

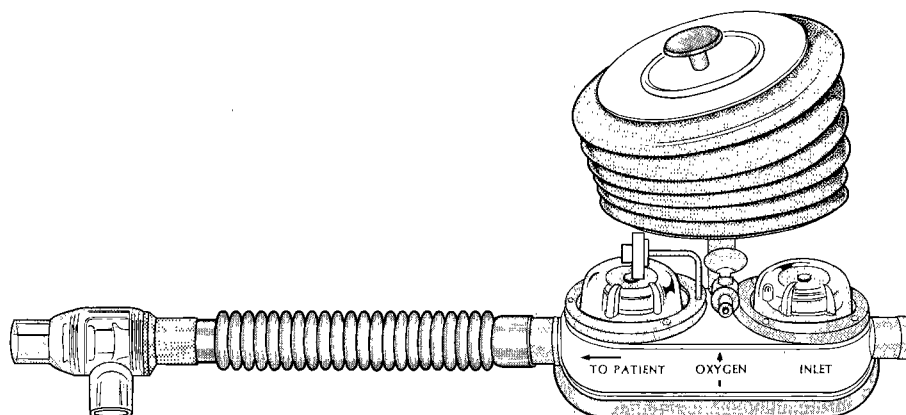
4. Anaesthetic and resuscitation equipment

Breathing machines

Oxford bellows

This is a hand-operated bellows unit for inflating the lungs (Fig. 4.1). It consists of an inlet connection and valve, the bellows in the middle, an outlet valve with outlet connection, and tap. There is a magnet in a holder under the bellows, which is used to immobilize the disk valve when a non-return valve (such as the Ambu) is in use.

Fig. 4.1. Oxford inflating bellows.



Compression of the bellows, during artificial respiration, will produce a full deflection of the flap valve during inspiration. In order to allow the patient to expire to the atmosphere, a small amount of air must pass back up the corrugated tube towards the bellows to reseal the flap valve. If the outlet flap valve of the bellows unit is not immobilized, air will be unable to pass back and the non-return valve will stick in the inspiration position. The magnet referred to above must therefore be fitted, if a non-return valve is being used.

The adult bellows can be exchanged for a paediatric type by unscrewing it from the base. The paediatric bellows has a full-stroke capacity of about 400 ml, making it easier to ventilate children.

The bellows should be inspected regularly. Possible faults in the bellows are listed below.

- *Cracks in the bellows*

Change the whole unit or just the bellows, as appropriate. To replace the bellows, proceed as follows:

1. Remove the bottom plate first, by taking out the four small screws, and then levering off the plate, which is cemented in place with an adhesive.
2. Loosen the inner bottom plate.
3. Access can then be gained to the ball-ended bolt that is attached to the top plate.

4. Holding the bolt with a pair of pliers or spanner, unscrew the knob on top of the bellows, releasing the bolt, spring, and bottom plate. The old bellows can then be pulled off the top plate.
5. Remove all the old cement from the end-plates.
6. Insert the inner top plate into the bellows, apply a small but continuous ring of glue to the groove in the outer top plate, position this on the bellows, and insert the knob.
7. Insert the spring into the bellows from the outer end, apply the ball-ended bolt, and tighten the knob.
8. Glue can then be applied to this thread to seal it. Care must be taken to keep the bellows and the plates concentric during tightening.
9. Stretch the bellows over the inner bottom plate and position the ring on the bellows' edge, in the groove in the plate.
10. Apply glue to the groove in the outer bottom plate and to the threads of the four small screws.
11. Assemble the bottom plate with the screws, again ensuring concentricity of the rubber in the grooved end-plate.
12. Allow the glue to dry for at least 1 hour before testing the bellows for leaks.

- *Cracks in the glass domes*

Replace the glass dome. (Note that the metal clamping rings are not interchangeable between the inlet and outlet valves.) It is advisable to use new gaskets with new glasses, and to tighten the fixing screws in rotation, a little at a time, so as not to stress the glass unevenly. Always ensure that the magnetic disc valve is installed in the outlet valve assembly, after dismantling the valve body.

- *Inoperative magnet*

If the magnet fails to lift the outer valve clear of the valve seating, check that the magnet is functioning, that the disc is the correct one, and that it is magnetic.

- *Faulty outlet valve*

Check the outlet valve by first replacing the magnet in its storage holder; block the inlet port with a cork, and attempt to extend the bellows. It should not be possible to extend the bellows more than 2.5 cm in 1 minute.

- *Leaks in the inlet valve*

To check the inlet valve, block the outlet port with a cork and attempt to compress the bellows. Again, movement should not exceed 2.5 cm in 1 minute. Remove the cork.

Penlon bellows unit

This is similar to, but simpler than, the Oxford bellows unit. It has a single flap and was designed specifically for use with a non-return valve. It must **never** be used with a simple spring-loaded expiratory valve. The maintenance of these units is similar to that for the Oxford bellows. The commonest site for leaks is at the base of the concertina bellows, where it is connected to the valve unit with a nut and washer. Both bellows are capable of delivering a volume of about 1300 ml; a 10-cm stroke will deliver about 800 ml.

Infant incubators

Infant incubators (Fig. 4.2) are used to keep unwell newborn or premature infants in controlled conditions of temperature, humidity, and oxygen level. Doors are