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## DEVICES FOR THE DISPOSAL OF WASTE-WATER IN CAMPS,

BY

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THE sanitary requirements of camps of some months, or, perhaps, years' duration, which are, however, not constructed on a permanent basis, have, like many other military matters, become more manifest since the outbreak of war. For temporary field camps, and for permanent ones, a moderate guide as to these requirements can be obtained from the existing handbooks on camp sanitation, but the large number of base camps in existence at the present time make their requirements deserving of more attention than has been their lot to possess in the past. This paper describes the sanitary structural work carried out at a large base camp in France, and may possibly furnish some useful information on this subject. The form of appliances that have been adopted are of a highly successful nature, and are described not because they contain new principles, but rather because they are considered to be the most satisfactory forms of apparatus that can be economically placed in field camps, which, although required for an indefinite period, are supplied with no drainage system. The camps furnished with the sanitary devices described in this paper, are limited in space, and are under the necessity of getting rid of their refuse within their own area. The upper surface consists of about 2 ft. of sand, under this is solid chalk, not readily absorbent. The congestion of these camps renders it most necessary that the ground be kept in as clean a condition as possible. The conduction of waste liquid into underground spaces without the fouling of surface earth is a problem presenting difficulties which I do not think can be appreciated except by those who are familiar with the practice of dealing with such matters.

The subjects can be divided into three sections :—

1. The disposal of excreta.
2. The disposal of kitchen waste.
3. The disposal of ablution water.

### THE DISPOSAL OF EXCRETA.

It is understood that in such camps as are under consideration any form of open trench is impossible. Excreta must be either carted away or burnt. It is almost invariably burnt, along with the general camp rubbish. Various forms of incinerators are in use. The beehive brick-built, or a similar contrivance built by filling empty petrol tins with earth or sand, but in permanent camps the "Horsfal" incinerator is usually adopted. The difficulty of combustion is not very great in any of these, especially if the supply of wood or coal is not too limited. I wish, however, to confine myself to the disposal of waste liquids. The separation of the liquid from the solid excreta, and the disposal of this, and of the contents of urine pails, are operations easy to perform, but not without fouling the ground. When the incinerator is built upon a concrete floor, a hole in this, leading by a pipe into the soakage pit, serves admirably. If, however, no concrete floor is available, a hopper has to be constructed. The simplest form is a shallow square-shaped funnel, of not less than 2 ft. diameter, so that the bucket can be placed inside the hopper before being tipped up for the purpose of pouring off the liquid portion. Another form which has been found satisfactory is, as shown in Plate 1, Fig. 2, and is 2 ft. long by 18 in. wide. The lid is hinged by a couple of stout screws, and serves as a rest to the bucket, so that any drippings flow down into the hopper portion of the contrivance. Such an appliance is kept well tarred. The practice of filling pits with the innumerable burnt tins, which are available in large quantities in most camps, has become very general. The tins are preferably pierced. The top layer

of tins is covered with old cloth or sacking, and about a 9 in. layer of earth forms the upper covering.

#### THE DISPOSAL OF KITCHEN SLOPS.

This problem presents the chief difficulty mentioned in the preceding paragraph. The emptying of dirty water into pits, and at the same time avoiding surface pollution. For a camp in continual use, the short earth trench filled with straw or stubble is not satisfactory. Something of a more lasting nature is advisable. At the same time the objects of the grease trap have to be observed, the removal of grease which is so fatal to the life of a soakage pit, and the removal of solid matter. Moreover,

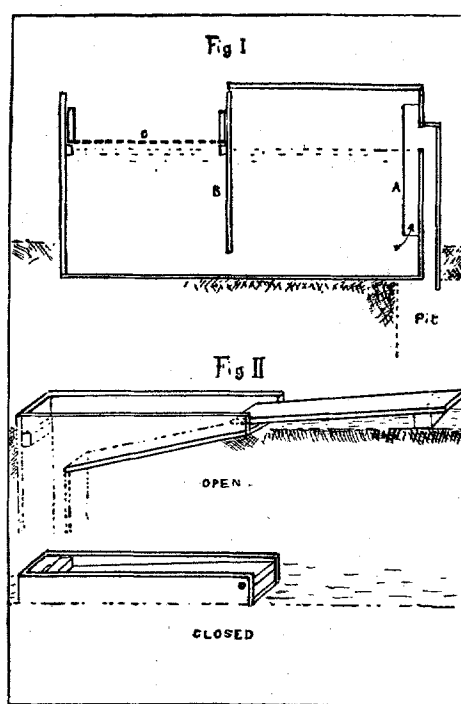


PLATE I.

the inlet to such a trap must be of sufficient a size as to allow of the emptying of large cauldrons of hot greasy water without spilling, and the trap itself of such proportions as to retain and cool large quantities of hot greasy water, and so prevent the melted grease from being swept through into the pit. The difficulty of obtaining a good supply of a combustible filtering medium for such traps, and the difficulty of combining efficiency of filtration with the required permeability, have led me to abandon any further attempts at filtration, and adopt a grease box as shown in Plate I., Fig. 1. This box is about 4 ft. long by 2 ft. wide, and has a depth of about 2 ft. It contains a baffle plate (B) coming to within 6 ins.

of the bottom of the box. In front of the outlet is a piece of bent tin (A), serving as a second baffle. The shape of this is more clearly understood by reference to Plate 2. The contrivance is kept well tarred. A moveable tray (C) serves to retain the coarser solids, but its perforations, unless of fair dimensions, are readily choked up. The sanitary squad is instructed to clear off the grease which collects on the upper surface of both compartments, but more particularly of the first. An operation carried out twice a day. The solid matter collecting at the bottom of this box is removed less frequently. It will be noticed that a considerable quantity of water is retained by such a trap, and that such water serves to cool any hot greasy water thrown into the trap. The box is covered by two lids supplied with handles.

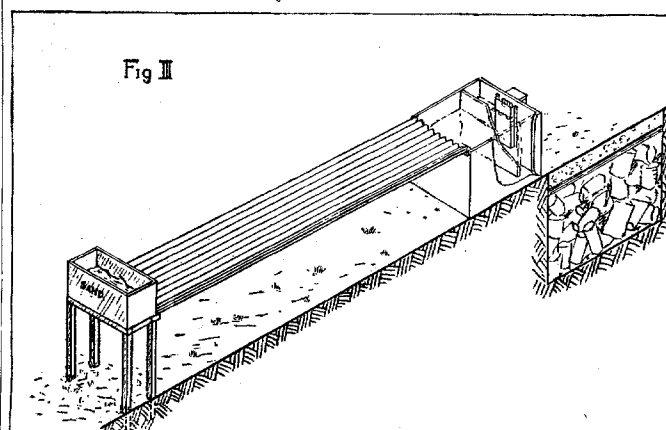


PLATE II.

Another kitchen requisite which it was considered expedient to instal was a table for the cleaning of mess tins and dixies. A handful of sand or clean earth rubbed on a greasy mess-tin will produce a clean polished article quicker than by any other means. The soldier knows this, and to avoid the fouling of the ground, simple forms of tables were constructed by a piece of corrugated iron 10 ft. by 2 ft. 6 in., as shown in Plate 2. Clean sand is placed in a box every morning. A simple form of grease trap on the same principle as the one above described is essential, as grease, tea-leaves, etc., are washed down the table.

#### THE DISPOSAL OF ABLUTION WATER.

This, perhaps, is the most difficult problem in large camps where the water supply is not to any very great extent limited. Partly because of the large quantity of soapy water that may have to be dealt with, and partly

because of the clogging effect which such water has on most soils. Unless one is content to allow ablution water to lie about in open spaces, over 5,000 gallons may have to be got rid of daily. I have preferred to keep this water entirely underground, especially in the summer. Instead of making use of pits, long underground trenches running in the looser upper surface have been much more satisfactory. These trenches are either covered over with odd pieces of wood, or filled with tins and covered with old sacking and a little earth. It is most impracticable to run soapy water into such underground systems without previously removing the scum which settles on the surface

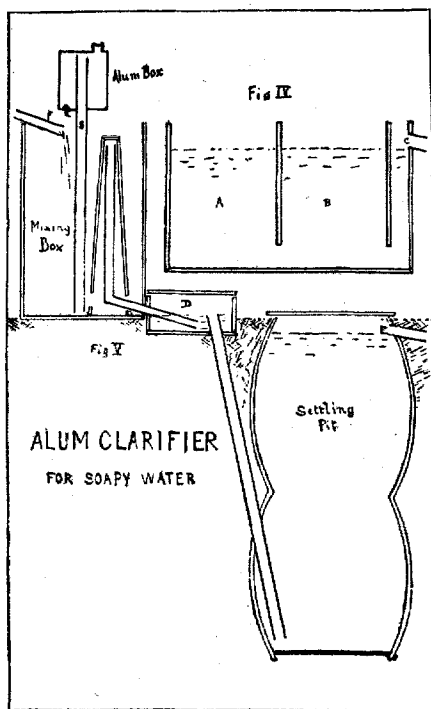


PLATE III.

of hard waters which have been rendered soapy. The result of neglecting this precaution is to considerably reduce the absorbing capacity of such soakage areas. This scum is readily removed by passing the water through a trap not unlike that described above, for dealing with kitchen slops. Such a trap is shown on Plate 3, Fig. 4. The amount of lime soaps daily removed from the surfaces of compartments A and B of this box is often as much as two to three bucketsful. Such a device does not remove the more finely suspended matter of soapy water, nor is such colloidal matter readily removed by filtration. Any attempt at filtration of soapy water are most impracticable without previously

passing the water through some such trap as the one described; for the scum of soapy water has a most clogging effect on any filter. If, however, this preliminary treatment be carried out, filtration through sand or coke is possible, as in this way the water is partially clarified, but, in my opinion, the additional process of filtration is seldom satisfactory or economical. It is fortunately not often necessary. The colloidal nature of such water does not readily lend itself to a clarifying process, unless some precipitant, such as aluminium hydroxide, be introduced. In one case I have installed an alum precipitating process. This was because the ground available for absorption was extremely limited, and a deep well had to be sunk to take the waste water. To avoid the choking of this, it was considered worth while introducing the scheme which is described below. A very much simpler method of adding the alum could have been devised, but an important objective was the economy of the reagent. Preliminary quantitative experiments with samples of soapy water from the ablution troughs indicated that about 10 grains per gallon of alum was the least quantity that could satisfactorily carry down the colloid. The apparatus constructed required some pieces of 2-in. water-piping, otherwise the material employed consisted mainly of easily obtainable articles, such as one or two packing cases and an ordinary petrol can. This process can be readily followed by reference to Plate 3. The water is first of all passed through a trap to remove the scum as previously described. A saturated potash alum solution containing approximately 10 per cent. of the crystalline salt or 5.5 per cent. of the dried salt, is introduced into the square petrol can by its ordinary stopper, which is then screwed down. The diagram shows that this solution cannot get out of the pipe P unless water is passing into the mixing box. In this case, water will rise in the tube S, and, forcing air into the can, will force an equal volume of the solution through the pipe P. When the mixing box is full, it automatically syphons out through a trap D, which serves as a constant level, and ensures the proper working of the syphon. From thence the water passes into a settling pit lined by two large barrels. This acts as a sedimentation tank, and the clear water flows away by the pipe E. It is preferable to fix a baffle plate in front of this outlet to retain a slight scum which collects on the surface water of this puisard.

When the mixing box empties, air is sucked through P equal in volume to that of the fall of water in pipe S. The S-shape of the pipe P is essential, and it should be as short as possible. It will be noted that the mixing box is made of such a size that its capacity is the volume requiring the amount of alum delivered by a length of the pipe S equal to the water depth in the box. It is more easy to make a box suitable to accompany an odd piece of piping than to obtain a pipe of a particular bore. This particular method of delivering an exact amount of alum requires the mechanical filling and emptying of the box, an action most conveniently carried out by means of a syphon. The bell syphon was constructed of wood with an inner iron pipe. The wood is well tarred and preferably coated with pitch. Such a scheme has been working with little attention for some time. A drawback is the clogging of the pipes with soap. They have to be cleaned occasionally with a large test-tube brush mounted on an iron rod or cane.

#### "THE PASSING OF SMALL-POX IN BRITAIN: TO WHAT IS IT DUE?"

DR. MILLARD'S REPLY TO DR. BOUSFIELD.

DR. BOUSFIELD, M.O.H. for Khartoum and Omdurman, does me the honour, in the May issue of PUBLIC HEALTH, of commenting at some length on the paper on small-pox which I read before the Society of Medical Officers of Health, and which was published in PUBLIC HEALTH for February and March.

As Dr. Bousfield rightly points out, the problem of small-pox prevention is very different in such a country as the Soudan from what it is in a highly organized country like Britain. Universal vaccination may be the best available method of combating small-pox there without its following that the same measure is either necessary or desirable here. To take an analogous case: anti-typhoid inoculation may be desirable for all who visit the Soudan, but few, I think, would seriously urge universal anti-typhoid inoculation here at home. The reason for the difference lies in the difference in the risk of exposure to infection.

Dr. Bousfield asks for certain information about Leicester, viz., the proportion of vaccinated and unvaccinated persons attacked in the epidemics of 1903 and 1904. The figures of the two epidemics combined were as follows:

	Cases.	Deaths.
Vaccinated ..	321 ....	5
Unvaccinated ..	390 ....	19
Doubtful ..	4 ....	1
	—	—
Total ..	715 ....	25
	—	—

Dr. Bousfield also suggests that a large proportion of the population of Leicester "had the wisdom to get vaccinated when the epidemic occurred." As a matter of fact, the amount of general vaccination in the Borough during the epidemic was surprisingly small, and can have had very little, if any, effect upon the course of the spread of the disease. In Leicester we do not at all believe in "panic" vaccination, and no efforts whatever were made by the Health Department to secure increased vaccination of the general population. We prefer to concentrate our efforts on the point of infection, *i.e.*, the notified case, and the resulting contacts. Here the maximum advantage is obtained with the minimum of vaccination. Personally, I believe that so long as there is reasonable ground for believing that the disease can be kept under control by administrative action, it is unnecessary and a mistake to try and "scare" the public into a general rush for vaccination. If unnecessary, it is certainly a mistake, because it not only involves considerable expense, but is apt to do great injury to the trade and reputation of the place.

The cost of panic measures is well exemplified in an outbreak of small-pox in the town of Waterburg, U.S.A., as reported in the current issue of PUBLIC HEALTH. In a town of 100,000 inhabitants, 250 cases of the disease recently occurred. The town is a centre of anti-vaccination, and the health authorities, believing strongly in vaccination, appear to have pursued a policy which has involved the town in an expense which, according to the Secretary of the State Board of Health, will, first and last, run into a quarter of a million dollars (£50,000). We may hope that this is an over-estimate, but one cannot help comparing it with the cost of the Leicester epidemic of 1903, when 394 cases occurred, and the total cost was estimated to be £2,241.

Limitations of space prevent me from dealing with the whole of Dr. Bousfield's criticisms, but there is one point that I must deal with. He says: "If, for instance, a mild