to hold the substance to be weighed, is usually folded diagonally, or its edges are turned up to contain the material being weighed.

In transferring material by spatula, the material may be lightly tapped from the spatula when the correct amount to be measured is approached. Usually this is done by holding the spatula with a small amount of material on it in the right hand and tapping the spatula with the forefinger. As material comes off the spatula, the left hand is working the balance-arresting mechanism, and the status of the weight is observed alternately with the tapping of the spatula. Most balances have a damping mechanism that slows down the oscillations and permits more rapid determinations of the balance or imbalance positions of the pans.

Once the material has been weighed, the balance beam is again put in the fixed position, and the paper or weigh boat holding the weighed substance carefully removed. If more than a single weighing is to be performed, the paper or weigh boat is usually marked with the name of the substance it holds. After the final weighing, all weights are removed with the forceps and the balance is cleaned, closed, and covered.

Most prescription balances contain built-in mechanisms whereby external weights are not required for weighing <1 g. Some balances use a rider, which may be shifted from the zero position toward the right side of the balance to add increments of weight marked on the scale in 10-mg units, up to 1 g. Another type of balance uses a central dial, calibrated in 10-mg units, to add weight up to 1 g. Both types of devices add the weight to the right-hand pan internally. In each case, the pharmacist may use a combination of the internal and external weights. For instance, if 1.2 g is to be weighed, the pharmacist can place a 1-g weight on the right-hand pan and place the rider or adjust the dial to add 0.2 g. Care must always be exercised to bring the rider or dial to zero between weighings to maintain accuracy.

Most use of the prescription balance is weighing of powders or semisolid materials, such as ointments. However, liquids may also be weighed in tared (weighed) vessels of appropriate size. The pharmacist must always be certain to account for the weight of the vessel in calculating the amount of liquid weighed.

Materials should never be downweighed, that is, substances should never be placed on the pan with the balance in the unarrested position, forcing the pan to drop suddenly and forcefully. The sudden slamming down of the pan can do serious damage to the balance, affecting its sensitivity and accuracy.

The most common type of prescription balance is the torsion balance. It operates on the tension of taut wires, which, when twisted by addition of weight, tend to twist back to the original position (Figure C.3).

In using an electronic balance, first make sure the balance is clean and level. The balance should be calibrated daily. Many of these balances have internal calibration, and some use an external 200- or 300-g weight. After calibration, a weighing boat or paper is placed on the balance pan, and the tare button is depressed to a reading of 0.000. Then, the required quantity of material is added to the weighing boat or paper; the dial constantly reads out the weight of material on the pan. Material can be easily removed or added to obtain the desired quantity.

Measuring Volume

The common instruments for pharmaceutical measurement are presented in Figure C.5. Two types of graduates, *conical* and *cylindrical*, are used in pharmacy. Cylindrical graduates are generally calibrated in metric units, whereas conical graduates may be graduated in both metric and apothecary units or with a single scale of either of the systems. Graduates of both shapes are available in a wide variety of capacities, ranging from 5 to 1,000 mL or more. Most graduates are made of a good-quality heat-treated glass, although graduates of polypropylene are also available. In measuring small volumes of liquids, <1.5 mL, the pharmacist should use a pipet as the one shown in Figure C.5. The bulky-looking device shown with the pipet is a pipet filler, used for drawing acids or other toxic solutions into the pipet without the mouth. The device, without being removed from the pipet, also allows for accurate delivery of the liquid.

In measuring volumes of liquids, the pharmacist should select the measuring