fahr., a relative humidity of 70 per cent, and an outside temperature of −10 deg. fahr., assuming the conductivity of the insulation to be 0.30 B.t.u. per hour per square foot per degree fahrenheit per inch thickness:

k = 0.30 B.t.u. per hour per square foot per degree fahrenheit per inch thickness.
t = 85 deg. fahr.
t_o = −10 deg. fahr..
R.H. = 70 per cent.
t_d = 74 deg. fahr.
f_i = 1.34 B.t.u. per hour per square foot per degree fahrenheit (average, Table 4)
U = 0.485 B.t.u. per hour per square foot per degree fahrenheit (Table 32)

$$x = 0.30 \left[\frac{85 - (-10)}{1.34\,(85 - 74)} - \frac{1}{0.485} \right]$$

= 1.3 in.

Condensation Chart

The chart (Fig. 11) can be used for approximating the thickness of insulation required to prevent condensation on the interior wall or roof surfaces of a building. The procedure for using this chart is as follows:

1. Locate the dry-bulb temperature t of the air near the ceiling on scale *A*, and pass horizontally to the proper relative humidity curve indicated on scale *B*.
2. From this point pass vertically downward.
3. Locate the difference between the temperature of the air at the ceiling and the lowest outside temperature on scale *D*, and draw a line horizontally until it intersects line *2*. (The vertical line drawn as per paragraph 2).
4. From the intersection of lines *2* and *3* draw a line to the point *P* in the lower left hand corner of the chart.
5. From the intersection of line *4* and line *AB*, draw a line horizontally until it intersects the diagonal line corresponding to the heat transmission coefficient of the uninsulated roof shown on scale *F*.
6. From the intersection found as per paragraph 5, draw a line vertically downward.
7. Locate the conductivity of the insulation to be used (expressed in B.t.u. per hour per square foot per degree fahrenheit) on scale *G* and draw a line to point *Q*.
8. From the intersection of lines *6* and *7*, draw a line horizontally to the left, and the correct thickness of insulation to use will be indicated on scale *H*.

Although this chart is intended primarily for roofs, it can be used for walls by taking the dry-bulb temperature and the corresponding relative humidity of the air near the walls at the point which will necessitate the maximum heat resistance to prevent condensation, instead of using the temperature and humidity near the ceiling.

Example showing Use of Condensation Chart

Determine the thickness of insulation required to prevent ceiling condensation for the following conditions:

Dry-bulb temperature near ceiling	85 deg. fahr.
Relative humidity	70 per cent
Lowest outside temperature	−10 deg. fahr.
Construction of uninsulated roof	1 in. yellow pine sheathing and built-up roofing.
Coefficient of transmission of roof	0.485
Conductivity of insulation to be used	0.30

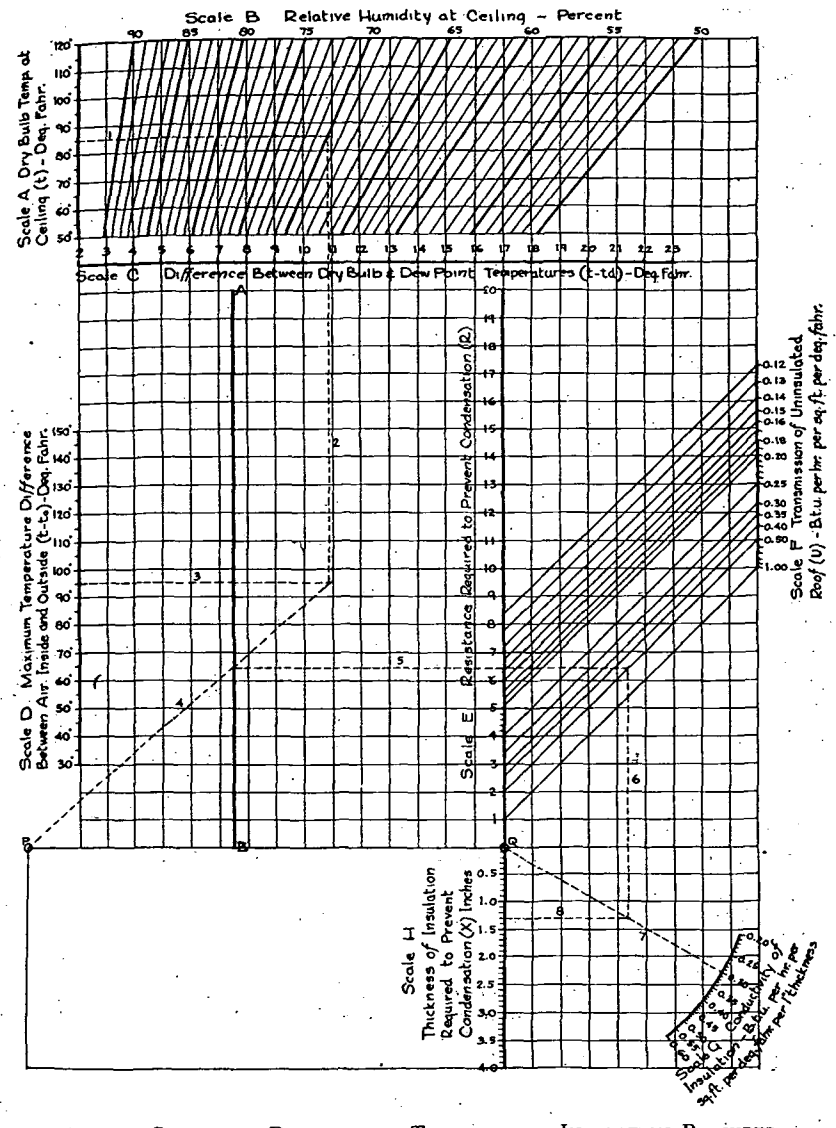

FIG. 11. CHART FOR DETERMINING THICKNESS OF INSULATION REQUIRED TO PREVENT CONDENSATION

The solution of this problem is indicated on the chart (Fig. 11) by the dotted line:

1. Locate the inside dry-bulb temperature of 85 deg. on scale *A*, and draw a line horizontally to the 70 per cent relative humidity curve, indicated on scale *B*.