Thus, no matter what the wind's direction, there will always be some openings directly exposed to the pressure force of the wind, and others to a suction force, and effective movement through the building assured.

VENTILATING OPENINGS

The openings employed in natural ventilation are:

A. Windows, representing apertures in walls or roof.
B. Roof ventilators of the unit type consisting of some kind of special construction designed to develop a localized suction from the wind, at the exterior of the opening.
C. Roof ventilators of the continuous type, giving openings throughout the length of building, having no special features to utilize the force of the wind.
D. Stacks causing flow by *gravity* (temperature difference) action.

Windows have the advantage of transmitting light, as well as providing ventilating area when open. Their movable parts are arranged to open in various ways; they may open by sliding as in the ordinary double-hung, wood window; by tilting on horizontal pivots at or near the center; or by swinging on pivots at top or bottom. Whatever the form and type of window used the thing of essential importance in ventilation is the amount of clear area that can be made available. The motive head to produce flow through windows is almost entirely dependent upon the distribution of those motive forces in and about a building, as discussed under wind and temperature difference. A pivoted window, projecting out from the plane of the wall is bound to impose some obstructive influence upon such air currents as exist in that particular vicinity, and may result in the production of some localized pressure or suction that will influence flow there, and to that degree, one type of window might give more or less active ventilation than another. But, speaking generally, the motive head causing flow through a window is determined by the forces of wind and temperature difference existing there, and not by the kind of window, except in so far as the kind of window establishes the area of opening.

Windows may be arranged for individual operation, or they may be grouped in long runs, as in factory buildings. Those used in office buildings may have deflecting devices at the sills for avoiding direct draft upon occupants, or a bottom pivoted ventilator, arranged to swing in at the top, may serve the same purpose.

ROOF VENTILATORS OF THE UNIT TYPE

A roof ventilator of the unit type consists of a structure built up around a roof opening in such a way as to cause the wind to *create* a suction in the vicinity of the opening, and so induce an outflow. Roof ventilators also have the advantage of whatever temperature difference prevails. Since they are intended for installations on roofs of buildings, and function as outflow openings only, they constitute but a part of a ventilating system, and some attention must be given to openings available for inflow. It is evident that such ventilators could not function even in the strongest wind, and with the maximum temperature difference, without inlet openings. Often such ventilators must depend upon infiltration only for inflow. Inlet openings of about twice the area of ventilators

should be provided. Dampers should be installed in ventilators, with adequate and accessible operating mechanism.

In considering roof ventilators, the general action of the wind upon the building, as described in the earlier part of this chapter, should be kept in mind.

A ventilator located within the region indicated by *A* in Fig. 1, will not contribute any inductive effect because in this region there is little or no wind. The ventilator opening will function, but will function in the same way as would a window in that locality, because of the resultant effect

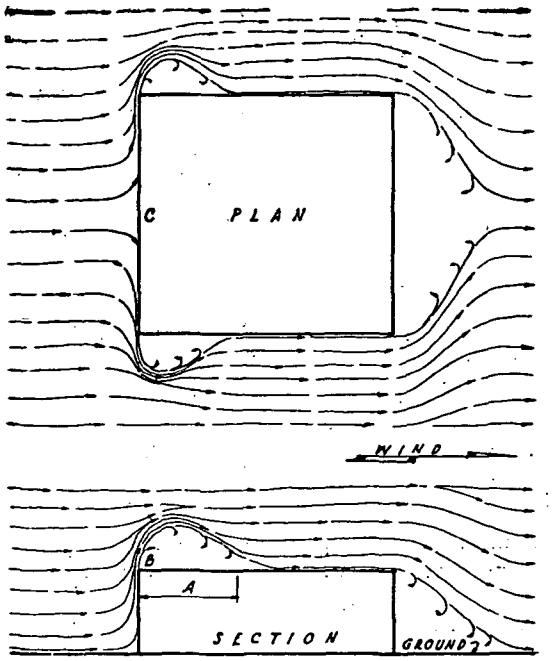

FIG. 1. THE JUMP OF WIND FROM WINDWARD FACE OF BUILDING. (*A*—LENGTH OF SUCTION AREA; *B*—POINT OF MAXIMUM INTENSITY OF SUCTION; *C*—POINT OF MAXIMUM PRESSURE)

of the suction produced by the wind acting upon the building, and by whatever temperature differences prevail.

Roof ventilators have the advantage in that the opening is effective if wind strikes the ventilator at all, no matter what the direction. On the other hand, if ventilators do not stand in the path of the wind, and depend only upon the same forces for producing flow as do windows or any other plain opening, they are at a disadvantage because of the greater resistance of their more complex passages.

While ventilators may be divided into certain classes or groups and the average efficiency of one class will be higher or lower than the average efficiency of another class, this does not in any way determine the