The fibers of the posterior roots are developed from the cells of the spinal ganglia. Before the neural groove is closed to form the neural tube a ridge of ectodermal cells, the **ganglion ridge** or **neural crest** (Fig. 644), appears along the prominent margin of each neural fold. When the folds meet in the middle line the two ganglion ridges fuse and form a wedge-shaped area along the line of closure of the tube. The cells of this area proliferate rapidly opposite the primitive segments and then migrate in a lateral and ventral direction to the sides of the neural tube, where they ultimately form a series of oval-shaped masses, the future spinal ganglia. These ganglia are arranged symmetrically on the two sides of the neural tube and, except in the region of the tail, are equal in number to the primitive segments. The cells of the ganglia, like the cells of the mantle layer, are of two kinds, viz., **spongioblasts** and **neuroblasts**. The spongioblasts develop into the neuroglial cells of the ganglia. The neuroblasts are at first round or oval in shape, but soon assume the form of spindles the extremities of which gradually elongate into central and peripheral processes. The central processes grow medialward and, becoming connected with the neural tube, constitute the fibers of the posterior nerve roots, while the peripheral processes grow lateralward to mingle with the fibers of the anterior root in the spinal nerve. As development proceeds the original bipolar form of the cells changes; the two processes become approximated until they ultimately arise from a single stem in a T-shaped manner. Only in the ganglia of the acoustic nerve is the bipolar form retained. More recent observers hold, however, that the T-form is derived from the branching of a single process which grows out from the cell.

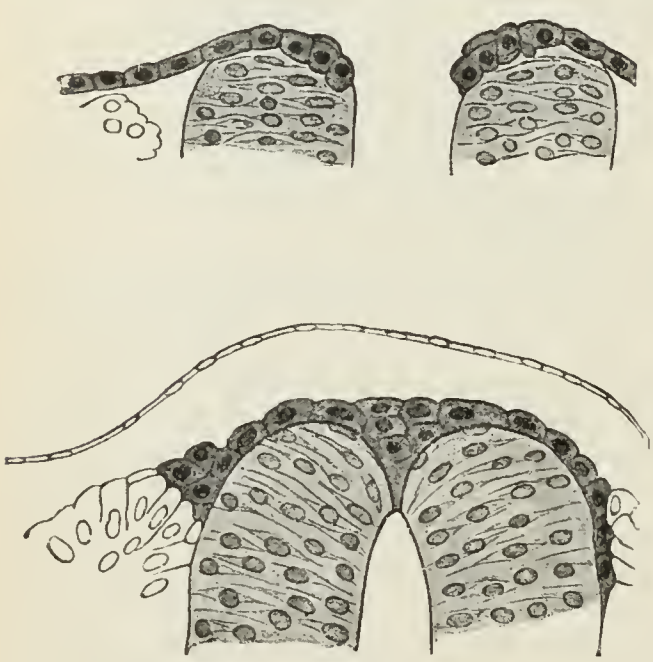

Fig. 644.—Two stages in the development of the neural crest in the human embryo. (Lenhossèk.)

The anterior or ventral and the posterior or dorsal nerve roots join immediately beyond the spinal ganglion to form the **spinal nerve**, which then divides into anterior, posterior, and visceral divisions. The anterior and posterior divisions proceed directly to their areas of distribution without further association with ganglion cells (Fig. 645). The visceral divisions are distributed to the thoracic, abdominal, and pelvic viscera, to reach which they pass through the sympathetic trunk, and many of the fibers form arborizations around the ganglion cells of this trunk. Visceral branches are not given off from all the spinal nerves; they form two groups, viz., (*a*) **thoracico-lumbar**, from the first or second thoracic, to the second or third lumbar nerves; and (*b*) **pelvic**, from the second and third, or third and fourth sacral nerves.

The Brain.—The brain is developed from the anterior end of the neural tube, which at an early period becomes expanded into three vesicles, the primary cerebral vesicles (Fig. 18). These are marked off from each other by intervening constrictions, and are named the **fore-brain** or **prosencephalon**, the **mid-brain** or **mesencephalon**, and the **hind-brain** or **rhombencephalon**—the last being continuous with the medulla spinalis. As the result of unequal growth of these different parts three flexures are formed and the embryonic brain becomes bent on itself in a somewhat zigzag fashion; the two earliest flexures are concave ventrally and are associated with corresponding flexures of the whole head. The first flexure