present, they are generally situated one above the other, the upper being the larger; the second piece has seldom more than one; the third, fourth, and fifth pieces are often formed from two centers placed laterally, the irregular union of which explains the rare occurrence of the sternal foramen (Fig. 121), or of the vertical fissure which occasionally intersects this part of the bone constituting the malformation known as *fissura sterni;* these conditions are further explained by the manner in which the cartilaginous sternum is formed. More rarely still the upper end of the sternum may be divided by a fissure. Union of the various centers of the body begins about puberty, and proceeds from below upward (Fig. 119); by the age of twenty-five they are all united. The xiphoid process may become joined to the body before the age of thirty, but this occurs more frequently after forty; on the other hand, it sometimes remains ununited in old age. In advanced life the manubrium is occasionally joined to the body by bone. When this takes place, however, the bony tissue is generally only superficial, the central portion of the intervening cartilage remaining unossified.

Articulations.—The sternum articulates on either side with the clavicle and upper seven costal cartilages.

The Ribs (Costæ).

The **ribs** are elastic arches of bone, which form a large part of the thoracic skeleton. They are twelve in number on either side; but this number may be increased by the development of a cervical or lumbar rib, or may be diminished to eleven. The first seven are connected behind with the vertebral column, and in front, through the intervention of the costal cartilages, with the sternum (Fig. 115); they are called **true** or **vertebro-sternal ribs.**[1] The remaining five are **false ribs**; of these, the first three have their cartilages attached to the cartilage of the rib above (**vertebro-chondral**): the last two are free at their anterior extremities and are termed **floating** or **vertebral ribs.** The ribs vary in their direction, the upper ones being less oblique than the lower; the obliquity reaches its maximum at the ninth rib, and gradually decreases from that rib to the twelfth. The ribs are situated one below the other in such a manner that spaces called **intercostal spaces** are left between them. The length of each space corresponds to that of the adjacent ribs and their cartilages; the breadth is greater in front than behind, and between the upper than the lower ribs. The ribs increase in length from the first to the seventh, below which they diminish to the twelfth. In breadth they decrease from above downward; in the upper ten the greatest breadth is at the sternal extremity.

Common Characteristics of the Ribs (Figs. 122, 123).—A rib from the middle of the series should be taken in order to study the common characteristics of these bones.

Each rib has two extremities, a **posterior** or **vertebral**, and an **anterior** or **sternal**, and an intervening portion—the **body** or **shaft.**

Posterior Extremity.—The **posterior** or **vertebral extremity** presents for examination a head, neck, and tubercle.

The **head** is marked by a kidney-shaped articular surface, divided by a horizontal crest into two facets for articulation with the depression formed on the bodies of two adjacent thoracic vertebræ; the upper facet is the smaller; to the crest is attached the interarticular ligament.

The **neck** is the flattened portion which extends lateralward from the head; it is about 2.5 cm. long, and is placed in front of the transverse process of the lower of the two vertebræ with which the head articulates. Its **anterior surface** is flat and smooth, its **posterior** rough for the attachment of the ligament of the neck, and perforated by numerous foramina. Of its two borders the **superior** presents a rough crest (*crista colli costæ*) for the attachment of the anterior costotransverse ligament; its **inferior border** is rounded. On the posterior surface at the junction of the neck and body, and nearer the lower than the upper border, is an eminence

[1] Sometimes the eighth rib cartilage articulates with the sternum; this condition occurs more frequently on the right than on the left side.