infected wounds in Calcutta. It should never be omitted when available, but under war conditions it may often not be at hand when required.

Conclusion.

In view of the experiences recorded in this note the use of strong permanganate solutions, not less than 1 in 500, for irrigating all dust and earth infected wounds appears to me to be well worthy of trial in the field. The crystals are so easily carried, and the solutions so harmless, that this simple plan could be easily carried out at the dressing stations in the case of all wounds in which any sloughing or suppuration has already commenced, or into which dust or earth is likely to have penetrated, with good hope of lessening the number of cases of tetanus, septic and anaerobic bacillary infections.

IODINE AS AN ANTISEPTIC IN JOINT INJURIES.

By A. GASCOIGNE WILDEY,

DEPUTY SURGEON-GENERAL, ROYAL NAVAL HOSPITAL, HASLAR.

THE accompanying case of severe lacerated wound exposing the knee-joint following an aseptic course after treatment by no other antiseptic than iodine is of special interest at the moment when the claims of the more caustic applications are being advocated:

S. McD., aged 30, shipwright, employed in Portsmouth Dockyard, while at work on November 18th, 1914, in the upper part of an ammunition hoist in a battleship under construction, fell with the staging to the bottom of the hoist, a distance of 40 ft., striking his right leg on some angle-iron. He suffered a severe lacerated wound rupturing the ligamentum patellae and the anterior capsule, widely exposing the interior of the knee-joint. He was with difficulty removed from the bottom of the hoist and received first aid in the dockyard. He was admitted to hospital at 11 p.m., about four hours after the accident.

Condition on Admission.

He was suffering from shock and collapse from haemorrhage. The pulse was 120. The interior of the right knee-joint was exposed by a lacerated wound forming a V-shaped flap, the point 5 in. below lower border of patella, the wings extending to either side of the joint. Part of the tubercle of the tibia was torn away and attached to the patellar ligament which was badly damaged. The anterior part of the capsule of the joint was torn through and was ragged. The crucial ligaments were intact. The joint was full of clot and the whole wound begrimed with oily dirt. There had been considerable haemorrhage and a tourniquet was on the limb.

Operation.

An operation was performed immediately under open ether anaesthesia. Intravenous saline was given at the same time. The wound was protected and the skin of the whole limb was shaved and shampooed with ether soap, cleaned with spirit biniodide (1 in 1,000), dried and sprayed with iodine 2 per cent. in alcohol. A very thorough toilet was performed. The edges of the skin wound were pared about $\frac{1}{4}$ in. all round. The gauze protection was removed from the wound, and all clots and dirt washed out of the joint by irrigation with normal saline solution. All badly soiled and damaged tissue, including the greater part of the patellar ligament, was cut away, and the joint thoroughly swilled with iodine solution, a gloved finger puddling the solution into all the synovial pockets. The iodine was immediately washed out with saline and the process repeated. The remains of the patellar ligament were sewn to the remains of the periosteum and deep fascia about the tubercle of the tibia with iodized catgut. The capsule was not completely closed. The skin was sutured with a special form of mattress stitch of silkworm gut. To allow for oozing of serum the extremities of the wound were not completely closed, but artificial drainage was not employed. The closed wound was sprayed with iodine and covered with sterile gauze and cotton-wool, and the limb placed in a back splint with side protection.

Progress.

The subsequent course was that of an aseptic operation on the joint. There was slight rise of temperature for the first forty-eight hours, after which it fell rapidly to normal; there was some slight oozing for the first day. Pain and constitutional disturbance in this case were less than occurred in a case of excision of semilunar cartilage performed on the same day after long preparation and under the strictest aseptic precautions. The wound has been sprayed with iodine daily, and has healed by first intention except at one corner where drainage was allowed. On the fourteenth day after the accident there was no pain, no effusion, and passive movements were commenced. The patient was sitting in a chair with the leg on a back splint.

The routine described above—that is to say, thorough skin toilet, paring of every particle of soiled and badly damaged tissue, swilling with iodine 2 per cent. in alcohol and with saline alternately, closure of the wounds by piling up the skin edges with mattress sutures to ensure complete coaptation, and the avoidance of artificial drainage—has been employed in all cases of lacerated wounds and compound fractures, and wounds of joints treated by me in the naval hospitals of Chatham, Plymouth, and Haslar during a period of four years. No other antiseptic than iodine is used in contact with the wounds. The results have been most gratifying. Sepsis has been extremely rare, and when it has occurred has invariably originated in the skin wound and never in the depths of the wound. The mattress sutures employed reduce the chances of infection by the skin wound. Every effort is made to secure rapid healing of the skin. Every particle of damaged skin is removed, plastic manœuvres being sometimes necessary to secure easy coaptation. A loose stitch or two permits free drainage of serum, and these gaps are closed as soon as possible. It is a great safeguard to spray the wound daily with iodine.

The case here recorded is the severest test to which I have subjected this method of treatment by iodine. If the repair of the ligamentum patellae proves efficient there is every prospect of a perfect functional result. Would such a functional result be likely after an application of pure carbolic?

While recording the almost uniform success of the iodine treatment without drainage in my experience, it is only fair to say that the cases admitted into the naval hospitals have generally received their injuries in ships or dockyard workshops, where they are not likely to be infected by very virulent organisms; also, we receive the patients very shortly after the occurrence of the injuries, and not infrequently iodine has been immediately applied to the wounds on giving first aid.

It will be noted that I have referred to "spraying" iodine. Iodine applied by means of an ordinary continuous bellows spray-producer is a most handy, efficient, and economical method. By this means the expenditure of iodine in this and other naval hospitals has been reduced to one-tenth of the amount formerly used when the solution was applied with swabs and brushes. A spray-producer with hook attachment, by which it can be fastened to the belt or coat, should prove useful for ambulance work in the field.

A SIMPLE FORM OF PORTABLE DRESSING STERILIZER.

By CHARLES W. CATHCART, F.R.C.S.,

SENIOR SURGEON, ROYAL INFIRMARY, EDINBURGH.

As there is much need at the present time for surgical equipment which combines simplicity of construction, and therefore moderate cost, with efficiency I think it right to publish an account of an improved form of the sterilizer for dressings which I introduced a good many years ago. The appliance was originally devised for sterilizing steel instruments with steam without rusting them, and for this purpose I introduced the method of controlling the direction of the current of steam by means of a three-way stopcock inside the sterilizer.¹

This device enabled me to give effect to a suggestion made to me at the time by Professor John Haldane, of Oxford, which was to heat the instruments before the steam came in contact with them and thus avoid condensation of moisture on their surface.

Shortly afterwards, however, the method of boiling instruments in a weak solution of alkali was introduced, and as this was a better method I adopted it for instruments and applied the sterilizer to the sterilizing of dressings.² For this purpose it has proved relatively better adapted than it was for instruments. The control of the direction of the steam by means of the internal stopcock with the pipes leading from it has two advantages—it enables one to finish the dressings practically dry, and it makes it possible with a very simple mechanism to introduce the steam into the inner chamber at the point or points most suitable for rapidly permeating

the dressings. A change recently made in the shape of the sterilizer is dependent on the shape of the simplified "drum," which now takes the form of a cube instead of a cylinder. Other details of improvement are chiefly concerned with the question of portability.

By adopting the cubical form for the "drum" or "kettle" I am able to dispense with the complication of sliding shutters, which were an essential feature of most drums previously used. The cubical box, which now forms the drum, is open at two opposite sides, which, for the sake of distinction, we may call ends; one constitutes the top, the other, provided with a false bottom of open-wire work, forms the bottom. Each of these open ends has a detachable cover, which fits equally well upon the open ends or the closed sides of the cube. During sterilization the covers are placed on the sides of the drum, leaving the top and bottom ends completely free for the current of steam to pass through the dressings. When the steaming is finished the covers are replaced in position, and the drum is lifted about by rings at the side.

The sterilizer, now also made cubical, retains as its essential feature the control of the direction of the current of steam by means of a stopcock which, with the exception of the handle, is enclosed within the outer chamber. The steam generated in the outer chamber, when so directed by the stopcock, is first of all led by means of a pipe from the stopcock into the open air. This allows the dressings to be heated. Afterwards, by a turn of the stopcock, the steam is directed through

Fig. 1.—Sterilizer packed ready to be placed in its wooden travelling case.

another pipe to the floor of the inner chamber where the open bottom of the drum stands. A single opening in the centre has been found sufficient for the present $9\frac{1}{2}$ in. cubical drum, but to allow of even more rapid permeation as well as of enlargement in the size of the drum the steam will be admitted by several openings in future. The present size of drum was made to have the same cubic capacity as the smaller size of cylindrical drum in common use. In rising up through the dressings to escape at the lid above, the steam drives all the air before it, and maintains a through current as long as the surgeon wishes. After sterilization is finished, the steam is again directed into the open air for fifteen or twenty minutes longer, and the lid of the sterilizer is lifted off. This gets rid of most of the steam. During this drying process, and afterwards, the dressings are protected from contamination by being wrapped, previous to sterilization, in a closely-woven fluffy cloth, such as flannelette about 6d. a yard, or by there being at the top and bottom of the drum a large pad of Gamgee tissue between them and the outer air.

Owing to the kindness of Dr. McGowan, of the Royal College of Physicians Laboratory, Edinburgh, who conducted the bacteriological inquiry, I find that sporing cultures of anthrax laid in the centre of the drum filled with dressings are killed after half an hour's steaming.

In working out the details of this improved drum and sterilizer I have received much assistance from Mr. Spence, the manager of Messrs. Stewart and Co.'s tinplate factory, Edinburgh. He has devised a stand on which the sterilizer can be placed when being heated by a Primus stove, and which, when reversed, fits over the top of the sterilizer as a protection when packed for travelling. The stand is bolted together without solder, and therefore cannot be loosened by the action of heat. He has also

invented a simple method of introducing the steam by as many apertures as one wishes through the floor of the sterilizing chamber, and in many other ways has made valuable suggestions.

The sterilizer can be boiled equally well on a gas ring, a kitchen fire, a camp fire in the open air, or a Primus paraffin stove; but for a movable hospital the latter will probably be found the most convenient.

A simple form of water gauge is provided, and consists of an open groove of tin furnished with a handle. A piece of brown paper is slipped into the groove, and when there is any doubt as to the quantity of water in the outer chamber the screw tap is undone, and the tin groove with its brown paper is inserted to the bottom. The discoloration of the brown paper at once shows the level of the water. Marks on the tin groove indicate the number of ounces in the boiler (outer chamber) at the maximum, medium, and minimum levels. The ordinary form of water gauge, which involves a piece of glass tubing, is liable to be broken, and was therefore not employed.

The cubical drum is well suited to nesting. A second slightly smaller drum fits inside the chief drum, and the Primus stove fits inside the inner one. A third drum could be added if required, and it would still be large enough to contain the Primus stove.

Fig. 2.—Sterilizer unpacked, with its contents displayed.

My first patterns were made entirely of tin. Made of this metal they would, with careful treatment, last for several years. With the view, however, of ensuring greater durability the sterilizer itself is now made of copper, while the stand, drums, and other fittings are of tin.

In order to have an independent opinion as to the efficiency of the sterilizer in its present form I sent one to Professor Woodhead. After having tested it and submitted it to Colonel Griffiths, the officer commanding the 1st Eastern General Hospital at Cambridge, he writes as follows: "We consider the sterilizer, with its various improvements, as being a really practical, economical, and efficient sterilizer for surgical dressings and instruments."

It is quite a simple matter to make larger sizes of this sterilizer. One to hold two drums side by side was frequently made when the cylindrical pattern of drum was used. One of these is now being made. The inner chamber will measure $21\frac{1}{2}$ in. long, 11 in. broad, and 11 in. deep. It will hold two cubical drums with $10\frac{1}{2}$ in. sides, and the steam will enter by four apertures beneath each of them. When packed for travelling this sterilizer can hold eight drums, that is, two of each of the following sizes of cube: $10\frac{1}{2}$, $9\frac{1}{2}$, $8\frac{1}{2}$, and $7\frac{1}{2}$ in. respectively, besides two Primus stoves. An advantage of ranging the drums side by side instead of above one another, as is usually done, is that an enlarged heating surface is available for the enlarged boiler.

The accompanying illustrations show the cubical sterilizer (1) when packed for transport, (2) when its contents are taken out and displayed. In the latter case the lower drum is shown closed as it would be after sterilization, while the upper one is shown with its covers fitted on to its sides, and laid on its side to make evident how free a passage is left for the steam during sterilization. The

card of instructions for use is shown in its fitting just below the stopcock.

During the war Messrs. Stewart and Co., 6, Gilmore Place, Edinburgh, are prepared to sell the instrument with fittings at the cost of production. At the present market price of metal the cubical copper sterilizer will, on this basis, cost 28s. 6d., while the tin stand will be 2s. 6d., the drums 3s. each, and the filler and water gauge 6d. each. The Primus stoves are sold at 8s. 9d., and will be sent at that price with the sterilizer, if required. Particulars as to cost and any other information required will be furnished by Messrs. Stewart and Co.

REFERENCES.

¹ *Edinburgh Medical Journal*, 1890. ² *Scottish Medical and Surgical Journal*, October, 1900.

EIGHTY-SECOND ANNUAL MEETING

OF THE

British Medical Association.

Held in Aberdeen on July 29th, 30th, and 31st.

PROCEEDINGS OF SECTIONS.

SECTION OF TROPICAL MEDICINE.

Professor W. J. R. SIMPSON, C.M.G., M.D., President.

DISCUSSION ON
KALA-AZAR OR PARASITIC SPLENOMEGALY
AND ALLIED INFECTIONS.

OPENING PAPER.

By Fleet Surgeon P. W. BASSETT-SMITH, C.B., R.N.,
M.R.C.P.

LEISHMANIASIS, which is the term used to cover all forms of disease dependent etiologically on the presence of the peculiar protozoal organisms known variously as *Leishmania donovani*, *L. infantum*, and *L. tropica*, may be divided clinically into two main groups. First, those in which the diffusion of the parasites is widespread in the body and in which the constitutional symptoms are very severe; and, secondly, those where the parasite causes a very local and superficial infection with practically no constitutional symptoms. I wish chiefly to speak of the former, though the local disease, especially as found in South America, is becoming more and more important.

Geographical Distribution.

The early history of kala-azar, meaning the black disease, as the condition was then called, was mainly centred in a small area in the Gangetic district of India, proceeding in an epidemic form to the foot-hills of the Himalayas, devastating the tea plantations in Assam and the villages in that region. The course of the epidemic has been very fully described by Rogers, and several Governmental Commissions were instituted to determine the cause and prevention. After the cause had been discovered in 1903 by Leishman and Donovan, many cases were found in other parts of India, particularly in the Madras Presidency, where Donovan and Patton have so continuously worked, showing that many of the irregular fevers known previously as non-malarial remittents were really kala-azar.

The extension of the disease eastward, probably through Tibet into China, is now definitely recognized, the most infected region being in the north-eastern part between the Yangtse and Peiho rivers. Cochran has shown the disease to be practically restricted to the north of the Yangtse river in the provinces of Chili, Shantung, Kiangsu, and part of Honan and Hupi. To the west India is linked up with Southern Europe by way of Arabia, Persia, and the Caucasus. Endemic centres appear to be present in Central Africa, Abyssinia, along the Blue Nile, and by the Sudan to Egypt, in which regions it has probably existed a long time.

In 1905 Pianise found *Leishmania* parasites in Southern Italy. Throughout the whole of the Mediterranean area that form of the disease known as infantile kala-azar has been proved to be prevalent—in Tripoli, Tunis, Algeria, the east coast of Spain, Southern Italy, Sicily, Greece,

Southern Russia, Portugal, and Egypt, and in most of the islands, Malta, Crete, etc. Laveran and Nicolle at the International Medical Congress, 1904, in a masterly paper, have described this form most fully.

We thus see that over a wide subtropical and tropical region of the Eastern hemisphere cases are to be found, but, as stated by Laveran, in these endemic zones the amount of sickness due to this cause is very incompletely known, many cases being erroneously diagnosed as malaria and other conditions giving rise to enlargement of the spleen. In the Western hemisphere, one case of the constitutional disease has been reported from Brazil, in a man who had not been out of the country for over twenty years.

Etiology.

The formidable character of the disease, with its high mortality, renders its prevention one of the most important problems of tropical medicine, especially as year by year the number of Europeans affected is steadily increasing. This, in the naval and military services, gives rise to anxiety to those in medical charge of bodies of men in the endemic areas.

From a morphological standpoint there appears to be no distinguishing character which can differentiate the parasite as found in China, India, or the Mediterranean. In man it is mainly an intracellular organism, chiefly affecting the endothelial cells, in which the parasites multiply, as many as 200 being found by Leishman in a single cell. The swollen cell is destroyed, but first tends to block up the lumen of the vessel and thus gives rise to pathological changes in the organ affected; from the ruptured cells some of the free bodies may be carried in the plasma and are found in the peripheral blood, but they are generally taken up by the polynuclear leucocytes, more rarely by the mononuclear cells, and very occasionally found in the eosinophiles. The frequency of their appearance in the peripheral blood appears to vary very greatly in different endemic areas; for instance, in Madras the percentage of positive findings is very high, as demonstrated by Patton and Donovan, but in other parts they can only be demonstrated in the later stages of the disease, their presence then being an indication of serious prognosis. It is, however, probable that with more accurate methods they will be found with greater frequency.

The examination of films is a very laborious procedure, but by cultivation of the blood on suitable media the possibility of showing that the bodies are really present when not detected in films has been demonstrated by Mayer and Werner and by Wenyon.

When studying the etiology, the amount of infection of the peripheral blood must determine the probability of bugs, fleas, and other arthropods acting as carriers of the infection. As shown by Patton, the frequency of the organism in the peripheral blood in the Madras cases points to the conclusion that the infection there is very severe, and that the rôle of the bed-bug (*C. rotundatus*) as a carrier is more likely, especially as he has so frequently demonstrated the flagellate stage of the organism in their intestinal tract. There are no doubt many controlling factors which may influence their doing so, as temperature, moisture, and the number of infected carriers biting a non-immune; also, as Patton has shown, the ingestion of a second feed of blood within a limited time tends to cause the destruction of the growing organism in the gut.

In a recent paper by Rogers and Dodds, the transmission of the disease by a non-flying insect carrier is ably put forward, and the evidence of house infection in Assam is very strong. On the estate of Rangamata, where new coolie lines were provided only a short distance away from the old ones, no case occurred in the 150 healthy coolies transferred to them, yet of the 50 who went on living in the old lines 16 per cent. died and others became quickly infected.

During the last sixteen years in which these preventive measures have been taken they have been uniformly successful. In a labour force of 7,000 workers the disease has been stamped out, where before it had caused a mortality of 207 per thousand.

Whether the bed-bug is the true carrier is not definitely certain, but in this district there appears much in favour of the hypothesis. Many observations have been made with other blood-sucking insects in India, and though