Checking with a manometer

1. Making a manometer: A manometer is a tool used to measure the pressure inside the biogas pit; it is simple in construction and easy to make (see Figure 5-1). Take two glass tubes 1-1.5 m in length with an internal diameter of 1 cm. Fix them to a board or a wall inside a room and join the bottom ends with a length of rubber hose or plastic tube; by the side of each tube make graduations in centimetre units. At the top of tube B, fix a round safety ball, or a bottle without a bottom of more than 200 ml capacity. Fill with coloured water (to faciliate observation) up to the level of the zero mark. Take a 'Y' tube and join to tube A, and observe the change in the water column in the U-shaped tube (which consists of tube A and tube B and the hose). From this we can tell the pressure inside the pit. For every 10 cm difference in the water levels on either side there is a corresponding change in pressure of a hundredth of an atmosphere. For example, if the level in tube A were to drop by 20 cm and the water level in tube B were to rise by 20 cm, then the difference in the level in the water column will be 40 cm – this will be called an internal pit pressure of 40 cm water.

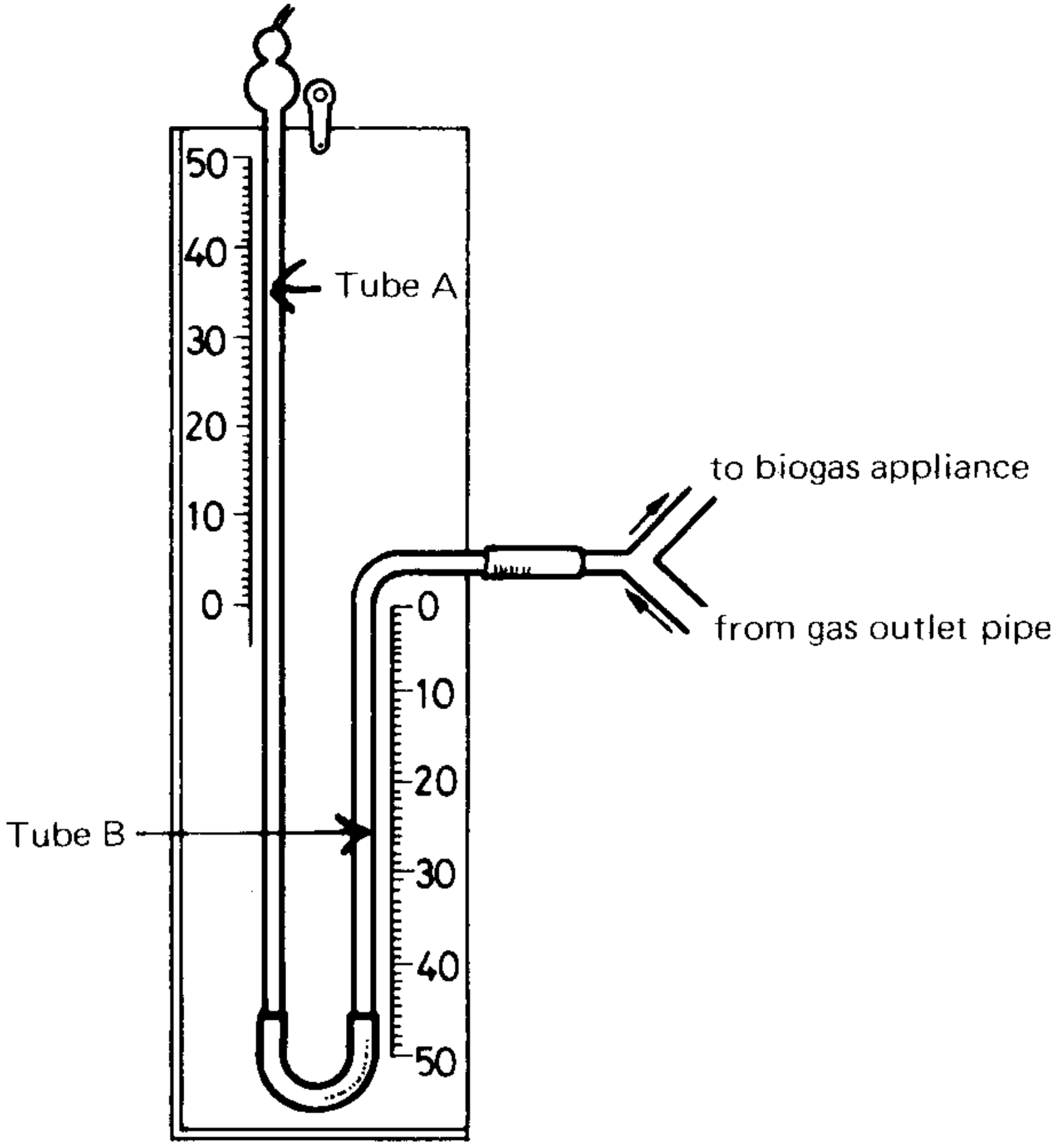

Fig. 5-1. A manometer.

A manometer not only checks the pressure, but also tells the magnitude and all pressure changes inside the pit. Therefore, one can control the pressure and ensure safety of the biogas pit. When the pressure within the pit is too high the water in the U-shaped tube will flow up into the safety bowl or bottle, and allow excess methane, or biogas to escape through the safety valve, thus automatically reducing the pressure within the pit. And when the pressure within the pit has been reduced to what is tolerable, the water will once again flow into the U-shaped tube and so maintain the gas pressure within the safe zone, avoiding damage to the pit from excess pressure within.

2. Using the manometer to check for watertightness and airtightness: Before attaching the manometer, first open the valve of the gas outlet pipe and fill the pit with water stopping when the inlet and outlet compartments are roughly half filled. Leave for three to five hours until the pit walls have become saturated with water. Then note the water level. After a day, see if there is any change. If there is any significant drop in water level, this will mean that the walls or bottom leak. When the water level stops dropping, make a mark on the wall. This will tell us that the leakage takes place between the initial level and the lower, final level. When leaks have been mended and you have made sure that the bottom and sides are watertight, then connect the manometer to the gas outlet pipe and start adding water, or else pump it up with air, using pumps or chemical spray devices. The purpose is to increase the air pressure inside. When a noticeable differential has been reached in the manometer, stop adding water or pumping air. Leave for 24 hours. Observe whether there is any drop in pressure. If the change in the height of the water column is nil or very small, i.e. 1-2 cm, the pit is shown to be airtight. However, a great drop in the water column indicates that it is not airtight. In the pressure test, one does not normally build up pressures greater than 100 cm difference in water level (or whatever the designed difference should be), so as to avoid damaging the pit.

One may also test for airtightness by filling the pit full of water, fixing on the manometer and then extracting the water out of the pit, thus building up a negative pressure or vacuum.