It will be noted that the proportionate heat loss by the three processes involved varies widely, as indicated in Table 6.

At air temperatures above the temperatures of the body surfaces, the body will, of course, be gaining heat by convection and losing heat only by evaporation. Increased air movement will favor both these processes and its net effect will depend on the relative humidity of the atmosphere. The phenomena involved are illustrated in Fig. 11 which shows the influence of air movement (at varying air temperatures and humidities) upon the upper limit of the *zone of evaporative regulation*. It will be noted that (for the nude subject in a semi-reclining posture) increase in air movement consistently increases evaporative cooling, and therefore heat tolerance, when relative humidity is high and air temperature low. When

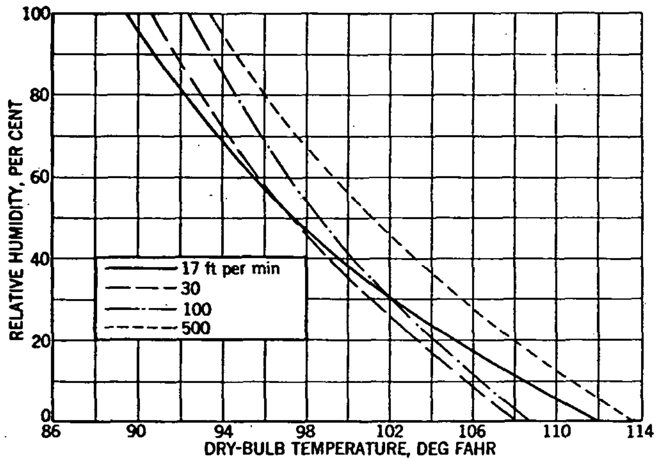

FIG. 11. CONTOUR CHART INDICATING UPPER LIMITS (WETTED AREA = 100 PER CENT) OF THE ZONE OF EVAPORATIVE REGULATION FOR VARIOUS AIR VELOCITIES FOR UNCLOTHED SUBJECTS

relative humidity is low and air temperature is high, however, an increase in air velocity from 17 to 30 or 100 fpm actually decreases heat tolerance. Under these conditions air temperature is above skin temperature and the increased demand for evaporative cooling exceeds the actual increase of evaporation due to the higher air movement. When an air velocity of 500 fpm is reached, the limits of the zone are broadened throughout its range. For very hot and dry environments, still air is more desirable than a slightly greater air movement but a high air movement is still better.

At low air temperatures the effect of increased air movement upon convection loss is a simple and direct one; but the exact quantitative influence of air movement upon the rate of cooling of a hot body has, until recently, been unknown. Studies at the *John B. Pierce Laboratory of Hygiene* have indicated that the cooling effect of air actually increases as

TABLE 6. PERCENTAGE OF TOTAL HEAT LOSS EFFECTED BY THE THREE CHIEF ROUTES OF THERMAL INTERCHANGE

Air Temperature	Deg F	60			70			80			90		
Air Movement	fpm	15	100	250	15	100	250	15	100	250	15	100	250
Evaporation	per cent	18	16	15	22	19	18	29	27	25	73	67	55
Radiation	per cent	43	26	19	40	26	17	37	24	17	14	10	13
Convection	per cent	39	58	66	38	55	65	34	49	58	13	23	32

the square root of its velocity[51]. Under the conditions of the experiments in question (semi-reclining lightly clothed subjects) the effect is represented by the formula:

$$\frac{C}{\Delta T} = 0.413\sqrt{V,} \qquad (2)$$

where

C = Convection loss in kilogram-calories per square meter of body surface per hour.

ΔT = Surface temperature of the body (clothing and exposed skin) minus air temperature, degrees Fahrenheit.

V = Velocity of air, feet per minute.

The extent of the effect may be indicated by the computed data in Table 7.

As emphasized in an earlier paragraph the problem of local drafts causing differential cooling of special areas of the body is one that must always be kept in mind. Experience and recent field studies by the A.S.H.V.E. Research Laboratory[52] place the desirable air movement between 15 and 25 fpm under ordinary room temperatures during the

TABLE 7. CORRESPONDING EQUIVALENT AIR TEMPERATURES PRODUCING EQUAL HEAT LOSS AT 15 FPM FOR VARIOUS AIR TEMPERATURES AND AIR MOVEMENTS

OBSERVED AMBIENT AIR TEMPERATURE DEG F	EQUIVALENT TEMPERATURE AT STANDARD AIR MOVEMENT OF 15 FPM WHEN OBSERVED AIR MOVEMENT IS			
	15 fpm	100 fpm	250 fpm	500 fpm
95	95	95.0	95.7	96.0
90	90	88.5	87.7	87.0
85	85	81.7	79.5	78.0
80	80	75.2	71.6	69.0
75	75	68.7	63.5	60.3
70	70	62.2	55.5	51.2
65	65	55.5	47.5	42.5
60	60	48.9	39.5	33.6
55	55	42.3	31.8	24.7
50	50	35.7	23.5	15.8

[51]The Influence of Air Movement on Heat Losses for the Clothed Human Body, by C.-E. A. Winslow, A. P. Gagge and L. P. Herrington (*American Journal of Physiology*, October, 1939, Vol. 127, p. 505).

[52]A.S.H.V.E. RESEARCH REPORT No. 1016—Classroom Drafts in Relation to Entering Air Stream Temperature, by F. C. Houghten, H. H. Trimble, Carl Gutberlet, and M. F. Lichtenfels (A.S.H.V.E. TRANSACTIONS, Vol. 41, 1935, p. 268).