muscles of the anterior tibio-fibular compartment with marked foot-drop, the paralysis was not absolutely complete, and sensation, though dulled, was not wholly lost over the region supplied by the musculo-cutaneous and anterior tibial nerves.

The condition of this patient's leg had remained stationary for several months in spite of massage and electrical treatment. On February 25th, 1915, an incision was made exposing the external popliteal nerve behind the knee. There was a large thickening of the nerve at the level of the joint, and just above this a branch nearly half the size of the nerve apparently passed into the biceps tendon. This proved to be a divided portion of the nerve firmly adherent to the tendon. It was separated and the trunk of the nerve freed for about 2 in. from the abundant fibrous tissue which was present; the nerve was then split vertically in the thickened portion, and as what appeared to be nerve fibres were found, the branch was implanted in the split and the nerve sutured together over it.

This case was transferred to another hospital for special treatment a few weeks after operation, before there was time for the appearance of any change in the condition.

In two cases of division of the musculo-spiral nerve one was divided just above the bend of the elbow by a rifle bullet, and in the other the nerve was divided in the middle of the arm and the case was complicated by a comminuted fracture of the humerus. In another case the ulnar nerve was divided by a bullet close to the junction of the upper and middle thirds of the forearm. These three cases were not seen by us until several months after the receipt of the injury and were transferred to other hospitals too soon after operation to allow of any improvement taking place before we lost sight of them.

We saw a few cases with wounds in the neighbourhood of large nerves, which showed only temporary signs of loss of function; in these the loss of sensation was only partial and the paralysis was not absolute, and the symptoms cleared up within a fortnight. These cases may be spoken of as nerve concussion, the nerve not being materially injured, its function being interfered with or lost for a short period.

CONCLUSIONS.

From our experience of these cases we have drawn the following conclusions concerning nerve injuries caused by modern missiles:

1. The function of a nerve may be interrupted without material injury, in which case the loss of function is only partial and returns early, probably always within a fortnight or three weeks.
2. When a nerve is partially or wholly divided loss of function is marked and permanent, and may even tend to increase. In these cases it is useless to expect spontaneous regeneration owing to the distortion and separation of the cut ends and the great development of dense fibrous tissue which appears to follow in all cases.
3. When a nerve is divided, the sooner an operation for its suture is performed the easier it is and the greater the likelihood of an early cure. In cases, however, where the wound is septic, it may be advisable to allow time for the wound to heal.
4. Even when nothing has been done for several months, there is still a chance of a successful result if late suturing is undertaken, so that no case need be looked upon as necessarily hopeless.

LOCALIZATION OF FOREIGN BODIES BY X RAYS.

By J. H. SHAXBY, CAPTAIN R.A.M.C.(T.),

3RD WESTERN GENERAL HOSPITAL, CARDIFF; LECTURER IN PHYSICS, UNIVERSITY COLLEGE, CARDIFF.

THE method of localization which I use in this hospital (described in a paper to be published by the Röntgen Society) may be of interest to your readers. It is simple and accurate, and abolishes measurement and calculation.

If, during the two exposures of an ordinary localization, an opaque body lies at the same depth from the plate as the foreign body whose position is required, then the shadow displacement of this control body is of course equal to that of the foreign body. As the depth of the foreign body is initially unknown it is necessary for the control body to exist at all possible depths, and for its various points to be recognizable from their shadows. I fulfil these conditions by using as the control a sort of miniature ladder with lead wire rungs, parallel and equi-

distant, but oblique, as shown in Fig. 1. The step distance is 1 cm., and the length of each rung 3 or 4 cm. The ladder is set up with its plane perpendicular to the photographic plate and its end AB as close as may be to the plate. Its position is chosen so that the two shadows of the rungs thrown on the plate in the two exposures of the localization lie one on each side of the base of the ladder, as in Fig. 2, a tracing from a negative. Thus any two corresponding points in the pattern are immediately referable to the point on the ladder whose shadows they are—for example, the points marked by dots and referred to as A_1 and A_2 are the shadows of a point half-way along the third rung, that is, of a point 2.5 cm. from the plate. Now the distance $A_1 A_2$ is equal to the distance $X_1 X_2$, between corresponding points of the shadows of the foreign body, which is therefore also 2.5 cm. from the plate.

Fig. 1.

The procedure, then, to determine the depth of the foreign body, is to set off the distance $X_1 X_2$ with dividers, transfer the latter to the ladder pattern, and find there the points $A_1 A_2$ showing the same displacement. Of course, care must be taken that $A_1 A_2$ is parallel to $X_1 X_2$, and that A_1 and A_2 are on the two shadows of the same rung—that is, are shadows of the same point on the ladder. The distance (if any) from the plate to a fuse-wire cross on the skin can be similarly found and deducted from the previous measure to give the net depth of foreign body below the skin. Usually, as in Fig. 2, the plate is close to the skin, and there is no deduction to be made.

Fig. 2.

If the fuse-wire cross has not been set exactly over the position of the foreign body by one of the usual screen methods, the point on the plate which is exactly over the foreign body can be found by Barrell's method, using the vertical lines through the two ends of the lead rungs instead of two vertical cylinders. That is to say, the lines CB and ED are produced; they meet at a point on the plate vertically over the focal spot of the target in the first position of the bulb. The lines FB and HG similarly intersect in the corresponding point for the second position

of the bulb. The two points thus found are joined respectively to X_1 and X_2 , and the intersection of these last lines is vertically over the point of the foreign body which casts the shadows X_1 and X_2 .

The ladder can be affixed immediately to a plate facing in any direction, and can be used with any type of apparatus. The procedure is quick and simple, and could be used at the bedside in case of need. The distance from plate to anticathode and the distance the bulb is moved are not required; the shadow displacement has not to be measured, but merely set off with compasses and matched, a simpler and more accurate proceeding. The estimation of depth can be easily made to a millimetre without any measurement whatever, and the one plate carries the complete data of localization of all foreign bodies whose shadows fall upon it. The instrument is made by Messrs. Newton and Wright, 72, Wigmore Street, W.

NOTE ON THE TREATMENT OF THE SYMPTOMS ARISING FROM INHALATION OF IRRITANT GASES AND VAPOURS.

By W. L. SYMES, M.R.C.S.,

ASSISTANT DIRECTOR OF THE PHYSIOLOGICAL LABORATORY OF THE UNIVERSITY OF LONDON.

(From the Physiological Laboratory of the University of London, South Kensington.)

INTRODUCTION AND MODE OF EXPERIMENT.

The following observations deal with the early stages of the bronchial and bronchiolar obstruction set up by inhalation of irritant gases.

They represent a preliminary account of unfinished work, and are given so early partly on account of immediate call for treatment of the condition in question and partly on account of the striking failure of treatment *via* the blood stream.

The animals employed were cats, initially anaesthetized by ether, then pithed through the foramen magnum, and supplied with air by a method of artificial respiration, previously devised by Golla and Symes, which has already been described in full detail.¹

The principle of the method is as follows: The lungs are made to dilate rhythmically by rhythmically diminishing the pressure on their outer surface by means of a pump, the piston of which produces the same pressure changes in the pleural cavity as are produced normally by the diaphragm. As in spontaneous breathing also, the lungs are emptied by their elastic recoil.

The condition of the airway (bronchioles) was recorded by a sensitive membrane manometer connected with the trachea. This shows, as in spontaneous breathing, negative pressure (downstroke) during inspiration and positive pressure (upstroke) during expiration.

Obstruction of the airway is indicated by diminished amplitude of the respiratory tracing, whilst conversely augmented amplitude of the tracing shows relief of the obstruction.

The "gas" (bromine vapour) was administered through a tracheal cannula. Its usual effect was rapid obstruction of the airway. Less commonly the obstruction came on gradually, several minutes elapsing before the tracing was reduced to one-half of its initial amplitude. In some cases profuse bronchorrhoea appeared in the course of an hour.

In all cases the relief afforded by intravenous injection of broncho-dilator drugs has been little or nothing, whilst the same (or similar) drugs administered by inhalation have consistently given relief, which, though not always great, has at times been considerable. The relief shown in the figure is moderate in degree and of short duration.

The drugs so far tested are the following:

Amyl Nitrite.

Injected intravenously, in suspension in normal saline, or subcutaneously without dilution, this body has given no relief. Inhaled, it has at times produced slight and temporary dilatation of the airway, but has more than once appeared to increase bronchorrhoea.

Atropine.

Atropine sulphate, in intravenous doses ranging from 0.5 mg. to 10.0 mg., has been without effect on the airway.

Adrenalin.

Intravenous administration of 0.1 mg. of adrenalin chloride has, on one occasion, afforded slight and temporary relief, but in the majority of cases has been without benefit.

Stramonium.

Intravenous injection of an infusion of stramonium leaf was without effect. Inhalation of the fumes from the smouldering powdered leaf, on the other hand, has consistently relieved the obstruction. The degree of relief depends, obviously, on the amount of fume inhaled. With respiration diminished by pronounced obstruction the relief is consequently small; but when the force of (artificial) respiration is augmented, and pulmonary ventilation thereby increased, stramonium fumes produce considerable and lasting dilatation of the airway.

The upper tracing shows bronchial spasm produced by bromine vapour, the middle tracing its relief by stramonium fumes, and the last gives the time in minutes.

Lobelia, Tobacco, Opium.

Pulv. lobeliae co. (Martindale), a powder containing a little lobelia in addition to stramonium, has also worked well, though, up to the present, it has not seemed more efficacious than the stramonium alone.

Fumes from smouldering tobacco (or snuff) have also dilated the airway.

Opium fumes have been found to give relief. The dilatation has not been great but has, once, proved relatively lasting.

Chloroform.

Chloroform vapour has on one occasion distinctly increased the obstruction. On no occasion has it appeared to give relief.

DISCUSSION OF RESULTS.

The failure of atropine injections to relieve the respiratory obstruction was surprisingly complete. In view of this failure and of the equal non-success of stramonium infusion and of adrenalin, contrasted with the efficacy of stramonium and other fumes, it appears that the bronchial circulation was largely, if not completely, arrested by the bromine vapour, and that relief was only afforded by direct contact of the remedies with the bronchial (and bronchiolar) mucosa. The efficacy of the stramonium fumes indicates further that muscular spasm is a factor in the obstruction.

Of the drugs that have been tried stramonium has, so far, been the most successful. Mixed with a little nitre it is readily ignited and smoulders freely. The fumes should, for obvious reasons, be inhaled through the nose rather than through the mouth. Overdosage from absorption of the active principles—atropine, hyoscyamine, hyoscine—through the pulmonary alveoli will be shown so clearly by thirst, by dilatation of the pupil, and by acceleration of the pulse, that dangerous dosage should be readily avoidable. Moreover, it may be anticipated that early and