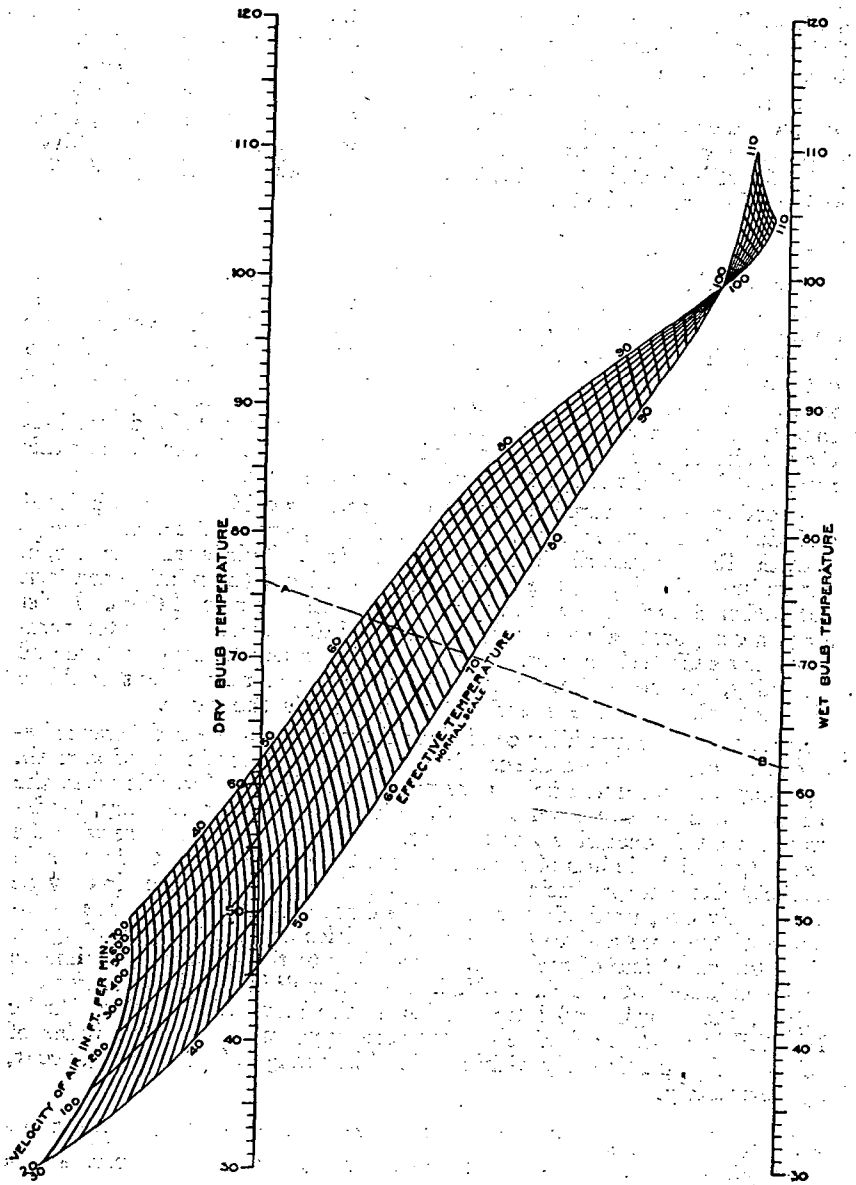

FIG. 1. THERMOMETRIC OR EFFECTIVE TEMPERATURE CHART SHOWING NORMAL SCALE OF EFFECTIVE TEMPERATURE. APPLICABLE TO INHABITANTS OF THE UNITED STATES UNDER FOLLOWING CONDITIONS:

A. Clothing: Customary indoor clothing. *B. Activity:* Sedentary or light muscular work. *C. Heating Methods:* Convection type, *i.e.*, warm air, direct steam or hot water radiators, plenum systems.

Definition of Effective Temperature

Briefly, *effective temperature* may be defined as an arbitrary index of the degree of warmth or cold felt by the human body in response to temperature, humidity, and movement of the air. Effective temperature is not a true temperature of the air but an index which combines temperature, humidity and air motion in a single value. The numerical value of the effective temperature index for any given air condition is fixed by the temperature of saturated air which, at a velocity or turbulence of 15 to 25 fpm, induces a sensation of warmth or cold like that of the given condition. Thus, any air condition has an effective temperature of 65 deg when it induces a sensation of warmth like that experienced in practically still air at 65 F saturated with moisture.

In all reports of the A.S.H.V.E. Research Laboratory, the term *still air* signifies the minimum air movement it was possible to obtain in the Laboratory's psychrometric chamber. Actually, the air motion was between 15 and 25 fpm in all experiments, without qualification, as measured by the Kata thermometer. This was not a linear movement of air but it represented the turbulence or eddy currents produced by the air change. Even in tightly sealed rooms, the natural air movement is not likely to fall below 10 fpm so long as there is a temperature or pressure difference between the air inside and that outside the room.

Fig. 1 shows the results obtained at the A.S.H.V.E. Research Laboratory in a single chart, the so-called thermometric chart. The equivalent conditions or effective temperature lines are shown by the short cross-lines. The difference between the effective temperature for still air and for moving air, of any velocity, represents the cooling resulting from that air velocity. This thermometric chart applies to average normal and healthy persons adapted to American living and working conditions. It is limited to sedentary or light muscular activity, and to rooms heated by the usual American convection methods (warm air, central fan and direct hot water and steam heating systems) in which the difference between the air and wall surface temperatures may not be great. The chart does not apply to rooms heated by radiant methods such as the British panel system, open coal fires, and the like. It will probably not apply with adequate accuracy to races other than the white or perhaps to inhabitants of other countries where the living conditions, climate, heating methods, and clothing are materially different from those of the subjects employed in experiments at the Research Laboratory.

If an occupant of a room loses heat by radiation to large wall or glass surfaces at lower temperatures, the air within the room must be maintained at a higher temperature to compensate for this effect in order to give the same feeling of warmth. The results of a recent study[18] by the A.S.H.V.E. Laboratory, shown in Fig. 2, indicate that in poorly insulated buildings this effect may become of considerable importance. Thus an occupant of a room having inside wall surface temperatures of 55 F on three sides will require an air temperature of 74 F to have the same feeling of warmth he would experience in a warm-wall room with air at 70 F. A wall consisting of 8-in. brick and plaster, with 16 F outside air tempera-

[18]Cold Walls and Their Relation to the Feeling of Warmth, by F. C. Houghten and Paul McDermott (A.S.H.V.E. Journal Section, *Heating, Piping and Air Conditioning*, January, 1933, p. 53).