Fortin's Mercurial Barometer & Aneroid Barometer

Air pressure is simply the mass of air above a given level. As we climb in altitude above the earth's surface, there are fewer air molecules above us; hence, atmospheric pressure always decreases with increasing height. Most of our atmosphere is crowded close to the earth's surface, which causes air pressure to decrease with height, rapidly at first, then more slowly at higher altitudes.

Fortin's Mercurial Barometer

Construction

A Fortin's barometer consists of a narrow glass tube of length about 90 cm. This tube is closed at one end. The tube is completely filled with mercury and kept inverted in a cistern filled with dry mercury. Usually, the glass tube is protected by enclosing it in a brass tube. The upper part of the brass tube has a slit that enables the level of the mercury in the glass tube to be seen. A scale graduated in millimetres is attached to the brass tube. This functions as the main scale. For accurate measurement, a vernier scale that can slide over the main scale is also fixed to the barometer. The vernier scale can be moved up and down using a screw.

The bottom of the cistern is like a bag made of flexible leather. The mercury level can be adjusted by means of a screw provided underneath. There is an ivory pointer in the cistern, placed at the top. The tip of this pointer coincides with the zero of the main scale. The level of the mercury column in the cistern can be changed with the screw under it. It is so adjusted that the ivory point is exactly at the surface of the mercury in the cistern. The whole apparatus is fixed in a vertical position.

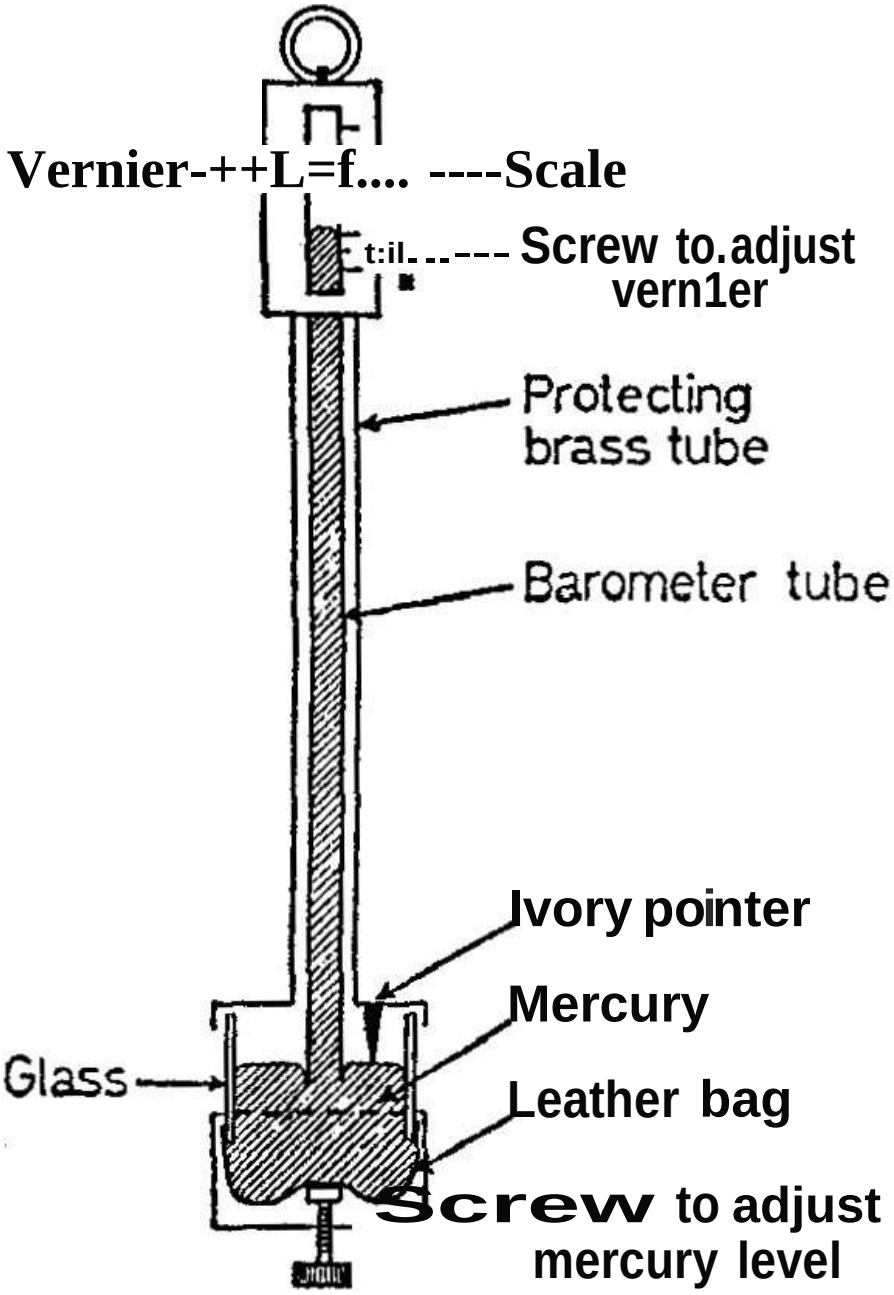
Working

Any change in the atmospheric pressure is accompanied by an immediate change in the level of the mercury in the glass tube. As the height of the mercury column in the barometer changes, mercury flows between the tube and cistern. As a result, the level of the mercury in the cistern also changes. To determine the length of the mercury column in the barometer, it is necessary to know the position of the free surface in the cistern as well as in the tube. The first step in measuring atmospheric pressure using Fortin's barometer is to set the mercury level in the cistern. Using the adjustment screw, set the level of the mercury in the cistern such that the ivory pointer just touches the mercury. The reading of the top of the mercury column is then measured using both the main scale and the vernier scale. Before the readings are noted, the vernier scale needs to be positioned properly. The vernier scale is to be adjusted so that its edge and the corresponding reading in the main scale just set tangentially to the meniscus. Now, the readings on the main scale and the vernier scale are noted, and the atmospheric pressure is calculated.

Advantages

Fortin's barometer is widely used in laboratories and in meteorological departments. The main advantages of Fortin's barometer are:

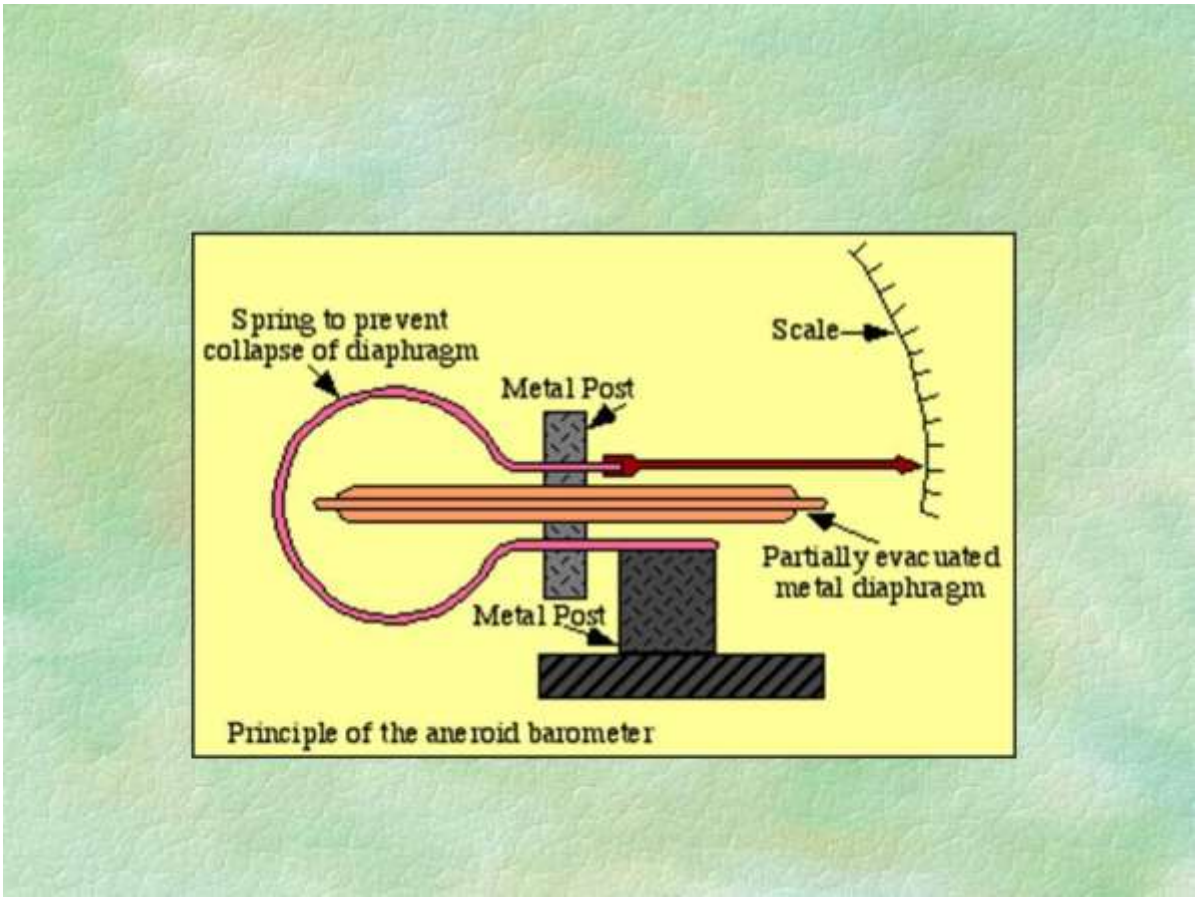
- It is portable.
- It allows the mercury level in the cistern to be set to zero. This makes the reading more accurate.



Fortin barometer

Aneroid Barometer

An aneroid barometer is an instrument for measuring pressure as a method that does not involve liquid. Invented in 1844 by French scientist Lucien Vidi. Inside this instrument is a small, flexible metal box called an aneroid cell. Before the cell is tightly sealed, air is partially removed, so that small changes in external air pressure cause the cell to expand or contract. The size of the cell is calibrated to represent different pressures, and any change in its size is amplified by levers and transmitted to an indicating arm, which points to the current atmospheric pressure the aneroid barometer often has descriptive weather-related words printed above specific pressure values. These descriptions indicate the most likely weather conditions when the needle is pointing to that particular pressure reading. Generally, the higher the reading, the more likely clear weather will occur, and the lower the reading, the better are the chances for inclement weather. This situation occurs because surface high-pressure areas are associated with sinking air and normally fair weather, whereas surface low-pressure areas are associated with rising air and usually cloudy, wet weather. A steady rise in atmospheric pressure (a rising barometer) usually indicates clearing weather or fair weather, whereas a steady drop in atmospheric pressure (a falling barometer) oft en signals the approach of a cyclonic storm with inclement weather. The altimeter and barograph are two types of aneroid barometers. Altimeters are aneroid barometers that measure pressure, but are calibrated to indicate altitude. Barographs are recording aneroid barometers. Basically, the barograph consists of a pen attached to an indicating arm that marks a continuous record of pressure on chart paper. The chart paper is attached to a drum rotated slowly by an internal mechanical clock.



Aneroid Barometer