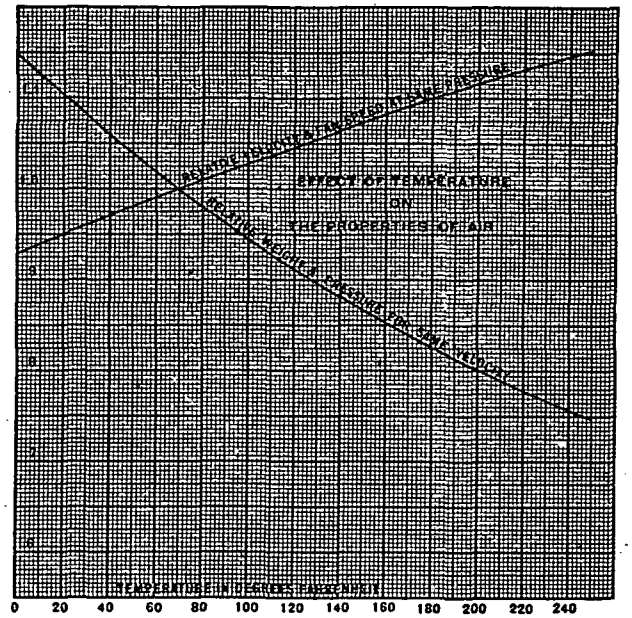
FIG. 3



HUMIDITY

Humidity is the moisture or water vapor mixed with the air in the atmosphere, and the weight of water vapor a given space will hold is dependent entirely on the temperature. The amount of vapor in any given space is independent of the presence of air, the only effect the air has being due to its temperature.

Absolute Humidity

Absolute humidity is the weight of a given volume of water vapor at a given temperature and percentage of saturation and is usually expressed as grains per cubic foot. The following tables give the weight of water vapor per cubic foot at different temperatures and percentages of saturation.

Relative Humidity

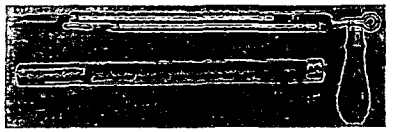
Relative humidity is the ratio of the weight of water vapor in a given space as compared to the weight which the same space is capable of containing when fully saturated at the same temperature. It is the ratio of the absolute humidity for the given condition to the absolute humidity at saturation. The quantity of moisture mixed with the air under different conditions of temperature and saturation is usually determined by means of some form of instrument in which a dry-bulb and a wet-bulb thermometer are used.

Dew-Point

The dew-point is the temperature at which saturation is obtained for a given weight of water vapor, or the point where any reduction in temperature would cause condensation of some of the water vapor. Any given amount of moisture must have some temperature at which saturation will occur and any further lowering of the temperature will cause condensation. This then will be its dew-point.

Dry-Bulb and Wet Bulb Thermometers

Usually the temperature of the air is determined by means of an ordinary or dry-bulb thermometer. The wet-bulb thermometer has the bulb covered with a piece of clean soft cloth and should be wet or dipped in water before taking a reading. Care should always be taken to keep the cloth free from dirt and to use pure clean water. This thermometer will give a depressed or lower reading than that of the dry-bulb thermometer in proportion to the evaporation from the wet surface of the cloth, and this depression is a measure of the amount of moisture in the air. This depressed reading corresponds to the temperature at which the air would normally saturate without any change in its heat contents. That is, the total heat in the air remains constant at a constant wet-bulb temperature. In order to obtain a true reading it is necessary that the thermometer be placed in a strong current of air.



The Sling Psychrometer

This instrument consists of a wet-and a dry-bulb thermometer mounted on a strip of metal and provided with a handle which permits of the thermometer being rapidly whirled through the air. When being used the instrument should be whirled continuously until no further drop in the wet-bulb reading is noted. The difference between the readings of the two thermometers is the wet-bulb depression, and by referring to the tables or to the Psychrometric Charts, Figs. 5, 6 and 7, the corresponding psychrometric conditions may be determined. There are other forms of instruments, generally of some stationary type, used for taking humidity readings, but the instrument described is reasonably accurate and is the one used by the United States Weather Bureau.

Relation of Humidity to Heating

To understand more thoroughly the relation of humidity to heating, it is necessary to know that the temperature felt by the human body, or the sensible temperature, as it is called, corresponds to the temperature of the wet-bulb thermometer; hence, the drier the air the greater is the difference between the actual and sensible temperatures. Dry air heated much above the normal will still be chilly, slight drafts are very noticeable and colds are easily contracted.

The excessive evaporation from the skin lowers the temperature of the body very rapidly, and as a result higher temperatures are required than would be necessary for comfort if the proper amount of humidity were present. On the other hand, if the percentage of humidity is excessive, evaporation from the body is below normal, with the result that the body heat is not radiated as speedily as is necessary for comfort. In general, the higher the humidity maintained the lower the temperature required for the same degree of personal comfort.

Relation of Dry-Bulb, Wet-Bulb and Dew-Point Temperatures

The relation between the temperature as shown by the dry-bulb and wet-bulb thermometer, and the relation to the dew-point should be thoroughly understood by those expecting to become at all familiar with the subject of humidity.

Dew-point, as previously stated, is the temperature at which saturation is obtained for a given amount of water vapor. In other words, the air is at the dew-point when it contains all the moisture it will hold at a given temperature, and when it is impossible to get the air to absorb more water vapor without raising the temperature. When air has been reduced to the dew-point, both wet- and dry-bulb thermometer register exactly the same; for instance, air at 50° temperature and 100 per cent. saturation will contain 4.076 grains of moisture per cubic foot, under which condition the dry-bulb and wet-bulb thermometers