to the liver cells, and allowed autolysis of the tissue, which appears to be the essential liver change, to occur. Some such combination of circumstances might account for the rarity of the disease.

It is evident that a very considerable amount of work from a histological, chemical, and bacteriological standpoint is necessary in the cases already observed. I am indebted for assistance to Mr. P. C. Laws, M.A., in investigating the bacteriology of the cases.

It should be noted that neither clinically nor pathologically do the cases observed bear any close similarity to cases of spirochaetal jaundice.

Professor R. A. Bolam, who has seen some of the cases during life, is engaged with some others on the clinical side of the problem, and we hope in the near future to describe the cases in detail, and to give our conclusions, based on a more thorough study than other pressing work has permitted till now.

REFERENCES.

- ¹ Best: Acute Yellow Atrophy. Thesis, University of Chicago, 1903.
- ² McDonald: Acute Yellow Atrophy. *Edin. Med. Journ.*, July, 1908.
- ³ Veszpremi and Kanitz: *Arch. f. Dermatol. u. Syph.*, Bd. 88, 1907.
- ⁴ Stiles and McDonald: Delayed Chloroform Poisoning. *Scottish Med. and Surg. Journ.*, 1904.
- ⁵ Tiletson: *Boston Med. and Surg. Journ.*, No. 16, 1908, p. 510.
- ⁶ Severin: *Zett. klin. Med.*, 1912 (76), S. 138.
- ⁷ Wells: *Chemical Pathology*, second edition, p. 492.
- ⁸ Discussion on Toxic Jaundice in Munition Workers, *Transactions of the Royal Society of Medicine*, January 23rd, 1917.
- ⁹ McDonald and Milne: Subacute Liver Atrophy. *Journ. of Path. and Bact.*, vol. xiii, 1908, p. 161.
- ¹⁰ Reichmann: *Munch. med. Woch.*, No. 18, p. 959.
- ¹¹ Miller: A Case of Acute Yellow Atrophy. *Journ. of Path. and Bact.*, vol. xiii, 1908, p. 53.

PERICARDIAL KNOCK.

BY

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THERE is a sound heard on auscultation in cases of penetrating wounds of the chest near the cardiac region which is unlike anything met with in civil practice. Its origin is, I believe, not yet established. The occurrence of this sound is now familiar to most of those who are dealing with these cases at the clearing stations. It is of the nature of a click, and varies from a faint sound heard by careful auscultation, to a noise which may be compared to that heard in the ear-piece of a telephone when the lever is moved up and down. It may be heard sometimes when standing at the foot of the patient's bed. Sometimes the patient is conscious of it, and on one occasion has himself called my attention to it. In nearly every case the sound disappears after forty-eight hours, although in one patient who was recovering from a chest wound without any complications the sound persisted for ten days. He was then sent to the base, and I have no further information about him. The sound has been, as a rule, most marked near the apex beat. It is usually double, corresponding to the heart sounds, and its intensity waxes and wanes with respiration, sometimes disappearing completely in full expiration. A distinct fremitus can be felt by the hand laid on the chest.

The first case in which I noted it was shown to me by Captain W. W. Rees, R.A.M.C. I then suggested that it was due to a shell fragment lodged where the pleura and pericardium are in contact. I thought this possible as I had previously heard a metallic rumbling sound in a case in which a shrapnel ball was seen by x-ray screen in the costo-diaphragmatic angle moving up and down with respiration. A skiagram in Captain Rees's case showed the fragment to be in the neighbourhood of the pericardium.

That this explanation was not the correct one was proved by the case of an officer shown to me by Lieut.-Colonel Newlands of the A.A.M.C. The characteristic sound could be heard when standing beside the patient's bed. The entry wound was outside the heart on the left side, and the track passed in the direction of the pericardium. Two days later a right-sided subphrenic abscess developed and was drained. The foreign body was found lying in the right side of the abscess cavity. An infected haemothorax was also drained. The patient died a few hours later, and at the autopsy a "shaggy" purulent pericarditis was present. This case showed clearly that the foreign body was not itself directly responsible for the sound.

In the next case I saw the foreign body was visible on the screen in the cardiac area. It moved continuously

with the heart beat, so that a skiagram showed only a blurred image. This patient died, and at the autopsy the pericardial surface was normal. There was no infection, exudate, or any sign of pericarditis. The cavity contained a few drops of blood-tinged serum due to the passage of the missile, which had traversed the pericardium and lodged in the interventricular septum. This case, as also several others in which the "knock" disappeared after twenty-four or forty-eight hours in patients who never had serious symptoms, shows that pericarditis is not the cause.

I may note in passing that the continuous movement of the foreign body shadow with the heart beat, as distinguished from an oscillatory movement at certain phases of the respiratory and cardiac rhythm, has indicated that the foreign body is actually in the heart wall or cavity.

It has been suggested that the sound is due to emphysema of the connective tissue of the mediastinum, but in one case the missile passed through the chest antero-posteriorly on the left side clear of the upper and outer margin of the heart. Moreover, a case has been reported by Captain Rees in which the sound was heard over the apex beat, which was normal in position. It was heard in systole and was loudest in full inspiration. The foreign body was seen on the x-ray screen moving with respiration, and in full inspiration there was an oscillatory movement communicated to it by the cardiac impulse. There was a clear space of some 2 in. between the heart shadow and that of the foreign body. The entry wound was over the lower end of the left scapula. Localization of the foreign body on anatomical cross-sections showed it to be lying behind the root of the left lung in close proximity to the rami bronchiales, and over 1 in. from the nearest point on the pericardium. The man's condition when he was sent to the base was very good.

The usual disappearance of the sound after a short period, and the absence of serious symptoms in many cases, suggests that it may be due to air in the interstitial connective tissue of the lung which is struck upon by the beats of the heart. Further records will doubtless throw more light on the subject.

A SIMPLE APPARATUS FOR NITROUS OXIDE-OXYGEN ANAESTHESIA.

BY CAPTAIN A. S. WILSON, R.A.M.C.

THE infrequent use of nitrous oxide-oxygen as an anaesthetic for major operations in the British Expeditionary Force would make it appear that its very great advantages have not been fully realized. The rapid induction of anaesthesia and the immediate recovery are most important factors; with any general anaesthetic, the shorter the duration of its influence the better for the patient. Nitrous oxide is shorter than any other.

It is by far the most agreeable anaesthetic to take, and struggling and resistance are uncommon. Post-operative nausea and vomiting are hardly ever encountered; headache, restlessness, and bronchopneumonia are much less frequent sequelae than after ether or chloroform.

With reasonable skill and care on the part of the anaesthetist it is by far the safest general anaesthetic. Cyanosis under nitrous oxide, as under any other anaesthetic, is always a danger signal; when present, it is an indication that an insufficient proportion of oxygen is being supplied; such a mixture will never produce satisfactory relaxation, and usually results in muscular twitching and disturbed respiration. On the other hand, an excess of oxygen causes persistent movement, and prevents the onset of unconsciousness; such excess is frequently indicated by a red flush across the patient's forehead.

Desirable variations in the depth of anaesthesia to suit the requirements of different phases of an operation are much more rapidly and safely attained than with ether or chloroform. It is beyond the scope of this short paper to reiterate Crile's well-known findings on the physiological advantages of nitrous oxide as an anaesthetic.

Even after a prolonged administration, lasting up to two hours or more, the patient always completely recovers from the anaesthetic before leaving the operating table; this is invaluable when the number of post-operative cases is so large that it is impossible to provide a sister or trained orderly to stand by each patient till he is round

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.