of soda lime or the rebreathing of carbon dioxide from other causes, such as faulty valves. It should be of value in the measurement of carbon dioxide in oxygen tents and in the estimation of the adequacy of ventilation in patients with bulbar poliomyelitis and other acute disturbances in ventilation.

Lumbar Sympathetic Nerve Block for Obstetrical Analgesia; Preliminary Report of Over 1,200 Cases. MARY LOU BYRD, M.D., EDWARD Y. POSTMA, M.D., AND GLENN M. VAN DOMMELEN, M.D., Department of Anesthesia and Obstetrics, Butterworth Hospital, Grand Rapids, Michigan.

SINCE November 1953 bilateral lumbar sympathetic nerve block has been used at Butterworth Hospital for obstetrical analgesia in about one third of the patients admitted in labor. The nerve block was achieved by the obstetrician, or obstetrical resident in most instances, blocking the third lumbar sympathetic ganglia, usually after labor was well established and when the cervix of the primipara was 5 to 8 cm. dilated and the multipara's cervix 3 to 6 cm. dilated. After a reasonable trial with 1 per cent cyclaine, the local anesthetic of choice was 1 per cent lidocaine, or lidocaine 1 per cent with 1 to 200,000 epinephrine. Length of action of the drugs used was one and one-half hour with 1 per cent lidocaine and about two hours with the lidocaine-epinephrine mixture. Anesthesia for delivery was most frequently pudendal nerve block supplemented by analgesia with inhalation agents.

Over 1,200 records of patients so treated were analyzed.

The advantages of the lumbar sympathetic block observed were: comfort of the patient during the first stage of labor, lack of depressant effect on the newborn, shortening of labor, complications of nerve block occurred within initial ten minutes—thus requiring less special observation of the patient as far as analgesia is concerned.

The complication most frequently observed was moderate hypotension. Blood pressure was taken frequently for twenty minutes after the nerve block was completed. Generalized convulsions occurred in three patients when 1 per cent cyclaine was used for the block. These patients promptly responded to oxygen and intravenous barbiturates. Epidural block occurred in 6.6 per cent of the patients and subarachnoid block in two patients.

Fifty-nine per cent of the multiparas were delivered in the first hour, 76.7 per cent within one and one-half hours, and 87.4 per cent within two hours. In the primiparas 28 per cent were delivered in the first hour, 45 per cent within one and one-half hours, and 62.5 per cent within two hours.

The Effect of Volatile Agents and Muscle Relaxants on Evoked Central Nervous System Responses in the Cat. HAMILTON S. DAVIS, M.D., WILLIAM H. DILLON, M.D., WILLIAM F. COLLINS, M.D., AND CLARK T. RANDT, M.D., Department of Surgery (Divisions of Anesthesiology and Neurosurgery) and Department of Medicine (Division of Neurology), Western Reserve University School of Medicine, Cleveland, Ohio.

IN a previous paper, we described the effect of gaseous anesthetic agents on electrically evoked potentials in the central nervous system of the cat. [ANESTHESIOLOGY **18**: 634, 1957]. Cyclopropane, ethylene and nitrous oxide were shown to depress evoked potentials in the midbrain reticular formation and, to a lesser extent, the posteroventrolateral nucleus of the thalamus. The present study represents an extension of that work and concerns the effect of muscle relaxants and volatile anesthetic agents. The muscle relaxant group included *d*-tubocurarine chloride in a dose range of 0.5–20.0 mg. kg.; gallamine triethiodide (Flaxedil), dose range 2.0–32.0 mg. kg.; succinylcholine chloride (Anectine), dose range 0.5–32.0 mg. kg.; and decamethonium bromide (Syncurine), dose range 0.4–4.0 mg. kg. The intravenous route of administration was used. The volatile anesthetic group included ethyl ether in a concentration range of 5–15 per cent in

oxygen, divinyl ether (Vinethene) in concentrations of 4–12 per cent, chloroform in concentrations of 0.5–3.0 per cent, and trichloroethylene (Trilene) in concentrations of 0.5–3 per cent.

The experimental methods have been described in detail in our previous publication. Control tracings were obtained for each animal, the test drugs applied intravenously or by inhalation and the effects on the evoked potentials in midbrain and thalamus recorded. In some instances, a relaxant and a volatile agent were observed sequentially in the same animal; however, no two relaxants were studied in the same animal.

The muscle relaxants were studied in 32 animals and were found to have no consistent effect on the amplitude or the conduction latency in either the periaqueductal midbrain reticular formation or the posteroventrolateral thalamic nucleus, provided that hypotension, hypothermia and hypoxia were avoided. The volatile agents were studied in nineteen animals and were found to depress both the midbrain and thalamic potentials, particularly the midbrain, in a manner similar to the gaseous agents. In the concentrations studied, the effect was most striking with ethyl ether and chloroform, somewhat less with divinyl ether and least with trichloroethylene. Cardiac arrhythmias and hypotension were a frequent problem with chloroform and, to a lesser extent, with trichloroethylene.

The results indicate that the volatile anesthetics depress the evoked potentials studied in the central nervous system of the cat while the muscle relaxants, even in extremely large intravenous doses, had no such effect.

The Design of Circle Absorbers. JAMES O. ELAM, M.D., Department of Anesthesiology, Roswell Park Memorial Institute, Buffalo, New York.

SEVERAL factors determine the optimal dimensions and features of an efficient, low-resistant carbon dioxide absorber.

Convenient Service Interval.—The period of service before the absorber will require a recharge with fresh absorbent should be appropriate to the anticipated schedule of maximal usage, for example we assume continuous or intermittent use of the absorber in a closed circle for eight hours.

Patient's Respiratory Parameters.—The average-to-maximal expected tidal volume for adults is 0.5 to 1.0 liter. Carbon dioxide output rates range from 12 to 18 liters per hour. Thus, during the eight hours of use, the average-to-maximal expected load in absorption would be about 100 to 150 liters of carbon dioxide.

Capacity and Apparent Density of Absorbent.—In a well-designed lime compartment, free from channeling, 100 g. of soda lime (either Indicating Soda Lime or Sodisorb) or Baralyme absorb about 15 liters of carbon dioxide before the exit gas exceeds one per cent. Therefore, about 870 g. of absorbent are required for the eight hour performance. This amount of lime fills a compartment of one liter volume.

Void Space of Absorbent in Relation to Tidal Volume.—As the pores in the lime granules are filled with water, only the voids or spaces between the granules relate to the accommodation of the patient's expired volume. The void space of lime is 47 per cent of its total volume. Thus, the one liter compartment filled with lime will accommodate a tidal volume of 470 cc.

However, as the lime becomes converted to carbonate, spaces between inert granules contribute no exposure to absorbing surfaces and the effective void space recedes during use of the adsorbent at a rate of about 60 cc. per hour. If the recommendations of Adriani and Rovenstine are to be followed literally, the patient's tidal volume exceeds the void space as soon as absorption begins. The problem of keeping the void space of the lime equal to the patient's tidal volume suggests the addition of a reserve absorber equal in size to the one in primary use. Then, as the void space of the first absorber approaches zero, the second reserve absorber can provide an effective void space equal to the patient's tidal volume. This and other rationale suggest the advantage of a two-chambered lime compartment with each chamber of about a liter in volume.