

the anesthetic atmosphere within the circuit showed concentrations of halothane which closely paralleled the predicted values. There is an important advantage to the back pressure in the flowmeter-vaporizer system. Intermittent positive pressure for controlled ventilation is not reflected with the same degree of fluctuation of pressure within the vaporizer, and halothane output is stabilized.

In clinical application, the Venturi Circulator has been used in its final design for nearly all cases in the general anesthesia practice of two of the authors during the past year, with complete satisfaction. The patient groups included all ages from newborns to 90 years. No cases were excluded because of type of operation, anesthetic agent, or operative risk.

#### SUMMARY

We have described a Dual-Venturi Circulator for anesthesia, the reasons for its value, and the methods for its use. Circulation of the respired atmosphere appears to be most advantageous when applied to infants, children, and the debilitated. The method also provides definite benefit to any patient. The factor of economy in reduced wastage of anesthetic agents is significant. The apparatus is simple in design, reliable in operation, and readily serviced by the anesthesiologist.

#### REFERENCE

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## A Method for Concurrent Artificial Ventilation and Cardiac Massage by the Same Individual

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When cardiac resuscitation must be initiated by a single individual, the current technique of interrupting massage to inflate the lungs can be both physically strenuous and relatively inefficient. This report describes a simple device (fig. 1) which reduces these difficulties by providing free use of the hands during artificial ventilation, thus allowing for improved coordination of resuscitative efforts with less physical strain and potential exhaustion for the rescuer.

The device is basically a mouth-to-mask ventilator using standard components: a mouth-piece from an underwater breathing apparatus (which is kept between the physician's teeth), a plastic elbow adapter, an accordion breathing tube, a nonbreathing valve and a metal elbow adapter for either an endotracheal tube or a face mask (with headstrap). Optionally, a demand valve for the administration of oxygen can be used.

For more efficient operation of this type of ventilator, and in order adequately to protect



FIG. 1. Cardiac resuscitation with mushroom-type pressure equalizing valve in modified mouth-to-mask ventilator.

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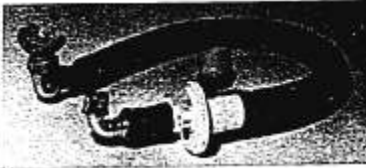


FIG. 2. Modified derivative of Chemical Warfare Laboratory "resuscitator" containing pressure release valve.

the physician's airway from contamination by the victim's exhalation, the nonbreathing valve should insure a prompt release of the increased airway pressure which occurs at the termination of the patient's forced inspiration. This increase can be equalized mechanically by a pressure-deflecting valve, preferably of the mushroom type (fig. 1),<sup>1</sup> or by a separate pop-off valve, as in the commercially-available derivative of the Chemical Warfare Laboratory resuscitator (fig. 2).<sup>2,3</sup> The addition of the breathing tubing will cause an increase of respiratory resistance, while the addition of the pop-off valve will limit the available inflation pressure. If the breathing tubing is incorporated into the rescuer's deadspace its con-

tent should be kept at 300 ml. to assure an optimal balance between the retention of CO<sub>2</sub> and the amount of fresh air which flushes the tubing with each respiratory cycle.

In the use of this ventilator, the rescuer follows the usual procedures for instituting resuscitative measures, ensuring the patient's airway and determining the adequacy of ventilation. In our experience we have been able to observe adequate chest expansion in all patients, including several robust men. We were impressed also by the greater ease of operation and decreased effort required on the part of the rescuer, compared with the usual method of cardiac resuscitation. These advantages constitute coronary artery protective factors of some value, to the older physician in particular.

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## A Cardiotope Recording System

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The moment-to-moment contact provided by the oscilloscopic display of an ECG has proven to be a valuable adjunct in patient management. Unfortunately, the problems associated with making simultaneous permanent records of important ECG changes and the time sequence of antiarrhythmic drug therapy, vari-

ations in ventilation or anesthetic depth, etc. have limited the applicability of this monitoring approach. In particular, the teaching value of dynamic sequential ECG changes often is lost in trying to recapitulate life-threatening situations from static records.

The Cardiotope Recording System, developed at the University of Kentucky Medical Center, represents one approach to high-quality permanent ECG recording with minimal technical and logistic difficulties. This system, assembled from commercially-available electronic equipment, utilizes one channel of a standard stereophonic tape recording for the

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