versely at the lower part of the popliteal space. The calf was swollen and tense; no pulse at ankle; foot cold and white.

Operation (November 4th, 4 p.m.).—Popliteal space opened up in its whole extent through an internal incision. Remains of inner head of the gastrocnemius cut through. Damaged saphenous vein tied above and below. Both vessels found torn for about one inch. The popliteal vein was ligatured just above the entry of the short saphenous vein.

Result.—On November 5th the foot was warm, pink in colour, sensation present. The three following days gangrene threatened; the foot was purple and oedematous, but there was still some slow circulation. From the 9th to the 14th there was gradual improvement; the foot was pink again, though oedema persisted. The patient was evacuated on November 26th with the circulation apparently re-established in foot and leg.

January 1st, 1917. Letter from patient's brother: "Leg doing well, but patient very ill from septic poisoning."

January 20th. Amputation for sepsis in calf. Details supplied by officer commanding No. 3 A.G.H., Brighton. "Foot becoming white and bloodless."

CASE II.

Cpl. B. Admitted December 4th, 1916, 11 a.m., with wound of left popliteal vessels.

On admission there was a wound over the lower end of the posterior aspect of the thigh. Calf swollen; foot cold and pulseless.

Operation (2 p.m.).—Wound entering popliteal space; opened by dorsal incision. Both vessels torn; suture impossible owing to laceration; tied above and below. Wound drained and closed.

Result.—Uneventful convalescence. Condition of foot never gave rise to anxiety. No oedema. Sent down after three weeks; no pulse to be felt at ankle.

Three months later: "Foot in perfect condition."

CASE III.

Pte. L. Admitted December 13th, 1915, 1 p.m., with wound of superficial femoral vessels.

On admission there was a perforating wound $1\frac{1}{2}$ in. in diameter entering the back of the left thigh and coming out in front through the middle of Hunter's canal. A tourniquet had been applied, and the patient was almost dead.

Operation (2 p.m.).—Anterior wound opened up; both ends of superficial femoral artery and vein tied. Oozing from posterior wound—? profunda vessels.

Result.—Condition gradually improved after twelve hours' severe collapse. The wound became septic, but eventually cleared up. The foot was in a critical state for two days, then circulation improved. Patient sent away after three weeks with small gangrenous areas on tips of toes—like Raynaud's disease.

Letter from England six weeks later: "Foot the same."

CASE IV.

Pte. E. Admitted January 3rd, 1917, 8 a.m., with wound of superficial femoral vessels.

On admission there was a small perforating wound of the upper part of the left thigh, missing the femur. The wound of entry was on the outer side of the thigh; that of exit on the inner side over the femoral vessels. The thigh was greatly swollen; foot cold, and no tibial pulse could be felt.

Operation (January 4th, 11 a.m.).—Hunter's canal opened; clot removed; both superficial vessels tied. Too severely torn to suture. A handful of dark clot removed from interior of thigh. Outer wound slit up.

Result.—On January 15th there was no oedema of the foot—circulation returned in a few hours. No tibial pulse felt. Condition of foot never doubtful.

Letter one month later: "Foot quite healthy."

CASE V.

Pte. H. Admitted January 3rd, 1917, 8 a.m., with wound of the left femoral vein and thrombosis of artery.

On admission the foot was cold; no pulse at ankle. The entry wound was in the upper third, outer side, of the thigh, and the exit wound in the adductor region. A foreign body was found embedded in the opposite adductors.

Operation (January 4th, 12 noon).—The inner wound was widely opened up; dead stinking muscle was freely excised, including nearly all the adductor longus, parts of the pectineus and vastus medialis. The two ends of the superficial femoral vein were found torn across transversely, and sealed by clot, too far away to be united—tied off. The artery was found uninjured but thrombosed—a firm lump two inches above the apex of Scarpa's triangle, and no pulse in Hunter's canal. An incision, one third of an inch, was made into the artery and a small white granular clot squeezed out; from below, three inches of soft red clot was pressed out, like lanoline from a tube. The vessel was closed in the ordinary way, and the pulse returned to the vessel in Hunter's canal, although it was not felt in the foot.

Result.—Fourteenth day: Wounds very septic, but now cleaning up and granulating well. The condition of the foot had never giving rise to any anxiety. No pulse to be felt at ankle; slight oedema below malleoli. Twenty-first day: Slight secondary haemorrhage. Wound opened up; artery found thrombosed again. Circulation in foot good; slight oedema.

CASE VI.

Pte. G. Admitted February 13th, 1917, with compound fracture of right tibia; injury to peroneal and posterior tibial vessels.

On admission there was a penetrating wound of the leg; calf swollen and tense; no pulse in foot.

Operation (12 hours after injury).—Wound in calf freely opened up: peroneal artery on back of fibula torn—ligated together with vein. Haemorrhage persisting, the posterior tibial artery was exposed through attachment of soleus to tibia—found torn; artery and venae comites ligatured. A third incision was made in the calf to relieve tension. Carrel's tubes inserted; Thomas's knee splint applied.

Result.—Some oedema of foot, but perfect circulation. Patient doing well when last heard of.

CASE VII.

Pte. M. Admitted November 8th, 1916, with wound of right femoral vein and artery (partial).

On admission there was a perforating wound of the thigh over the line of the artery. Foot cold; faint dorsalis pedis pulse.

Operation (18 hours later).—Lateral tear in vein one inch long, sutured. Partial tear in artery—intima bulging like a small aneurysm—repaired by stitches, and fascial flap from roof of Hunter's canal sewn round.

Result.—Uneventful convalescence.

CONCLUSION.

Only a small series of cases has been brought forward, but the results are interesting. The experience of those who have ligatured the main artery alone will probably show that amputation has often to be resorted to, especially in popliteal cases.

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FURTHER REPORT ON THE EFFECTS OF HIGH EXPLOSIVES ON THE EAR.

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I HAVE had under observation at the West Cliff Canadian Eye and Ear Hospital, during a period of four months, over one hundred cases of injury to the internal ear and its central connexion from high explosives. The chief symptoms are deafness and disturbance of equilibrium (dizziness, etc.). As these cases were first seen after an interval of several weeks or months, in order to observe the more recent effects of such explosives on the ear I was sent to France for six weeks. During this time I was stationed first at a Canadian casualty clearing station (Colonel Blanchard) and then at a Canadian stationary hospital (Colonel Davis). In addition to examining cases of injury to the ear at these stations I was permitted by the courtesy of the officers commanding to examine cases at adjacent casualty clearing stations and at a stationary hospital. The few cases of shell concussion deafness seen may be accounted for by the quietness then existing at these fronts.

The following applies to recent injuries (the cases seen at West Cliff will be dealt with in a subsequent paper). The majority were observed from twenty hours to a week after injury.

I saw over 200 cases exhibiting nerve symptoms ascribed to high explosives. Of these, 50 complained of deafness of varying degree. Of these 50, 17 showed demonstrable signs of injury to the internal ear traceable to the explosive. Of the others, the deafness in many had been temporary and no objective signs of disturbance of equilibrium could now be seen. The persisting defect of hearing was due in some to old middle-ear inflammation, in others to blockage of the external canal from wax or some other cause.

Of the 17 cases—7 had symptoms of nerve deafness without perforation of the membrana tympani, 10 had deafness with signs of recent perforation; 6 had definite middle-ear trouble previous to the concussion; of the other 11, with no previous history of ear trouble, 6 had recent perforation; 12 complained of vertigo and had observable signs due to it, the others had no complaints or symptoms of equilibrium disturbances.

My conclusions are:

1. Exposure to high explosives may produce rupture of the membrana tympani. This rupture may occur at any part of the membrane. It varies in size, and two perforations are occasionally seen. Small perforations are most frequent, but there may be a large perforation, and in one of these the malleus was driven back.
2. The rupture in the membrana tympani tends in most cases to spontaneous closure. Its non-closure is usually due to its large size, or middle-ear suppuration following the rupture. Appropriate treatment hastens healing and diminishes the risk of suppuration. Adhesion of the malleus to the internal wall of the middle ear is frequent.
3. Concussion of the internal ear with nerve deafness and equilibrium disturbances occurs with or without rupture. In many cases the concussion passes off with slight damages to hearing, though equilibrium disturbances may persist for a considerable period.
4. The concussion may pass off, leaving an injured nerve mechanism demonstrable by (a) nerve deafness of a varying degree; (b) defect of equilibrium. The subsequent history of these will be referred to in the report of the cases observed at the West Cliff Hospital.
5. The treatment of recent perforated membrane which gives most satisfactory results aims at leaving the blood clot over the perforation intact. The following has been found satisfactory: A plug of cotton is placed in the meatus, and the lobe of the ear is cleaned and dried. The plug is removed, and then the outer part of the external meatus is cleaned by pledgets of cotton dipped in hydrogen peroxide. The meatus is then dried, and washed with pledgets dipped in alcohol and again dried. A piece of sterile cotton is then placed in the ear.
6. All the cases ought to be kept in bed for at least ten days to allow effects of the concussion to subside.
7. High explosives may cause a definite injury to the ear and its central connexions. The diagnosis requires considerable experience. A considerable proportion of the cases seen with deafness following exposure to high explosives had no sure definite trauma demonstrable, and the deafness present was accounted for by some other cause. Speedy recognition of those so injured by high explosives, with treatment, means more rapid recovery of hearing, diminution of the subjective symptoms of vertigo, so apt to persist, and subsequent usefulness. In view of these facts, an otologist of experience ought to be available at appropriate centres.
8. Apart from such injuries there were frequently seen cases of deafness or ear disease in which removal to the base was unnecessary—for example, wax in the ear, furunculosis in the canal, or slight serous discharge from old perforations; and cases where delay in treatment involved in transportation to the bases has aggravated the disease and delayed the recovery—for example, acute middle-ear disease. In such cases an otologist ought to be available.

A NOTE ON THE PREVENTION OF PEDICULOSIS.

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THAT, under certain conditions of warfare, the difficulty of keeping the soldier free from pediculosis is a matter of great difficulty, is now too well known to require comment; and the prevention of pediculosis is of importance not only on account of the distress which the condition directly causes, but also by reason of the part it may play in the dissemination of disease.

A method of prophylaxis which I adopted nearly two years ago has perhaps some elements of novelty. Early in 1915 I learnt from officers and men who had taken part in the previous winter campaign that simple cleanliness, however scrupulous, was, under certain conditions, inadequate to prevent infection by pediculi. It appeared clear that some antiparasitic prophylactic was necessary.

The possibility which seemed at first practical and most likely of success was to obtain some solution of a parasiticide substance in a volatile solvent which could be sprayed on those parts of underclothing chiefly haunted by the parasite. While I was investigating a spray for this purpose, Mrs. Arthur Thomson brought me some under-

vests, which were being made by a work party in Oxford for distribution to soldiers, with the query whether they could be dipped, previous to distribution, in some anti-parasitic solution. Those undervests were made of a material called butter-muslin, which is very thin and light and so cheap that I believe the intention was that the garments could be thrown away after being worn once. With such a tenuous material it appeared likely that dipping of the whole garment might be adopted without the use of such a quantity of solution as to render the cost prohibitive for wide use. There are, of course, other drawbacks to dipping the usual types of underwear in solutions of any kind.

From a consideration of such literature as was immediately available to me, the parasiticides which appeared most promising were naphthalene and sulphur, and, after some experiments, I finally adopted a solution of naphthalene and sulphur, 1 per cent. of each, in benzol. This solution, at first intended as a spray, was now used to dip the undervests; though it could still be used as a spray. When the undervests are dipped in this solution and wrung, the benzol, of course, evaporates in a few minutes and leaves the garments impregnated with sulphur and naphthalene in minute particles. I found that undervests so treated did not cause any irritation when worn next the skin, and that they retained the naphthalene and sulphur sufficiently long for practical purposes. By this method those substances not merely are deposited on the surface of the garment, but actually penetrate the fibre.

The cost of such an undervest in the spring of 1915 was about fourpence; and the cost of dipping, when batches of about fifty were done at a time, was about one farthing a garment. Owing to the increase in prices the cost both of the garment and of the dipping has about doubled when the various materials are privately purchased.

Benzol, which was first used, later became unobtainable, and the second grade of petrol was used instead. The latter does not seem to be quite such a good solvent, especially for sulphur; but in either case it is well to allow at least twenty-four hours for solution, the substances being used in fine powder. The solution can be made with sufficient accuracy by using an ounce and a half each of naphthalene and sulphur to one gallon of benzol or petrol. Solution may not be quite complete. The quicker the manipulation the larger the number of garments that can be dipped in a given quantity of solution; and various devices towards such economy will suggest themselves.

Undervests of this material are very comfortable to wear. Owing to their thinness they do not, in cold climates, constitute an undesirable addition to ordinary underwear; and in tropical climates I believe they have been worn alone. Impregnation with sulphur and naphthalene does not give rise to such an objectionable aroma as one might imagine. It would be an obvious advantage, for more complete protection, to have pants made and treated in the same way, and I understand that this is now frequently done.

Since June, 1915, undervests of this material and dipped in this way have been sent out in large numbers to officers and men at the seats of war. Those who received them were requested to return a report as to their value in preventing infection by pediculi. I should have published this note at an earlier date but for the fact that my knowledge was based largely upon hearsay. There was the obvious source of fallacy that men who received the garments as a gift would not perhaps care to send back adverse reports. I am indebted to Mrs. Gorrans not only for taking the actual dipping in hand, but also for her trouble in corresponding with the men who have received the vests. She has now distributed some thousands of these garments. The testimony of officers and men has been so unanimous in favour of the high or complete protection which these vests have afforded against *Pediculus corporis* that I feel that further hesitation in making the method more widely known may be unjustifiable. In any case this note may relieve me of further correspondence on the subject.

I have no personal knowledge of other methods which may be in use for the same object, but from recent evidence I am inclined to think that such as are in use are not entirely successful. Some weeks ago two officers admitted to my wards suffering from trench fever complained of having been infested with pediculi, and incidentally remarked that the only officer who seemed to