

and causes a crack at a distance from the place struck, generally half way round to the opposite side. Sometimes in a fall, with the head foremost, the skull would escape injury, but for the body, which falls on it, pressing the end of the spine against its base.

In the LOWER JAW we have to remark the greater mechanical advantage, or lever power, with which the muscles act, than in most other parts of animals. The temporal and masseter muscles pull almost directly at right angles to the line of the jaw, while in most other cases, as in that of the deltoid muscle lifting the arm, the muscles act very obliquely, and with power diminished in proportion to the obliquity. An object placed between the back teeth is compressed with the whole direct power of the strong muscles of the jaw; hence the human jaw can crush a body which offers great resistance, and the jaws of the lion, tiger, shark, and crocodile, &c. are stronger still. The teeth rank high among those parts of the animal body, which appear almost as if they were severally the fruits of distinct miraculous agencies, so difficult is it to suppose a few simple laws of life, capable of producing the variety of form so beautifully adapted to purposes which they exhibit. They constitute an extraordinary set of chisels and wedges, so arranged as to be most efficient for cutting and tearing the food, and with their exterior enamel, so hard, that, in early stages of society, teeth were made to answer many purposes for which steel is now used. It seems, however, as if the laws of life, astonishing as they are, had still been inadequate to cause teeth, ceased in their hard enamel, to grow as the softer bones grow, and hence has arisen a provision more extraordinary still; a set of small teeth appear soon after birth, and serve the child, until six or seven years of age; these then fall out, and are replaced by larger ones, which endure for life; the number being completed only when the man or woman is full grown, by four teeth, called wisdom teeth, because they come so late, which rise to fill up the then spacious jaw.

The SPINE OR BACK BONE has in its structure as much of beautiful and varied mechanism, as any single part of our wonderful

frame. It is the central pillar of support, or great connecting chain of all the other parts; and it has, at the same time the office of containing within itself and of protecting from external injury, a prolongation of the brain, called the spinal marrow, more important to animal life than the greater part of the brain itself. We shall see the spine uniting the apparent incompatibilities of great elasticity, great flexibility in all directions, and strength both to support a load, and to defend its important contents.

ELASTICITY.—The head may be said to rest on the elastic column of the spine, as the body of a carriage rests on its springs. Between each two of the twenty-four vertebræ, or distinct bones, of which the spine consists, there is a soft elastic intervertebral substance, about half as bulky as a vertebra, yielding readily to any sudden jar; and the spine, moreover, is waved or bent a little, like an italic *f* as seen when it is viewed sideways; and, for this reason also, it yields to any sudden pressure, operating from either end. The bending might seem a defect in a column intended to support weight; but the disposition of the muscles around is such, as to leave all the elasticity of the bend and a roomy thorax, without any diminution of strength.

FLEXIBILITY.—The spine may be compared to a chain, because it consists of twenty-four distinct pieces, joined by smooth rubbing surfaces, so as to allow of motion in all directions; and a little motion, comparatively, between each two adjoining pieces, becomes a great extent of motion in the whole line. The articulating surfaces are so many, and so exactly fitted to each other, and are connected by such number and strength of ligaments, that the combination of pieces is really a stronger column than a single bone of the same size would be. The strength of the spine, as a whole, is shown in man's easily carrying upon his head a weight heavier than himself, while each separate vertebra is a strong irregular ring, or a double arch, surrounding the spinal marrow. The spine increases in size towards the bottom, in the justest proportion, as it has more weight to bear.