The above examples demonstrate that while the effective temperature and hence the feeling of warmth and rate of total heat loss does not differ greatly in the two cases the relative proportion of sensible and latent heat loss is reversed. In order to maintain the air conditions stipulated the air conditioning equipment must remove 54.1 per cent more sensible heat in (*A*) than in (*B*); and 76.5 per cent more latent heat or water vapor in (*B*) than in (*A*). In (*A*) 69 per cent of the total heat loss is sensible while in (*B*) only 45 per cent of the total loss is sensible.

CONDITIONING AIR FOR HUMAN COMFORT

There are four fundamental ways of producing effective cooling: (1) The dry bulb temperature may be lowered by direct cooling or removal of heat. (2) The moisture content of the air may be reduced. (3) Air motion may produce effective cooling except for extremely severe conditions. (4) Evaporation of water without addition or subtraction of heat is accompanied by an increase in moisture content and a fall in dry bulb temperature along the wet bulb line resulting in effective cooling.

Take as an example a condition of 92 deg. dry bulb and 40 per cent relative humidity having a wet bulb temperature of 72.8 deg. and effective temperature of 81.1 deg. This condition can be made equivalent to 78 deg. effective temperature or it can be made to feel 3.1 effective deg. cooler by any one of the four fundamental changes mentioned.

(1) By the removal of heat the dry bulb may be made to fall to 85.5 deg. (see Fig. 1) along the "90 grain moisture per pound of dry air" or 64.2 deg. dew-point line when the effective temperature will be 78 deg.

(2) Without removal of sensible heat or lowering of the dry bulb, the moisture content may be reduced from 90 to 44 grains per pound of dry air, when the effective temperature will be 78 deg.

(3) A 500 ft. velocity (see Fig. 4) will change the still air condition of 81.1 deg. effective temperature to 78 deg. Effective Temperature or will give 3.1 deg. Effective Temperature cooling.

(4) Evaporation of water at room temperature without addition or removal of heat will cause the point on the chart, Fig. 1, indicated by our condition, to move along the wet bulb line to the left thereby lowering the dry bulb temperature and increasing the moisture content. The wet bulb temperature will remain the same but the effective temperature will be lowered. By adding 14 grains of moisture without heat, the dry bulb will fall to 83.8 deg. and the effective temperature will fall to 78 deg.

The best method of producing effective cooling to be employed in any particular case will depend upon accompanying circumstances and should be determined by a competent engineer. Generally, the removal of heat or water vapor or both, by direct cooling or dehumidifying is most effective. Effective cooling by air motion or evaporation of water is relatively much less expensive, but these methods of cooling are limited to certain conditions of temperature and humidity. Cooling by evaporation of water is effective when the air is dry or when there is considerable difference between the wet and dry bulb temperature. Cooling by air motion is most effective at low temperatures. When the effective temperature approaches that of the body little or no cooling results and for certain higher temperatures air motion will make an uncomfortable condition even less bearable.

For moderately high temperatures greater effective cooling is experienced as the result of air motion at high humidities than at low humidities. This suggests a valuable method of cooling by a combination of evaporation and air motion. Take, for example, a condition of 96 deg.

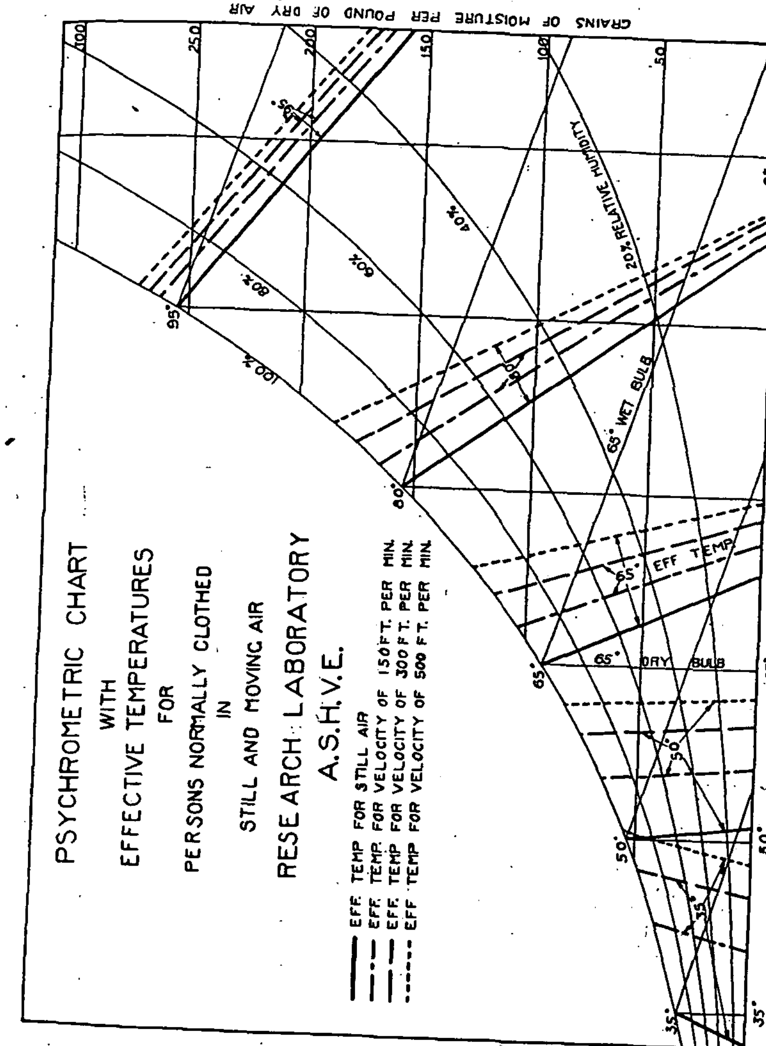

FIG. 5. PSYCHROMETRIC CHART WITH EFFECTIVE TEMPERATURE LINES FOR STILL AND MOVING AIR

dry bulb and 80 deg. wet bulb having an effective temperature of 85.7 deg. A 300 ft. air velocity will improve this condition by only 2.2 deg. Saturation with water vapor will give a condition of 80 deg. dry bulb, 80 deg. wet bulb and 80 deg. effective temperature or 5.7 deg. effective tempera-