thermometers register exactly the same. For example, air at a dry-bulb temperature of 50 F and a relative humidity of 100 per cent (saturation) will contain 53.47 grains of moisture per pound, under which condition the dry-bulb and wet-bulb thermometers will both register 50 F. If this air is heated, both thermometers will rise, but the wet-bulb temperature will rise more slowly and the relative humidity will be rapidly reduced. The dew-point temperature remains constant at 50 F since any given number of grains of moisture per pound has a fixed and definite dew-point temperature of saturation.

A pound of air at a dry-bulb temperature of 72 F, and a wet-bulb temperature of 59 F contains about 53.4 grains of water vapor. If this air is passed through a fine spray of recirculated water, it will absorb moisture; the dry-bulb temperature will immediately begin to fall, but the wet-bulb temperature will remain constant at 59 F until the dry-bulb temperature has dropped to the wet-bulb temperature, namely, 59 F. As the absorption takes place, the dew-point temperature will gradually rise from 50 F to 59 F, when saturation is obtained. At ordinary temperatures the absorption of one grain of moisture per cubic foot lowers the dry-bulb temperature approximately 8½ deg.

RELATION OF DEW-POINT TO RELATIVE HUMIDITY

A peculiar relationship exists between the dew-point and the relative humidity and this is found most useful in air conditioning work. This is, that for a fixed relative humidity there is substantially a constant difference between the dew-point and the dry-bulb temperature over a considerable temperature range. The following table giving the room temperature, dew-point temperature, and dew-point differentials for 50 per cent relative humidity illustrates this relationship most clearly:

Dry-bulb temperature	65.0	70.0	75.0	80.0	85.0	90.0
Dew-point temperature	45.8	50.5	55.25	59.75	64.25	68.75
Difference between dew-point and dry-bulb temperature	19.2	19.5	19.75	20.25	20.75	21.25

It will be seen from an inspection of this table that the difference between the dew-point temperature and the room temperature is approximately 20 deg throughout this range of dry-bulb temperatures or, to be more exact, the differential increases only 10 per cent for a range of practically 25 deg.

This principle holds true for other humidities and is due to the fact that the pressure of the water vapor practically doubles for every 20 deg through this range.

The approximate relative humidity for any difference between dew-point and dry-bulb temperature may be expressed as:

$$\frac{100}{2^{\frac{t-t_1}{20}}} \tag{3}$$

where

t_1 = dew-point temperature.

This principle is very useful in determining the available cooling effect obtainable with saturated air when a desired relative humidity is to be maintained in a room, even though there may be a wide variation in room temperature. This problem is one which applies to certain industrial conditions, such as those in cotton mills, tobacco factories, etc., where relatively high humidities are carried and where one of the principal problems is to remove the heat generated by the machinery. It also permits the use of a differential thermostat, responsive to both the room temperature and to the dew-point temperature, to control the relative humidity in the room.

TEMPERATURE OF EVAPORATION

Air may also be saturated adiabatically by being brought into contact with water without the addition or subtraction of external energy. Under this condition water vaporizes into the space occupied by the air, assuming that no heat is available from the water itself. That is, no temperature change takes place in the unvaporized water present, and the heat required for change of state must come from the sensible heat in the air itself, thus resulting in the lowering of its temperature.

The moisture content of the air, therefore, is increased and its temperature is lowered simultaneously, and it is obvious that the increase in latent heat must exactly equal the decrease in the sensible heat of the mixture. Further, this process will go on until the air becomes saturated, when no further exchange between the sensible and latent heat is possible. This final temperature at which adiabatic saturation takes place in any body of air of known temperature and moisture content is known as the *temperature of evaporation* and corresponds to the *wet-bulb* temperature.

TEMPERATURE OF ADIABATIC SATURATION

In order that no heat exchange may take place between the water and the surrounding air, it is necessary that the water shall be introduced at the temperature of evaporation. On the other hand, if free water shall be exposed to a continuous current of air of a given temperature and moisture content, the water will ultimately assume of its own accord this equilibrium temperature of evaporation. It is for this reason that an ordinary thermometer which has its bulb covered by a wetted cloth or otherwise is coated with the water, if protected against outside sources of heat such as radiation and if subjected to a stream of air having a definite temperature and moisture content, will indicate the temperature of adiabatic saturation. This proves the identity between what is termed the *wet-bulb temperature* and the *temperature of adiabatic saturation*.

With the ordinary sling psychrometer which is used in measuring the moisture content of air, however, there is always some radiation present and, if the wet-bulb be not strongly ventilated, the error due to radiation may be considerable. With strong ventilation, however, the radiation effect is usually less than one per cent. This error depends upon the