the fact that "a deprival of fresh air produces phthisis." Parke says, that "the practical limit of purity will depend on the cost which men are willing or able to pay for it," and that "it may be fairly assumed that the quantity of fresh air supplied to every inhabited room should be great enough to remove all sensible impurity, so that a person coming from the external air should perceive no trace of odor or difference between the room and the outside air in point of freshness."

We might here relate how air becomes contaminated by carbonic acid gas from human respiration, or the many other causes; also of experiments which have been made in endeavoring to establish some standard of purity which internal air should have, and the widely different results arrived at by different authors. We might also cite tables giving the cubic amount of fresh air per head which should be allotted under different circumstances; but all data on this point is within the reach of anyone in the numerous treatises on hygiene, and we consider it unnecessary to repeat it here. It will suffice to say that hospitals, theatres or any edifice where a large number of people assemble at a time, require per head a greater amount of fresh air per hour than is necessary in an ordinary dwelling; in which latter case it is fixed by DeChaumont at 1 cubic foot per second for each man as the minimum allowance, but we think this might be reduced.

A very large apartment is more difficult to heat and ventilate than a small one, but a moderate sized one will give the best results all round. We know that when air is changed more rapidly than three times in an hour, it occasions draughts in the room, though this is somewhat dependent upon the degree of temperature at the time.

It is evident after all the above considerations that in order to have a comfortable and healthy room, we must harmonize the workings of the heating apparatus with that of the ventilating system, and both of these to the size of the room in relation to the number of its inmates.

The introduction of fresh air should in preference be made at the ceiling than at the floor line (Morin), though the opposite mode has been known to give good satisfaction. All air entering a room should be filtered through a fine guage to remove its coarse impurities before its introduction in the room. Ducts should be so designed that the air will have an equal distance to travel in them all.

MODES OF VENTILATION.

There is the artificial and natural mode. The latter is the natural operation of a change of air which is due to a difference in density between internal and external air; the mode is very good in winter, but it should not be altogether relied upon in the summer season, when the outside temperature is often that of the house. Natural ventilation is obtained in many ways which are well known; but the most common is by depending on the opening and shutting of doors, cracks around windows, &c. It is mainly achieved, and better, by chimneys and shafts constructed for the purpose. One good way of many, of getting window ventilation is by lowering the top sash a little and lifting the lower one a few inches, the upper layers of air in the room being lighter in density escape at the top opening, while it is replaced by a fresh supply entering at the bottom, where the draught is checked by a board put in front of the opening to change the direction of the current.

We can say that hot-air heating is a mode of natural ventilation. Astonishing results in ventilation are obtained by burning a gas jet in a chimney shaft. Morin says, that with 7 ft. cubic of gas burnt per hour in a flue eleven inches square and 66 ft. high, 13,300 cubic feet of air will be drawn from the room.

ARTIFICIAL VENTILATION.

This mode is accomplished either by pulsion (forcing air in the room), or extraction (aspering the air). In both cases the action can be secured in different ways, such as a jet of steam, etc., but most commonly by the use of a "fan" put in rapid motion by some motive power. These modes are used only where the space to be ventilated is very considerable, where natural ventilation would not be sufficient. When only one of these modes is used, preference is to be given to pulsion; but they are sometimes combined, as was the case in the "Palais du Trocadero" during the Paris Exposition of 1878, where ventilation was most perfect. The main point of excellence of natural ventilation, and which is not possessed by any other system is, that it can be depended on for a given result per hour, independently of outside temperature, or the direction of prevailing winds.

Competency in putting up a system, either of ventilation or heating, is not possessed by all those who lay claim to it; and this results sometimes in a good apparatus failing to give all the satisfaction which it otherwise might, whereas, if the work were properly executed, it would often effect not only an increase of comfort, but also a saving of expenses in working the system.

We have answered sufficiently, we think, the spirit of the competition for which this "essay" has been written, in restricting ourselves to treating simply of the principles on which the different systems are dependent for their action; and of the nature and value of the results as given by each under ordinary management, as compared to what should constitute good heating and ventilation, leaving out the question of the varied modes of application which can be made of each system according to circumstances. For example, as in hospitals, quarantine stations, schools, etc., etc.; it would require quite a series of articles to treat of these questions separately.