atmosphere. In moistening the material air has to be supplied for removing the latent heat of absorption as well as to supply the necessary moisture.

Rate of Evaporation and Absorption.—Some years ago the writer made a series of tests to determine the laws governing the rate of evaporation from a free water surface. It was found that there were three controlling factors which determined this rate of evaporation:—

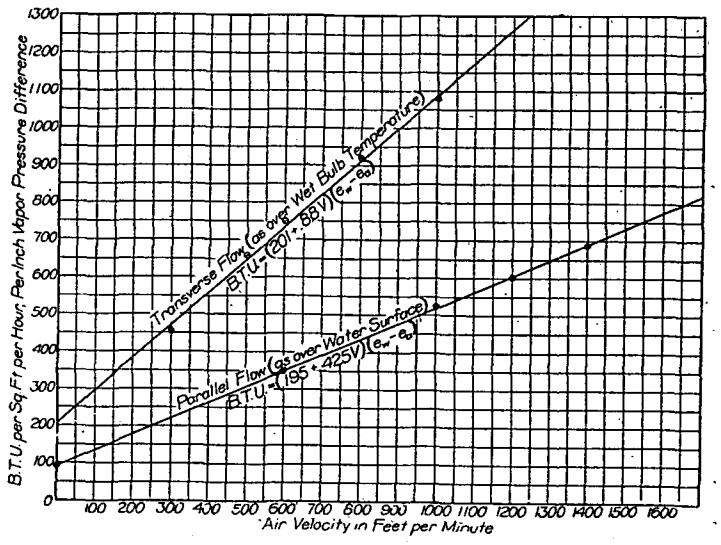

FIG. 4. CURVES SHOWING B.T.U. TRANSMISSION BY EVAPORATION FROM WATER SURFACE

With various velocities of air per inch pressure difference (mercury) in vapor pressure in air and vapor pressure of water (as determined by Carrier—1913-14)

1st, The vapor tension of the water corresponding to its temperature;

2nd, The vapor tension of the moisture in the air corresponding to its absolute moisture content or dew point temperature;

3rd, The effective velocity of air over the surface.

It was found that both in still air and under constant conditions of air velocity that the rate of evaporation from the surface was proportional to the difference in vapor pressure between the air and water regardless of the temperatures of the air. The evaporation from an unheated water surface at constant air velocity would be in direct proportion to the difference in vapor tensions corresponding respectively to the dew point of the air and to wet bulb temperature

of the air. It will be seen by referring to the psychrometric formula, that the difference of the vapor tensions is nearly proportional to the difference between the wet and dry bulb temperatures for all atmospheric conditions. Therefore, the rate of evaporation from an unheated water surface at a given air velocity is practically proportional to the wet bulb depression regardless of the temperature.

It was also found that for a constant difference of vapor pressures, the rate of evaporation started with a fixed minimum in still air and increased from this point in direct proportion as the air velocity was increased. The rate of evaporation from a free water surface at

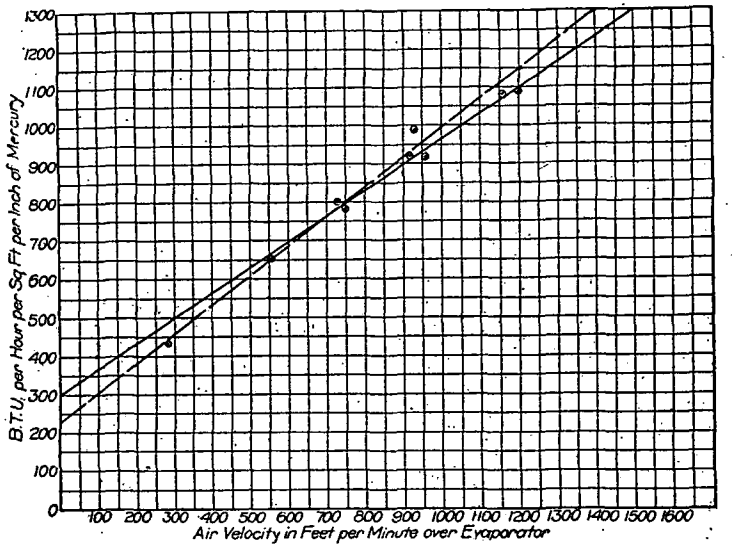

FIG. 5. HEAT TRANSMISSION BY EVAPORATION FROM SURFACE OF WET BULB EVAPORATOR (WITH TRANSVERSE FLOW)
As determined by B. H. Coffey and Geo. A. Horne, 1916

varying velocities per inch difference of vapor pressure as obtained by these experiments is shown by Fig. 4. From this it will be seen that the rate of evaporation from a free water surface with *parallel air flow* may be simply expressed numerically as follows:—

$$G = \frac{(95 + 0.425V)}{r}(e_w - e_a);$$

and with *transverse air flow* as follows:

$$G = \frac{(201 + 0.88V)}{r}(e_w - e_a) \text{ (approx.)}$$