tion. Whether or not this convectional movement is a sufficient force to give satisfactory ventilation, is a question to be considered later.

The second of these natural aids to ventilation is "Diffusion."

The air that we take into the lungs may contain but little water-vapor; and, if pure, it contains a very small percentage of carbonic acid gas. The latter is a chemical compound of carbon and oxygen. It exists in the free atmosphere in very small quantities,—the average amount of which has been estimated at 3½ volumes of carbonic acid gas in 10,000 volumes of air. On the other hand, the breath expired from the lungs is saturated with moisture, and contains between 4 per cent and 5 per cent. of carbonic acid gas; or, to state it in the same form as above, in 10,000 volumes of expired air there are about 430 volumes of carbonic acid gas. The problem of ventilation is to prevent these two products—moisture and carbonic acid gas—from accumulating in excess within the occupied spaces. Aqueous vapor, at the same temperature and pressure, is lighter than air; carbonic acid gas is considerably heavier. It might be supposed, therefore, that when these products are emitted from the lungs, the aqueous vapor would raise to the ceiling, and the carbonic acid gas settle to the floor. There is a tendency to this movement; but, at the same time, a process goes on which is equally as effective as the force of gravity. This process is known as *diffusion*. A simple illustration of diffusion may be seen by putting a few drops of milk into a glass of clear water. Soon the milk is seen to diffuse through the water, giving a uniform whitish shade to the whole. The same thing goes on with the aqueous vapor and carbonic acid gas. Instead of separating completely according to density, from the air of the room, these products diffuse throughout the whole room; so that wherever the foul air opening is placed, it will find almost uniform proportions of the products that ventilation is required to remove. If any difference, however, exists in the distribution of these gases, the excess of carbonic acid will be found at the floor; while that of water-vapor will be found at the ceiling.

Another aspect of diffusion is the movement of gases through porous walls. Suppose that the air of a room becomes overcharged with carbonic acid gas, and at the same time robbed of its oxygen; then the carbonic acid will diffuse outward through the plaster of the walls, and through the brick or between the clapboards; and the oxygen from the outside will in the same manner diffuse into the room. So that a natural ventilation proceeds at all times, even if the room appears perfectly air-tight. This natural ventilation is, of course, most rapid in rooms that have the greatest amount of wall-space exposed to the free outside atmosphere.

A third natural aid to ventilation is the *wind*. When the fresh air inlets are on the windward side of the building, there will be no question about plenty of ventilation. But when the wind blows from the side opposite the inlets, there is little or no ventilation. To make free use of the wind, therefore, it is necessary, either to have *inlets* at *all sides* of the buildings, or to have inlets that *always face* the *wind*. These two methods will be illustrated in detail in discussing particular systems of ventilation.