it in his pocket, as thousands do, yet unable, through a deplorable ignorance, to avail himself of its extraordinary powers.

Small as is the knowledge of it in our own country in which it was invented, it is less known and less used upon the Continent. But it should be recorded to the credit of the "heathen Chinee," that he is not altogether in the dark respecting its merits, the writer being credibly informed that it is frequently seen in the hands of educated Chinese merchants, to the great amazement of many an Englshman, who doubtless regards it as a Pagan device, about as well adapted for its purpose as the slender chopstick for the conveyance of food to the mouth.

A French writer upon mathematics, half a century ago, wrote that "in England the use of the slide-rule is taught in the schools at the same time with the letters of the alphabet," a statement which, it is needless to say, must be taken with more than the usual reservation. One writer has said of it, and justly, that "for a few shillings most persons might put into their pockets many hundred times as much power of calculation as they have in their heads; for the use of the instrument is attainable without any knowledge of the properties of logarithms on which it is constructed."

The labour and fatigue of manipulating long series of figures for nautical and astronomical purposes had long been felt to be irksome to those engaged in it. One of the earliest attempts by mechanical means to lessen and facilitate this labour was made more than 250 years ago, by the immortal Baron Napier, of Murchiston, in Scotland; and as this attempt was the precursor of logarithms, and the subsequent slide, it is necessary to allude to it. The invention consisted of a number of flat bone or ivory slabs, one of which was called the "index-rod," and also ten others, one for each of the digits, headed at top with its own digit. By placing these rods side by side, so that the top figures exhibit the multiplicand, and deriving from the index a line of figures corresponding to each number of the multiplier, the quotient is obtained by simply adding these figures together, no knowledge of the multiplication table being necessary. Division was effected in a somewhat similar manner, but with these aids arithmetical calculations were tedious even operations. It was not that the rods were esteemed because of their saving so much labour, for they did not do so; but it was that from the simplicity of the operation, more accurate results were likely to be obtained, than by the ordinary methods of multiplying and dividing. From the circumstance of the rods being made of bone or ivory, they were called "Napier's bones," and they have been more frequently noticed in historical works than in those relating to their use.

It would be altogether beyond the purpose of this sketch to enter minutely into the construction of logarithms, but it may be briefly said that they are a series of numbers in arithmetical progression, corresponding to others in geometrical progression, by means of which complex and lengthy calculations can be

* From an article in the St. James' Magazine.

made with lightning-like rapidity, combined with perfect accuracy and ease. As a practical illustration, it may be mentioned that the innumerable and tiresome processes for obtaining numbers in a series, which would have to be resorted to were it not for their aid, would almost preclude the possibility of such works as the Nautical Almanac, and many kindred works. The radix, or root 1, from which Napier started, being found to be an in-convenient one, Mr. Henry Briggs, mathematical professor at Gresham College, in the year 1615, and, shortly after Napier's invention, adopted the number 10 for the root, as being preferable, and on this basis logarithmus have since been constructed, and npon this method huge volumes of nothing but tables of logarithms of various kinds have been calculated, and remain ready for the use of astronomers and others, who thus find the drudgery of their labour obviated; and an easy, pleasant, and unerring mode of calculation made ready to their hands. The discovery was looked upon by the learned as the great one of the age. Mr. Briggs, it is recorded was "beside himself for joy"; and Kepler, the great astronomer, "regarded it as a miracle." Napier's invention was not, like those of Kepler and Newton, connected with any analogies or coincidences which might have led him to it, but was the result of unassisted reason and science ; and, says his biographer, "we shall be vindicated in placing him in one he does not say, "had mademany successful attempts to discover his canon for the periodic movements of the planets, and Newton had applied the palpable tendency of heavy bodies to the earth to the system of the universe in general; but Napier wrought out his admirable rules by the slow scientific process arising from the gradual evolution of truth.'

In the early part of the seventeenth century Mr. Edmund Gunter, also a professor at Gresham College, invented the sector, and several other very useful instruments, including the surveyor's chain of 100 links for land measuring. He it was who first conceived the idea of marking out, on a scale, spaces whose lengths vary in exact proportion to the logarithmic value of numbers placed over against them.

This scale, so marked, he termed the "line of numbers," and it is in all respects identical with that now in use upon the sliderule. All the various operations of multiplication and division of numbers, &c., can be performed on this single scale by means of a pair of compasses, but these were subsequently abolished a few years afterwards by the Rev. William Oughtred, an eminent mathematician, who first adopted the plan of placing one scale against another, and sliding them together as might be required, and hence the term "slide-rule." He was a man who set little value upon instrumental aids, unless in the hands of those who had previously learned the principles on which they were con-structed. A pupil of his-William Forster-says that in the year 1630, he spoke to him of a Gunter's rule he had, six feet long, to be used with a pair of "beame compasses"; upon which he answered that "the use of the compasses was a poor inven-tion, and the performance very troublesome." "But," said he to Forster, "seeing you are taken with such mechanical wayes of instruments, I will show you what devices I have had by mee these many yeares; and first he brought mee two rulers of that sort, to be used by applying one to the other without any com-passes." Mr. Forster then goes on to speak of the "great expediteness of this method, which farre excelleth any other instrument which hath bin knowne." The inconvenience of having two detached scales or rulers was soon found; and they were joined together by brass clips; and presently afterwards the slide in a groove, as we now have it, was devised by a Mr. Everard.

It may be supposed that at first the sliding-rule was not much used, if only from the difficulties experienced in its construction. This may be judged of somewhat from the following extract from the interesting diary of Mr. Pepys. Under the date of Aug. 10, 1664, Pepys says: "Abroad to find out one to engrave my tables upon my new sliding-rule with silver plates, it being so small that Brown, who made it, cannot get one to do it. So I got Cocker, the famous writing master, to do it, and I set an hour beside him to see him design it all; and strange it is to see him, with his natural eyes, to cut so small at his first designing it, and read it all over, without any missing, when, for my life, I could not, with my best skill, read one word or letter of it." To this entry Pepys adds, the next day, "Comes Cocker with my rule, which he hath eugraved to admiration for goodness and smallness of work. It cost me 14s. the doing." The prices of those days were high, as compared with those of our own time, when, for a few shillings, a rule may be obtained of greater accuracy, and in a more convenient form than was then charged for merely marking the division.