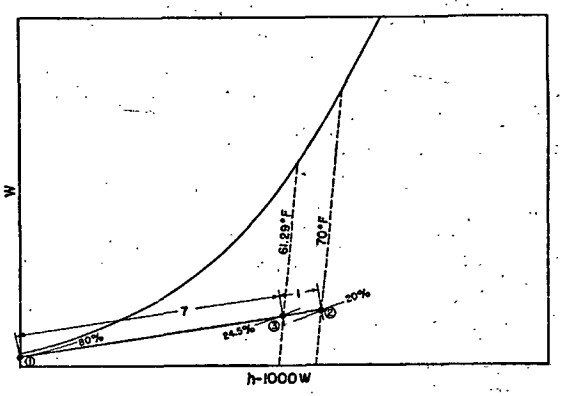

FIG. 5. ILLUSTRATION OF USE OF MOLLIER DIAGRAM IN SOLUTION OF EXAMPLE 8

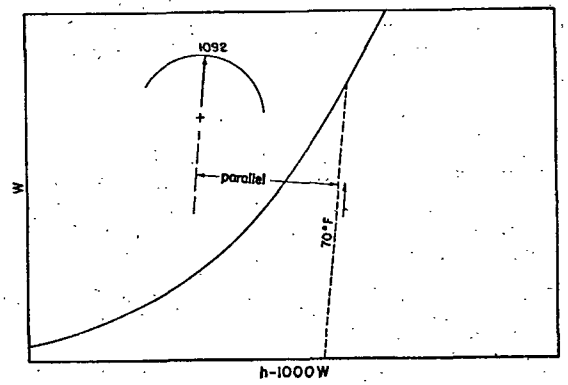

FIG. 6. ILLUSTRATION OF USE OF MOLLIER DIAGRAM IN SOLUTION OF EXAMPLE 9

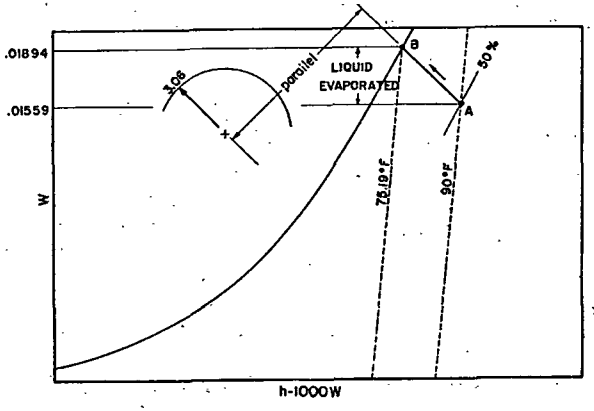

FIG. 7. ILLUSTRATION OF USE OF MOLLIER DIAGRAM IN SOLUTION OF EXAMPLE 10

the weight of water evaporated is 0.01894 − 0.01559 = 0.00335 lb per pound of dry air.

On the Mollier Diagram, Fig. 7, a line is drawn through the initial state point (90 F, 50 per cent saturation) in the direction given by the protractor for a specific enthalpy of 3.06 Btu/lb_w.

If air is saturated adiabatically with spray water which is recirculated, the water will ultimately assume a temperature such that the air is brought to saturation at exactly the same temperature; that is, the water will assume the thermodynamic wet-bulb temperature of the air.

Example 11. Air at 75 F and 60 per cent saturation is saturated adiabatically with recirculated spray water. Find the resulting temperature and the weight of water added per pound of dry air.

Solution. In view of the foregoing remarks the solution of this example reduces to the determination of the thermodynamic wet-bulb temperature of the air. Its humidity

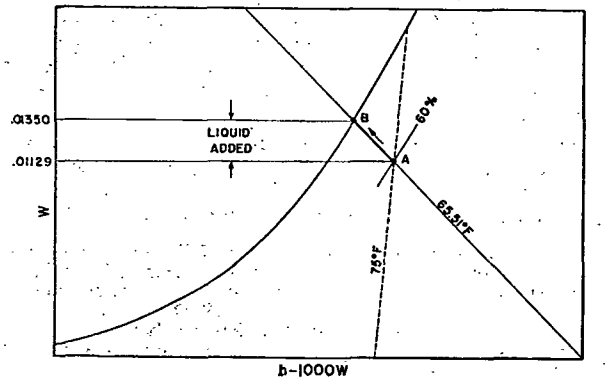

FIG. 8. ILLUSTRATION OF USE OF MOLLIER DIAGRAM IN SOLUTION OF EXAMPLE 11

ratio is 0.60 × 0.01882 = 0.01129; its enthalpy is 18.018 + 0.60 × 20.59 = 30.372; Equation 7 defining thermodynamic wet-bulb temperature becomes

$$h_s^* - (W_s^* - 0.01129)h_w^* = 30.372$$

At 65 F the value of the lefthand member is 29.995; at 66 F its value is 30.746; by interpolation the thermodynamic wet-bulb temperature is 65.51 F where the humidity ratio at saturation is 0.01350; consequently the weight of water added is 0.01350 − 0.01129 = 0.00221 lb per pound of dry air.

On the Mollier Diagram, Fig. 8, the process is represented by the line AB which is a segment of the 65.51 F thermodynamic wet-bulb line. The difference between the ordinates at B and at A is the weight of water added per pound of dry air.

Cooling Load

The problem of calculating the cooling load for an air conditioned space usually reduces to the determination of the quantity of *inside air* that must be withdrawn and the condition to which it must be brought by suitable processing so that its return to the conditioned space will have the net effect of removing given amounts of energy and water from the space.

Let M denote the weight of dry air withdrawn with *inside air* per hour. With it will be withdrawn energy of amount Mh_1 and water of amount