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A pedestal designed to facilitate intensive care

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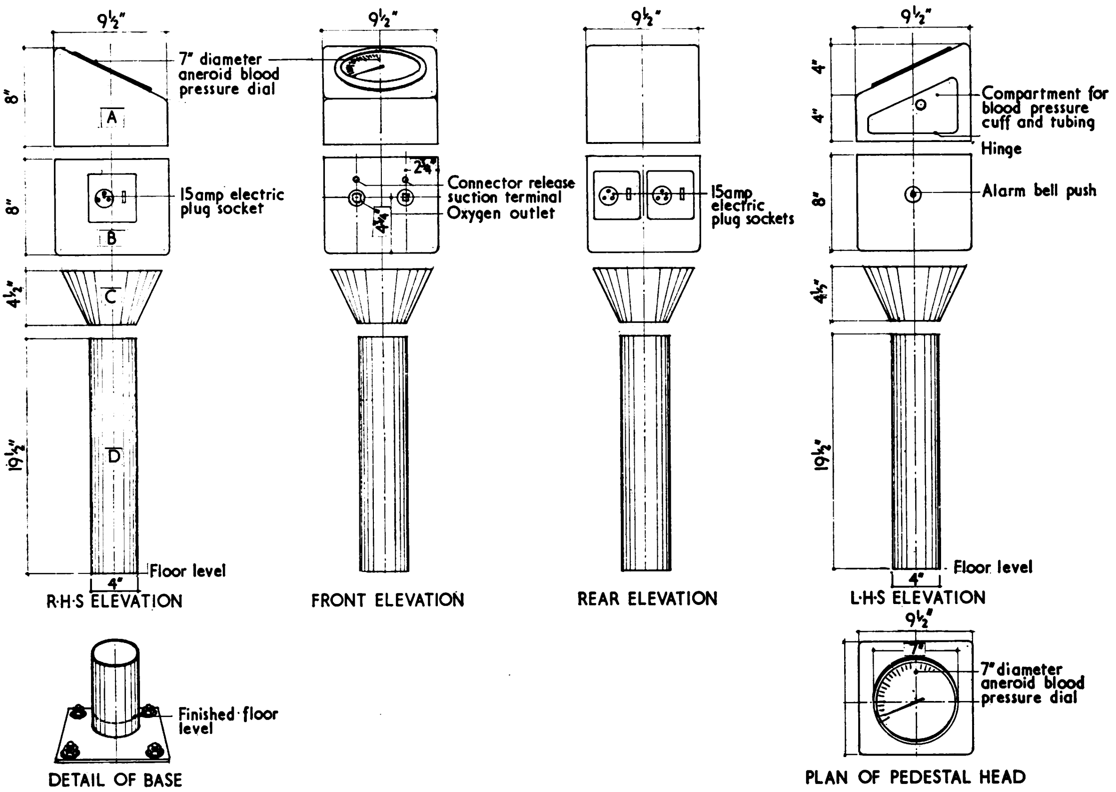
A pedestal for the provision of essential services at the bedside in an intensive care area is described and illustrated. The aim is to facilitate the relay of information on vital functions from the patient to monitors without transgression of free space about the patient. Modifications in basic design which would increase the value of such a pedestal in special circumstances are indicated.

In the design of an intensive care unit three problems which need to be solved are (1) the supply of essential services (oxygen, suction, power, etc.) to the bedside; (2) the relay of information on vital functions to remote recorders; and (3) the maintenance of free access to the patient. To maintain free access it is necessary that nowhere should the patient's bed be in contact with the wall, and, ideally, there should be a minimum of 5 ft. (1·5 m.) of clear space around each bed. If essential services are led to the patient from a wall this free space is inevitably transgressed, access to the patient is obstructed, and conduits, and those who have to avoid them, are endangered. An alternative route for conduits commonly used is from the ceiling, either directly or by a gantry, but a festoon of overhead tubes and wires constitutes an inaccessible dust-trap, and, wherever conduits come from the ceiling or are led by a gantry, there is difficulty in placing the terminals so that they do not endanger the heads of taller members of staff but are not out of reach of those who are shorter. A logical alternative is a pedestal to which conduits are led under the floor and that serves as a permanent bollard to which the patient's bed can be closely related by the shortest possible complex of leads and tubes which does not diminish access to the patient. It is the purpose of this paper to describe such a pedestal.

In Fig. 1 the four component parts of the pedestal and their dimensions are shown. Incorporated are an anaeroid pressure dial and a compartment in which the blood-pressure cuff and tubing are stowed; outlets for oxygen, suction, and power; and an alarm bell-push which allows the summoning of medical aid. For stability the base plate of the pedestal is cast into the concrete floor slab or secured to a reinforced support, and through its hollow support or core pass the conduits for oxygen, suction, and power. The sections labelled B, C, and D in Fig. 1 are welded together to form a single structure. In Fig. 2 the method of union by which section A is attached to section B is illustrated. Bolts pass through the solid base of A and are secured to the corner flanges of the open top of B. This arrangement allows section A to be removed for maintenance and repair work on the terminals situated in section B.

Self-sealing oxygen and suction outlets are sited on the front of section B. A push-button operates a spring-release mechanism by which the attachments are simply removed. The oxygen terminal has a hexagonal section and the suction outlet a square section. The respective attachments have corresponding bayonet fittings which prevent interchange. Section B also has three 15 amp. power outlets sited posteriorly and on the right side; the alarm bell-push is sited on the left side. Metal conduits connected to the oxygen and suction terminals in section B advance within the hollow core of the pedestal and are then directed under the flooring of the intensive care unit to an easily accessible point—for example, the duty-room in the intensive care area—where control valves are sited (Fig. 3, a and b). These control valves are suitably coloured to differentiate between oxygen and suction, and each is given a number which corresponds with the individual pedestal, so as to enable the oxygen or suction supply to individual pedestals to be cut off for maintenance or modification. The oxygen and suction valves are connected respectively to a central oxygen bank and a compressor unit. Similar conduits lead power from outside the intensive care unit to the pedestal. All conduits are made of copper and



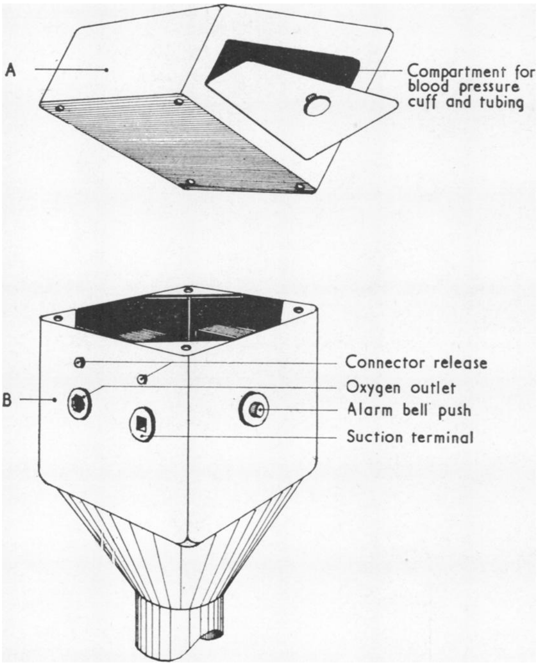
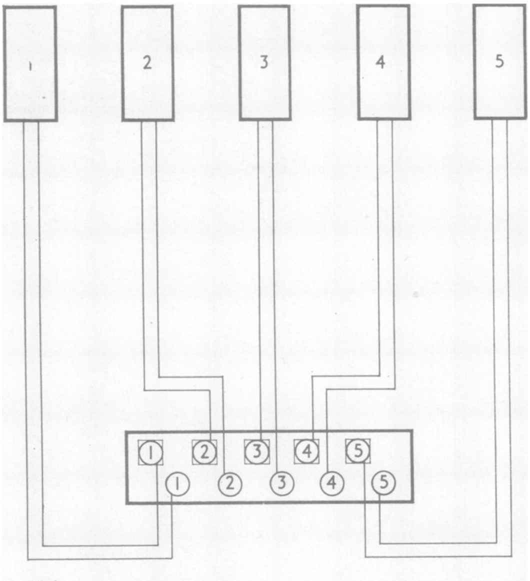


FIG. 1 (*Above*). *The essential features which relate to the construction and basic equipment of the intensive care pedestal.*

FIG. 2 (*Left*). *The method of union between sections A and B of the intensive care pedestal.*

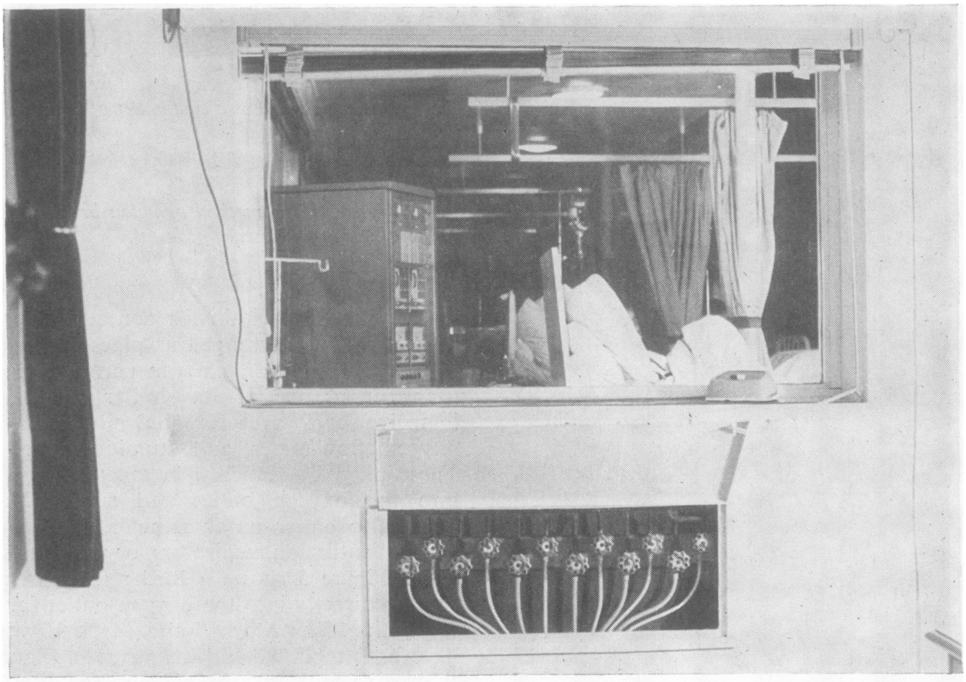
set permanently within the concrete floor. Conduits should be arranged as pipes within a larger pipe with inspection traps to permit maintenance.

In Fig. 4 one of six similar pedestals in an intensive care area is shown assembled. The oxygen flow-meter and humidifier are shown. These plug, by standard bayonet fittings, directly into the oxygen outlet and supply humidified oxygen to either nasal catheter, face-mask, controlled ventilation respirators, or anaesthetic equipment. Figure 5 shows a Bird respirator, modified to plug directly into the oxygen outlet for assisted ventilation. The Mark 8 and Mark 10 ventilators have been modified for this purpose. Figure 4 also shows the suction terminal equipment assembled and in situ. This consists of a safety valve and



(a)

FIG. 3. *(a) The plan of conduits which supply oxygen and suction from control valves to the pedestal; (b) the control valves shown in relation to an observation window which allows a clear view of the intensive care area from a duty-room. The mobile monitoring console in relation to the head-end of the first and second beds is angled so that the dials are visible from the duty-room. On the window-sill in the duty-room is the speaker of an intercommunication system which allows separate conversation with staff in relation to each bed.*



(b)

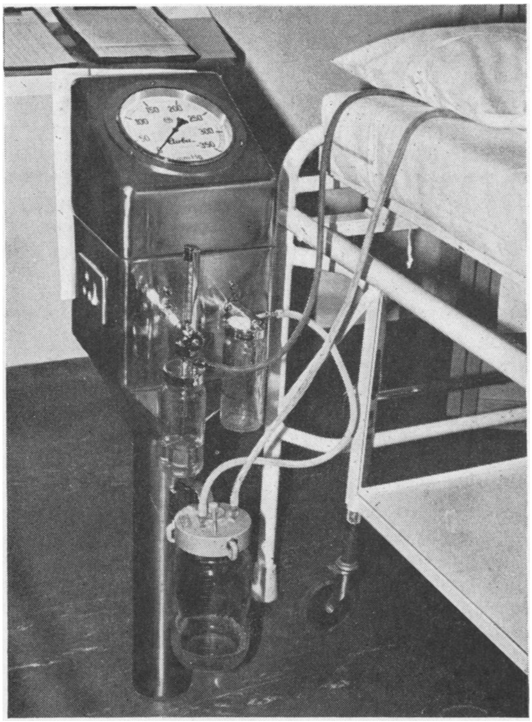


FIG. 4. *A pedestal with oxygen flow-meter and humidifier, and suction receiver, safety valve, and flask. The aneroid dial and a power outlet are also shown. The bottles are vulnerable and are broken from time to time, even by well-trained, careful staff familiar with the equipment. The relationship between the pedestal and the rostral end of a bed is shown. Note the absence of obstruction to access to the patient's head because the caudal end of the metal frame of the bed is cut so low that the mattress projects above it. The bed is high, to facilitate operative procedures. The tray under the bed is a convenient repository. The table-top on which the charts are placed is a convenient surface when endotracheal intubation or therapeutic bronchoscopy are required but is of flap-down design, so that there is a clear passage at the head-end of the bed when the table-top is not required, and even when the table is in use access is but little obstructed.*

flask connected to the suction outlet by a standard bayonet fitting which is in turn connected by tubing to a receiver flask which clamps to the pedestal support. The spring-release head to the receiver flask, which remains fixed throughout use but which is easily removed for cleaning, allows the receiver flask to be removed for emptying and replacement during use.

It is possible to modify, over a wide range, the pedestal illustrated and yet retain the principles of free access and reliance on distant monitors. Modifications include the addition of terminals for the reception of E.E.G. and E.C.G. electrodes, intravenous and intra-arterial pressure monitoring catheters, and rectal thermometers. Figure 6 shows a pedestal with the support modified to contain the suction receiver and with the addition of a telethermometer. Strain-gauges can be built in or attached to the pedestal, and all information relayed from the patient to the pedestal can be transmitted under the floor and thence either directly or indirectly to adjacent monitors on the wall.

It is rarely necessary to monitor a large number of parameters in more than two patients at the same time in the average intensive care room, particularly one which serves a cardio-thoracic or neurosurgical service. Therefore in the equipment of an intensive care area designed to accommodate six or eight patients, only two or at the most three pedestals need to be of the more

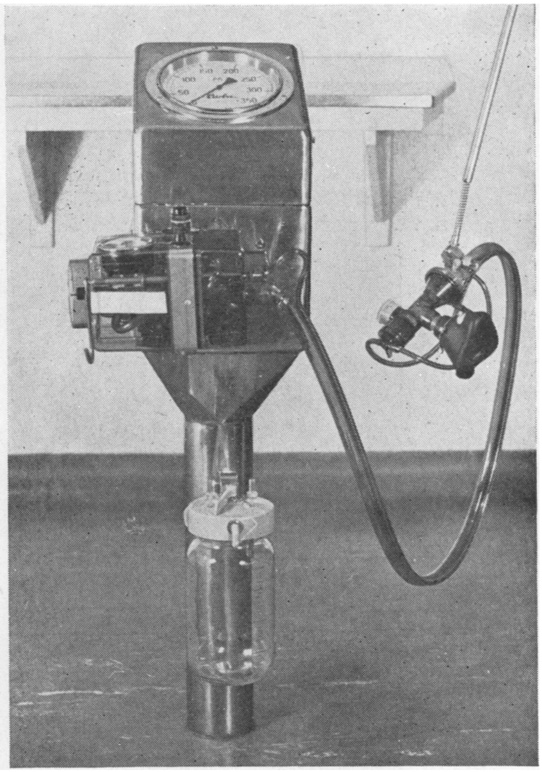


FIG. 5. *A pedestal with a modified Bird Mark* 10 *respirator attached to the oxygen outlet.*

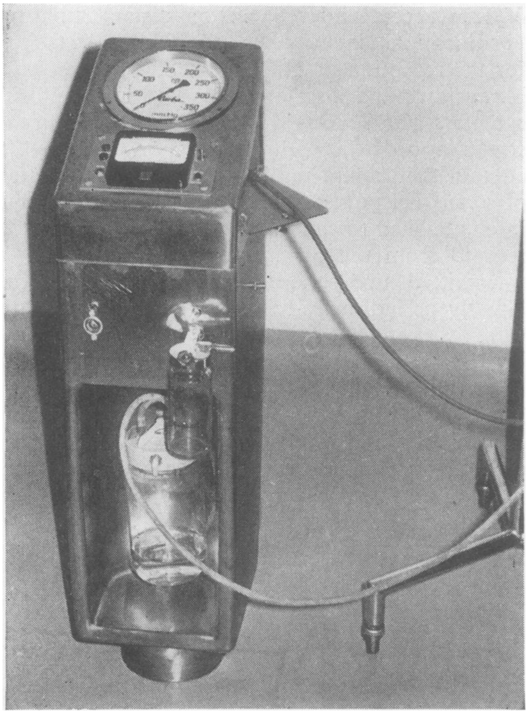


FIG. 6.

FIG. 6. *A pedestal of modified design in which the suction receiver is lodged in the column of the pedestal. This pedestal looks clumsy in comparison with that shown in Figures 4 and 5. The modification was intended to protect the glass bottles, but the number of bottles broken, never large, is not significantly smaller in relation to use of the pedestal illustrated here. Incorporated in the pedestal is a telethermometer in front of the aneroid blood-pressure dial. The bell-push for summoning medical aid is sited on the left lateral face of the pedestal below the compartment in which the blood-pressure cuff is housed—here shown with the hatch open.*

FIG. 7. *One of the intensive care units with the pedestals in use; the unobtrusiveness of the pedestals is a feature. Since both sexes are nursed in the same area, there is the need to screen patients for toilet and other purposes, and curtains are therefore available. These are suspended by nylon runners on short rods which extend only for the length of a bed. The monitoring console and the observation window are on the left. Other windows are of frosted glass since the unit is at ground level in a converted hutment. The slender pillars are necessary to support the roof; these would not be necessary in a unit designed* ab initio *and not as a conversion. When patients begin to sit up their pillows are supported by a wooden board, which in the circumstances of cardiac arrest is slipped under the mattress and serves as a rigid posterior support to facilitate external cardiac massage. When not in use the 'cardiac arrest' board is stored on the tray under each bed.*

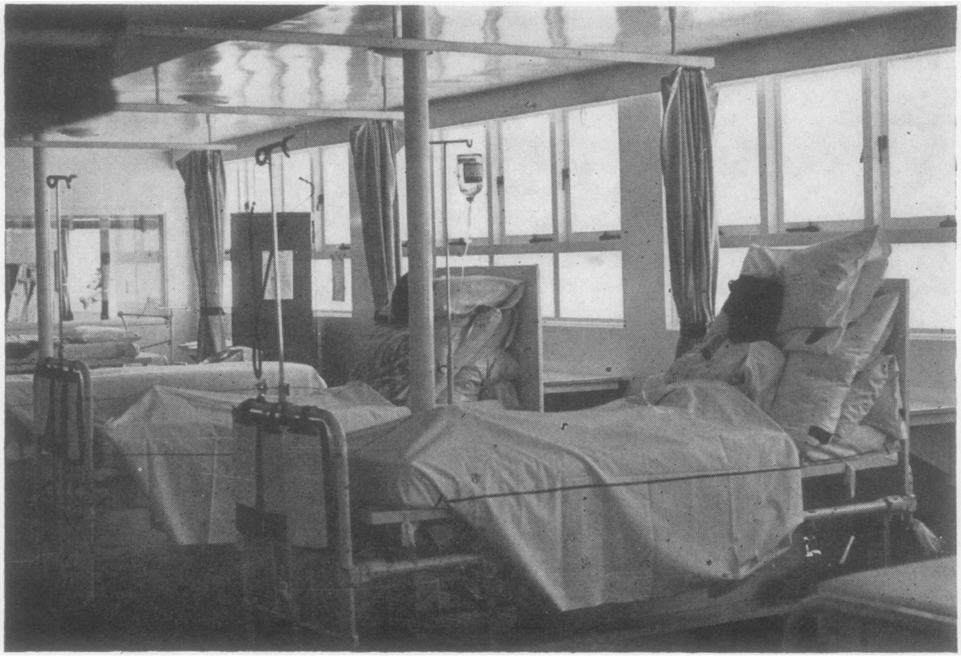


FIG. 7.

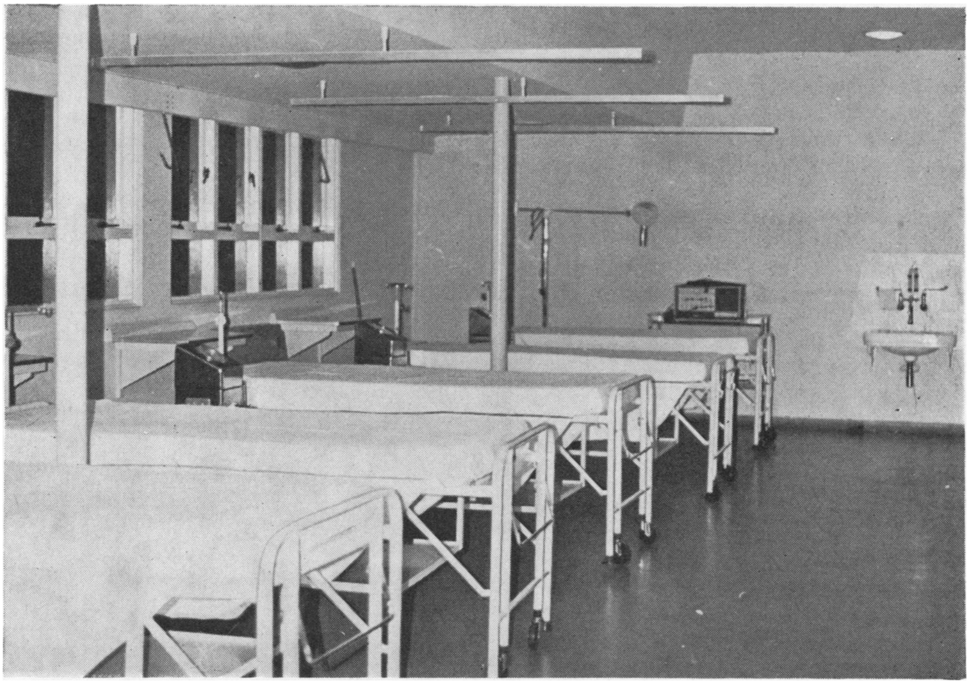


FIG. 8 (*Above*) *A unit similar to that shown in Fig. 7 in which the end of the room opposite to the observation window is shown. The pedestals in relation to three beds are seen. Curtains have been removed for laundry purposes. The tray under each bed is shown. A portable D.C. defibrillator can be seen against the far wall.*

FIG. 9 (*Left*) *The space at the head-end of each bed is shown. The pedestal in relation to the bed in the foreground and the unobtrusive flap-down surfaces in relation to the bed-heads are clear. The mobile monitoring console has been moved to show the observation window. Freedom of access, particularly to the patient's head, is a feature. Two 'cardiac arrest' boards serve as pillow props.*

sophisticated variety and the remainder can be the simpler variety, earlier described.

The pedestals and equipment described above have proved adequate for all patients admitted to an intensive care unit who have required monitoring. Some patients have had to be monitored for long periods.

The pedestals described have been in use for more than two years in the Thoracic Surgical Unit in Wentworth Hospital, Durban. Similar units serve the Neurosurgical Units in the same hospital. In one of the units (Figs 7, 8, and 9) nearly 600 patients have been managed in the period during which the pedestals have been available. It is standard practice in this unit for every patient who has been submitted to a thoracic surgical procedure to be transferred from the operating theatre to the intensive care area, where the patient is retained for rarely less than 24 hours and often as long as three or four days. Those longest retained have usually been submitted to surgery with cardiorespiratory bypass. Detailed monitoring—of E.C.G., venous and arterial pressure, temperature, pulse rate, and occasionally E.E.G.—has never been required for more than two patients at a time. The principles of untrammelled access to the patient have been shown to be well served by the system evolved. The unit is air-conditioned and the pedestals are constructed of stainless steel, and, in an intensely humid climate, the under-floor arrangement of conduits has not given rise to technical faults.

The pedestals were designed to the authors' specifications and constructed by the Building Services Department of the Natal Provincial Administration. Their cost is therefore difficult to assess, since this includes the manufacture of prototypes. At a rough estimate each pedestal costs £40 but mass-production would reduce this.