

without reducing the diameter of the canal beyond that of the narrow portion, and, therefore, without producing compression of the spinal marrow. Mr. Earle found* that vertebræ united in this manner may be bent backwards to a right angle, and laterally to half a right angle, without injury to the enclosed nervous substance. The design of this structure is farther evident from its not existing in the dorsal and lumbar portions of the spine, which admit of no motion whatever, and where there is no variation in the diameter of the spinal canal.

A plan entirely different is followed in the vertebræ of the back and loins. For the purpose of ensuring the proper actions of the wings, the great object here is to prevent motion, and to give all possible strength and security; and accordingly the whole of this portion of the spine, together with the sacrum, is consolidated into one piece. All the processes are largely developed, and pass obliquely from one vertebra to the next, mutually locking them together; and, in order most effectually to preclude the possibility of any flexion, the spinous processes, and sometimes even the bodies of the dorsal vertebræ are immovably soldered together by ossific matter, so as to form one continuous bone.

The sacrum (v, Fig. 224) consists of the union of a great number of vertebræ, as many as twenty being ankylosed together for this purpose; so that they form a bone of great length. The coccygeal vertebræ (q) are also numerous, but are compressed into a small space, and enjoy great latitude of motion, being subservient to the movements of the tail.

The ribs are numerous, and of considerable strength: they send out processes, which are directed backwards, passing over the next rib before they terminate, and giving very effectual support to the walls of the chest. The ribs are continued along the abdomen, and afford protection to the viscera in that cavity; and some arise even from the sacrum, and from the iliac bones. Those which are in front are

* In the paper already quoted, p. 278.