Clinical and other Notes.

A NEW CREMATOR LATRINE SYSTEM.
BY CAPTAIN F. HARVEY.
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The disposal of the excreta of any community under conditions in which water carriage is out of the question is an ever fertile source of trouble, difficulty, and danger. Therefore, any new departure which, if successful, would tend to revolutionise all the existing methods must, of necessity, be worth our most careful consideration. I thus make no apology for bringing forward a new scheme which appears practicable, simple, economical, and might, from a hygienic point of view, be considered perfect.

To refer briefly to existing methods, the situation may be summed up under two headings:

(1) Trenches.
(2) Buckets.

With regard to the former, I think everyone of any experience in the matter is now agreed that the short, parallel trench system, which I strongly advocated in 1906 ("Sanitary Notes," JOURNAL OF THE ROYAL ARMY MEDICAL CORPS), has so many advantages over the long, deep system, that the latter need scarcely now be considered at all. Further, I think that in any case the trench system can only be considered as applicable to camp sites of less than one month's duration, and, generally speaking, half that time, and then with certain other special limitations as to soil, site, &c.

Briefly to sum up the advantages of the short trench:

(1) Practically no fouling of the sides.
(2) Less liability to flooding.
(3) The fullest advantage taken of the vital soil layer.
(4) Reduction of flies to a minimum.
(5) The only method for troops on the move.

The disadvantages are:

(1) The large area of ground involved.
(2) The necessity of a daily or bi-daily shift.

With regard to (1) and (2), the "frontage," taking a 7 per cent. basis, is directly proportional to the "x" strength, as a ratio of \( \frac{x}{2} \) by \( x = \) feet (assuming the usual 1 foot width of trench, 3 feet interspace, and 3 feet depth from before backwards). The "depth" is proportional to the number of shifts in a given number of days, the latter representing directly the number of feet; that is, assuming the space between each
trench is utilised, there being two, four, &c., moves every three, six, &c.,
days, which is the average rate of progression, using an 18-inch excavations.
The area of ground required is then easily calculated. (The usual
frames and seats on runners are easily moved.)

For example, 250 men are in occupation for fourteen days. Then
\( \frac{250}{7} \) by 250 by 14 equals the area in square feet (or a rectangle of
70 feet by 14 feet). This allows for ten shifts. In a large camp,
however, of restricted site and prolonged duration, the limitations of this
method are obvious and of necessity one turns to the "bucket" system.

Here, again, we have all the well-known dangers and difficulties,
first and foremost of which I would place our great sanitary enemy,
"the contractor." As before, the only methods that we need consider
are three:

(1) Dry earth.
(2) Wet antiseptic.
(3) Destruction.

The former, as everyone is painfully aware, involves removal by the
contractor and burial on some system or other, usually unsatisfactory
and insanitary, over which we have little real control and which in
tropical stations especially, is often an exceedingly serious question, added
to which are all the usual disadvantages connected with buckets.

Colonel Wardrop (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,
June, 1906) remarks, and I think his opinion of that date must be taken
as voicing the then sanitary opinion of India, under the heading of
"Latrine Infection in the Enteric Fever of India": "Day by day the
fact is being forced upon us in India that our greatest sanitary need is a
more perfect latrine and a better disposal of the night soil."

His conclusions are overwhelmingly in favour of an antiseptic system
instead of dry earth; that is to say, the addition of some liquid antiseptic
directly to the excreta, which are afterwards removed and buried as usual.
Up to then this view appeared to have been gradually gaining ground,
judging from the literature on the subject. But from this date onwards
destruction appears to have gained the front place in our sanitary ideas,
and it is interesting to note that some still hold to the addition of anti­
septics, although destruction is the object in view, which would appear
to be an economic fallacy.

It is under the heading of destruction that I wish to bring forward
a new, universal Cremator Latrine. I suggest that such a system would
take us a distinct step further forward by the use of a "destructible
receptacle," coupled with the most "perfect incinerator" that has yet
been devised.

I assume that we are only considering the necessities of fixed semi-
permanent or camping grounds regularly occupied for definite periods,

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1 In this case fifteen, the nearest multiple of three must be taken, as the trenches
are 8 feet.
and of civil or military communities under Colonial or tropical conditions (especially in India or West Africa), and in places where, as I have said before, water carriage is out of the question.

In talking of a portable destructor I mean a contrivance that is easily transported in the same sense and under the same limitations as the rest of an ordinary camp equipment, and as such would be eminently applicable to the necessities of the Territorial Army in peace, or mobilised, or at the regular training and musketry camps; where there is no reason why we should be ten years behind the times in clinging to our old dry-earth buckets.

To refer to some of the already tried destruction systems, the following may be mentioned:

(1) The (American) Smith Camp Crematory (Munson).—Without discussing this further, one notes that one machine for 200 men weighs about 3 tons. The system is that of a number of hoppers around a central furnace. Camp refuse is dealt with at the same time.

(2) The (American) Bissel Incinerator Wagon (Munson).—For excrement and garbage. This is equally impracticable.

(3) An Improvised Incinerator, described by Lieutenant R. G. F. Tate, R.A.M.C., from Dalhousie (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, May, 1909), in which dry and wet refuse are reduced to a dry ash, and which is portable enough for manoeuvres. It is not stated how the system is worked when dealing with excreta, and with regard to the use of buckets, whether any inflammable material is used instead of dry earth, what amount of excreta that can be dealt with regularly, and whether any offensive odours are present. According to Lieutenant Tate's statements, this destructor, which might be described as of a cradle or bed-cot extensible type, was very successful in dealing with the dry and wet refuse at his station in India.

(4) A Note on the Incineration of Excreta in India, by Captain Safford, R.A.M.C. (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, July, 1909). This appears to be a rectangular brick affair, cheap in construction, producing little smoke, and inoffensive in operation; fuel, however, is a difficulty. One would be placed behind each latrine, and the buckets filled with dry leaves. This, of course, is not a system that could be described as portable or of possible universal adoption, and would be quite inapplicable to our camps at home, as, indeed, would any of the following systems:

(5) McCall Incinerators, mentioned by Lieutenant-Colonel W. G. Macpherson, C.M.G., in an article on the “Panama Canal” (JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, September, 1908). Again there is something of the Smith crematory system; metal plates in latrine boxes, which are heated by a fire placed beneath them. The plates and the great cost of fuel required appear to be serious difficulties. Lieutenant-Colonel Macpherson suggests that combustible
plates of cardboard would be an improvement, and states "they have given great satisfaction and seem to have come to stay." It must be noted that destruction of refuse does not enter into combination with this system.

(6) Lieutenant-Colonel H. A. Haines (The Journal of the Royal Army Medical Corps, January, 1908) describes a cheap destructor of bricks, mud, and some improvised ironwork. He advocates the use of kerosene oil smeared on the insides of the pans, and the addition to the excreta of 4 per cent. carbolic acid and sawdust.

(7) Lieutenant-Colonel W. A. Morris (The Journal of the Royal Army Medical Corps, April, 1909) in an article, "The Treatment of Excreta in India by HgCl₂, and Incineration," uses the same type of incinerator. Firewood and horse litter are used to start the fire, and rubbish is employed to keep it going. This officer advocates kerosene oil for the floors and woodwork of the latrines as a preventative against flies; and the urine is boiled in a boiler enclosed in the incinerator.

(8) Lieutenant-Colonel B. Skinner, M.V.O. (The Journal of the Royal Army Medical Corps, April, 1909), carries out much the same principle, and uses "Fuel, rubbish, dead leaves, sweeping and stable litter for incineration for the complete combustion of excreta and urine." This officer places litter or sweepings and leaves in the latrine pans, and fills the urine receptacles two-thirds full with the same materials.

(9) Lieutenant-Colonel G. Allen (The Journal of the Royal Army Medical Corps, November, 1905) only aims at sterilisation of mixed liquid and solid sewage, which has afterwards to be trenched in as usual, by raising it to "60° C., and maintaining the temperature at this height for thirty minutes." He advocates the use of weak carbolic in the pans as a preventative against flies and odours. Considerable amount of fuel is required, and the machine is really an improvised metal boiling apparatus. This method would appear to be limited to dealing with only comparatively small amounts of sewage.

(10) Lieutenant-Colonel Cree (The Journal of the Royal Army Medical Corps, May, 1907) used a built destructor, in which he found "fireproof bricks a necessity," and wood or coal fuel. Crude kerosene oil was used in the pans with the excreta, and the latter were immediately transferred to a common receptacle by the attendant sweeper, prior to incineration.

To "summarise" the vital points in any system of destruction would appear to be as follows:—

1. The receptacle.
2. The addition to the excreta.
3. The type of incinerator, its efficiency and portability.
4. The cost and facility of operation and the inclusion in the scheme of refuse destruction.

Taking these points in detail:—
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(1) The Receptacle.—The system which I now advocate eliminates altogether the pail or any form of permanent receptacle. The cost of acquiring, maintaining, storing, transporting, and cleansing a large number of pails or pans is altogether done away with. In their place I use under each latrine seat, on a slide or suspended, specially manufactured rectangular boxes of suitable dimensions, or tarred calico bags, the former being set up from flat sheets; either is easily transportable. The space occupied by about a gross and a half of the bags or the flat sheets packed would be something like 4 by 3 by 3 feet (36 cubic feet), or the dimensions of an ordinary fair-sized packing case.

In the case of sheets, if not already waterproofed on one side, they would be brushed over with heavy oil before being set up, the setting up merely involving turning up of the sides and ends, which are held in position by the addition of some very simple, inexpensive rivet, clip, or fastening. The nature of the material used would be a form of rough papier mâché, or other suitable and cheap material, such as compressed and stiffened tarred felting, or woollen shoddy, a cheap trade refuse from Yorkshire, worked up in sheets, tarred and compressed. The cost, taking into consideration large contracts, might be as low as 10s. per gross.

When full the box or bag is removed from under the seat and placed directly inside the incinerator. A wire-basket frame, with the ends and sides that would fall down like a child's bed-cot, would hold the boxes when in position, but would be dispensed with in the case of bags, or if the material were found to be sufficiently strong to stand up (in the box form) for, say, forty-eight hours on the slide without giving way. Wire frames or trays would in any case facilitate handling and removal to the incinerator.

(2) The Addition to the Excreta.—Sawdust, wood shavings or chips, dried leaves, crushed pine needles (as suggested by Major R. J. Blackham, referring to the "Goux System and its Application to India," The Journal of the Royal Army Medical Corps, June, 1906), or peat moss litter in small quantities, would be placed in the bottom of each box, and again sprinkled on, when nearly full, once or twice. In addition, two or more sprinklings daily of some cheap crude oil of the paraffin series would facilitate combustion and keep away flies. The small amount of urine usually passed during evacuation would be easily taken up by the peat moss litter. In any case this would not be a serious difficulty, judging from the usual appearance of the average bucket.

(3) The Type of Incinerator.—No extemporised or locally-made amateur brick or mud incinerators are worth considering for this scheme. The best types undoubtedly are small semi-portable incinerators, manufactured by a certain well-known Destructor Co., who are recognised specialists at this work and have been making destructors for years. They are perfect fume-cremating furnaces, and to burn excreta cheaply and satisfactorily it is absolutely necessary to have the finest possible type of
furnace. These are made in various sizes, are comparatively inexpensive, will last for years with reasonable use, and are as transportable as the rest of the usual camp equipment. Their weight and bulk compare very favourably with the equivalent number of buckets required. Taking the daily dry combustible refuse at about one-third of a ton and the treated and boxed excreta at about one-sixth of a ton for a camp of 1,000 men, two destructors each costing about £6 10s., and weighing about 8 cwt. (or one double the size), would with a careful stoker cremate the whole to a fine ash if worked continuously. The stoker is very important; no casual regimental man told off for the job would do, but a pensioner with experience in stoking, under the orders and paid, if possible, by the medical officer in charge of the sanitary arrangements of the camp, a regimental pioneer, or else a specially interested man of the Royal Army Medical Corps Sanitary Section would be required. I have seen these destructors in operation burning excreta mixed with sawdust, and the results obtained were apparently perfect, a fine ash being produced and the absence of any offence being most remarkable.

CAMP OF 1,000 MEN FOR ONE MONTH.

<table>
<thead>
<tr>
<th>Bucket and Dry Earth System</th>
<th>New Cremator Latrine System</th>
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<tbody>
<tr>
<td>Contractor at usual rates for buckets</td>
<td>No. 4 type (or one No. 3), two destructors, £6 10s. each;</td>
</tr>
<tr>
<td>Ditto for refuse</td>
<td>capital outlay divided over 3 camps in equal increments (without interest)</td>
</tr>
<tr>
<td></td>
<td>£4 6 8</td>
</tr>
<tr>
<td>* Cost of transport of 100 buckets (this includes about 20 for urine), maintenance, and storage.</td>
<td>* Cost of transport of one or two destructors, maintenance, and storage.</td>
</tr>
<tr>
<td>Note.—This does not include the increment of original capital (£15 per cent.) cost of buckets, which would be gradually struck off as worn out and not replaced.</td>
<td>6 bales of peat moss litter at 5s.</td>
</tr>
<tr>
<td></td>
<td>10 gals. of crude paraffin</td>
</tr>
<tr>
<td></td>
<td>6 gross of cremator latrine bags or boxes at 10s. per gross (delivered)</td>
</tr>
<tr>
<td></td>
<td>£12 10 0</td>
</tr>
<tr>
<td>£12 10 0</td>
<td>£12 10 0</td>
</tr>
<tr>
<td>£10 0 0</td>
<td>3 0 0</td>
</tr>
<tr>
<td>100 buckets (this includes about 20 for urine), maintenance, and storage.</td>
<td>9 6 8</td>
</tr>
<tr>
<td>Balance to wire frames or (?) labourer</td>
<td>3 3 4</td>
</tr>
</tbody>
</table>

* Assumed to balance, but probably the destructors would cost less.

(4) The Cost and Facility of Operation.—For facility of operation the incinerators would be placed close to the latrines in the camp. The removal of each box or bag by hand would involve very little time or labour, the removal would be cleanly and easily controlled, and the “contractor would be non-existent.” The cost without experience is difficult to estimate, but taking into account the enormous advantages from a sanitary point of view, the elimination of the contractor question, the economic advantage, the feasibility of the universal adoption of this scheme, and its application to all and any camps where the usual latrine
frames and seats are allowed, whether for trench or bucket system, I think that any slightly increased expense is more than outweighed. It is more probable, however, that a financial saving would be effected in the long run. It must be noted also that the destruction of refuse, which is so extremely desirable, is included.

A comparative estimate might appear something like that on p. 571.

With reference to this estimate, it might be noted that at a camp of about 1000 population lasting three months, such as exists in several places, for example, in the Southern Command at Wool, Wills-worthy, Wedgock Park, &c., the destructor would pay for itself the first year; the second year it would be saving money. This money saved would go towards paying for certain minor accessories not previously thought of, and which would develop with experience, such as a frame with corrugated zinc roofing to stack temporarily the full cremator boxes or bags waiting for their turn to be burned, and to form a shelter for the destructor plant and dry refuse, &c.
It should be noted that I have not, up to the present, attempted to deal with the urine in this scheme. Urine does not turn into dust, and does not breed or attract flies. In any case, if thought expedient, a few drops of crude paraffin oil applied to each tub would form a film on the surface lasting sufficiently long for the discouragement of flies; and some powerful chemical could be added in small quantity also, if it were thought advisable, to kill off possible pathogenic germs. The stone pit or filter system could be used to dispose of the then sterilised urine in bulk, which soon finds its way into the soil, and which as a fluid is easier to deal with than excreta. Any system of attempting to sterilise large volumes of urine by

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An Adaptation of the Authorised Wooden Latrine Frames for Camps.

Note.—The bags (6), when full, are simply detached from the iron hoops (5) under the latrine seats by pinching the toothed spring clips (7). The mouth of each bag is closed, with tarred string (previously looped ready) and then placed directly in the furnace. The boxes (8) would be slid on to a board and placed in the furnace, without further handling. The bags might be made of tarred calico (capacity 1 c. ft.); the boxes of compressed tarred felting or papier-mâché.
heat seems not only impracticable, but is very expensive and seriously complicates the bigger question of incinerating the excreta. The McCall incinerators, however, do deal with this question, by evaporation. I propose to discuss this side of the question in a further note.

A CASE OF PARATYPHOID FEVER FOLLOWED BY INFECTION OF THE KIDNEY BY A PARACOLON BACILLUS.

By Captain D. Harvey, V.H.S.
Royal Army Medical Corps.

Private B., Highland Light Infantry, was admitted to hospital in Darjeeling on September 21st, 1908, suffering from fever. He had arrived in the station from Dum Dum on August 18th, 1908; there were at the time no cases of enteric fever in hospital either at Dum Dum or at Darjeeling.

On admission he stated that he had been unwell for at least ten days previously, that he had been unable to take his food, and had suffered from headache. One of the principal symptoms during the fever was a severe sore throat.

Four days after admission diarrhoea developed, and the patient became collapsed, but there was no hemorrhage from the bowel. He rallied well from this under appropriate treatment, and thereafter his temperature was of a high remittent type, intermitting on two occasions, and finally dropping to normal on the thirty-fourth day of disease, and twenty days after admission to hospital. It is noted that for some time during convalescence his pulse-rate was rapid.

He arrived at the Convalescent Depot, Naini Tal, on December 12th, 1908, looking very fit, and stated that he felt perfectly well. On examination of his urine by the direct plating method he was found to be passing in large numbers a bacillus resembling the Bacillus paratyphosus B, in the appearance of the colonies. These colonies, when closely packed, were small, blue, and transparent, but where they had room to grow out showed a definite greyish-purple centre.

The urine was turbid, and contained a small quantity of albumen; on centrifuging a few pus-cells and blood-cells were seen, and an occasional tube-cast (blood). A count of the urine showed that there were 40,000,000 bacilli per cc. On January 12th, 1909, this man’s serum gave the following agglutination reactions:—

<table>
<thead>
<tr>
<th>Dilutions of serum</th>
<th>1–20</th>
<th>1–40</th>
<th>1–100</th>
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<tbody>
<tr>
<td>Typhoid bacillus</td>
<td>Trace</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Para. A</td>
<td>+</td>
<td>+</td>
<td>±</td>
</tr>
<tr>
<td>Urine bacillus</td>
<td>±</td>
<td>±</td>
<td>Trace</td>
</tr>
<tr>
<td>Para. B</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

The bacillus from the urine gave the following reactions:—

A short, thick bacillus, only feebly motile, non-Gram staining.