from the anaesthetic. During busy times at casualty clearing stations, when men are being rapidly evacuated, nitrous oxide anaesthesia allows of a patient being taken to the ambulance train immediately after operation.

Next to local anaesthesia it is the nearest to the ideal anaesthetic. In cases in which infiltration is insufficient nitrous oxide will be found a most useful and harmless adjunct; the analgesia which can be produced by hovering over the patient's face with the mask, supplying only a very gentle flow of nitrous oxide, is generally sufficient. It is not necessary to produce unconsciousness, merely a temporary "dissociation of ideas."

Nitrous oxide-oxygen is a perfectly suitable anaesthetic for any operation; there are no genuine contraindications.

It is advisable to employ the almost universal preliminary injection of omnopon, scopolamine, and atropine, one ampoule omnopon-scopolamine ($\frac{3}{4}$ grain omnopon, $\frac{1}{16}$ grain scopolamine) being given an hour and a half before operation, and another half ampoule with $\frac{1}{16}$ to $\frac{1}{8}$ grain atropine sulphate half an hour before operation.

In thoracic surgery the paravertebral injection of novocain solution will greatly reduce the amount of anaesthetic required. In abdominal surgery, local infiltration—on the lines of Crile's anoci-association—combined with nitrous oxide, will result in perfect relaxation of the abdominal wall.

Those who have wished to employ this form of anaesthesia may have been discouraged by the difficulty and discomfort of administration with the ordinary apparatus supplied. The apparatus I have constructed may appeal to them; with it I have been able to maintain anaesthesia, lasting in some cases over two hours, with a minimum of difficulty.

The apparatus has been used in all cases described in the paper on thoracic surgery by Captains Lockwood and Nixon,* in which local anaesthesia was found insufficient.

FIG. 1.—Apparatus fitted for working. The height of the cabinet is 2 ft. 6 in. and of the bracket 2 ft. 6 in.

The apparatus is assembled from materials available in any hospital, with the addition of a few minor items easily obtainable at a trifling cost.

It consists of a stand carrying two nitrous oxide cylinders (500 gallons each) and one 40-ft. oxygen cylinder in a vertical position, with a central upright for suspending the nitrous oxide gas bag, as shown in Fig. 1.

The nitrous oxide cylinders are connected direct to the gas bag by means of the delivery tube supplied for the ordinary foot stand. Gas passes from the bag through two lengths of "concertina" flexible tubing to the combined mixing chamber and face-piece of Hewitt's nitrous

oxide-oxygen apparatus. The supply of nitrous oxide is conveniently controlled by a straight hand key on the cylinder valve; the flow of oxygen is regulated by a Haldane's oxygen apparatus, which provides a pressure-reducing valve and a convenient mechanism for varying the amount of this gas as required. One of the four delivery tubes is connected to the oxygen inlet on the mixing chamber by a single length of concertina tubing. It is advisable to surround the upper end and connexions of the nitrous oxide cylinders with hot-water bottles to obviate the danger of freezing at the outlet. The usual precautions are necessary to prevent leaking at the connexions, the two lengths of concertina tubing are joined over a short piece of metal pipe. The gas bag should be covered; a small landing net (obtainable anywhere at very small cost) will be found useful for this purpose.

FIG. 2.—Diagram of arrangement of top; dimensions 12 in. from back to front and 18 in. from side to side.

The construction of the stand will depend entirely on the materials and labour available. It is a very great advantage to have it mounted on four strong castors, as this renders it perfectly mobile.

The form of stand shown will be found convenient and simple. Two separate compartments are provided: that for the nitrous oxide cylinders is lined with cloth or other suitable material to retain the warmth provided by two hot-water bottles hanging inside. Both compartments have side doors with hinged top extensions, which facilitate the replacing of cylinders. There is a bracket on the top of the central upright for attaching the upper end of the nitrous oxide bag.

Some difficulty may be experienced with the differently shaped cylinders which have been supplied to the British Expeditionary Force recently; they are shorter and stouter than those which were formerly distributed. It is impossible to link two of these newer cylinders together by means of the ordinary delivery tube as stated above. Pending the distribution of a suitable connexion (which is contemplated) it will be found convenient to attach one of the ends of the delivery pipe to a nitrous oxide cylinder and fix a temporary gas-tight plug in the other arm of the tube.

With the above apparatus I have found it possible to maintain anaesthesia on about 120 gallons of nitrous oxide and 20 gallons of oxygen per hour.

ANAESTHETICS IN MILITARY HOSPITALS.

BY

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HAVING now been administering anaesthetics for several years in hospital and private practice and daily for the last seven months at the Lord Derby War Hospital, Warrington, with 3,000 beds in the summer and 2,500 in winter, the following is my experience:

The patient is given as a preliminary morphine $\frac{1}{4}$ grain, atropine $\frac{1}{16}$ grain, half an hour before the operation. The preliminary injection of morphine and atropine is not only followed by less secretion of mucus and a quieter anaesthesia, but the patient usually sleeps for an hour or two after the operation, thus causing very much less trouble to the nursing staff—a great advantage in a busy hospital.

The anaesthetic mostly used by me is ether, preceded by chloroform. I use two separate masks, one covered with a layer of lint for chloroform and the other with two layers of lint for ether. By using two separate masks the danger of giving a mixture of unknown strength is avoided, and I almost invariably use the open ether drop method on a Schimmelbush's mask.

At the beginning of the administration I drop about one drachm of chloroform slowly on the mask, holding it an inch or so from the patient's face and quietly talking to him, or in nervous cases getting him to count. During this time the mask is lowered, until in about a minute

* This paper will appear in an early issue.

or so it is resting on the face. I then replace it by the ether mask and quickly drop on ether till the lint is saturated. Next I place a towel, two or three folds, over the mask to increase the concentration, leaving sufficient space to apply the anaesthetic continuously. By this method I rarely get any struggling and often not the slightest movement on the part of the patient, who is generally ready for the operator in three or four minutes. This ensures the maximum degree of safety, is certainly very quick, and preferable to beginning with ether alone. Patients all agree that the chloroform is pleasanter and less irritating. For instance, it is quite the rule for those men who have had both anaesthetics to tell me that they prefer chloroform. The average quantity of anaesthetic for an operation of half an hour is 2 drachms of chloroform, 3 oz. of ether. Occasionally it is very difficult to keep some of these young subjects under with the ether drop method alone, especially in abdominal cases, and it may be necessary to resort to a little chloroform or C.E. mixture for a short time and then resume the ether.

In my private and previous hospital experience I have administered nearly three thousand anaesthetics, the bulk by the method outlined, and have not had one fatal case or any serious difficulty.

In my early days I was taught to give ether by the Clover method, but now rarely use it, for to my mind the ether drop method is very much better, in that the patients very rarely get cyanosed, have less trouble with mucus, a quieter anaesthesia, and less sickness after the operation.

I have also introduced a Shipway's warm ether apparatus, and, in conjunction with my own methods, find it very useful in cases requiring prolonged administration, in that it conserves the body heat of the patient, and is also a saving of the anaesthetic.

Ethyl chloride and nitrous oxide have proved quite satisfactory for patients requiring a short anaesthesia such as for incisions and manipulation of joints.

I find, after giving anaesthetics daily in a military hospital, that it is quite different from administering them in a general hospital in peace. In the latter it is the exception to have a strong, healthy young man to anaesthetize, the majority of cases being women and children or men usually with a definite organic or inflammatory lesion and often well prepared for an operation. Military cases are frequently robust young men who have lived an outdoor life for varying periods and many of them have been in the trenches and subject to war strain and nervous exhaustion. I have also found that men suffering from shell shock require much more anaesthetic than other men and have a greater tendency to excitement whilst going under. In these cases a little encouraging suggestion during the first stage of anaesthesia not only helps during the administration, but is also beneficial afterwards. At first I was inclined to attribute this to the mode of living, which made them difficult to anaesthetize, but I am now convinced there is a nervous element to contend with. It is impossible in many cases to judge by the appearance of the men how they are likely to behave under an anaesthetic. Some of the apparently quiet and sickly-looking men take a large quantity of anaesthetic and become troublesome with excitement, whereas some of the rough-looking and vigorous need very little.

In a short note Marcus W. Lyon (*Anatomical Record*, Philadelphia, 1917, xiii) records the case of a woman, aged 41 years, whose right kidney was absent, the left being hypertrophied. The right ureter was connected with the urinary bladder and contained a little calcareous debris. The adrenals on both sides were in their normal positions. There was only one Fallopian tube and one ovary. The interest of the case is that the patient's maternal grandmother had been operated upon for some abdominal condition and that one kidney—it is not stated which—was found to be absent.

SURGEON B. J. LLOYD, of the United States Public Health Service, sanitary inspector under the Bureau of Medicine, in a recent report states that at Bremerton, Washington, where the Paget Sound navy yard is situated, and at Seattle, the neighbourhood swarms with prostitutes from all parts of the country. He recommends that the Navy Department should procure the enactment of a law declaring a general district, one hundred miles in diameter, surrounding every military and naval reservation. From this all undesirable persons should be excluded, and the most objectionable should be interned.

ON THE TREATMENT OF GUNSHOT WOUNDS WITH A SOLUTION OF SOAP AND WATER AND PRIMARY SUTURE.

BY

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At the suggestion of Colonel Cuthbert Wallace, consulting surgeon to our army, I commenced treating as many gunshot wounds as possible by primary suture, using instead of an antiseptic a solution of soap and water.

The solution used has been of the strength 1 in 40. Pure *sapo durus* (1 part), obtained in blocks, is cut into shavings and dissolved in hot water (20 parts) which has been previously boiled. When required for use the solution is mixed with an equal volume of sterile water.

OPERATIVE TECHNIQUE.

Superficial Wounds.

Superficial wounds are completely excised and soap solution well rubbed into the surface; they are then stitched up.

Single Penetrating Wounds.

The skin wound is completely excised, the exposed surface of the wound in the muscle cut away, and the track of the missile laid thoroughly open. The wound being held widely open with retractors, the surface of the track is cut away all round, *from the inside*, with scissors until all damaged muscle, as far as it is visible to the naked eye, is removed. Foreign bodies, clothing, or any small, loose fragments of bone, are removed, all bleeding points ligatured, and the whole wound thoroughly swabbed out with soap solution. Muscles and fasciae are closed with catgut and the skin sutured.

If the metal has passed almost through the thickness of a limb, it is removed by a counter incision and the wound converted into a seton wound.

Seton Wounds.

Both entrance and exit wounds are treated as above, and it is generally possible in this manner to expose and excise the whole track, one half from each incision. In cases in which this has been impossible for anatomical reasons the centre of the track has been well rubbed with gauze and soap.

If it only involved the division of a thin layer of muscle, the entrance and exit wounds were directly connected, laying open freely the whole track, which could then be dealt with. If there is gross loss of muscular tissue so that the ends cannot be approximated, or if a large dead space is left, the skin is sutured over the wound and a very small split rubber tube introduced for twenty-four to forty-eight hours.

In cases in which it is difficult to approximate the skin edges without undue tension one or more incisions may be made down to the deep fascia parallel to and at some distance from the wound. This occurs most often in the forearm and lower part of the leg.

Amputations.

Amputations have been completely stitched up with a very small split tube introduced into one corner for twenty-four hours. Penetrating wounds of knee-joints have been completely excised down to the synovial membrane, the joint well irrigated with soap solution, and the wound closed in layers.

Effect of the Soap Solution.

The effect of the soap solution on the wound appears to be haemostatic. Instruments, needles, etc., tend to become somewhat slippery—a slight disadvantage.

RESULTS.

During the last four months all cases in which it was possible have been treated by this method, but during one period of pressure it was impossible.

Patients have been kept on an average for ten days and then evacuated by barge to one general hospital, where they have been seen by Colonel Cuthbert Wallace, and reports on progress have been given to me by him and sent by the medical officers of that hospital.