METHOD.

The apparatus used is very simple. The accompanying diagram illustrates it sufficiently well. A glass cannula is introduced into the median basilic vein and is attached to a 20 c.cm. glass syringe by an intervening piece of rubber tubing. One glass cannula is placed in the proximal end of the vein of the recipient and another in the distal end of that of the donor. There should be at hand, if possible, ten syringes. These are all sterilized by heat and are all coated internally with liquid paraffin. This is accomplished by first dipping the plunger of the syringe in the paraffin and then, after attaching the tube and cannula, the paraffin is drawn up

Diagram illustrating the apparatus for transfusion and the method of its employment as described in the text.

through the whole apparatus and expelled. An essential part of the procedure is to prevent any stagnation in the flow through the cannula during the operation. This is accomplished by using normal saline solution as a substitute for blood where a syringe of blood is not available. Thus, for some reason the assistant who is drawing off blood from the donor may encounter some momentary cause of delay; under such conditions the surgeon takes a syringe of normal saline solution, and by slowly pressing the piston of the syringe, keeps a current of fluid moving in the cannula of the recipient until such time as the syringe of blood is available.

The uncoupling of the syringe is always made at its junction with the rubber tubing; pressure on the tubing between thumb and finger is sufficient to control the flow during the process.

A current of blood or normal saline solution is constantly kept up. The amount of normal saline solution thus introduced is negligible, as it is introduced very slowly. Conditions may arise where there is some delay which necessitates the similar use of normal saline solution in the case of the donor. Here, too, the current of flow must be constant. Another point of some importance which one learns by experience is that after about 500 c.cm. have been transfused it is advisable to employ syringes newly coated with paraffin, otherwise there is a tendency to clot. The operation may be carried out very rapidly and, in our experience, without difficulty. One great advantage over any method in which the donor and recipient are buckled together by cannulae is that both individuals are free to move about, and are able to alter their position, or take a drink, etc., without interfering with the operation. Those who have tried both methods will realize the tremendous advantage in this, particularly if the recipient is very ill.

The apparatus we have described is not new. The principle of the syringe and cannula method was first brought to our attention by Captain L. Bruce Robertson, one of our colleagues in Toronto at the Hospital for Sick Children there. He had employed it in a considerable number of instances with most gratifying results in such cases as "haemorrhage in the newly-born," and in haemophilia. Captain Robertson in turn obtained the idea from one of the New York clinics. Unfortunately we are unable to obtain the literature which would enable us to place the credit where it is due.

ITS VALUE IN MILITARY SURGERY.

The advantage of the direct transfusion of human blood in the cases of severe haemorrhage which we encounter in the emergencies of military surgery cannot, to our minds,

be overestimated. In cases of secondary haemorrhage with sloughy wounds it is the ideal treatment, and has great advantages over normal saline solution. We know that the latter diminishes the coagulability of the blood while the former increases it. Further, the transfusion of human blood acts locally upon the wound, and induces healthy reaction there. Lastly, we have reason to believe that all the elements of transfused blood function in the recipient. If such be the case it is undoubtedly the ideal therapeutic measure in haemorrhage, and in cases where there is shock *plus* haemorrhage.

Recent articles show that haemorrhage is one of the main causes of the fatal issue in bullet wounds of the abdomen—most writers indeed placing it as the chief cause of death. If such cases live long enough to reach the operating table their chances of recovery would undoubtedly be vastly improved if transfusion of human blood were undertaken either while the operative procedure were in progress or immediately afterwards. The symptoms due to haemorrhage and shock will be lessened and immediate beneficial results will be obtained.

Our former colleague, Captain L. Bruce Robertson, has successfully demonstrated the value of the treatment in Northern France, where he has employed it in No. 2 Canadian Casualty Clearing Hospital. Unfortunately we cannot give details of his cases, but in private correspondence he asserts that the results obtained have been most gratifying. The apparatus is simple and could well be employed in hospital units near the front. Captain Robertson was prepared to carry it out in a field ambulance unit if necessary.

NOTE.—Since preparing this paper for the press we learn that Captain Robertson has published the details of seven cases successfully treated in France, in an article entitled "The Transfusion of Whole Blood: a Suggestion for its more Frequent Employment in War Surgery," in the BRITISH MEDICAL JOURNAL for July 8th, p. 38.

TRENCH FEVER: THE FIELD VOLE A
POSSIBLE ORIGIN.

BY

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VARIOUS more or less unsatisfactory suggestions have been put forward in explanation of the occurrence of "trench fever" among the troops in the western front. It is the object of this note to suggest still another tentative theory as to the mode of origin of this quite definite condition.

It is now well known that a new disease, to which this name has been applied in default of a better, has appeared among the soldiers in the trenches, and also to a very much lesser extent among the medical personnel of the field ambulances through which the sick are evacuated. New troops occupying an old line of trenches remain healthy for the first four or five days or so, and it is only towards the end of that time—so far as my experience goes—that cases begin to turn up suffering from a fever which, as the experience of the regimental medical officer increases, can be recognized as being of this nature without delaying diagnosis until the temperature curve has been followed over a considerable period.

The question naturally presents itself when a new disease is encountered, Is there any other new condition or association of conditions existing with regard to those attacked by this disease, and, if so, is it possible to correlate it with the presence of the disorder in question? Looked at in this way, it is not difficult to assert that there is such a new condition of biological importance, this being the commensal association (if the term be permissible) with human beings of the long-tailed field vole, or field mouse, as it is commonly called.

The trenches along the western front have for some considerable time swarmed with rats and mice; they haunt the shelters with incredible boldness, while by night they scuffle and squeak in the roofs of the dug-outs, and run freely along the top of the trenches. Rats, as is common knowledge, are the disseminators of plague as well as of the less familiar sokodu, or rat-bite fever (so-called), besides being subject to the bacillus of pseudo-leprosy and acting as the source of trichiniasis by conveying

that infection to the pig, while some years ago the possibility was suggested that they might even act as a reservoir for the virus of rabies. Mice are not generally indicted as disseminators of anything worse than favus. The mice of the trenches, however, are not the ordinary house mice that have always lived in domestic association with humanity, but are mainly field mice of the species particularized zoologically as the long-tailed field vole, a creature which, it is well known, is subject to extensive epizootics of high mortality while living in a state of nature.

These field voles, like certain other creatures—the sub-arctic lemming, the sand grouse of Tibet, the clouded-yellow butterfly, and so on—seem to follow a vague periodic law of irregular waves of excessive multiplication, and on reaching the summit of their wave of increase they fall victims to the action of another vague law, whereby upon the specific population having exceeded a certain (unknown, but no doubt quite definite) figure to unit area, it adjusts itself with great suddenness, owing to the rise and rapid spread of some virulent infection, the progress of which offers many parallels to the incidence and spread of typhoid and other intestinal infections in the past in crowded camps of soldiers unprotected by appropriate inoculation, or in congregations of pilgrims in the East. The infective agents in these sudden epizootics do not all seem to have been traced, but in the case of guinea-pigs, bred in overcrowded hutches, it is probably the paratyphoid bacillus.

In the trenches field voles have been observed (as is only natural) lying dead in considerable numbers as the result of a gas attack, and the stray trench cats doubtless do something towards keeping down their numbers.* There is some reason to believe that weasels are on the increase in the neighbourhood of the trenches, and from a French source I understand that owls have been seen quarrying the ground near the firing line hunting for mice; but any checks on their increase have as yet been only temporary.†

Field mice have been blamed as the source of a disease now extinct, the sweating sickness or *sudor anglicus* of the Middle Ages, of which a small epidemic, however, is said to have broken out in the south-west of France in the early years of the present century; it seems reasonable to suggest, in view of what has gone before, that they may perhaps be the source from which the infection of this new "trench fever" is derived as well.

There are innumerable opportunities for the spread of infection from the rodents in the trenches, apart altogether from dissemination by their parasites. I have made no flea census of either the mice or the rats in the trenches,† but at present fleas give little or no trouble to the troops during their turns in the trenches, though body lice, and to a lesser extent crab-lice, do. The field mice (and the rats), however, run about over their food, get into the men's mess tins at night, and eat their way into the bags of provisions that come up as rations; I have caught a mouse in my own iron ration in its bag. In the food their habits are never of the most sanitary, and even where they do not obviously soil it they nibble here and there where it is not noticed, and rub their bodies over everything as they scramble about. I have even seen the leather lining of the brim of an officer's cap nibbled away by these trench mice (and since writing this they have attacked my own in the same way, and tunneled a hole into my greatcoat as I lay wrapped up in it for warmth at night), and I have heard, at second hand, of a man's ear being bitten during his sleep; they nibble books and magazines, tear letters to shreds, and make their nests with the fragments; I have

* Human beings seem much more easily affected by chlorine gas than are other forms of life. After a German gas attack I have seen larks, swallows, sparrow, and blow-flies in apparently undiminished numbers, while partridges were still present near the trenches. Dead rats lay stinking over the top of the parapets and breeding maggots, but all the rats were not killed, and plenty of field voles survived, being less affected than are the rats.

† The Danysz virus has been used to a certain extent against the rats in the trenches, phosphorus, strychnine, and arsenic are too dangerous to be made use of where there are so many human beings; rattling with dogs or ferrets has many obvious drawbacks, but it is said that powdered squibs seem to offer some prospects of usefulness as a safe poison for trench rats if laid down well mixed with food. Traps and wire snares are comparatively useless; the rodents are too well fed to be tempted by the former; while humanity forbids the use of such means as cork chippings fried in suet, or the mixture of dry pea-flour with plaster of Paris. The buried pitfall for field mice that is said to act well at home—an empty jam-pot or pickle jar sunk into the ground so that its open mouth is flush with the surface, cannot be made use of in the trenches.

† Short-tailed field voles examined in May were infested with ticks.

even caught them running off with latrine paper to furnish their happy homes. The chances of infection by organisms carried by the field voles in the trenches are endless.

It appears safe to predict that if the increase of these rodents, rats and voles alike, is not checked in some way or other, their rate of multiplication during the warm weather will result either in the excess of this four-footed population overflowing the districts adjacent to the line held by our troops and causing considerable damage to the crops as they migrate from what may be described as their "endemic centre"; or else in the development of a sudden epizootic of some virulent disease which will effectually keep down their numbers. In this latter case, if trench fever has anything to do with these creatures, the possibilities of human infection will, of course, be greatly increased.

A CASE OF ULCERATING GRANULOMA SUCCESSFULLY TREATED BY INTRAVENOUS INJECTIONS OF ANTIMONY.

BY

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ULCERATING granuloma, also called ulcerating granuloma of the pudenda, granuloma pudenda, sclerosing granuloma, granuloma venereum or granuloma inguinale, is a disease very rarely seen in England. In some parts of the tropics the condition is, however, far from rare, and causes serious ravages amongst the population. It is very common, for example, in British Guiana, Brazil, and other parts of South America, while it has also been reported from the West Coast of Africa, Australia, India (Madras), South China, and other places.

It is a true venereal disease—for example, is acquired by sexual connexion, but has nothing to do with syphilis or the other usual venereal diseases. The character of the lesions resembles in some ways the type of change seen in lupus or rodent ulcer, and the ulceration most frequently attacks the groins, pubis, and body of the penis in the male, and the labia majora and other parts of the vulva in the female. The glans penis is not so frequently attacked, perhaps, but, as the case to be described shows, does not entirely escape. Once started, the disease slowly progresses and new areas appear.

The lesions are auto-inoculable—for example, from the side of the scrotum to the contiguous thigh, or from one labium majus to the other in the female. The ulceration spreads concentrically, healing or a tendency to healing occurs in the centre, and is accompanied by scarring, resulting in dense fibrous tissue formation. Ultimately the whole of the sexual parts with the perineum and anus become involved, and horrible lesions are produced, which resist most forms of treatment, such as mercury and iodides, local escharotics, and canterization. The only treatment hitherto found in any way effective has been by x rays, which has quite frequently been successful in cases seen in Madras. South American cases, however, have not done so well under its influence, though de Souza Araujo in Brazil reported as recently as 1915 a cure, and at the same time drew attention to the pioneer work of MacLeod and Sequiera in this connexion.

The disease is believed by some to be of protozoal nature; Donovan and Carter in India, Cleland, Strangman, and others in Australia, Wise in British Guiana, and Flu in Surinam, have all seen and described bodies of an apparently identical nature in the lesions. The true nature of these bodies and their zoological affinities are nevertheless still unknown.

The use of antimony in tropical medicine was first suggested by Mesnil and Nicolle for trypanosomiasis in 1906. Plimmer and Thomson followed this up by employing the potassium and sodium tartarate of antimony in rats infected with such parasites. Subcutaneous injections of this drug quickly cleared the parasites from the blood and