of the vapor in the air-vapor mixture to migrate into the brine. Here it condenses into liquid water and decreases the concentration of the absorbent. In order that the process be continuous means must be provided for counteracting the diluting effect of the extracted moisture and also for maintaining the temperature of the brine sufficiently low to hold the desired vapor pressure.

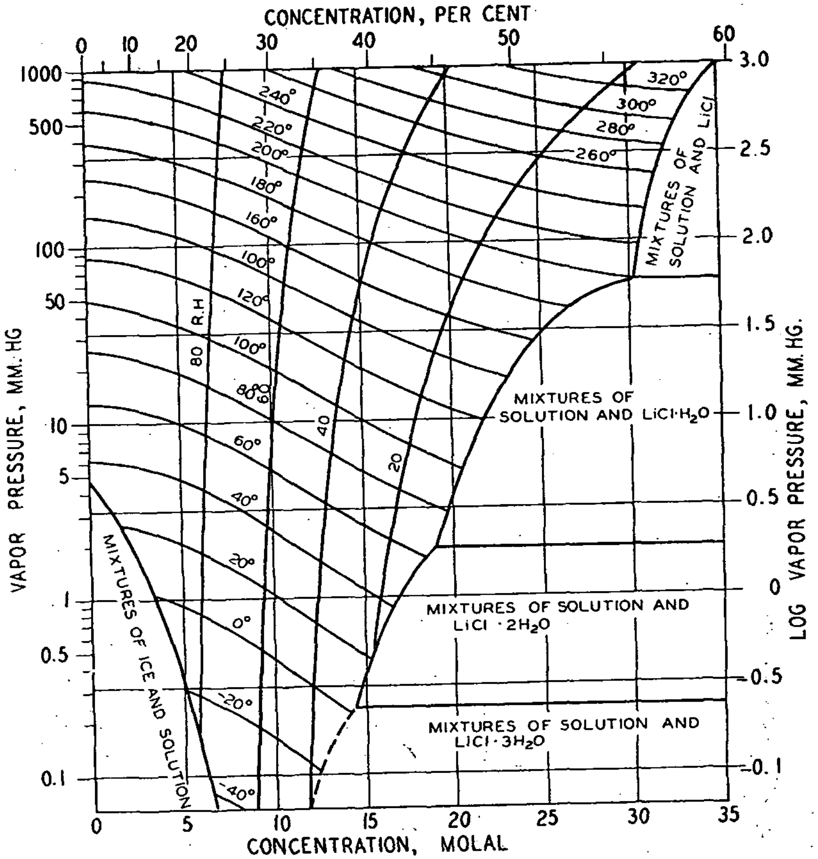

FIG. 2. TEMPERATURE—PRESSURE—CONCENTRATIONS FOR LITHIUM CHLORIDE

As the water vapor is added to the absorbent and condenses, it gives up its latent heat of condensation which tends to raise the temperature of both the absorbent and the moist air stream. For every pound of water absorbed and condensed the heat added to the air stream and the brine combined is obtainable from steam tables. For instance, at 60 F the amount of this heat is about 1057 Btu. In addition to this heat there is involved also the so-called heat of mixing which is frequently considerable.

Temperature-Pressure-Concentration Relations

Since the absorption process can continue only as long as there is a difference in vapor pressure between the absorbent and the air-vapor mixture and since at a given temperature of the absorbent the vapor pressure depends on the concentration of the solution, evidently there must be a relation between these quantities which if known would state the limits of the process. The relationship would also depend on the absorbent being used, and would have to be determined for each substance used as an absorbent. Fig. 2 shows this relationship graphically for lithium chloride. It will be noted that this chart is essentially similar to that shown in Fig. 1 and its direct usefulness is limited by much the same considerations.

In order to permit numerical calculations of air conditioning problems it is desirable to have tables for use instead of a chart like Fig. 2, and Tables 7, 8, 9 and 10 can be used in making calculations for lithium chloride.

Instead of tabulating the vapor pressure of the solution of lithium chloride it is preferable to tabulate the dew-point of air in equilibrium with lithium chloride, since it is easy to interpolate between values of the dew-point and not so easy to interpolate accurately between values of vapor pressure. The values for dew-point may be converted to vapor pressures, relative humidity, and wet-bulb of air in equilibrium by means of the usual psychrometric chart or formula.

In Tables 7, 8, 9 and 10 the unit of concentration is the *mol*. A 'M' *molal solution is defined as a solution containing* $M \times 42.37$ grains of anhydrous lithium chloride per 1000 grains of water. The formula connecting concentration in mols with weight in per cent is equivalent to: $[100 \times M \times 42.37] \div [1000 + (M \times 42.37)]$.

PROBLEMS IN PRACTICE

1 ● What is the heat content above −40 F of 2.5 lb of ammonia when under a pressure of 92.9 lb per square inch gage and a temperature of 160 F?

First determine the condition of the ammonia at the stated temperature and pressure. Do this by finding the absolute pressure which in this case is 92.9 lb gage plus 14.7 or 107.6 lb per square inch absolute. From Table 1 note that the *saturation temperature* at this pressure is 60 F. Therefore, the ammonia is superheated 100 F, and the total heat per pound can be read directly from the Table as 689.9 Btu. In the 2.5 lb of ammonia there are 2.5×689.9, or 1724.75 Btu.

2 ● What volume is necessary to accommodate 0.27 lb of saturated F_{12} vapor when compressed to 99.6 lb gage?

The absolute pressure is 99.6 plus 14.7 or 114.3 lb. In Table 2 find that one pound of F_{12} vapor saturated occupies 0.368 cu ft. Then the 0.27 lb would occupy 0.27×0.368, or 0.099 cu ft.

3 ● How much heat would be removed from air passing over a coil through which 2 lb of methyl chloride per minute is forced? The coil is under a gage pressure of 64 lb per square inch and the liquid refrigerant is completely vaporized in passing through the coil.

Find that the absolute pressure is 64 plus 14.7 or 78.7 lb per sq in. From Table 3 note that the saturation temperature at this pressure is 75 F (nearly) and that the heat