

lowered to 60 deg. and below, according to the outside temperature. The result was that the children were healthier, freer from colds and infections; the "snuffles" decreased. Besides this the children learned faster and better. The principal, viewing it from the pedagogic standpoint, was more impressed even than the school doctor.

As to light: I am strongly of the opinion that the room should be narrow; that it should not be wider than twice the distance from the top of the window to the floor; that the proportion of floor space to wall space should not exceed one to four; that the windows should be so placed that the light comes from behind or to the sides of the pupils, or, rather, that in looking toward their books, the teacher, or the blackboard, they should not have to look directly at a strong light, or their books should not be shadowed so as to strain the eyes.

These effects can be had in various ways. The teacher can be seated at the back of the rooms, with the students' backs to the teacher; or shades pulling up from below can make a dark background for the pupils, or the teacher can be so placed in the room that the wall furnishes a dark background. Blackboards should be treated in the same way.

Believing, as I do, that the removal of air should be as direct as possible, I believe in low ceilings. Between the ceiling and the heads of the occupants is a volume of warm, foul air, which is being chilled and dropping into the breathing zone all of the time. The less space you have, the less foul air there will be to drop back into the breathing zone. I therefore believe in an eight or nine-foot ceiling. You will get the operators to heat only a certain volume of air and they will heat the same volume whether the ceiling is 8 feet or 12. By taking off the extra 4 feet you increase the amount of air which will be furnished in the breathing zone and that is what counts.

But the principal thing which should interest us is ventilation. The harm which is done by bad air falls into two general groups: The quick-acting or air-borne infections, and the slow-acting or air-caused conditions. Some illustrations of the former are influenza, common colds and cerebro-spinal meningitis, and possibly

anterior poliomyelitis, diseases in which the bacteria can be transported considerable distances; pneumonia and tuberculosis, where infections cannot be transported far, and scarlet fever, diphtheria, and measles which can only be transported very short distances.

The causative agents in the first group in the order of their importance are: Bacteria, dust, humidity, heat, organic exhalations and odors; carbon monoxide and carbon dioxide, almost negligible.

The causative factors in the second group in the order of their importance are: Heat, humidity, organic exhalations, carbon dioxide, carbon monoxide, bacteria, dust, odors. These different elements, with the exception of bacteria, have been so thoroughly discussed that I need not discuss them now.

Many efforts have been made to discover pathogenic bacteria in air. In these cultures saprophytes usually overgrow, and the tests are negative for tubercle and the usual pathogenic bacteria. Conclusions that pathogenic bacteria are not spread by air cannot be logically drawn. Efforts to find typhoid in a general water supply which we are certain is spreading typhoid fever are unsuccessful. Efforts to find typhoid in a milk supply proved epidemiologically to be typhoid spreading have proven fruitless. Nevertheless, we do not conclude that there is no typhoid there.

The mouth has been filled with *Bacillus prodigiosus*, and petri plates have been exposed at varying distance, with quiet breathing, talking, coughing, etc. From this it has been concluded that bacteria can be thrown through the air about 20 feet, and the inference is drawn that that is the limit of the danger zone. The air in front of quiet breathers has been found to have fewer bacteria than when the same air was inhaled. The sum total of all of these observations is an idea that bacteria are not air-borne; that they are spread by physical contact. I contend that the inference is unwarranted. Such experiments would have to be impossibly protracted to give results from which conclusions could be drawn.

A person breathes 16 times a minute for 75 years. The absence of pathogenic bacteria from a given cubic yard of air does not prove that there will not be patho-