drug management, body temperature, and blood pressure. The possibility of artefact was eliminated by direct observation of the EEG signal during the case. Detailed information, such as we supplied in our case report, is necessary to interpret adequately the EEG changes and to answer the question asked in our title. For these reasons, I do not feel that the question has been answered by the Brompton Hospital study. The question can only be answered by a well-designed study to validate the prospective value of their observations.

During the last 8 yr, I have used many different automated EEG analyzers as cerebral monitors during cardiopulmonary bypass. Like Dr. Bolsin, I believe that they can be useful monitors of drug effect and cerebral function. However, I do not believe that significant neurologic damage will be seen unless the observed ischemic changes in the EEG are more prolonged than 4 min. Even when prolonged changes occur, in my experience, significant neurologic damage is not always evident. In addition, such EEG changes are generally associated with a time of high risk, such as the placement or removal of the aortic crossclamp, or the commencement of ejection of blood from the heart. I do not believe that they occur randomly throughout cardiopulmonary bypass. Irrespective of this, the purpose of our case report was to illustrate the uncertainty of the EEG as a neurological monitor, and, in this, I think we succeeded.

KEVIN J. FISH, M.SC., M.B., CH.B., F.F.A.R.C.S., F.R.C.P.(C.)
Associate Professor of Anesthesia (Clinical)
Anesthesiology Service (112A)
Veterans Administration Medical Center
3801 Miranda Avenue
Palo Alto, California 94304

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A New Agent-specific Filling Device for Anesthetic Vaporizers

To the Editor:—To avoid accidental filling of vaporizers with wrong agents, the Cyprane patented keyed filling system* has been widely used. The system uses two agent-specific connections at both ends of the flexible tube adaptor, but one connection should be enough to establish such agent-specificity between the correct bottle and the appropriate filling ports of the corresponding vaporizer.

We invented a new filling and emptying system that utilizes the same agent-specific configurations and dimensions of screw-threaded caps and the bottle-necks, allowing direct connection between the bottle and the corresponding vaporizers. Also, this adapts the same keyed collar on the bottle neck as the conventional Cyprane's one to the keyed receptacle on the filling port of the vaporizers to assure the agent-specificity.

The bottle-neck is directly screwed upward to the filling port with the keyed receptacle, when faced downward, of the appropriate vaporizer (Fig. 1). Then, the bottle is turned around 180° manually with the protecting handle, in conjunction with the rotary housing, to the upside-down position. The rotary housing has two passages in it, the upper one for air and the lower one for liquid, both of which can be shut off ("Closed") or connected together ("Open") by a rotary valve, which is manually operated 90° between the "Open" position and "Closed" position with a knob. When the valve is "Open," the passages are connected through the valve, and the liquid in the upside-down bottle flows down into the vaporizer as air bubbles up to the bottle from the vaporizer (Fig. 2). The liquid level in the vaporizer comes up to the maximum level where the opening of the air-passage is situated to be automatically shut off by the rising liquid level to avoid overfilling. The rotary valve should be "Closed" before the vaporizer is turned on, and the bottle can be left there, either in the upside-down position or in the upright position, or should be unscrewed during the use of the

* Canadian Standards Association (CSA): Z 168.4, Keyed filling devices applied to anaesthetic equipment, Rexdale, Ontario, 1975

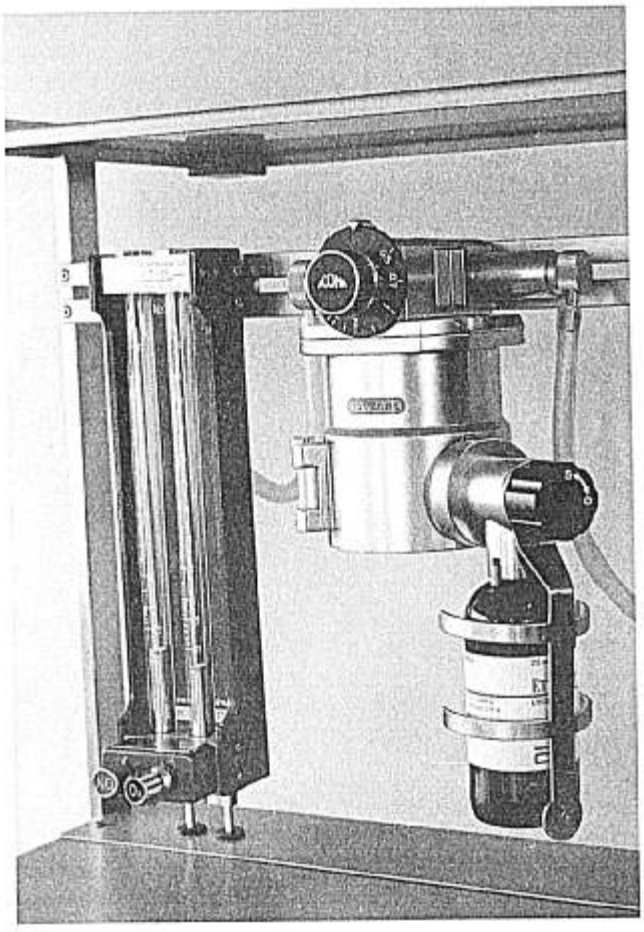

FIG. 1. A vaporizer with a new agent-specific filling device (closed and draining position). To connect the bottle to the vaporizer, a handle, which also serves as the bottle protector, should be downwards and the rotary valve should be at the S (Shut-closed) position, and then the bottle neck is screwed to the filling port, which accepts only the appropriate bottle-neck (so-called keyed system).

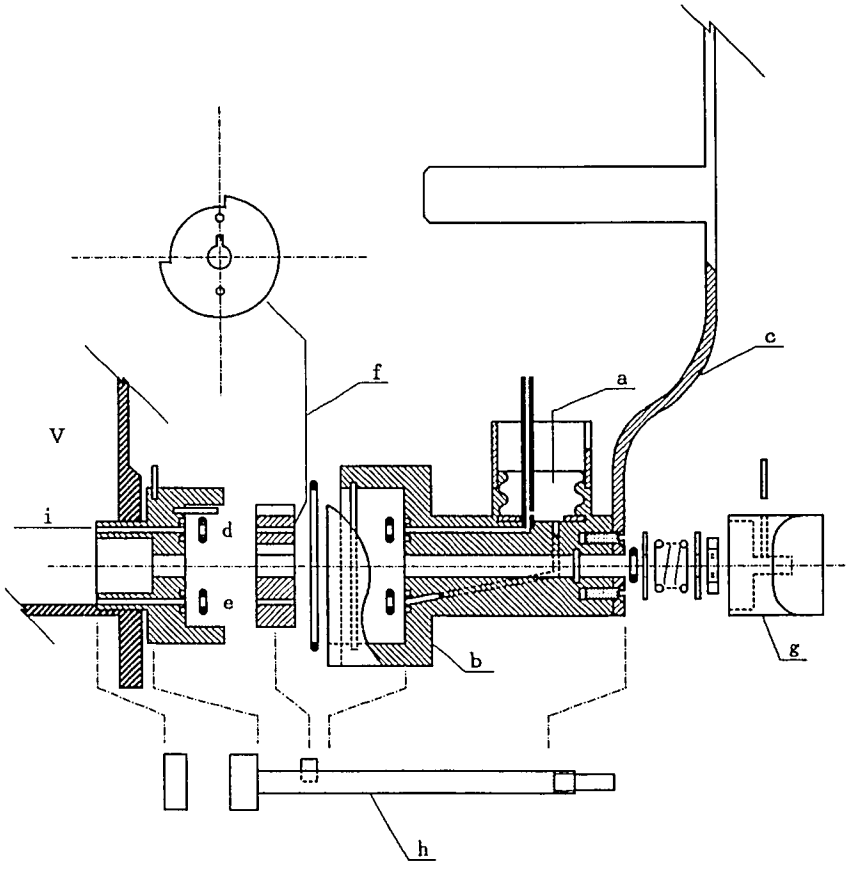

FIG. 2. Schematic drawing of the device ("Open" and filling position). a-filling port with the keyed receptacle; b-rotary housing; c-protecting handle; d-air-passage; e-liquid-passage; f-rotary valve; g-knob for the rotary valve; h-shaft for the rotary valve; i-maximum level of liquid filling; V-vaporizer.

vaporizer. For draining, the rotary valve should be "Open" after the empty correct bottle is connected in the upright position.

This system uses only one keyed connection, and eliminates the need for the second special connection between the filling adaptor and the filler receptacle that is essential to the Cyprane system. Because there is no flexible tube adaptor being used, liquid flow for filling or draining is almost twice as fast as with the Cyprane system. Once the bottle is directly screwed onto the vaporizer, the bottle can stay in the appropriate position either for filling or for emptying, and no hands are needed to hold the bottle during such procedures. To refill the vaporizer, a liquid anesthetic bottle can stay even at the upside-down position during a long anesthetic case, and just opening the valve (after the vaporizer has been turned off) will do it. All maneuvers are very simple and self-explanatory. We have used this device in daily practice, and, so far, have found that it is satisfactorily efficient and robust over 1 yr.

TORU SATO, M.D.
Professor and Chairman of Anesthesiology

MITSUGU ODA, M.D.
Associate Professor of Anesthesiology

TOSHIO KURASHIKI, M.D.
Instructor in Anesthesiology

Department of Anesthesiology
Tottori University Hospital
36-1 Nishi-machi, Yonago, 683
Japan

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Accuracy of Expired Carbon Dioxide Partial Pressure Sampled from a Nasal Cannula. I.

To the Editor:—In the October, 1987, issue of ANESTHESIOLOGY, J. M. Goldman[1] described a system consisting of a 16-gauge angiocath passed through a nasal cannula that was used to monitor "end-tidal P_{CO_2}." He claimed this setup may be useful in determining the "adequacy of ventilation in the sedated or narcotized patient." It was implied that the plateau on the graph of end-tidal carbon dioxide ($ETCO_2$) as a function of time indicated that the sampled gas was end-tidal. This same arrangement has been used in the sedated patient at our institution. It does, indeed, provide information concerning respiratory rate, and may serve as a form of apnea monitor. However, one should be cautious in interpreting the $ETCO_2$ value displayed, as the sampled gas mixture most likely does *not* represent a true end-tidal gas mixture.

When properly measured, $ETCO_2$ can be a useful means of estimating arterial partial pressure of CO_2 (Pa_{CO_2}). True $ETCO_2$ approximately equals the alveolar partial pressure (Pa_{CO_2}). When studied systematically and sampled properly, end-tidal to arterial P_{CO_2} gradients are small.[2,3] However, in previous studies where small gradients were found, a mouth piece, mask, or endotracheal tube was utilized for expired gas sampling (closed system with minimal deadspace). This minimizes gas mixture with ambient air which would act to dilute true end-tidal gas, and yield an artifactually low $ETCO_2$ value.

The open system described by Dr. Goldman, in which nasal cannulas are used for simultaneous oxygen (O_2) administration, does not meet the stated conditions necessary to assure true end-tidal gas sampling. Resulting $ETCO_2$ values can be anticipated to be artifactually low. If one uses this falsely low value as a basis for administering opiates or other drugs with respiratory depressant properties, the potential danger is obvious. Further, as expired minute ventilation is decreased with opiate administration, the bias flow of O_2 through the cannulas comprises a large fraction of sampled gas, thus further diluting true end-tidal gas. For this reason, the system suggested cannot reliably serve as a method for determining *trends* in true $ETCO_2$.

The data shown in figure 1 were gathered using the nasal cannula open system and a closed mask system in a volunteer. Data were collected *via* a mass spectrometer (Perkin-Elmer). A 6.7 mmHg P_{CO_2} difference was seen over a 30-s period, thus illustrating the potential error in designating a sample from such an open system as "end-tidal."

WILLIAM F. URMEY, M.D.
Department of Anesthesia
Brigham and Women's Hospital
75 Francis Street
Boston, Massachusetts 02115