vaporization and thus produced some degree of self-regulation. If an increased oxygen concentration was desirable a flow of oxygen was directed into (7) or (10).

Induction of anesthesia was usually accomplished by thiopental, although it was found possible with ether-air alone. Attempts at endotracheal intubation in the apneic patient following ventilation with air or ether-air, had to be limited to periods of about 30 seconds, in order to prevent hypoxia.

For major abdominal surgery, extremely light anesthesia or analgesia was sucessfully maintained for many hours in the curarized artificially ventilated patient by leaving (7) unclamped and (8) partially clamped.

With the use of this assembly anesthetists with some experience could provide rapidly reversible safe anesthesia and excellent relaxation for major surgery. [Supported by the Surgeon General, Department of the Army, Contract No. DA-49-007-MD-858 and by the Johnson & Johnson Co., New Brunswick, New Jersey.]

CORRESPONDENCE

"Hypercapnia" versus "Hypercarbia"

To the Editor.—When referring to arterial carbon dioxide tension it is a pity that the terms hypo or hypercarbia cannot be generally adopted. In the article on "Hyperventilation with Oxygen—Possible Cause of Cerebral Hypoxia" (ANESTHESIOLOGY 21: 135, 1960) the words "hypocapnia" and "hypocapnea" occur in two consecutive paragraphs. One has to reread the second paragraph carefully to be sure whether or not the author is referring to a disturbance of respiratory volume but it seems that he still means a low carbon-dioxide tension. He would have avoided this pitfall by using the word "hypocarbia" which, I believe, is etymologically more correct.

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To the Editor.—In reference to Dr. Lewis' letter, the use of the word acapnia (to mean decreased CO_2 and later more properly called hypocapnia, just as anoxia came to be termed hypoxia) is puzzling in itself, for it comes from a Greek root *kapnos* meaning smoke. Why should CO_2 be compared to smoke? I have not tried to track this down. But Yandell Henderson was using the term acapnic shock years ago.

Dr. Lewis quite correctly objects to the word hypocapnea which (unless it was a typographical error) demonstrates a confusion on the part of the author by introducing the root pneo from which comes pneumonia, hyperpnoea, and so on. Although hypo- and hyper-capnia are all right, I agree with Dr. Lewis that hypo- and hyper-carbia would be better because you then avoid the confusing similarity in sound of -pnea and -pnia. There are, naturally, objections to the carbia words. Carbia comes from a Latin word for charcoal, about as far away from, or as close to, CO_2 as smoke. A further objection is that these words combine Greek prefixes and Latin nouns. To get around this you would have to say sub- and super-carbia.

I have found several instances where in the same book or paper the words hypercapnia and hypercarbia (or hypo) are used interchangeably. I think capnia or carbia are equally correct. I prefer carbia.

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Halothane in Low Flow Systems

To the Editor.—In a recent article, (Pearcy, W. C.: Cost of Halothane Anesthesia in Low Flow System, ANESTHESIOLOGY 21: 32, 1960) it was stated that the halothane output from the Copper Kettle of a standard Foregger anesthetic machine was estimated at 25 per

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cent of the oxygen flow through the "kettle."

Specifically, it was stated that 80 cc. of oxygen delivered through the "kettle" would pick up 20 cc. of halothane. No temperature was stated. According to the vapor pressure curve of halothane at a temperature of 21 C. (the average temperature in our operating rooms) the delivered halothane would represent about 50 per cent of the oxygen flow through the "kettle." Thus, 80 cc. of oxygen delivered through the kettle would pick up 40 cc. of halothane. Rather than 2 per cent halothane in the total flow of approximately one liter, as stated by the author, 4 per cent halothane would actually be delivered. This has been confirmed for two Copper Kettles and two Heidbrink Vernitrol machines using both a Beckman oxygen analyzer and a sensitive flowmeter.

To achieve from the copper kettle a 20 cc. output of halothane from an 80 cc. input of oxygen would require a temperature of less than 10 C.

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DIFFERENTIAL HYPOTHERMIA With the aid of a newly developed, highly efficient thermoregulatory unit, the blood temperature may be reduced 16 degrees C. per minute and rewarmed 9 degrees C. per minute while the esophageal temperature is lowered 3 degrees C. per minute and raised 1 degree C. per minute. The heart is protected from hypoxia by the rapid hypothermia below 16 degrees C. while the body is at a mild hypothermic level. Cardioplegia for 15–20 minutes has been produced in 52 dogs with no significant histological damage of the heart or lungs and with an 85 per cent survival rate. Changes in electrolytes in coronary vessels rapidly returned to normal upon rewarming. Such differential hypothermic cardioplegia has been done successfully in 10 patients. (*Urschel, H. C., and Greenberg, J. C.: Differential Cardiac Hypothermia for Elective Cardioplegia, Ann. Surg. 152: 845, (Nov.) 1960.*)

THYROTOXIC CRISIS It has been confirmed clinically that controlled hypothermia, *i.e.*, body cooling associated with a heavy neuro-endocrinoplegic treatment, is a useful procedure in the management of surgical thyrotoxicosis. Milder conditions may be dealt with by prolonged preoperative, intraoperative and postoperative neuroplegia alone. In severe postoperative thryotoxic crises, unusually strong resistance to body cooling must be expected, requiring the use of heavy neuroplegia during the induction of hypothermia, or even of a true potential general anesthesia. (*Bobbio, A., and others: Neuroplegia and Hypothermia in Management of Surgical Thyrotoxicosis, J. Int. Coll. Surg. 34: 372 (Sept.) 1960.*)

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