

bol. What that symbol happens to be doesn't at all matter to the general principle: a, b, c, d, e, f, g, h, i, would do quite as well as 1, 2, 3, 4, 5, 6, 7, 8, 9. As a matter of fact, our existing numerals, called Arabic, are a compromise between the two systems of picture-writing and alphabetic signs. They come to us, like the beginnings of most mathematical signs, from the remote and mysterious East; and they make their first appearance under hardly-recognizable forms in the Indian cave-inscriptions of the first and second centuries. One, two and three are there represented by parallel bars, placed sideways instead of lengthways, and standing of course, for our old friends the human fingers. It is easy enough to see how —, =, ≡ are readily converted into 1, 2, 3, the first being made upright on the analogy of the Roman I, and the other two being hastily run together with connecting lines into 2 and 3. The other units, 4, 5, 6, 7, 8, and 9, are the initials or most prominent letters of the name of each corresponding number in the language of the inscriptions. We might make a similar English table thus:—, =, ≡, F, V, S, E, I, N. The immense advantage of the new numerals lies, of course, in the fact that each of them represents a single unit by a single symbol, and so allows us to express sums like 2, 347, 859, 427, and so forth, in a way unattainable under any other system. Nay, our symbolic conceptions are thus allowed even to outrun the resources of language, and the astronomer and the mathematician now habitually deal with strings of figures which it would be impossible for them so much as to express in words.

Most things, unfortunately, are called by wrong names. Our existing ciphers, though originally Indian, are now universally described as Arabic, because they came to the western world from India and Africa through

the mercantile medium of the Spanish Arabs. From Spain they spread to the European nations, though not without considerable opposition by the way, such as invariably testifies to the goodness and soundness of every genuine human improvement. Whenever you hear a loud popular clamor raised against anything as wicked or foolish, you may be pretty sure it will really turn out in the end a valuable invention: what everybody says must be wrong. This simple conclusion flows as a matter of course from the familiar principle, first definitely formulated by "poor Carlyle," that there are so many billion people in the world, mostly fools. Paynim numerals met with little favour, accordingly, from the mediæval merchant. The bankers of Florence were forbidden, on the verge of the fifteenth century, from employing these dangerous Saracen signs in any of their account books; and the University of Padua (so very like our own Oxford) ordained that its stationer should keep a list of books for sale with the prices marked, "not in ciphers, but in plain letters." The hapless modern purchaser rather desires, on the contrary, that prices should be marked, not in letters, but in plain ciphers. It is noticeable that the very word cipher, here employed, is itself Arabic, and its progeny includes not only the familiar French *chiffre*, but also, through the Italian *zefiro*, the much less immediately recognizable derivative, zero. Arabic numerals were at first confined in use to mathematical works; they were then employed for the paging of books; and it was not till the middle of the fifteenth century that they first found their way with any security into general commercial society.

It is curious to reflect that the whole decimal system itself, with all its faults and shortcomings and awkwardness, has been foisted upon us as a pure survival by the mere acci-