Good ventilation exists when each of the factors mentioned going to make good air has the proper value, and the proper relation to each other, regardless of the method of obtaining the same. If outside air is good as pertaining to these factors, then good ventilation may be obtained by supplying a sufficient quantity of outside air. If, however, any of the factors required in good ventilation are not satisfactory for the outside air, then ventilation will not be good, regardless of the amount of such air supplied, unless such factors are corrected. Again, if all of the above factors are perfected by artificial conditioning, by washing, or by any other process, ventilation is perfect even though no outside air is used.

The processes and laws of chemistry and physics are well enough understood by the heating and ventilating engineer to enable him to artificially control at will all of the known factors pertaining to good ventilation, and it, therefore, becomes merely a question of economy as to whether it is better to artificially condition air and recirculate it, or to use outside air.

AMOUNT OF NEW AIR TO BE SUPPLIED PER PERSON

	Cubic Feet per Minute			
	Without Humidification or Recirculation	With Humidification but Without Recirculation	With Humidification and Recirculation	Number of Air Changes per Hour
SCHOOLS—				
Class Rooms	30	20	5 to 10	
Assembly Rooms	15 to 20	10 to 15	5 to 10	
Gymnasiums	30	25	15 to 20	
Toilets				10 to 20
Locker Rooms				5 to 10
Kitchens				20 to 60
Lunch Rooms				10 to 20
THEATERS—				
Seating Space	30 to 50	20 to 30	10 to 15	
HOSPITALS—				
Wards	30 to 40	20 to 30		
Kitchens				20 to 60
Dining Rooms				10 to 20
Toilets				10 to 20
HOTELS—				
Dining Rooms				10 to 15
Kitchens				20 to 60
Ball Rooms				5 to 10
Work Space				5 to 10
Assembly Rooms	20 to 30	15 to 20	10 to 15	

Note.—See paper Modern Trend in the Science of Ventilation, Perry West, JOURNAL, A. S. H. & V. E. June, 1924.

CHAPTER XVII

HOW TO USE THE SYNTHETIC AIR CHART

In view of the announcement that after three years of investigation of the question of a standard for measurement of ventilation, the Society had adopted the Synthetic Air Chart for the purpose of comparing the air conditions in any room with the ideal or standard conditions, the Research Bureau worked out the following description of its method of application. It was thought that the operation of the Synthetic Air Chart might not be found entirely clear without some explanation and the late John R. Allen, then director of the Research Bureau, submitted the following brief statement for the benefit of those interested, together with illustrations of the apparatus necessary to make the measurements involved.

THE Synthetic Air Chart offers a means of determining the percentage of perfect ventilation by considering all the known factors that make up the air conditions in a room. These factors with their proper weights, experimentally determined, are represented by columns arranged vertically across the chart. The base of each column represents the ideal condition, or 100 per cent perfect. Bordering on either side of the main column are two narrow columns marked "− %" and "+ %." The former denotes the penalization to be subtracted from the Percent of Perfect Column, and the "+ %" denotes the condition considering only the one particular factor.

The various factors are divided into three groups which are separated by the double lines. *First*, Wet Bulb Difference which includes Temperature, Humidity, and Air Motion; *second*, Dust, Bacteria, and Odors; *third*, Carbon Dioxide. The latter, although not really a factor, since it is not considered injurious, serves as an index of the amount of air supplied and of the distribution in the room. In addition, columns providing for Other Injurious Substances and for Distributions are given. The upper limit of any of these groups represents the condition where life would cease to exist. Hence at this point the "− %" column would indicate 100 per cent penalization. (Since the upper ends of the columns represent conditions not obtained in practice they are not included on the chart.)

To illustrate the method of graduating the columns, consider the first which is headed Wet Bulb Difference. When at rest with no air motion, the ideal wet bulb temperature is 56 deg. The upper portion of the column represents the unlivable condition which is approximately 106 deg. with 100 per cent humidity or a wet bulb difference of 50 deg. from the ideal. Any variation from 56 deg. would therefore represent a definite percentage of variation from the ideal. The graduations in the other columns were constructed in like manner.