of the theoretical depression with the wet bulb temperature around 68 deg. (see Fig. 1). The writer has found that this percentage of error will increase with lower wet bulb temperatures and will decrease decidedly at higher wet bulb temperatures (see Fig. 2). This error is apparently due to three factors:—

1st, The transmission or conduction of heat of the surrounding air through the layer or film of cool air surrounding the bulb to the bulb itself;

2nd, By direct radiation from surrounding objects which will normally be at the dry bulb temperature;

3rd, Transmission through the stem of the thermometer which, of course, is at the dry bulb temperature.

The writer has found that this error could be largely eliminated by the use of high velocities and by protecting the thermometer from radiation from warmer bodies, and also by covering the stem of the thermometer with a wicking. Thus, the error by transmission or conduction through the air itself is apparently small at the usual high air velocities at which wet bulb readings are taken.

The writer has found through a careful mathematical investigation comparing the observed depression with a theoretical depression, that the vapor pressure in the air for any given observed wet bulb and dry bulb temperature of the standard sling psychrometer by the following psychrometric formula:—

$$e = e' - \frac{(P - e')\ (t - t')}{2920 - \frac{69500}{80 + t_p - t'} + .0017P\ (t - t')}$$

This may be placed in an approximate form more convenient for calculation, as follows:—

$$e = e' - \frac{(P - e')\ (t - t')}{2920 - \frac{69500}{80 + t_p - t'} + (.00000022)\ (t - t')^2}$$

where e = the vapor pressure of the moisture actually contained in the air, i.e., the vapor pressure corresponding to the dew point;

e' = the vapor pressure corresponding to the observed wet bulb temperature, using a sling psychrometer or air velocity of approximately 2000;

P = the barometric pressure in inches of mercury;

t = the dry bulb temperature in degrees fahrenheit;

t' = the observed wet bulb temperature in degrees fahrenheit with a sling psychrometer or equivalent wet bulb thermometer;

t_p = the boiling point in degrees fahrenheit corresponding to the barometric pressure; for the standard barometric pressure (29.92), t_p equals 212 deg.

The general form of this was determined rationally in 1911. This has been carefully deduced by calculation in the plotting of curves covering all range of conditions between 32 and 180 deg. wet bulb and dry bulb temperatures up to 800 deg. fahr. and also for various barometric pressures. This is particularly valuable, as it can be applied without any corrections to *observed* wet bulb readings for all temperatures above 32 deg. with the probability of error less than that due to a tenth of a degree error in reading the wet bulb temperature.

The dew points obtained by this formula have been compared with the corresponding dew points as given by the U. S. Weather Bureau which were based on actual dew point observations and have been found to agree with these through their more accurate ranges, i.e., the ranges covered by a preponderance of actual observations.

This formula, which is exact for all ranges of temperature and humidity above 32 deg. and for all barometric pressures, would indicate that Professor Farrel's formula, adopted by the U. S. Weather Bureau must be inexact for extreme conditions of low humidities and for high temperatures at all humidities. It is also apparently inaccurate for low barometric pressures. Through the usual range of normal atmospheric conditions, however, the constants employed are such as apparently to give very accurate dew point determinations, when it is taken into consideration that the formula is based on a series of vapor pressures which are now known to be incorrect. Both the above formulae and the Government formula for vapor pressures are inaccurate below 32 deg. if ice is allowed to form on the wet bulb, although these formulae will apply if readings of the wet bulb are taken at the instant water on the wet bulb is subcooled to a minimum point below the freezing point without the formation of ice crystals. The reason that a different psychrometric equation must be used below 32 deg. wet bulb temperature is that to r', the latent heat of water vapor at the wet bulb temperature, there must be added 144 B.t.u., which represents the additional latent heat required in the melting of ice. For the temperatures below 32 deg. the following formula is correct:

$$e = e' - \frac{(P - e')\ (t - t')}{3000 + 2.2P - 1.6\,t'}$$